

CE1-13, Part I

C101.2, C101.3, C101.3.1 (NEW), C101.3.2 (NEW), C101.4.2, C101.4.3, C101.4.6 (NEW), C101.4.6.1, C101.4.6.2, C101.4.6.3, C101.5, C102, C102.1, C102.1.1, R101.2, R101.3 (IRC N11101.2), R101.3.1 (NEW) (IRC N1101.2.1 (NEW)), R101.3.2 (NEW) (IRC N1101.2.2 (NEW)), R101.4.2, R101.4.3 (IRC N1101.3), R101.4.6 (NEW), R101.4.6.1, R101.4.6.2, R101.4.6.3 (NEW), R101.5 (IRC N1101.5 (NEW)), R102, R102.1, R102.1.1 (IRC N1101.7)

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.2 Scope. This code applies to *commercial buildings and residential buildings*, and the building sites and associated systems and equipment. Commercial buildings shall meet the requirements of the commercial provisions of this code, designated with a prefix "C". Residential buildings shall meet the requirements of the residential provisions of this code, designated with a prefix "R". Provisions without a designation "C" or "R" apply to all buildings.

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. ~~This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective.~~ This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

C101.3.1 Alternate materials, systems, approaches or techniques. This code is intended to provide flexibility to permit the use of innovative materials, systems, approaches or techniques to achieve this objective, provided such alternate proposals are *approved by the code official*.

C101.3.2 Above-code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as «mandatory» in Chapters C4 and R4 shall be met.

~~**C101.4.2 Historic buildings.** Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

C101.4.3 C101.4.2 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. ~~Additions, alterations, renovations or repairs shall not create~~

~~an unsafe or hazardous condition or overload existing building systems.~~ An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,
7. Alterations that replace less than 50 percent of the luminaires in a space less than 5000 square feet, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the ~~bulb~~ lamp and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

~~C101.4.4~~ C101.4.3 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.

~~C101.4.5~~ C101.4.4 Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

~~C101.4.6~~ C101.4.5 Mixed occupancy. Where a building includes both *residential* and *commercial* occupancies, each occupancy shall be separately considered and meet the applicable provisions of IECC—Commercial Provisions or IECC—Residential Provisions.

C101.4.6 Exempt buildings or work. The following buildings or portions thereof shall be exempt from this code:

C101.4.6.1 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, is exempt from this code.

C101.4.6.2 Certain additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs, to the extent that compliance with this code would create an unsafe or hazardous condition or overload existing building systems, and for which there is not a feasible compliant alternative, shall be exempt from this code.

C101.4.6.3 Envelope assemblies of low-energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code, shall be exempt from the *building thermal envelope* provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4. Btu/h /ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.

~~C101.5 Compliance.~~ Residential buildings shall meet the provisions of IECC-Residential Provisions. Commercial buildings shall meet the provisions of IECC-Commercial Provisions.

~~C101.5 Compliance materials.~~ The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

~~C101.5.1 Compliance materials.~~ The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

SECTION C102

ALTERNATE MATERIALS – METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

~~C102.1 General.~~ This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the intent of this code.

~~C102.1.1 Above code programs.~~ The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.

Reason: This proposed change reorganizes Section 101 to provide greater clarity regarding intent and flexibility, applicability and exemptions, and compliance materials, all as part of the Scope and General Requirements section. This will help both the code official and the registered design professional to understand how these important concepts apply.

Cost Impact: The code change proposal will not increase the cost of construction. It clarifies a framework for the energy code and does not affect either design or construction.

C101.2-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: While the proponent's intent was to simplify the administrative provisions, the committee found them to be more complex. It contained many ambiguous terms which would made administration of the code difficult. There was redundancy of the scoping sections introduced by the proposal. Finally, there was no justification for the 5000 square foot threshold introduced into the existing building exceptions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing Self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C101.1 Title. [Text unchanged]

C101.2 Scope. These Commercial Provisions of this code apply ~~This code applies to commercial buildings and the buildings sites and associated systems and equipment.~~

C101.3 Intent. [Text unchanged]

C101.3.1 Alternate materials, systems, approaches or techniques. The use of innovative materials, systems, approaches or techniques is permitted to achieve this objective provided such alternate proposals are approved by the code official.

C101.3.2 Above-code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapter 4 of these commercial provisions shall be met.

C101.4 Applicability. [Unchanged]

C101.4.1 Existing buildings. [Unchanged]

C101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

C101.4.3 C101.4.2 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exceptions: [Text unchanged except as follows]

7. Alterations that replace less than 50 percent of the luminaires in a space less than 5000 square feet, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the ~~bulb~~ lamp and ballast within the existing luminaires in a space less than 1000 square feet, provided that the alteration does not increase the installed interior lighting power.

C101.4.4 C101.4.3 Change in occupancy or use. [Text unchanged]

C101.4.5 C101.4.4 Change in space conditioning. [Text unchanged]

C101.4.6 C101.4.5 Mixed occupancy. [Text unchanged]

C101.4.6 Exempt buildings or work. The following buildings or portions thereof shall be exempt from this code:

C101.4.6.1 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are-is exempt from this code.

C101.4.6.2 Certain additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs, to the extent that compliance with this code would create an unsafe or hazardous condition or overload existing building systems, and for which there is not a feasible compliant alternative as accepted by the code official, shall be exempt from this code.

C101.4.6.3 Envelope assemblies of low-energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code, shall be exempt from the *building thermal envelope* provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4. Btu/h /ft2 (10.7 W/m2) or 1.0 watt/ft2 (10.7 W/m2) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.

C101.5 Compliance materials. Residential buildings shall meet the provisions of IECC Residential Provisions. Commercial buildings shall meet the provisions of IECC Commercial Provisions.

~~C101.5.4 Compliance materials.~~ The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

Delete without substitution:

SECTION C102

ALTERNATE MATERIALS – METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

C102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the intent of this code.

C102.1.1 Above code programs. ~~The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Commenter’s Reason: As Chief Sustainability Officer of the New York City Department of Buildings from 2002-12, and in writing the legislation and administrative provisions for the New York City Energy Conservation Code, I found Chapter 1 of the IECC disorganized, redundant and confusing to interpret. In addition, it did not offer substantive assistance as to how the IECC could or should be administered and enforced. Our mayor vigorously and specifically wanted a strongly enforced energy code. We worked hard to develop a structure which would accommodate both high-rise commercial buildings and single-family homes. The structure in this proposal and in CE35-13 reflects an experienced view of that protocol, and it is offered for other jurisdictions that want good compliance with the IECC.

Specifically, the Intent section should reflect the entire intent of the code. Sections C102 and R102 of the 2012 IECC return to the issue with little added substance to Sections C101.3 and R101.3, and have therefore been folded into the Intent section.

Similarly, the Applicability section should include a paragraph on Exemptions, and within that group the miscellaneous exemptions in Sections C101 and R101; thus, historic buildings, certain alterations and the envelopes of low-energy buildings or additions are brought under a new Exemptions section. And Compliance Materials appropriately becomes its own section.

This proposed modification of the 2012 IECC reorganizes the 2012 sections, but neither adds nor eliminates content. It is improved from the April Code Development proposal in separating out Parts I and II and acknowledging slight differences between them. This modification also differs from the Code Development proposal in that it does NOT address the issue of separation of the residential and commercial administrative provisions from the single set of administrative provisions approved in the 2010 Final Action Hearing – this issue is addressed in a separate public comment

CE1-13, Part I

Final Action: AS AM AMPC_____ D

CE1-13, Part II

C101.2, C101.3, C101.3.1 (NEW), C101.3.2 (NEW), C101.4.2, C101.4.3, C101.4.6 (NEW), C101.4.6.1, C101.4.6.2, C101.4.6.3, C101.5, C102, C102.1, C102.1.1, R101.2, R101.3 (IRC N1101.2), R101.3.1 (NEW) (IRC N1101.2.1 (NEW)), R101.3.2 (NEW) (IRC N1101.2.2 (NEW)), R101.4.2, R101.4.3 (IRC N1101.3), R101.4.6 (NEW), R101.4.6.1, R101.4.6.2, R101.4.6.3 (NEW), R101.5 (IRC N1101.5 (NEW)), R102, R102.1, R102.1.1 (IRC N1101.7)

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.2 Scope. This code applies to *residential buildings* and *commercial buildings* the buildings sites and associated systems and equipment. Commercial buildings shall meet the requirements of the commercial provisions of this code, designated with a prefix "C". Residential buildings shall meet the requirements of the residential provisions of this code, designated with a prefix "R". Provisions without a designation "C" or "R" apply to all buildings.

R101.3 (N1101.2) Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. ~~This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective.~~ This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

R101.3.1 (N1101.2.1) Alternate materials, systems, approaches or techniques. This code is intended to provide flexibility to permit the use of innovative materials, systems, approaches or techniques to achieve this objective, provided such alternate proposals are approved by the code official.

R101.3.2 (N1101.2.2) Above-code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as «mandatory» in Chapters C4 and R4 shall be met.

~~**R101.4.2 Historic buildings.** Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

R101.4.3 (N1101.3) R101.4.2 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. ~~Additions, alterations, renovations or repairs~~

~~shall not create an unsafe or hazardous condition or overload existing building systems.~~ An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,
7. Alterations that replace less than 50 percent of the luminaires in a space less than 5000 square feet, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the ~~bulb~~ lamp and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

R101.4.4 R101.4.3 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.

R101.4.5 (N1101.4) R101.4.4 Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

R101.4.6 R101.4.5 Mixed occupancy. Where a building includes both *residential* and *commercial* occupancies, each occupancy shall be separately considered and meet the applicable provisions of IECC—Commercial Provisions or IECC—Residential Provisions.

R101.4.6 Exempt buildings or work. The following buildings or portions thereof shall be exempt from this code:

R101.4.6.1 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, is exempt from this code.

R101.4.6.2 Certain additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs, to the extent that compliance with this code would create an unsafe or hazardous condition or overload existing building systems, and for which there is not a feasible compliant alternative, shall be exempt from this code.

R101.4.6.3 Envelope assemblies of low-energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code, shall be exempt from the *building thermal envelope* provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4. Btu/h /ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.

R101.5 Compliance. Residential buildings shall meet the provisions of IECC-Residential Provisions. Commercial buildings shall meet the provisions of IECC-Commercial Provisions.

R101.5 (N1101.5) Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

~~**R101.5.1 (N1101.5) Compliance materials.** The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.~~

SECTION R102

~~ALTERNATE MATERIALS – METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS~~

~~**R102.1 General.** This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the intent of this code.~~

~~**R102.1.1 (N1101.7) Above code programs.** The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Reason: This proposed change reorganizes Section 101 to provide greater clarity regarding intent and flexibility, applicability and exemptions, and compliance materials, all as part of the Scope and General Requirements section. This will help both the code official and the registered design professional to understand how these important concepts apply.

Cost Impact: The code change proposal will not increase the cost of construction. It clarifies a framework for the energy code and does not affect either design or construction.

C101.2-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposal contains some technical flaws, particularly in the text related to above code programs.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment 1:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

R101.1 Title. [Text unchanged]

R101.2 Scope. These Residential Provisions of this code apply ~~This code applies to residential buildings~~ and the buildings sites and associated systems and equipment.

R101.3 Intent. [Text unchanged]

R101.3.1 Alternate materials, systems, approaches or techniques. The use of innovative materials, systems, approaches or techniques is permitted to achieve this objective provided such alternate proposals are approved by the code official.

R101.3.2 Above-code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapter 4 of these residential provisions shall be met.

R101.4 Applicability. [Unchanged]

R101.4.1 Existing buildings. [Unchanged]

R101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

R101.4.3 R101.4.2 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: [Text unchanged except as follows]

7. Alterations that replace less than 50 percent of the luminaires in a space less than 5000 square feet, provided that such alterations do not increase the installed interior lighting power.

8. Alterations that replace only the ~~bulb-lamp~~ and ballast within the existing luminaires in a space less than 1000 square feet, provided that the alteration does not increase the installed interior lighting power.

R101.4.4 R101.4.3 Change in occupancy or use. [Text unchanged]

R101.4.5 R101.4.4 Change in space conditioning. [Text unchanged]

R101.4.6 R104.4.5 Mixed occupancy. [Text unchanged]

R101.4.6 Exempt buildings or work. The following buildings or portions thereof shall be exempt from this code:

R101.4.6.1 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are-is exempt from this code.

R101.4.6.2 Certain additions, alterations, renovations or repairs. ~~Additions, alterations, renovations or repairs, to the extent that compliance with this code would create an unsafe or hazardous condition or overload existing building systems, and for which there is not a feasible compliant alternative as accepted by the code official, shall be exempt from this code.~~

R101.4.6.3 Envelope assemblies of low-energy buildings. ~~The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code, shall be exempt from the *building thermal envelope* provisions of this code:~~

- ~~1. Those with a peak design rate of energy usage less than 3.4. Btu/h /ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.~~
- ~~2. Those that do not contain *conditioned space*.~~

R101.5 Compliance materials. ~~Residential buildings shall meet the provisions of IECC-Residential Provisions. Commercial buildings shall meet the provisions of IECC-Commercial Provisions.~~

C101.5.1 Compliance materials. ~~The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.~~

SECTION R102

ALTERNATE MATERIALS – METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

R102.1 General. ~~This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the intent of this code.~~

~~— **R102.1.1 Above code programs.** The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Commenter’s Reason: As Chief Sustainability Officer of the New York City Department of Buildings from 2002-12, and in writing the legislation and administrative provisions for the New York City Energy Conservation Code, I found Chapter 1 of the IECC disorganized, redundant and confusing to interpret. In addition, it did not offer substantive assistance as to how the IECC could or should be administered and enforced. Our mayor vigorously and specifically wanted a strongly enforced energy code. We worked hard to develop a structure which would accommodate both high-rise commercial buildings and single-family homes. The structure in this proposal and in CE35-13 reflects an experienced view of that protocol, and it is offered for other jurisdictions that want good compliance with the IECC.

Specifically, the Intent section should reflect the entire intent of the code. Sections C102 and R102 of the 2012 IECC return to the issue with little added substance to Sections C101.3 and R101.3, and have therefore been folded into the Intent section. Similarly, the Applicability section should include a paragraph on Exemptions, and within that group the miscellaneous exemptions in Sections C101 and R101; thus, historic buildings, certain alterations and the envelopes of low-energy buildings or additions are brought under a new Exemptions section. And Compliance Materials appropriately becomes its own section.

This proposed modification of the 2012 IECC reorganizes the 2012 sections, but neither adds nor eliminates content. It is improved from the April Code Development proposal in separating out Parts I and II and acknowledging slight differences between them. This modification also differs from the Code Development proposal in that it does NOT address the issue of separation of the residential and commercial administrative provisions from the single set of administrative provisions approved in the 2010 Final Action Hearing – this issue is addressed in a separate public comment.

Public Comment 2:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

R101.2 Scope. This code applies to *residential buildings* and the buildings sites and associated systems and equipment. Chapter 1 of these residential provisions shall incorporate Chapter 1 of the commercial provisions by reference, changing all references to “commercial buildings” to “residential buildings,” unless the referenced commercial provisions are amended herein.

Delete without substitution:

~~**R101.3 Intent.** This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.~~

R101.4 Applicability. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

R101.4.1 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

R101.4.2 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.

R101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed;
7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the alteration does not increase the installed interior lighting power.

R101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

R101.4.5 Change in space conditioning. Any nonconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this code.

R101.4.6 Mixed occupancy. Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions of the IECC—Commercial and Residential Provisions.

R101.5 Compliance. Residential buildings shall meet the provisions of IECC—Residential Provisions. Commercial buildings shall meet the provisions of IECC—Commercial Provisions.

R101.5.1 Compliance materials. The code official shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

R101.5.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this code shall be exempt from the building thermal envelope provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h-ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain conditioned space.

SECTION R102 ALTERNATE MATERIALS—METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

R102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code.

R102.1.1 Above code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an

energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapter 4 shall be met.

PART 2—ADMINISTRATION AND ENFORCEMENT
SECTION R103
CONSTRUCTION DOCUMENTS

R103.1 General. Construction documents and other supporting data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

R103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their *R*-values; fenestration *U*-factors and SHGCs; area-weighted *U*-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing; duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details.

R103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

R103.3.1 Approval of construction documents. When the *code official* issues a permit where construction documents are required, the construction documents shall be endorsed in writing and stamped "Reviewed for Code Compliance." Such *approved* construction documents shall not be changed, modified or altered without authorization from the *code official*. Work shall be done in accordance with the *approved* construction documents.

One set of construction documents so reviewed shall be retained by the *code official*. The other set shall be returned to the applicant, kept at the site of work and shall be open to inspection by the *code official* or a duly authorized representative.

R103.3.2 Previous approvals. This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

R103.3.3 Phased approval. The *code official* shall have the authority to issue a permit for the construction of part of an energy conservation system before the construction documents for the entire system have been submitted or *approved*, provided adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted.

R103.4 Amended construction documents. Changes made during construction that are not in compliance with the *approved* construction documents shall be resubmitted for approval as an amended set of construction documents.

R103.5 Retention of construction documents. One set of *approved* construction documents shall be retained by the *code official* for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.

SECTION R104
INSPECTIONS

R104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official*.

R104.2 Required approvals. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.

R104.3 Final inspection. The building shall have a final inspection and not be occupied until *approved*.

R104.4 Reinspection. A building shall be reinspected when determined necessary by the *code official*.

R104.5 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

R104.6 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

R104.7 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

R104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

R104.8.1 Revocation. The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

SECTION R105

VALIDITY

R105.1 General. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

SECTION R106

REFERENCED STANDARDS

R106.1 Referenced codes and standards. The codes and standards referenced in this code shall be those listed in Chapter 5, and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections R106.1.1 and R106.1.2.

R106.1.1 Conflicts. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

R106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

R106.2 Conflicting requirements. Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.

R106.3 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

R106.4 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

SECTION R107

FEES

R107.1 Fees. A permit shall not be issued until the fees prescribed in Section R107.2 have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

R107.2 Schedule of permit fees. A fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

R107.3 Work commencing before permit issuance. Any person who commences any work before obtaining the necessary permits shall be subject to an additional fee established by the *code official*, which shall be in addition to the required permit fees.

R107.4 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

R107.5 Refunds. The *code official* is authorized to establish a refund policy.

SECTION R108

STOP WORK ORDER

R108.1 Authority. Whenever the *code official* finds any work regulated by this code being performed in a manner either contrary to the provisions of this code or dangerous or unsafe, the *code official* is authorized to issue a stop work order.

R108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property involved, or to the owner's agent, or to the person doing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order, and the conditions under which the cited work will be permitted to resume.

~~**R108.3 Emergencies.** Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.~~

~~**R108.4 Failure to comply.** Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.~~

**SECTION R109
BOARD OF APPEALS**

~~**R109.1 General.** In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The *code official* shall be an ex officio member of said board but shall have no vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.~~

~~**R109.2 Limitations on authority.** An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The board shall have no authority to waive requirements of this code.~~

~~**R109.3 Qualifications.** The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.~~

Commenter's Reason: As Chief Sustainability Officer of the New York City Department of Buildings from 2002-12, and having written the legislation and administrative provisions for the New York City Energy Conservation Code, I believe having two different sets of administrative provisions, where both commercial and residential applications are significant in number, is cumbersome to use, in practice – particularly as they diverge over several cycles, in volume, in cost; and they result in a waste of paper throughout the publication and printing of this code. In order to acknowledge where the smaller scale of residential homes may benefit from some adjustment in language or procedure, I propose highlighting this in the specific section, but making it clear also where residential and commercial codes are identical. If, farther down the line, code officials find due to many significant differences that they prefer to have actually two different chapters, then that split can occur at that time. But in the end, administrative and enforcement procedures are simpler if they are consistent for residential and commercial buildings – this applies for both practitioners and code officials.

CE1-13, Part II

Final Action: AS AM AMPC _____ D

CE2-13, Part I
C101.3, R101.3 (N1101.2)

Proposed Change as Submitted

Proponent: William W Stewart, FAIA, PE, representing self (codedoc@sbcglobal.net)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the ~~effective~~ use and conservation of energy over the ~~useful~~ life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: The deleted words are subjective and add nothing to the code. The “effective” use of energy is neither definable or enforceable. What is effective to some is not effective to others. No where in the code is the “useful” life of a building defined and it depends of the needs of the occupant. Is a building designed with cutting edge technology no longer useful when a higher level if technology is applied to newer buildings? Additionally, a remodeled building could have a longer “useful” life than anticipated by the original owner. As revised, the code would be understandable and enforceable.

Cost Impact: The code change will not increase the cost of construction.

C101.3-CE-STEWART.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: The proposal removes subjective terms from the code that do not provide guidance in use and application of the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing Energy Efficient Codes Coalition, Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Commenter's Reason: We recommend approval of CE2 Part I, as modified by this public comment. We do not object to removal of the word "useful" as set forth in the original proposal, but we do object to removal of the word "effective." The term "effective use of energy" has been part of every edition of this energy code since (at least) the 1992 Model Energy Code, without causing any problems. It does not make sense to simply reference the "use and conservation of energy" without clarifying that the purpose of the code is to regulate the effective use of energy through design and construction.

CE2-13, Part I

Final Action: AS AM AMPC_____ D

CE2-13, Part II
C101.3, R101.3 (N1101.2)

Proposed Change as Submitted

Proponent: William W Stewart, FAIA, PE, representing self (codedoc@sbcglobal.net)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.3 (N1101.2) Intent. This code shall regulate the design and construction of buildings for the ~~effective~~ use and conservation of energy over the ~~useful~~ life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Reason: The deleted words are subjective and add nothing to the code. The “effective” use of energy is neither definable or enforceable. What is effective to some is not effective to others. No where in the code is the “useful” life of a building defined and it depends of the needs of the occupant. Is a building designed with cutting edge technology no longer useful when a higher level if technology is applied to newer buildings? Additionally, a remodeled building could have a longer “useful” life than anticipated by the original owner. As revised, the code would be understandable and enforceable.

Cost Impact: The code change will not increase the cost of construction.

C101.3-CE-STEWART.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: The proposal appropriately removes a subjective term.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R101.3 (N1101.2) Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Commenter's Reason: We recommend approval of CE2 Part II, as modified by this public comment. We do not object to removal of the word "useful" as set forth in the original proposal, but we do object to removal of the word "effective." The term "effective use of energy" has been part of every edition of this energy code since (at least) the 1992 Model Energy Code, without causing any problems. It does not make sense to simply reference the "use and conservation of energy" without clarifying that the purpose of the code is to regulate the effective use of energy through design and construction.

CE2-13, Part II

Final Action: AS AM AMPC ____ D

CE4-13, Part I

C101.4.1 through C101.4.5, C202, C401.2.1, Chapter 5 (CE) (NEW), R101.4, R202 (IRC N1101.9); R402.3.6 (IRC N1102.3.6), Chapter 5 (RE) (NEW) (IRC N1106 (NEW))

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC – COMMERCIAL PROVISIONS

Delete without substitution as follows:

C101.4.1 Existing buildings. ~~Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.~~

C101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

C101.4.3 Additions, alterations, renovations or repairs. ~~Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.~~

Exception: The following need not comply provided the energy use of the building is not increased:

- ~~1. Storm windows installed over existing fenestration.~~
- ~~2. Glass only replacements in an existing sash and frame.~~
- ~~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.~~
- ~~5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.~~
- ~~6. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed,~~
- ~~7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.~~
- ~~8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the alteration does not increase the installed interior lighting power.~~

~~**C101.4.4 Change in occupancy or use.** Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.~~

~~**C101.4.5 Change in space conditioning.** Any nonconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this code.~~

~~Delete without substitution as follows:~~

~~**C401.2.1 Application to existing buildings.** Additions, alterations and repairs to existing buildings shall comply with one of the following:~~

- ~~1. Sections C402, C403, C404 and C405; or~~
- ~~2. ANSI/ASHRAE/IESNA 90.1.~~

Add new text as follows:

CHAPTER 5 CE EXISTING BUILDINGS

SECTION C501 GENERAL

C501.1 Scope. The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing buildings and structures.

C501.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

C501.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or and systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

C501.4 Compliance. Alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for alterations, repairs, additions and changes of occupancy or relocation, respectively, in the International Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code and NFPA 70.

C501.5 New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

C501.6 Historic buildings. Historic buildings are exempt from this code.

SECTION C502 ADDITIONS

C502.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion of the

existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Additions complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

SECTION C503 **ALTERATIONS**

C503.1 General Alterations to any building or structure shall comply with the requirements of the code for new construction. Alterations shall be such that the existing building or structure is no less conforming with 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 they 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.

Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

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

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

C503.2 Change in space conditioning. Any nonconditioned or low energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

SECTION C504 **REPAIRS**

C504.1 General. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C501.3 and this section. Work on nondamaged components that is necessary for the required *repair* of damaged components shall be considered part of the *repair* and shall not be subject to the requirements for *alterations* in this chapter. Routine maintenance required by Section C501.3, ordinary repairs exempt from *permit*, and abatement of wear due to normal service conditions shall not be subject to the requirements for *repairs* in this section.

Where a building was constructed to comply with ANSI/ASHRAE/IESNA 90.1. repairs shall comply with the standard and need not comply with Sections C402, C403, C404 and C405.

C504.2 Application. For the purposes of this code, the following shall be considered repairs.

1. Glass only replacements in an existing sash and frame.
2. Roof repairs where neither the sheathing nor the insulation is exposed.
3. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided however that an existing vestibule that separates a conditioned space from the exterior shall not be removed.

4. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION C505
CHANGE OF OCCUPANCY OR USE

C505.1 General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or C405.5.2 (2) to another use in Table C405.5.2(1) or C405.5.2 (2), the installed lighting wattage shall comply with Section C405.5.

Add new definitions as follows:

HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

Reason: (PART I) This proposal was submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The primary purpose of this proposal is to move the regulation of existing buildings under the IECC out of Chapter 1 and into its own Chapter. Chapter 1 should be reserved for administrative provisions of the code and not the technical standards applicable to renovating or expanding existing buildings. For the Commercial IECC there are additional provisions for existing buildings found in Section C401.2.1. Therefore the primary purpose is editorial. But the purpose is also forward looking. The vast majority of our building stock is existing. If more energy savings is to be found, a significant route is the upgrade of existing buildings. This change anticipates a growth in detail of such provisions, and the SEHPCAC feels that having a distinct existing buildings chapter will better accommodate the growth of such standards.

The committee used the general format of Chapter 34 of the IBC. It compared existing language in the IBC with that in the IECC and either chose language from one code or the other, or occasionally melded the two codes. The following table lists for each new section the source of the text.

Proposed Chapter Sections	Source code and Section
C501.1 Scope	IBC 3401.1
C501.2 Existing Buildings	IECC C101.4.1
C501.3 Maintenance	IBC 3401.2
C501.4 Compliance	IBC 3401.3
C501.5 New and replacement materials	IBC 3401.4
C501.6 Historic buildings	IECC C101.4.2
C502, Additions	IECC C101.4.3
C502.1 General	
C502.1 – General exception	IECC C401.2.1
C503 Alterations	IBC 3404.1 and IECC
C503.1 General	CC101.4.3
C503.2 Change in space conditioning	IECC 101.4.5
C504 Repairs	IBC 3405.1
C504.1 General	IECC C101.4.3
C504.2 Application	IECC C101.4.3
C505 Change of Occupancy or Use	IECC C101.4.4
C505.1 General	

The proposal does simplify the language of the historic building section to a simple exemption, but at the same time proposes a definition Historic Buildings to be added to the IECC. Most of the current text of Section C101.4.2 is actually definition. The Committee noted that there is a difference between the definitions of historic buildings in the IBC versus the IECC. It chose the IBC version, for consistency with the lead code. The IRC does not define historic buildings. Another substantive change – or perhaps clarification is regarding a potential of a low energy space becoming a fully conditioned space. The current text of the IECC does not address such a conversion. This proposal treats such changes the same as that of creating a conditioned space from a non-conditioned space.

Section C101.4.3 includes a list of 8 actions which are exempt from compliance with the code. Since C101.4.3 addresses all three actions (additions, alterations and repairs) it is unclear where the 8 exceptions applies. The Committee reviewed each and felt that 4 belonged in the alteration section and 4 in the repairs section.

Finally the provisions currently found in Section 401.2.1 allowing the use of ASHRAE 90.1 is translated into an alternate compliance path. for additions in Section C502. The assumption is that the design of an addition can comply with the IECC or the ASHRAE 90.1 regardless of the requirements applied to the original building. For Alterations a similar exception is provided allowing use of either IECC or ASHRAE 90.1. These are simply shown as text allowing alternate compliance and not exception. The term exception implies a lesser standard; ASHRAE 90.1 should not be viewed as a lesser standard. However for repairs, the proposal only allows use of ASHRAE 90.1 for repairs if the original design was per ASHRAE 90.1.

Cost Impact: The code change proposal will not increase the cost of construction. The proposal is an editorial relocation of existing text. There will be no impact on the cost of construction.

CHAPTER 5 (NEW)-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Modified

Modify the proposal as follows:

REPAIR. The reconstruction or renewal of any part of an existing building ~~for the purpose of its maintenance.~~

(Portions of the code change not shown remain unchanged.)

Committee Reason: The proposal makes the existing building provisions of the IECC easier to use. It provides a future platform for other existing building provisions by allowing them to be in one place in the code rather than scattered in multiple locations. There was discussion that proposed Section C501.3 Maintenance did not belong in the IECC based on a lack of specific existing text requiring maintenance. The Committee modified the definition of repair because it felt the added text was not needed because it was simply adding a reason for 'repair'.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Maureen Traxler, City of Seattle Department of Planning & Development, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C501.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or and systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's ~~designated~~ authorized agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

(Portions of code change proposal not shown remain unchanged)

Commenter's Reason: This modification makes these 2 sections of the IECC consistent with ADM22-13, all 5 parts of which were approved as submitted at the Committee Action Hearings. ADM22 consistently replaced "designated agent" with "authorized agent" throughout the International Codes.

Public Comment 2:

Maureen Traxler, City of Seattle Department of Planning & Development, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

(Portions of code change proposal not shown remain unchanged)

Commenter's Reason: This modification makes the IECC-Commercial language identical to the definition of "repair" approved for almost all the codes in ADM60-13. (The proposal was disapproved by the ISPSC Committee; a public comment is submitted asking for approval.) Part IV of ADM60 revised the definition in the residential portion of the IECC so without this modification, the definition will be different in IECC-Commercial as compared to IECC-Residential.

As approved by the IECC-CE Committee, a "repair" is indistinguishable from an alteration. Alteration is defined in part as "Any construction or renovation to an existing structure..." How would a code official or building owner distinguish "construction or renovation" which is alteration, from "reconstruction" which is repair? The purpose of the proposed work is the only way to make a reasonable distinction between alteration and repair. The pertinent code provisions support this conclusion. Other parts of CE4 create a separate section for repairs, Section C504, which states "Work on nondamaged components that is necessary for the required *repair* of damaged components..." Note that repair of damage is explicitly included in this provision.

CE4-13, Part I

Final Action: AS AM AMPC_____ D

CE4-13, Part II

C101.4.1 through C101.4.5, C202, C401.2.1, Chapter 5 (CE) (NEW), R101.4, R202 (IRC N1101.9); R402.3.6 (IRC N1102.3.6), Chapter 5 (RE) (NEW) (IRC N1106 (NEW))

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC – RESIDENTIAL PROVISIONS

Revise as follows:

R101.4 Applicability. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

R101.4.1 Existing buildings. ~~Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.~~

R101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.~~

R101.4.3 (N1101.3) Additions, alterations, renovations or repairs. ~~Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.~~

Exception: ~~The following need not comply provided the energy use of the building is not increased:~~

- ~~1. Storm windows installed over existing fenestration.~~
- ~~2. Glass only replacements in an existing sash and frame.~~
- ~~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.~~
- ~~5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.~~

6. ~~Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,~~
7. ~~Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.~~
8. ~~Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.~~

R101.4.4 Change in occupancy or use. ~~Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.~~

R101.4.5 (N1101.4) Change in space conditioning. ~~Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.~~

R101.4.6 R101.4.1 Mixed occupancy. Where a building includes both *residential* and *commercial* occupancies, each occupancy shall be separately considered and meet the applicable provisions of the IECC—Commercial and Residential Provisions.

Delete without substitution as follows:

R402.3.6 (N1102.3.6) Replacement fenestration. ~~Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table R402.1.1.~~

Add new text as follows:

CHAPTER 5 (RE) **EXISTING BUILDINGS**

SECTION R501 (N1106) **GENERAL**

R501.1 (N1106.1) Scope. The provisions of this chapter shall control the *alteration, repair, addition and change of occupancy of existing buildings and structures.*

R501.2 (N1106.2) Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

R501.3 (N1106.3) Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or and systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

R501.4 (N1106.4) Compliance. *Alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alterations, repairs, additions and changes of occupancy or relocation, respectively, in the International Residential Code, International Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code and NFPA 70.**

R501.5 (N1106.5) New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided no hazard to life, health or property is created. Hazardous materials

shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

R501.6 (N1106.6) Historic buildings. *Historic buildings* are exempt from this code.

SECTION R502 (N1107) **ADDITIONS**

R502.1 (N1107.1) General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

SECTION R503 (N1108) **ALTERATIONS**

R503.1 (N1108.1) Alterations. Alterations to any building or structure shall comply with the requirements of the code for new construction. Alterations shall be such that the existing building or structure is no less conforming with 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 they 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 the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

R503.2 (N1108.2) Change in space conditioning. Any nonconditioned or low energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

R503.3. (N1108.3) Replacement fenestration . Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table R402.1.1.

SECTION R504 (N1109) **REPAIRS**

R504.1 (N1109.1) General. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C501.3 and this section. Work on nondamaged components that is necessary for the required *repair* of damaged components shall be considered part of the *repair* and shall not be subject to the requirements for *alterations* in this chapter. Routine maintenance required by Section C501.3, ordinary repairs exempt from *permit*, and abatement of wear due to normal service conditions shall not be subject to the requirements for *repairs* in this section.

R504.2 (N1109.2) Application. For the purposes of this code, the following shall be considered repairs.

1. Glass only replacements in an existing sash and frame.

2. Roof repairs where neither the sheathing nor the insulation is exposed.
3. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION R505 (N1110)
CHANGE OF OCCUPANCY OR USE

R505.1 (N1110.1) General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

Add new definitions as follows:

HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

(PART II): This proposal was submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

See the Reason statement for Part I of this proposal.

When the IECC was divided into two parallel documents, the provisions for existing buildings were copied nearly word for word into both C104 and R104. Therefore the IECC residential proposal mirrors the IECC Commercial proposal with 3 distinct differences.

1. ASHRAE 90.1 is not address as the standard is not applicable to 'residential' buildings.
2. Section R402.3.6 on replacement fenestration is added as it only applies to residential.
3. What is Item 3 in Section C504.2 does not appear in the residential version. This Item addresses maintaining door vestibules and/or revolving doors where such doors separate conditioned from non-conditioned space. Vestibules are a requirement in the IECC Commercial new construction provisions – but are not found in the residential. Therefore requiring maintenance under the residential provisions is inappropriate.

Cost Impact: The code change proposal will not increase the cost of construction. The proposal is an editorial relocation of existing text. There will be no impact on the cost of construction.

CHAPTER 5 (NEW)-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This code change proposal creates a needed framework for energy conservation requirements for existing buildings. This consolidates all existing building requirements in a single location and provides a framework for future development of regulations for existing buildings.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

(Portions of the code change proposal not shown remain unchanged.)

Commenter's Reason: At the Dallas hearings there were several Part I and Part II proposals that rendered different results because of the different committees hearing them. While it is understandable that in rare instances it is ok to have results be different for commercial verses residential, many of these items need to have the same requirement for both applications and we feel that this is one of those items.

We agree that it will be easier to just move a lot of the existing building provisions to their own chapter so that the scope and applicability can be addressed more fully and consistently than having separate requirements mixed throughout chapters 1-4, but feel that the requirements should be the same for commercial and residential buildings. The modification made by the commercial committee for Part I was an improvement to the original proposal and we would request that modification replace the submitted language for the residential provisions in Part II, siting additionally the committee's reason for approval.

Public Comment 2:

Maureen Traxler, City of Seattle Department of Planning & Development, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R501.3 (N1106.3) Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or and systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's ~~designated~~ authorized agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

(Portions of the code change proposal not shown remain unchanged.)

Commenter's Reason: This modification makes these 2 sections of the IECC consistent with ADM22-13, all 5 parts of which were approved as submitted at the Committee Action Hearings. ADM22 consistently replaced "designated agent" with "authorized agent" throughout the International Codes.

CE4-13, Part II

Final Action: AS AM AMPC_____ D

CE5-13
C202, C101.4.3, C409 (NEW)

Proposed Change as Submitted

Proponent: Eric Makela, Britt/Makela Group, Inc., representing Northwest Energy Codes Group (eric@brittmakela.com)

Delete and substitute as follows:

~~C101.4.3 Additions, alterations, renovations or repairs.~~ Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

- ~~1. Storm windows installed over existing fenestration.~~
- ~~2. Glass only replacements in an existing sash and frame.~~
- ~~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.~~
- ~~5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.~~
- ~~6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed.~~
- ~~7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.~~
- ~~8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.~~

C101.4.3 Additions, alterations, or repairs. Additions, alterations, or repairs to an existing building, building system or portion thereof shall comply with Section C409.

Add new text as follows:

SECTION C409
ADDITIONS, ALTERATIONS, OR REPAIRS

C409.1 Scope. The provisions of this chapter shall control the *alteration, repair, and addition* of existing buildings and structures for compliance with the *International Energy Conservation Code*.

C409.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration*, or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

C409.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices and/or systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent

shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

C409.4 Additions, alterations, or repairs. Additions, alterations, or repairs to an existing building, building system, or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portions of the existing building or building supply system to comply with this code. Additions, alterations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems.

C409.4.1 Additions. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply as a single building. Additions shall comply with Section C409.4.1.1.

Exception: Additions complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404, and C405.

C409.4.1.1 Prescriptive compliance. Additions shall comply with Sections C409.4.1.1.1 through C409.4.1.1.5.

C409.4.1.1.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections C402.1 through C402.4.

C409.4.1.1.1.1 Vertical Fenestration. New vertical fenestration area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with vertical fenestration that results in a total building fenestration area greater than C402.4.1 shall comply with Section C402.3.1.1 for the addition only. Additions that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407 or ASHRAE 90.1.

C409.4.1.1.1.2 Skylight area. New skylight area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with skylight area that result in a total building skylight area greater than C402.3 shall comply with Section C402.3.1.2 for the addition only. Additions that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407 or ASHRAE 90.1.

C409.4.1.1.2 Building mechanical systems. New mechanical systems and equipment serving the building heating, cooling or ventilation needs, that are part of the addition, shall comply with Section C403.

C409.4.1.1.3 Service water heating systems. New service water-heating equipment, controls and service water heating piping shall comply with Section C404.

C409.4.1.1.4 Pools and inground permanently installed spas. New pools and inground permanently installed spas shall comply with Section C404.7.

C409.4.1.1.5 Electrical power and lighting systems. New lighting systems that are installed as part of the addition shall comply with Section C405.

C409.4.1.1.5.1 Interior lighting power. The total interior lighting power for the addition shall comply with Section C405.5.2 for the addition alone or if the existing building and the addition complies as a single building.

C409.4.1.1.5.2 Exterior lighting power. The total exterior lighting power for the addition shall comply with Section C405.6.2 for the addition alone or if the existing building and the addition complies as a single building.

C409.4.2 Alterations. Alterations to existing buildings shall comply with Section C409.4.2.1 through C409.4.2.4. Alterations shall be such that the existing building or structure is no less complying with the provisions of this code than the existing building or structure was prior to the alteration.

Exception: Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404, and C405.

C409.4.2.1 Building envelope. New building envelope assemblies that are part of the alteration shall comply with Sections C402.1 through C402.4.

C409.4.2.1.1 Vertical Fenestration. The addition of vertical fenestration that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of vertical fenestration that results in a total building fenestration area greater than C402.4.1 shall comply with Section C405.2.2.3.2 for the space adjacent to the new fenestration only. Alterations that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407 or ASHRAE 90.1.

C409.4.2.1.2 Skylight area. The addition of skylight area that results in a total building skylight area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of skylight area that results in a total building skylight area greater than C402.3 shall comply with Section C402.3.1.2 for the space adjacent to the new skylights. Alterations that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407 or ASHRAE 90.1.

Exceptions: The following building envelope alterations are exempt from Section C409.4.2.1.

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.

C409.4.2.2 Heating and cooling systems. New heating, cooling, and duct systems that are part of the alteration shall comply with Sections C403.

C409.4.2.2.1 Economizers. New cooling systems that are part of alteration shall comply with section C403.3.1 or C403.4.1.

C409.4.2.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section C404.

C409.4.2.4 Lighting. New lighting systems that are part of the alteration shall comply with Section C405.

Exceptions.

1. Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
2. Alterations that replace on the bulb and ballast within the existing luminaires in a space provided that the alteration does not increase the installed interior lighting power.

C409.4.3 Repairs. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C409.3 and this section. Work on nondamaged components that is necessary for the required repair of damaged components shall be considered part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section C409.3, ordinary repairs exempt from permit, and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section. Where a building was constructed to comply with

ANSI/ASHRAE/IESNA 90.1. repairs shall comply with the standard and need not comply with Sections C402, C403, C404 and C405.

Exceptions: The following alterations are exempt from Section C409.4.3.

1. Glass only replacements in an existing sash and frame this is a repair.
2. Reroofing for roofs where neither the sheathing nor the insulation is exposed this is a repair.

Revise definition as follows:

IECC SECTION C202 GENERAL DEFINITIONS

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

Reason: The commercial provisions of the 2012 IECC require that additions, alterations, renovations, or repairs comply with the provisions of the energy code without providing a clear “roadmap” on the specific requirements that apply to these projects. The goal of this code change proposal is to provide clear direction to the code user on what provisions must be complied with based on the type of project. Increasing the clarity of the code will increase the compliance rate and result in increased energy savings for these projects.

This proposal places all of the requirements for additions, alterations, renovations, and repairs into a new section in the commercial provisions of the IECC and builds off the work conducted by the ICC SEHPCAC in the development of their existing building proposal. The additions portion of the proposal provides direction on what options are available for demonstrating compliance for projects up to 30% window to wall ratio and for those projects up to 40% window to wall ratio. References into the code are also provided when HVAC, water heating, and lighting systems are included in the project. The alteration portion of the proposal provides clear guidance on how to address alterations that increase fenestration area for the building that exceeds the prescriptive fenestration limits for the building as defined in the code. Exceptions currently included in Section C101.4.3 of the 2012 IECC have been moved into this new section and linked to the applicable references to the building envelope, HVAC, or lighting section. Repairs have been clearly identified and essentially exempted from the requirements of the IECC if they fall within certain defined parameters.

Cost Impact: The code change proposal will not increase the cost of construction.

C409 (NEW)-EC-MAKELA.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: There was initial support of this proposal by the committee. They saw this as complimentary to the action taken to approve CE4-13 to create a new Existing Buildings chapter, with the elements of CE5 being added to provide additional guidance. The committee made modifications to the definition of repair as made in CE4 and also modified the proposal to remove the provisions on maintenance. Further modifications were discussed, but the committee felt that it would be better to address multiple modifications by public comment how CE5 would meld with CE4. There was also concern that ASHRAE 90.1 should not be referenced as a option within the existing building provisions, but that these provisions should stand on their own.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Name: Eric Makela, Britt/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Revise as follows:

REPAIR. ~~The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.~~

Section C101.4.3 Additions, alterations, or repairs. Additions, alterations, or repairs to an existing building, building system or portion thereof shall comply with Section C409.

**SECTION C409
ADDITIONS, ALTERATIONS, OR REPAIRS**

C409.1 Scope. The provisions of this chapter shall control the *alteration, repair, and addition* of existing buildings and structures for compliance with the IECC.

C409.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration, or* abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

C409.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices and/or systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

C409.4 Additions, alterations, or repairs C502.1 General. Additions, alterations, or repairs to an existing building, building system, or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building supply system to comply with this code. An Additions, alterations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. Additions shall comply with Section C502.2.

C409.4.1 Additions. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply as a single building. Additions shall meet the specific requirements in Section C409.4.1.1.

Exception: Additions complying with ANSI/ASHRAE/IESNA 90.1, need not comply with Sections C402, C403, C404, and C405.

C409.4.1.1 C502.2 Prescriptive compliance. Additions shall comply with Section C402 and Sections C409.4.1.1.1 to C409.4.1.1.5 C502.2.1 through C502.2.6.2 when applicable.

C409.4.1.1.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections C402.1 to C402.4.

C409.4.1.1.1.1 C502.2.1 Vertical Fenestration. New vertical fenestration area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with vertical fenestration that results in a total building fenestration area greater than C402.4.1 shall comply with Section C402.3.1.1 for the addition only. Additions that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407, or ASHRAE 90.1.

C409.4.1.1.1.2 C502.2.2 Skylight area. New skylight area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with skylight area that result in a total building skylight area greater than C402.3 shall comply with Section C402.3.1.2 for the addition only. Additions that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407, or ASHRAE 90.1.

C409.4.1.1.1.2 C502.2.3 Building mechanical systems. New mechanical systems and equipment serving the building heating, cooling or ventilation needs, that are part of the addition, shall comply with Section C403.

C409.4.1.1.1.3 C502.2.4 Service water heating systems. New service water-heating equipment, controls and service water heating piping shall comply with Section C404.

C409.4.1.1.1.4 C502.2.5 Pools and inground permanently installed spas. New pools and inground permanently installed spas shall comply with Section C404.7.

C409.4.1.1.1.5 C502.2.6 Electrical power and lighting systems. New lighting systems that are installed as part of the addition shall comply with Section C405.

C409.4.1.1.5.1 C502.2.6.1 Interior lighting power. The total interior lighting power for the addition shall comply with Section C405.5.2 for the addition alone or if the existing building plus the addition complies as a single building.

C409.4.1.1.5.2 C502.2.6.2 Exterior lighting power. The total exterior lighting power for the addition shall comply with Section C405.6.2 for the addition alone or if the existing building plus the addition complies as a single building.

C409.4.2 Alterations. Alterations to existing buildings shall comply with Section C409.4.2.1 to C409.4.2.4. *Alterations shall be such that the existing building or structure is no less complying with the provisions of this code than the existing building or structure was prior to the alteration.*

Exception: Alterations complying with ANSI/ASHRAE/IESNA 90.1, need not comply with Sections C402, C403, C404, and C405.

C409.4.2.1 C503.2.1 Building envelope. New building envelope assemblies that are part of the alteration shall comply with Sections C402.1 to C402.4 as applicable.

C409.4.2.1.1 C503.2.1.1 Vertical Fenestration. The addition of vertical fenestration that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of vertical fenestration that results in a total building fenestration area greater than C402.4.1 shall comply with Section C405.2.2.3.2 for the space adjacent to the new fenestration only. Alterations that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407, or ASHRAE 90.1.

C409.4.2.1.2 C503.2.1.2 Skylight area. The addition of skylight area that results in a total building skylight area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of skylight area that results in a total building skylight area greater than C402.3 shall comply with Section C402.3.1.2 for the space adjacent to the new skylights. Alterations that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407, or ASHRAE 90.1.

Exceptions: The following building envelope alterations are exempt from Section C409.4.2.1.

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.

C409.4.2.2 C503.2.2 Heating and cooling systems. New heating, cooling, and duct systems that are part of the alteration shall comply with Sections C403 as applicable.

C409.4.2.2.1 C503.2.2.1 Economizers. New cooling systems that are part of alteration shall comply with Section C403.3.1 or C403.4.1, as applicable.

C409.4.2.3 C503.2.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section C404, as applicable.

C409.4.2.4 C503.2.4 Lighting. New lighting systems that are part of the alteration shall comply with Section C405 as applicable.

Exceptions.

1. Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
2. Alterations that replace on the bulb and ballast within the existing luminaires in a space provided that the alteration does not increase the installed interior lighting power.

C409.4.3 Repairs. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C409.3 and this section. Work on nondamaged components that is necessary for the required repair of damaged components shall be considered part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section C501.3, ordinary repairs exempt from permit, and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section. Where a building was constructed to comply with ANSI/ASHRAE/IESNA 90.1, repairs shall comply with the standard and need not comply with Sections C402, C403, C404 and C405.

Exceptions: The following alterations are exempt from Section C409.4.3.

1. Glass only replacements in an existing sash and frame this is a repair.
2. Reroofing for roofs where neither the sheathing nor the insulation is exposed this is a repair.

Commenter's Reason: The IECC Code Development Committee saw CE5 as complementary to CE4 that was approved as modified. CE4 provided the framework for a new chapter in the IECC and CE5 provided guidance necessary to determine compliance for additions, alterations and repairs. There was initial support on CE5 except for two primary issues that the committee felt were best addressed through the Public Comment process. The main issues focused on the definition of repair and also to the number of references to ASHRAE 90.1.

This Public Comment modifies the format and language in CE5 so it can merge seamlessly into CE4. The end result is the format from CE4 with the guidance provided in CE5 to increase the understanding on how to demonstrate compliance for additions, alterations and repairs. The two code change proposals have been merged together at the end of this reason statement to demonstrate how the finished code will appear in the 2015 IECC if approved.

The commercial provisions of the 2012 IECC require that additions, alterations, renovations, or repairs comply with the provisions of the energy code without providing a clear "roadmap" on the specific requirements that apply to these projects. The goal of this code change proposal is to provide clear direction to the code user on what provisions must be complied with based on the

type of project. Increasing the clarity of the code will increase the compliance rate and result in increased energy savings for these projects.

The additions portion of the proposal provides direction on what options are available for demonstrating compliance for projects up to 30% window to wall ratio and for those projects up to 40% window to wall ratio. References into the code are also provided when HVAC, water heating, and lighting systems are included in the project. The alteration portion of the proposal provides clear guidance on how to address alterations that increase fenestration area for the building that exceeds the prescriptive fenestration limits for the building as defined in the code. Exceptions currently included in Section C101.4.3 of the 2012 IECC have been moved into this new section and linked to the applicable references to the building envelope, HVAC, or lighting section. Repairs have been clearly identified and essentially exempted from the requirements of the IECC if they fall within certain defined parameters.

The following code text will be published in the 2015 IECC if this public comment is approved. The underlined areas show where the CE5 language fits into the CE4 code change proposal.

**CHAPTER 5 CE
EXISTING BUILDINGS
SECTION C501
GENERAL**

C501.1 Scope. The provisions of this chapter shall control the *alteration, repair, addition* and change of occupancy of existing buildings and structures.

C501.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

C501.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices or and systems which are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

C501.4 Compliance. *Alterations, repairs, additions* and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alterations, repairs, additions* and changes of occupancy or relocation, respectively, in the *International Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code* and NFPA 70.

C501.5 New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

C501.6 Historic buildings. *Historic buildings* are exempt from this code.

**SECTION C502
ADDITIONS**

C502.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. Additions shall comply with Section C502.2.

Additions complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

C502.2 Prescriptive compliance. Additions shall comply with Sections C502.2.1 through C502.2.6.2.

C502.2.1 Vertical Fenestration. New vertical fenestration area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with vertical fenestration that result in a total building fenestration area greater than C402.3.1, or additions that exceed the fenestration area greater than C402.3.1 shall comply with Section C402.3.1.1 for the addition only. Additions that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407.

C502.2.2 Skylight area. New skylight area that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. Additions with skylight area that result in a total building skylight area greater than C402.3.1, or additions that exceed the skylight area shall comply with Section C402.3.1.2 for the addition only. Additions that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407.

C502.2.3 Building mechanical systems. New mechanical systems and equipment serving the building heating, cooling or ventilation needs, that are part of the addition, shall comply with Section C403.

C502.2.4 Service water heating systems. New service water-heating equipment, controls and service water heating piping shall comply with Section C404.

C502.2.5 Pools and inground permanently installed spas. New pools and inground permanently installed spas shall comply with Section C404.7.

C502.2.6 Electrical power and lighting systems. New lighting systems that are installed as part of the addition shall comply with Section C405.

C502.2.6.1 Interior lighting power. The total interior lighting power for the addition shall comply with Section C405.5.2 for the addition alone or if the existing building and the addition complies as a single building.

C502.2.6.2 Exterior lighting power. The total exterior lighting power for the addition shall comply with Section C405.6.2 for the addition alone or if the existing building and the addition complies as a single building.

SECTION C503 ALTERATIONS

C503.1 General Alterations to any building or structure shall comply with the requirements of the code for new construction. Alterations shall be such that the existing building or structure is no less conforming with 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 they 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.

Alterations complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.

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

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

C503.2 Change in space conditioning. Any nonconditioned or low energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

C503.2.1 Building envelope. New building envelope assemblies that are part of the alteration shall comply with Sections C402.1 through C402.4.

C503.2.1.1 Vertical Fenestration. The addition of vertical fenestration that results in a total building fenestration area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of vertical fenestration that results in a total building fenestration area greater than C402.3.1 shall comply with Section C402.3.1.1 for the space adjacent to the new fenestration only. Alterations that result in a total building vertical glass area exceeding that specified in Section C402.3.1.1 shall comply with Section C407.

C503.2.1.2 Skylight area. The addition of skylight area that results in a total building skylight area less than or equal to that specified in Section C402.3.1 shall comply with Section C402.3. The addition of skylight area that results in a total building skylight area greater than C402.3.1 shall comply with Section C402.3.1.2 for the space adjacent to the new skylights. Alterations that result in a total building skylight area exceeding that specified in Section C402.3.1.2 shall comply with Section C407.

C503.2.2 Heating and cooling systems. New heating, cooling, and duct systems that are part of the alteration shall comply with Sections C403.

C503.2.2.1 Economizers. New cooling systems that are part of alteration shall comply with section C403.3.1 or C403.4.1.

C503.2.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section C404.

C503.2.4 Lighting. New lighting systems that are part of the alteration shall comply with Section C405.

Exceptions.

1. Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

SECTION C504
REPAIRS

C504.1 General. Buildings and structures, and parts thereof, shall be repaired in compliance with Section C501.3 and this section. Work on nondamaged components that is necessary for the required *repair* of damaged components shall be considered part of the *repair* and shall not be subject to the requirements for *alterations* in this chapter. Routine maintenance required by Section C501.3, ordinary repairs exempt from *permit*, and abatement of wear due to normal service conditions shall not be subject to the requirements for *repairs* in this section.

Where a building was constructed to comply with ANSI/ASHRAE/IESNA 90.1, repairs shall comply with the standard and need not comply with Sections C402, C403, C404 and C405.

C504.2 Application. For the purposes of this code, the following shall be considered repairs.

1. Glass only replacements in an existing sash and frame.
2. Roof repairs where neither the sheathing nor the insulation is exposed.
3. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided however that an existing vestibule that separates a conditioned space from the exterior shall not be removed.
4. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION C505
CHANGE OF OCCUPANCY OR USE

C505.1 General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or C405.5.2 (2) to another use in Table C405.5.2(1) or C405.5.2 (2), the installed lighting wattage shall comply with Section C405.5.

Add new definitions as follows:

HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

REPAIR. The reconstruction or renewal of any part of an existing building.

CE5-13

Final Action: AS AM AMPC_____ D

CE7-13, Part I

C101.4.2, C202 (NEW), R101.4.2, R202 (NEW) (IRC N1101.9 (NEW))

Proposed Change as Submitted

Proponent: Jim Edelson, New Buildings Institute (jedelson@comcast.net), Ric Cochrane, National Trust for Historic Preservation, David Collins, The Preview Group representing The American Institute of Architects

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code. The provisions of this code relating to the construction, *repair, alteration*, restoration and movement of structures, and *change of occupancy* shall not be mandatory for *historic buildings*. No provision of this code shall be used to require the *alteration* of an *historic building*.~~

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

HISTORIC BUILDING. Any building or structure that is one or more of the following:

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

Reason: The current language for Historic Buildings in the IECC-Commercial, the IECC-Residential and the IEBC is confusing, inconsistent with I-Code conventions for definitions, and does not clearly describe how buildings and districts are listed or determined to be eligible to be listed as historic. The charging language in C101.4.2 contains no fewer than three semi-colons and nine instances of the word "or". This makes the language very difficult to parse. The sentence structure in the current language that addresses eligibility is confusing and obfuscates who does the determinations.

The IECC mixes the definition of "historic building" with the charging language for historic buildings. Not only does this further make the charging language difficult to understand, it makes the language inconsistent with the way the I-Codes deal with definitions. Generally, the I-Codes keep definitions out of the code language and gather all definitions together into a definitions section.

Finally, the language does not align with how buildings and districts are officially designated by the governing authorities as eligible for listing as historic.

This proposal solves these three problems. First, it moves the definition of an historic building to the definitions sections in the IECC and edits the charging language of C101.4.2 to simply refer to that definition. It remedies the confusion caused by the sheer complexity of the defining language by converting the running list of qualifications into a clearly delineated numbered list. Finally, the proposal gives the language clarity and specificity as to how a building is officially determined to be eligible for the various lists of historic buildings. In accordance with the Code of Federal Regulations, Title 36, Chapter I, Part 63, determinations of eligibility for listing in the National Register of Historic Places are made by State Historic Preservation Offices in coordination with the Keeper of the National Register of Historic Places. This is an official process conducted in accordance with federal standards. This proposal aligns the code language with the language of this official process and removes any ambiguity as to who can make determinations of eligibility.

The charging language in the IECC also creates a rather large loophole. Historic buildings as defined by Section C101.4.1 are exempted completely from the code in its entirety. This means that no work being done on an historic building has to comply with the IECC at all - not alterations, not changes of use, not even additions. The definition of "historic building" is rather broad. It includes buildings that are certified as contributing to a local, state or national historic district. These are buildings that generally do not have enough historical significance/character to merit designation on their own, but do have enough to help define the overall significance/character of a district. Yet they are completely exempted from the energy code.

Buildings with historic significance may have social and aesthetic values, and the energy code should not be written in a way that will degrade these values. But rather than wholly exempting historic buildings like the current language in the IECC does, other I-Codes, especially the IBC and IFC, have balanced the protection of historic buildings with the intended goals of the codes. The IECC should follow this example and balance the competing values of historic preservation and energy conservation, rather than granting a wholesale exemption to historic buildings.

This proposal narrows the historic building loophole by eliminating the most egregious part, the exemption for additions to historic buildings. Additions to historic buildings are new construction, and in this case there is no historic character or historic fabric to protect. This change will make additions subject to the provisions of the IECC. However, it ensures that only the addition is subject to the IECC and exempts the historic building itself from any requirements that might be triggered by the addition.

This proposal is one of four proposals in Cycle B to create this consistency for Historic Buildings across the I-codes. The other three proposals are being made to the IECC-Commercial, the IEBC and the IPMC.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The term 'historic building' currently defined in the IBC, IEBC and IgCC. The definition in the IBC and IgCC is:

Historic buildings. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

The definition in the IEBC is:

Historical Building. Any building or structure that is listed in the State or National Register of Historic Places: designated as a historic property under local or state designation law or survey; certified as a contributing resource within a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Register of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places.

These proponents have submitted proposals to add this definition to the *International Property Maintenance Code* (PM2-13) and to the *International Existing Buildings Code* (EB1-13)

C101.4.2-EC- COCHRANE-COLLINS-EDELSON .docm.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Modified

Modify the proposal as follows:

C101.4.2 Historic buildings. The provisions of this code relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings. ~~No provision of this code shall be used to require the alteration of an historic building.~~

Section 202

HISTORIC BUILDING. Any building or structure that is one or more of the following:

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

Committee Reason: The revision provides a better format by providing an inclusive definition of historic buildings in Section 202 - definitions and then leaves the regulation of those historic buildings in active provisions of the code. The definition was modified to clarify that a historic district could also be created by a state in addition to a National or local designation. The second sentence of C101.4.2 was deleted because it was retained in CE4-13 and didn't need to be repeated in this section.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jim Edelson, New Buildings Institute, Lee Kranz, Washington Association of Building Officials, David Collins, American Institute of Architects, Ryan Meres, Institute for Market Transformation, request Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C101.4.2 Historic buildings. The No provisions of this code relating to the construction, *repair, alteration*, restoration and movement of structures, and *change of occupancy* shall not be mandatory for *historic buildings* provided a report has been submitted to the code official and signed by a registered design professional, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the building.

Commenter's Reason: Two different committees heard the residential and commercial portions of the IECC. The two committees took different action on R and C Section 101.4.2, the charging language for historic buildings. The Residential committee approved CE8(I&I)-13 and the Commercial committee approved CE7(I)-13. These disparate actions leave the IECC with inconsistent approaches to Historic Buildings.

CE7(I&I) restructured the historic building definition and requirement for clarity, but did little to narrow the historic building exemption. CE8(I&I) restructured for clarity, but also narrowed the exemption through only exempting historic buildings from provisions that would "compromise the historic nature and function of the building." Both committees liked the idea of narrowing the Historic Buildings exemption. The Residential committee preferred CE8 as a reasonable way to limit the missed opportunity for energy savings the historic buildings exemption creates. However, the Commercial committee heard much more testimony and came to a different conclusion. By default, CE8 leaves the determination of impact on the historic building up to the building official, even though the building department is not the agency authorized by most preservation legislation to designate historic buildings or make determinations about impact on historic buildings. The committee heard testimony from preservationists about the problems of making the building department responsible for this determination, and even discussed among themselves about the difficulties for building officials. Though the Commercial committee liked the idea of reasonably narrowing the exemption, they preferred CE7 because of the implications of enforcement of CE8.

The proponents of CE7 and CE8 have come together to submit joint comments to reconcile the two approaches, bring consistency to the residential and commercial sections of the IECC, and address the concerns of the Commercial Committee. Unlike CE7 this approach narrows the exemption for historic buildings in the IECC; however, it does not require the building official to make a determination of impact as in CE8. It hinges exemption on the submission of a report detailing how the provision would damage the historic significance of the building. The report mechanism is already a part of the I-Codes; it is utilized in the IEBC (Section 1101.2 Report) to deal with historic buildings unable to comply with accessibility provisions without harming the integrity of the historic building. A report is only required for **non-compliance** with code provisions; any work in compliance with IECC provisions would not require a report. The comment provides three options for a report signatory, the architect, the State Historic Preservation Office (SHPO) or the local preservation authority, providing both flexibility and reliability for the reporting requirement. The building official simply has to receive the report, but the creation of the report requires the project to substantiate the need for exemption from a given provision of the IECC.

This comment is being submitted to CE7(I), which prevailed in the Commercial section. Another corresponding comment is being submitted to CE8(II), which prevailed in the Residential section.

CE7-13, Part I

Final Action: AS AM AMPC_____ D

CE7-13, Part II

C101.4.2, C202 (New), R101.4.2, R202 (New) (IRC N1101.9 (New))

Proposed Change as Submitted

Proponent: Jim Edelson, New Buildings Institute (jedelson@comcast.net), Ric Cochrane, National Trust for Historic Preservation, David Collins, The Preview Group representing The American Institute of Architects

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.4.2 Historic buildings. ~~Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code. The provisions of this code relating to the construction, *repair, alteration, restoration* and movement of structures, and *change of occupancy* shall not be mandatory for *historic buildings*. No provision of this code shall be used to require the *alteration of an historic building*.~~

Add new definition as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

HISTORIC BUILDING. Any building or structure that is one or more of the following:

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

Reason: The current language for Historic Buildings in the IECC-Commercial, the IECC-Residential and the IEBC is confusing, inconsistent with I-Code conventions for definitions, and does not clearly describe how buildings and districts are listed or determined to be eligible to be listed as historic. The charging language in C101.4.2 contains no fewer than three semi-colons and nine instances of the word “or”. This makes the language very difficult to parse. The sentence structure in the current language that addresses eligibility is confusing and obfuscates who does the determinations.

The IECC mixes the definition of “historic building” with the charging language for historic buildings. Not only does this further make the charging language difficult to understand, it makes the language inconsistent with the way the I-Codes deal with definitions. Generally, the I-Codes keep definitions out of the code language and gather all definitions together into a definitions section.

Finally, the language does not align with how buildings and districts are officially designated by the governing authorities as eligible for listing as historic.

This proposal solves these three problems. First, it moves the definition of an historic building to the definitions sections in the IECC and edits the charging language of C101.4.2 to simply refer to that definition. It remedies the confusion caused by the sheer complexity of the defining language by converting the running list of qualifications into a clearly delineated numbered list. Finally, the proposal gives the language clarity and specificity as to how a building is officially determined to be eligible for the various lists of historic buildings. In accordance with the Code of Federal Regulations, Title 36, Chapter I, Part 63, determinations of eligibility for listing in the National Register of Historic Places are made by State Historic Preservation Offices in coordination with the Keeper of the National Register of Historic Places. This is an official process conducted in accordance with federal standards. This proposal

aligns the code language with the language of this official process and removes any ambiguity as to who can make determinations of eligibility.

The changing language in the IECC also creates a rather large loophole. Historic buildings as defined by Section C101.4.1 are exempted completely from the code in its entirety. This means that no work being done on an historic building has to comply with the IECC at all - not alterations, not changes of use, not even additions. The definition of "historic building" is rather broad. It includes buildings that are certified as contributing to a local, state or national historic district. These are buildings that generally do not have enough historical significance/character to merit designation on their own, but do have enough to help define the overall significance/character of a district. Yet they are completely exempted from the energy code.

Buildings with historic significance may have social and aesthetic values, and the energy code should not be written in a way that will degrade these values. But rather than wholly exempting historic buildings like the current language in the IECC does, other I-Codes, especially the IBC and IFC, have balanced the protection of historic buildings with the intended goals of the codes. The IECC should follow this example and balance the competing values of historic preservation and energy conservation, rather than granting a wholesale exemption to historic buildings.

This proposal narrows the historic building loophole by eliminating the most egregious part, the exemption for additions to historic buildings. Additions to historic buildings are new construction, and in this case there is no historic character or historic fabric to protect. This change will make additions subject to the provisions of the IECC. However, it ensures that only the addition is subject to the IECC and exempts the historic building itself from any requirements that might be triggered by the addition.

This proposal is one of four proposals in Cycle B to create this consistency for Historic Buildings across the I-codes. The other three proposals are being made to the IECC-Commercial, the IEBC and the IPMC.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The term 'historic building' currently defined in the IBC, IEBC and IgCC. The definition in the IBC and IgCC is:

Historic buildings. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

The definition in the IEBC is:

Historical Building. Any building or structure that is listed in the State or National Register of Historic Places: designated as a historic property under local or state designation law or survey; certified as a contributing resource within a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Register of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places.

These proponents have submitted proposals to add this definition to the *International Property Maintenance Code* (PM2-13) and to the *International Existing Buildings Code* (EB1-13)

C101.4.2-EC- COCHRANE-COLLINS-EDELSON .docm.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The committee preferred other code change proposals submitted that deal with historic buildings. (Note: CE8 was approved as submitted.)

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Donald Vigneau, AIA, representing Northeast Energy Efficiency Partnerships, Inc, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R101.4.2 Historic buildings. The provisions of this code relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings. ~~No provision of this code shall be used to require the alteration of an historic building.~~

Section 202

HISTORIC BUILDING. Any building or structure that is one or more of the following:

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

Commenter's Reason: This change proposal and CE-8-13 that follows both make changes to Historic Building definitions and requirements. CE7-13 however is far more preferable, as it is consistent with the applicable requirements in IBC Section 3409.1. The CE-7 proposal is also a far clearer and usable definition and set of provisions than CE-8, and should remain the consistent wording for definition and requirements within the IBC and the Residential and Commercial Energy Codes.

A corresponding Public Comment seeks to overturn the Residential Committee AS of CE 8-13 Part II to correlate this request.

CE7-13, Part II

Final Action: AS AM AMPC ____ D

CE8-13, Part II

C101.4.2, C202 (NEW), R101.4.2, R202 (NEW) (IRC N1101.9 (NEW))

NOTE: PART I DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART I IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART II.

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

~~**R101.4.2 Historic buildings.** Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code. Alterations and repairs to *historic buildings* shall comply with this code to the extent that such compliance does not compromise the historic nature and function of the building.~~

Add new definition as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

HISTORIC BUILDING. Any building or structure that is:

1. Listed in the State or National Register of Historic Places
2. Designated as a historic property under local or state designation law or survey
3. Certified as a contributing resource within a National or State Register listed or locally designated historic district, or
4. Determined or certified by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places to be eligible to be listed in the State or National Register of Historic Places either individually or as a contributing resource in an historic district.

Reason: The existing requirement exempts historic buildings from all energy efficiency requirements, even those that do not impact the historic value of the building at all, such as lighting controls, attic insulation, or mechanical equipment efficiency. This modification requires energy efficiency measures only where they will leave the historic value of the building undisturbed.

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

Note: The term 'historic building' currently defined in the IBC, IEBC and IgCC. The definition in the IBC and IgCC is:

Historic buildings. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

The definition in the IEBC is:

Historical Building. Any building or structure that is listed in the State or National Register of Historic Places: designated as a historic property under local or state designation law or survey; certified as a contributing resource within a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the

National or State Register of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places. In addition to this proposal, definitions of historic building are proposed in CE7-13, CE9-13 being heard by this committee, PM2-13 being heard by the Property Maintenance Committee and EB1-13 being heard by the Existing Buildings Committee..

C101.4.2-EC-KRANZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This change will allow some increases in energy efficiency in historic buildings when the installation does not affect the historic nature of the building.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, Jim Edelson, New Buildings Institute, David Collins, American Institute of Architects, Ryan Meres, Institute for Market Transformation, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R101.4.2 Historic buildings. ~~Alterations and repairs to historic buildings shall comply with this code to the extent that such compliance does not compromise the historic nature and function of the building. No provision of this code relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall be mandatory for historic buildings provided a report has been submitted to the code official and signed by the owner, a registered design professional, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the building.~~

Commenter's Reason: Two different committees heard the residential and commercial portions of the IECC. The two committees took different action on R and C Section 101.4.2, the charging language for historic buildings. The Residential committee approved CE8(I)-13 and the Commercial committee approved CE7(I)-13. These disparate actions leave the IECC with inconsistent approaches to Historic Buildings.

CE7(I&II) restructured the historic building definition and requirement for clarity, but did little to narrow the historic building exemption. CE8(I&II) restructured for clarity, but also narrowed the exemption through only exempting historic buildings from provisions that would "compromise the historic nature and function of the building." Both committees liked the idea of narrowing the Historic Buildings exemption. The Residential committee preferred CE8 as a reasonable way to limit the missed opportunity for energy savings the historic buildings exemption creates. However, the Commercial committee heard much more testimony and came to a different conclusion. By default, CE8 leaves the determination of impact on the historic building up to the building official, even though the building department is not the agency authorized by most preservation legislation to designate historic buildings or make determinations about impact on historic buildings. The committee heard testimony from preservationists about the problems of making the building department responsible for this determination. Though the Commercial committee liked the idea of reasonably narrowing the exemption, they preferred CE7 because of the implications of enforcement of CE8.

The proponents of CE7 and CE8 have come together to submit joint comments to reconcile the two approaches, bring consistency to the residential and commercial sections of the IECC, and address the concerns of the Commercial Committee. Unlike CE7 this approach narrows the exemption for historic buildings in the IECC; however, it does not require the building official to make a determination of impact as in CE8. It hinges exemption on the submission of a report detailing how the provision would damage the historic significance of the building. A report is only required for **non-compliance** with code provisions; any work in compliance with IECC provisions would not require a report. The comment provides four options for a report signatory, the architect, the State Historic Preservation Office (SHPO), the local preservation authority or the building owner. The building official

simply has to receive the report, but the creation of the report requires the report signatory to substantiate the need for exemption from a given provision of the IECC.

The only difference between the residential and commercial proposals is that the owner can sign the report in the residential section. This reflects the reality that, unlike in commercial projects, a large portion of residential projects do not have an architect involved. Although it is good to have the SHPO or the local preservation commission available as options for signing the report, it could be problematic to make the large portion of residential projects without architects dependent on those organizations' capacity or willingness to participate in the codes process.

This comment is being submitted to CE8(II), which prevailed in the Residential section. Another corresponding comment is being submitted to CE7(I), which prevailed in the Commercial section.

Public Comment 2:

Donald Vigneau AIA, representing Northeast Energy Efficiency Partnerships, Inc., requests Disapproval.

Commenter's Reason: OVERTURN THE RESIDENTIAL ENERGY CODE COMMITTEE RECOMMENDATION FOR APPROVAL AS SUBMITTED AND DISAPPROVE PART II CONSISTENT WITH THE COMMERCIAL ENERGY CODE COMMITTEE ACTION. This change proposal and CE-7-13 that precedes it both make changes to Historic Building definitions and requirements. CE7-13 however is far more preferable, as it is consistent with the applicable requirements in IBC Section 3409.1. The CE-7 proposal is also a far clearer and usable definition and set of provisions than CE-8, and should remain the consistent wording for definition and requirements within the IBC and the Residential and Commercial Energy Codes.

A corresponding Public Comment seeks to overturn the Residential Committee Disapproval of CE 7-13 Part II to correlate this request.

CE8-13, Part II

Final Action: AS AM AMPC_____ D

NOTE: PART I REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE8-13

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.4.2 Historic buildings. Any buildings or structures that is are listed in the state or national register of historic places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a national register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the national or state registers of historic places either individually or as a contributing building to a historic district by the state historic preservation officer or the keeper of the national register of historic places, are exempt from this code. Alterations and repairs to historic buildings shall comply with this code to the extent that such compliance does not compromise the historic nature and function of the building.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

HISTORIC BUILDING. Any building or structure that is:

1. Listed in the State or National Register of Historic Places
2. Designated as a historic property under local or state designation law or survey
3. Certified as a contributing resource within a National or State Register listed or locally designated historic district, or
4. Determined or certified by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places to be eligible to be listed in the State or National Register of Historic Places either individually or as a contributing resource in an historic district.

Reason: The existing requirement exempts historic buildings from all energy efficiency requirements, even those that do not impact the historic value of the building at all, such as lighting controls, attic insulation, or mechanical equipment efficiency. This modification requires energy efficiency measures only where they will leave the historic value of the building undisturbed.

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

Note: The term 'historic building' currently defined in the IBC, IEBC and IgCC. The definition in the IBC and IgCC is:

Historic buildings. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

The definition in the IEBC is:

Historical Building. Any building or structure that is listed in the State or National Register of Historic Places: designated as a historic property under local or state designation law or survey; certified as a contributing resource within a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Register of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places.

In addition to this proposal, definitions of historic building are proposed in CE7-13, CE9-13 being heard by this committee, PM2-13 being heard by the Property Maintenance Committee and EB1-13 being heard by the Existing Buildings Committee..

C101.4.2-EC-KRANZ.doc

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee preferred the action taken to approve CE7-13.

Assembly Action:

None

CE12-13 C101.4.3, C202 (NEW)

Proposed Change as Submitted

Proponent: Shirley Ellis, Energy Systems Laboratory, Texas A&M Engineering Experiment Station, Texas A&M University System (shirleyellis@tamu.edu)

Revise as follows:

C101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Replacement of existing fenestration, provided, however, that the area of the replacement fenestration does not exceed 25 percent of the total fenestration area of an existing building and that the U-factor and SHGC will be equal to or lower than before the fenestration replacement.
- 3 4. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
45. Construction where the existing roof, wall or floor cavity is not exposed.
56. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
67. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed.
78. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
89. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

FENESTRATION AREA. The total area of the fenestration measured using the rough opening and including the glazing, sash, and frame. For doors where the glazed vision area is less than 50 percent of the door area, the fenestration area is the glazed vision area. For all other doors, the fenestration area is the door area, using the rough opening and including the frame.

Reason: Currently when a portion of the fenestration in a store-front or curtain wall building is damaged the IECC requires the replacement fenestration to meet the requirements of the current code. Often times this requires additional construction to the undamaged portions of the fenestration to ensure the code compliant replacement is compatible.

This code change will allow replacement of damaged fenestration in existing buildings to be replaced without requiring the fenestration to meet the current U-factor and SHGC requirements when falling within certain parameters.

The damaged area needing replacement must not exceed 25% of the total fenestration of the building and it must be equal or better than currently installed.

Cost Impact: The code change proposal will not increase the cost of construction.

C101.4.3-EC-ELLIS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal was felt to be too broad and could be abused. While the proponent expressed a need to allow people to address damage to fenestration, the committee felt that existing exceptions addressed that need. The provision could allow someone to 'replace' 25% one month, 25% the next month and in short order could replace all the buildings fenestration.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shirley Ellis, Energy Systems Laboratory, representing Texas A & M University System, requests Approval as Submitted.

Commenter's Reason: Currently when a portion of the fenestration in a store-front or curtain wall building is damaged the IECC requires the replacement fenestration to meet the requirements of the current code, while the ANSI/ASHRAE/IESNA 90.1 allows an exception for replacement of 25% of the fenestration provided that the U-factor and SHGC will be equal to or lower than before the replacement. This exception brings into the IECC the exact language from the ANSI/ASHRAE/IESNA 90.1, thereby allowing the contractor the option of using the IECC or ANSI/ASHRAE/IESNA 90.1.

This code change will allow the use of the IECC provisions when making repairs to a building that include replacement of damaged fenestration. Without this exception many buildings needing repairs that include damages to fenestration revert to the ANSI/ASHRAE/IESNA 90.1 rather than the IECC. This choice is often due to the additional construction and increased costs for work to the undamaged portions of the structure associated with ensuring the code compliant replacement fenestration is compatible.

CE12-13

Final Action: AS AM AMPC____ D

CE15-13, Part I

C101.4.3, C202 (New), C402.2.1.1, R101.4.3 (IRC N1101.3), R202 (New) (IRC N1101.9 (New))

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

Proponents: Michael D. Fischer, Kellen Company, representing Center for the Polyurethanes Industry (mfischer@kellencompany.com); Michael D. Fischer, Kellen Company, representing Polyisocyanurate Insulation Manufacturers Association; Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. ~~Reroofing for roofs where neither the sheathing nor the insulation is exposed.~~ Roof recover or roof repair.
6. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
67. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,
78. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
89. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

Add new text as follows:

C402.2.1.1 Roof replacement. For roof replacements, where the existing roof assembly is part of the building thermal envelope and contains insulation entirely above deck, roof replacement shall include compliance with the requirements of Table C402.1.2 or Table C402.2.

Add new definitions as follows:

**SECTION C202
GENERAL DEFINITIONS**

[B] REROOFING. The process of recovering or replacing an existing *roof covering*. See “Roof recover” and “Roof replacement.”

[B] ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

[B] ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

[B] ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

Reason: Fischer (Part I) The current requirements that govern envelope performance requirements during reroofing do not utilize definitions contained in the building codes. The use of the term reroofing in and of itself is overly broad and subject to confusion. Roof replacement, which is the specific condition intended for envelope compliance, provides an important opportunity to decrease building energy use in US buildings. This proposal provides needed clarity to ensure that buildings are evaluated for compliance to current energy code requirements when the roof is replaced. The proposal also improves the exception to ensure that roof repair and recover projects are clearly not intended to bear additional expense that could be burdensome.

Fischer (Part II) The exceptions to applicability of the IECC for reroofing are unclear, and include confusing language. This proposal includes definitions used in the roofing chapter of the IBC in order to better scope the appropriate exceptions to the envelope requirements in the IECC.

The proposed language clarifies that roof replacement triggers the envelope requirements, but only when the roof assembly is part of the thermal envelope and the insulation is entirely above the roof deck. If the insulation is located within an attic cavity, roof replacement itself does not trigger insulation upgrades. The proposal also makes it clear that recover and repairs are not intended to trigger energy upgrades, while ensuring that the opportunity to add roof insulation when the roof is replaced is not missed.

Reason: Dean, Harris, Misuriello, Prindle, Stone: The purpose of this code change is to clarify code requirements related to roofs on existing buildings by distinguishing between roof repairs, roof recovering, and roof replacement. The proposal creates new definitions for each of these actions (Chapter 2), clarifies that repair and recover are exceptions to the code (section C101.4.3), and clarifies that when certain roof replacements occur (new section C402.2.1.1), that the roof must meet the roof insulation requirements in Table C402.1.2 or C402.2.

While the code generally requires additions, alterations, renovations or repairs to comply with the code, the specific application in many instances may not be entirely clear or consistently interpreted and enforced. Roof replacements are a good example of this issue. This code proposal is intended to resolve any interpretation issues related to roof replacement and ensure that proper insulation is installed when the opportunity is presented. It is important that opportunities to improve the efficiency of existing buildings are seized when presented and the replacement of roofs is one such important opportunity.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The four proposed definitions are terms defined in the IBC, the term 'roof replacement' is also found in the IgCC. The definitions found in the other codes are the same as proposed here.

C101.4.3-EC-FISCHER-DEAN-HARRIS-MISURIELLO- PRINDLE-STONE.doc

Committee Action Hearing Results

Part I of this code change was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee felt that the proposal didn't bring sufficient clarity to the exceptions and might allow a large area of a roof to be 'reconstructed' without taking advantage of an opportunity to achieve energy conservation improvements. The committee encouraged the SEHPCAC to try to bring consensus to this issue for the public comments.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Michael D. Fischer, Kellen Company, representing the Center for the Polyurethanes Industry of the American Chemistry Council, requests Approval as Submitted.

Commenter's Reason: During the deliberation on a series of proposals related to the exceptions and clarifications to the scope and applicability of the IECC to existing buildings, the committee was unable to come to agreement regarding what concepts to take forward. In its reasoning statements on these proposals, the IECC-C committee directed the parties to work with the ICC Sustainability, Energy & High Performance Building Code Action Committee (SEHPCAC) on a potential public comment. CPI reviewed the technical issues with the SEHPCAC, and the SEHPCAC decided not to submit a public comment on CE13. Part II of this proposal was approved by the IECC-R committee, which felt the addition of definitions from the building code added clarity to the code. Part I is essentially the same, except that it also includes a clear requirement to address those conditions where roof replacement occurs - as part of the building thermal envelope - and where there is insulation entirely above deck. Because the code as written contains exceptions to requirements, the code is not always clearly interpreted. This proposal uses definitions from the building code to clarify the current requirements.

Public Comment 2:

Michael D. Fischer, Kellen Company, representing the Polyisocyanurate Insulation Manufacturers Association, requests Approval as Submitted.

Commenter's Reason: Each year about 2.5 billion square feet of roof coverings are installed on existing buildings. The opportunity to upgrade the insulation levels on these roof systems occurs just once in several decades- or longer when roofs are "recovered". When existing roofs (that are part of the building's thermal envelope) are removed and replaced, and when the roof assembly includes above-deck insulation, the energy code requires that the insulation levels comply with the requirements for new construction. Unfortunately, this requirement is prescribed using vague and confusing language. For example, the requirement does not utilize the terms defined in the IBC, and it does not correlate the requirements and exceptions to the definitions and the prescriptive insulation tables.

The IECC-R Committee recommended Part II of this proposal for approval as submitted. Part I contains the same definitions from the IBC, and provides clear unambiguous direction on how the energy code provisions apply to roof repair, roof recover, and roof replacement. The proposal does not change the requirements and does not increase the insulation levels for existing buildings. What it does provide is clarity.

In a survey of building departments in many states and regions in the US, we found that online roofing permit application forms rarely included any information on the energy code and required insulation levels. With this change, it will be easier for building departments to correlate the building code- and energy code- requirements for roof replacements.

This proposal will not increase the cost of construction; what it will do is make the code easier to interpret and enforce. Along the way, it will help ensure that the opportunity to save energy when replacing roofs is not lost.

Public Comment 3:

Brian Dean, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Submitted.

Commenter's Reason: We recommend approval of CE15 Part I as submitted. Roofing replacement represents an important opportunity to increase the energy efficiency of our existing building stock. Because most roofs are designed to last for decades, it is important that the opportunity is not missed because the code requirements are vague. The IECC residential committee recommended Part II of CE15 for approval because it added clarity to the code; we believe that Part I should be approved for the same reason.

CE15 has a narrow scope, focusing only on the need to address insulation levels when the roof is part of the thermal envelope and the insulation is entirely above deck. When the roof is replaced as described in the definition of roof replacement and in related building code provisions, this proposal will improve the clarity of the code without increasing the current requirements.

CE15-13, Part I

Final Action: AS AM AMPC _____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE15-13

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.4.3 (N1101.3) Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. ~~Reroofing for roofs where neither the sheathing nor the insulation is exposed.~~ Roof recover or roof repair.
6. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
67. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,
78. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
89. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

Add new definitions as follows:

**SECTION R202 (N1101.9)
GENERAL DEFINITIONS**

[B] REROOFING. The process of recovering or replacing an existing *roof covering*. See “Roof recover” and “Roof replacement.”

[B] ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

[B] ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

[B] ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The four proposed definitions are terms defined in the IBC, the term 'roof replacement' is also found in the IgCC. The definitions found in the other codes are the same as proposed here.

PART II – IECC – Residential

Committee Action:

Approved as Submitted

Committee Reason: This language improves the clarity of the code regarding roofing repair and replacement.

Assembly Action:

None

CE20-13, Part I

C101.4.4, C101.4.5, R101.4.4, R101.4.5 (IRC N1101.4)

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy from an F, S or U occupancy to an occupancy other than F, S or U shall comply with this code. Any space that is converted to a dwelling unit or portion thereof, from another use or occupancy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is permitted to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3 and Section C401.2 (3).

C101.4.5 Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is permitted to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3 and Section C401.2 (3).

Reason: The existing IECC phrase “Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy...” (from Section C101.4.4) does not reference a standard for predicting energy demand, even in the Commentary, and could be subject to widely different interpretations. Storage, utility and industrial buildings are the most likely building types to have substantially deficient envelopes, and therefore this amendment replaces the current code language with a more straightforward requirement to bring any of those building types up to code when converting them to other uses.

The exceptions appended to both C101.4.4 and C101.4.5 are included to recognize the fact that converting an existing building to full compliance with current energy code is extremely difficult and costly. Conditions such as slab edges, structural thermal bridges, and window configurations cannot be practically remedied in many cases. Therefore, we propose an alternate compliance path allowing either a 10% higher envelope UxA value or a 10% higher Total Building Performance value. This will result in the preservation and adaptive reuse of more existing buildings, which itself is a significant energy conservation measure.

Note that the first sentence in each exception should be deleted if a separate proposal for a “component performance” building envelope U-value trade-off option is not approved.

Cost Impact: The code change proposal will not increase the cost of construction, it will decrease the cost.

C101.4.4-EC-KRANZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee found the language to be flawed and therefore would be difficult to enforce. The changes of occupancies listed are limited. Many are left out. Would it mean that a change from a warehouse to a restaurant would not require any energy improvements? Such was not found to be acceptable.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy from an F, S or U occupancy to an occupancy other than F, S or U shall comply with this code. Any space that is converted to a dwelling unit or portion thereof, from another use or occupancy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption cost of the proposed design is permitted to be 110 percent of the annual energy consumption cost otherwise allowed by Section C407.3 and Section C401.2 (3).

C101.4.5 Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption cost of the proposed design is permitted to be 110 percent of the annual energy consumption cost otherwise allowed by Section C407.3 and Section C401.2 (3).

Commenter's Reason: The Committee's reason statement for disapproval suggests that the impact of this proposal was not fully understood. This proposal would certainly apply to a warehouse (S occupancy) being converted to a restaurant (A2 occupancy). The IECC language as it now stands is problematic for two reasons: it is both unenforceable and unaffordable. There is no standard mentioned in the code or even in the commentary that a code official could use to determine which proposed use would require more energy than an existing use. The current language also penalizes energy conservation, because if the existing occupant has been frugal with energy use, any new occupancy could be seen as requiring more energy and would thus mandate a full energy upgrade.

Enforceable: This proposal limits the provision to a specific group of use types that were not originally designed for comfort conditions.

Affordable: Instead of full energy code compliance for buildings going through a change of use or change in space conditions, this proposal permits 10% more energy use than required for new construction. This allows certain hard-to-upgrade existing conditions such as slab edges or building entrances to remain in place.

The first sentence of each exception has been stricken because the referenced component performance proposal (CE88-13) was not approved.

CE20-13, Part I

Final Action:

AS

AM

AMPC _____

D

CE20-13, Part II

C101.4.4, C101.4.5, R101.4.4, R101.4.5 (IRC N1101.4)

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy ~~that would result in an increase in demand for either fossil fuel or electrical energy from an F, S or U occupancy to an occupancy other than F, S or U~~ shall comply with this code. Any space that is converted to a dwelling unit or portion thereof, from another use or occupancy shall comply with this code.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is permitted to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3 and Section C401.2 (3).

R101.4.5 (N1101.4) Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is permitted to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3 and Section C401.2 (3).

Reason: The existing IECC phrase “Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy...” (from Section C101.4.4) does not reference a standard for predicting energy demand, even in the Commentary, and could be subject to widely different interpretations. Storage, utility and industrial buildings are the most likely building types to have substantially deficient envelopes, and therefore this amendment replaces the current code language with a more straightforward requirement to bring any of those building types up to code when converting them to other uses.

The exceptions appended to both C101.4.4 and C101.4.5 are included to recognize the fact that converting an existing building to full compliance with current energy code is extremely difficult and costly. Conditions such as slab edges, structural thermal bridges, and window configurations cannot be practically remedied in many cases. Therefore, we propose an alternate compliance path allowing either a 10% higher envelope UxA value or a 10% higher Total Building Performance value. This will result in the preservation and adaptive reuse of more existing buildings, which itself is a significant energy conservation measure.

Note that the first sentence in each exception should be deleted if a separate proposal for a “component performance” building envelope U-value trade-off option is not approved.

Cost Impact: The code change proposal will not increase the cost of construction, it will decrease the cost.

C101.4.4-EC-KRANZ.doc

Committee Action Hearing Results

PART II – IECC – Residential Committee Action:

Approved as Modified

Modify the proposal as follows:

R101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy from an F, S or U occupancy to an occupancy other than F, S or U shall comply with this code. Any space that is converted to a dwelling unit or portion thereof, from another use or occupancy shall comply with this code.

Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the simulated total building performance option in Section C407.3 R405 is used to comply with this section, the annual energy consumption cost of the proposed design is permitted to be 110 percent of the annual energy consumption cost otherwise allowed by Section C407.3 R405.3 and Section C401.2 (3) .

R101.4.5 (N1101.4) Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception: Exception: Where the component performance building envelope option in Section C402.1.3 is used to comply with this section, the Proposed UA is permitted to be up to 110 percent of the Target UA. Where the simulated total building performance option in Section C407.3 R405 is used to comply with this section, the annual energy consumption cost of the proposed design is permitted to be 110 percent of the annual energy consumption cost otherwise allowed by Section C407.3 R405.3 and Section C401.2 (3) .

Committee Reason: The proposal clarifies the intent of the code and the exceptions provide additional flexibility. The modification provides succinct language applicable to the Residential Provisions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, requests Disapproval.

Commenter's Reason: We completely agree with the committee's reason statement for disapproval in Part I and could add several more instances that this proposed code section does not properly cover. The residential energy committee proposed a change that would even take it further to just say that anything modified to a dwelling unit has to comply with the code but what about modifications from a dwelling unit to another occupancy?

What if you went from a dwelling to an office, or dwelling unit to assisted living, or dwelling unit to education facility? These changes would require significant lighting changes, at a minimum, if not also mechanical changes, that should be covered. The language that already exists in the code is quite adequate and should not be replaced by the proposed language.

CE20-13, Part II

Final Action: AS AM AMPC____ D

CE21-13
C101.4.7 (New)

Proposed Change as Submitted

Proponent: John R. Norris, P.E., Fibrebond Corporation, representing self (bob.norris@fibrebond.com)

Add new text as follows:

C101.4.7 Exempt buildings. Buildings exempt from the provisions of the *International Energy Conservation Code*, include buildings designed for purposes other than general space comfort conditioning. Any building where heating or cooling systems are provided which are designed for purposes other than general space comfort conditioning. Buildings included in this exemption include:

1. Electrical equipment switching buildings which provide space conditioning for equipment only and in which no operators work on a regular and are less 1,000 square feet.

Reason: Additional insulation in these buildings will increase the amount of heat retained, thus making the air-conditioner run more often. It is not practical to comply with the *International Energy Conservation Code* envelope requirements.

Cost Impact: The code change proposed will not increase the cost of construction it will decrease the construction cost by as much as \$11.30 per square foot depending on the Climate Zone. In addition there will be a monthly savings based on energy consumption. Actual savings will vary by Climate Zone. The useable area of the building is reduced by about 9% and larger buildings may be required to maintain clearances for equipment.

C101.4.7 (NEW)-EC-NORRIS.doc

Committee Action Hearing Results

The following errata were not posted to the ICC website.

C101.4.7 Exempt buildings. Buildings exempt from the provisions of the *International Energy Conservation Code*, include buildings designed for purposes other than general space comfort conditioning. Any building where heating or cooling systems are provided which are designed for purposes other than general space comfort conditioning. Buildings included in this exemption include:

1. Electrical equipment switching buildings which provide space conditioning for equipment only and in which no operators work on a regular basis and are less 1,000 square feet.

Committee Action:

Disapproved

Committee Reason: The committee felt that the proposal was too broad and could be used for many buildings not intended by the proponent. The 1000 square foot exemption was felt to be too large.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Rosenstock, Edison Electric Institute, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C101.4.7 Exempt buildings. Buildings exempt from the provisions of the *International Energy Conservation Code*, include buildings designed for purposes other than general space comfort conditioning. Any building where heating or cooling systems are provided which are designed for purposes other than general space comfort conditioning. Buildings included in this exemption include:

1. Electrical equipment switching buildings which provide space conditioning for equipment only and in which no operators work on a regular basis and are less ~~4,000~~ 1,100 square feet.

Committer's Reason: This proposal should be approved as modified for the following reasons:

-These buildings are used to house equipment, and any space conditioning is only meant to prevent damage to equipment. The amount of time that people work in these spaces is usually minimal.

-Based on feedback from EEI member companies, anywhere from 50% to 100% of utility vaults or enclosed switching stations or substations are not conditioned. For electric equipment buildings that are conditioned, the temperature settings are typically much higher in the summer (85 degrees F or higher) and much lower in the winter (65 degrees F or lower) than spaces that are meant for human comfort conditioning.

-Some of the electric equipment vaults being used by utilities are sized at 18 feet by 60 feet, or 1,080 square feet. It is suggested that the size limit be increased to 1,100 square feet to accommodate the largest buildings that would fall under this category.

CE21-13

Final Action: AS AM AMPC_____ D

CE22-13, Part I

C101.5.1, R101.5.1 (N1101.5)

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition.

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C101.5.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that demonstrate compliance with ~~meet the intent~~ requirements of this code.

Reason: The purpose of this code change is to clarify the code. Specifically, this proposal improves sections C101.5.1 and R101.5.1 by changing the reference from the “intent” to the “requirements” of the code and refocuses compliance materials on demonstrating compliance. As a result of this improved language, in order to be approved, compliance materials such as computer software or worksheets must be designed to demonstrate that a project meets the *requirements* of the IECC, not simply the “intent” of the IECC.

The current code language is vague because of the reference to the “intent” of the code. Presumably this is a reference to Sections C101.5.1 and R101.3, which provides no guidance as to specific compliance requirements. Alternately, some may claim that this language permits a subjective interpretation of “intent” by the authority enforcing the IECC. Neither interpretation is a suitable substitute for the specific requirements of the code.

Cost Impact: The code change proposal will not increase the cost of construction.

C101.5.1-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Disapproved

Committee Reason: The proposal would harm the usefulness of this section for general administration of the code and specifically the consideration of alternate materials and methods. 'Intent' provides the code official a critical tool in the evaluation of compliance.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C101.5.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that demonstrate compliance with the requirements and intent of this code.

Commenter's Reason: We recommend approval of CE22, Part I, as modified by this public comment. This proposal as modified further clarifies that compliance software, worksheets, and other materials must show compliance with the specific requirements of the code, as well as meeting the intent of the IECC to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

Although we continue to think CE22, Part I, as submitted, would improve the code for the reasons outlined in the original reason statement, some concern was raised at the committee hearing about eliminating the reference to "intent" of the code and possibly reducing the flexibility needed by code officials to accomplish their important work. This proposal does not remove a code official's ability to make judgment calls on compliance, but rather refocuses code compliance software, worksheets, and other materials on the actual requirements of the code, not just an undefined and subjective "intent" of the code. By definition, compliance with the intent of the code in any given situation can only be determined in connection with the specific requirements. It will obviously still be within the discretion of the code official to exercise judgment on whether to approve computer software, worksheets, manuals or other materials in the first place. However, we propose to add the reference to word "intent" back into the provision in the proposed modification in order to address this concern and reinforce this discretion.

CE22-13, Part I

Final Action: AS AM AMPC_____ D

CE22-13, Part II

C101.5.1, R101.5.1 (N1101.5)

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition.

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R101.5.1 (N1101.5) Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that demonstrate compliance with ~~meet the intent~~ requirements of this code.

Reason: The purpose of this code change is to clarify the code. Specifically, this proposal improves sections C101.5.1 and R101.5.1 by changing the reference from the “intent” to the “requirements” of the code and refocuses compliance materials on demonstrating compliance. As a result of this improved language, in order to be approved, compliance materials such as computer software or worksheets must be designed to demonstrate that a project meets the *requirements* of the IECC, not simply the “intent” of the IECC.

The current code language is vague because of the reference to the “intent” of the code. Presumably this is a reference to Sections C101.5.1 and R101.3, which provides no guidance as to specific compliance requirements. Alternately, some may claim that this language permits a subjective interpretation of “intent” by the authority enforcing the IECC. Neither interpretation is a suitable substitute for the specific requirements of the code.

Cost Impact: The code change proposal will not increase the cost of construction.

C101.5.1-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposed change would remove the flexibility that the code official needs to enforce this code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R101.5.1 (N1101.5) Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that demonstrate compliance with the requirements and intent of this code.

Commenter's Reason: We recommend approval of CE22, Part II, as modified by this public comment. This proposal as modified further clarifies that compliance software, worksheets, and other materials must show compliance with the specific requirements of the code, as well as meeting the intent of the IECC to "regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building."

Although we continue to think CE22, Part II, as submitted, would improve the code for the reasons outlined in the original reason statement, some concern was raised at the committee hearing about eliminating the reference to "intent" of the code and possibly reducing the flexibility needed by code officials to accomplish their important work. This proposal does not remove a code official's ability to make judgment calls on compliance, but rather refocuses code compliance software, worksheets, and other materials on the actual requirements of the code, not just an undefined and subjective "intent" of the code. By definition, compliance with the intent of the code in any given situation can only be determined in connection with the specific requirements. It will obviously still be within the discretion of the code official to exercise judgment on whether to approve computer software, worksheets, manuals or other materials in the first place. However, we propose to add the reference to word "intent" back into the provision in the proposed modification in order to address this concern and reinforce this discretion.

CE22-13, Part II

Final Action: AS AM AMPC____ D

CE24-13 C101.5.2, C202 (NEW)

Proposed Change as Submitted

Proponent: Vickie Lovell, InterCode Inc., representing National Greenhouse Manufacturers Association (vickie@intercodeinc.com)

Revise as follows:

C101.5.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code shall be exempt from the *building thermal envelope* provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.
3. Greenhouses.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

GREENHOUSE. A structure or a separate area of a building that maintains a specialized environment essential for the cultivation, protection or maintenance of plants.

Reason: (for 101.5.2) Energy codes and standards have historically applied to buildings intended primarily for human occupancy and use. There are structures, buildings and space uses where strict application of the code poses increasing challenges. All types of agricultural buildings including barns, livestock shelters, sheds, and stables are unique structures in design, construction and operation and different from other commercial buildings in terms of internal loads, schedules, and building usage. Included in those types of structures are greenhouses and separated portions of buildings whose primary function is the cultivation, protection or maintenance of plants.

This proposal exempts greenhouses or separated portions of buildings whose primary function is the cultivation, protection or maintenance of plants from the building thermal envelope of the International Energy Conservation Code. This code change is intended to provide clarity to what the code already says about greenhouses, and what parts of the energy code should be required for compliance.

Strict application of the building envelope provisions of the code in greenhouses is cost prohibitive. Compliance with the building thermal envelope for greenhouses may actually be counterproductive, even detrimental to plant growth, since most plants require controlling the available natural light and highly specialized temperature-controlled conditions. Arbitrarily changing growing conditions can result in reduced output for greenhouse growers, and will have serious negative consequences to the US agricultural/horticultural/floricultural economy. Therefore, this topic merits thoughtful consideration of the implications and ramifications of requiring greenhouses to comply with the entirety of the IECC.

Although the current title of section C101.5.2 is somewhat narrow in scope, it provides for some exemptions to the building thermal envelope provisions in the code. The current provisions in Section C101.5.2 would exempt such buildings from the thermal envelope provisions in the code if they did not contain conditioned space (room or space within the building that is being heated or cooled) or the peak design rate of energy use was less than 1 watt per square foot for space conditioning purposes. However, some greenhouses do contain conditioned space that exceeds the stated peak connected load. In reality, the whole point of a greenhouse is to control a unique environment for the cultivation, protection or maintenance of plants, and such environment is not intended to maintain suitable conditions specifically for human occupancy. Currently such buildings are not exempt from the building thermal envelope provisions of the code. But greenhouses should be exempt.

Other requirements of the IECC and the IBC would still apply to Group U greenhouses. All other building code requirements would still apply for structural, fire, egress, accessibility for such cases where a greenhouse is also used as a retail business, such as garden centers and retail stores that sell plants to the public. This exemption is NOT intended to apply to retail businesses who may display plants and flowers in regular buildings that are not intended to be greenhouses and are environmentally controlled as retail spaces. This would not apply to office buildings and atriums where plants are displayed for aesthetical purpose. But it could capture botanical gardens which also maintain a specialized environment. In such businesses, the plants may be able to survive in the ambient temperature without specifically managing their growing conditions and environment. The proposed definition makes it clear that it is a unique climate controlled environment that defines a greenhouse or similar facility.

Some universities maintain greenhouses for research and studies in horticulture and should be exempt. In these cases, the IBC building, fire structural and other such requirements for mercantile, business and education still apply if the greenhouse is permitted as a Group B, E or M use or occupancy. These IBC provisions based on occupancy are primarily for the comfort and/or protection of people, and appropriately should apply. All Group U provisions of the IBC would still apply. Additionally, the IECC requirements for HVAC would still apply.

The proposed language is based on a current exemption used in the energy code of the State of Wisconsin. A NY Department of State Codes Division opinion on this topic considers all buildings used primarily for agricultural purposes as commercial processes and do not need to comply with the energy codes of the state based upon an ASHRAE 90.1 exemption. This included any greenhouse whether built on a commercial or residential building property site since the greenhouse is not designed for occupancy and falls under their view of a "commercial processes".

The initiatives to make this industry more energy efficient and sustainable are in motion. The USDA and other federal agencies and private organizations are making huge strides in helping growers be more energy efficient and sustainable by using soil amendments, reducing runoff from irrigation, using appropriate methods of reducing energy consumption, using improved pest management methods, reducing potable water or other natural surface or subsurface water resources, reducing waste, and promoting organic growing.

The current IECC requirements that reduce energy use for other aspects of greenhouses are appropriate EXCEPT the requirements that impede or inhibit the growth of plants, which is the primary function of a greenhouse.

(Section 202) The word "greenhouse" conjures up diverse images as to what a greenhouse might look like including the numerous ways plants are cultivated, marketed and sold. However, this definition captures the primary purpose of a greenhouse, which is to create unique environmental conditions inside a structure or a separated portion of a building that are ESSENTIAL for the cultivation, protection or maintenance of plants. This proposed definition is intended to exclude a retail business owner that brings plants indoors temporarily for display or seasonal promotions.

That environment includes control of the available natural or artificial light, managing the temperature and humidity, dispersing and managing water and controlling the growing medium regardless of the outside climate conditions. If that specific environment is not maintained, the plants cannot survive.

Previous code discussions regarding greenhouses have often bogged down because the focus gets shifted to whom or how the plants are being marketed and sold, public access or not, and other conditions. However, that information is irrelevant to this definition. The proposed definition makes it clear that **the primary descriptive feature of a greenhouse is the unique environment that must be maintained in order for the plants inside the greenhouse to survive.**

Cost Impact: This code change proposal will not increase the cost of construction.

C202-GREENHOUSE (NEW)-EC-LOVELL.doc

Committee Action Hearing Results

Committee Action:

Approved as Modified

Modify the proposal as follows:

GREENHOUSE. A structure or separate area of a building that maintains a specialized sunlit environment specific to essential for cultivation, protection or maintenance of plants.

(Portions of proposal not shown remain unchanged)

Committee Reason: The committee concluded that greenhouses as defined should be exempt from envelope provisions. Environments needed for plants would be difficult to achieve if full compliance with envelope provisions was mandated. The committee expressed concern that the separation from parts of a building which are conditioned for human use provide thermal isolation, but did not include such modification.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Vickie Lovell, Intercode, Inc. representing National Greenhouse Manufacturers Association, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

GREENHOUSE. A structure or separate, thermally isolated area of a building that maintains a specialized sunlit environment specific to and essential for cultivation, protection or maintenance of plants.

Commenter's Reason: The purpose of the greenhouse is to create a unique environment that is essential for the plants to thrive.

Although this proposal was overwhelmingly recommended for approval, some interested parties expressed concern that conditioned portions of buildings used primarily for human occupancy such as sunrooms, atria, lobbies, glass enclosed walkways, and other areas that sometimes feature could be considered to be "greenhouses" by designers trying to take advantage of exceptions to the code provided to commercial growers.

This modification provides additional clarification to the definition that helps the code official identify the intention of the building designer when compared to other buildings that may feature plants for aesthetic purposes. It clarifies that the separated, unique and specialized environment for the intentional cultivation of a particular crop is what defines a greenhouse. Without the specific and essential environment created by the greenhouse, the plants could not thrive.

This modification to the original proposal purposely EXCLUDES those areas or types of buildings such as sunrooms, atria, lobbies, glass enclosed walkways, and similar areas for human occupancy - even if plants are prominently featured.

Public Comment 2:

Eric Makela, Britt/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

GREENHOUSE. A structure or a separate area of a building that maintains a specialized sunlit environment ~~specific to~~ exclusively used for the cultivation, protection or maintenance of plants.

Commenter's Reason: The current language in CE 24 would allow a greenhouse to be used for both retail and as an area for the cultivation, protection or maintenance of plants as there is no language that would prevent these spaces from serving dual purposes. There is no limit on the quantity of space conditioning in the structure only that what is sufficient to protect the plants. The exemption for commercial greenhouses is needed, as energy codes were not intended to address are glass buildings with this type of specific purpose, but the definition must be clear that the greenhouse should only be used for cultivation, production or maintenance of plants and not for other purposes e.g. retail spaces where the space could be conditioned for human occupancy. The addition of the words "exclusively used" will allow jurisdictions to accurately interpret this exemption.

Public Comment 3:

Ray A. Bucklin, Ph.D, PE, University of Florida, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter's Reason: This Public Comment is intended to express my support for the committee action on CE24-13 for "Approved as Modified."

In your deliberations for the revisions for the 2015 ICC Energy Conservation Code I ask that the information provided by the National Greenhouse Manufacturers Association be given your full consideration and approval. The NGMA is the leading organization in the USA representing an association of companies providing greenhouse designs, materials, hardware, supplies and equipment which represents all the major aspects of greenhouse systems for the crop producers.

A greenhouse is a specialized building for plant production, and therefore it should not be considered in the same way as other more general building designs in its code requirements. The greenhouse must orchestrate numerous climate control and crop supportive sub-systems to provide a particular and necessary greenhouse environment to manage specific crops with the goal of obtaining the production quantity and quality of product to meet the market demands. This is much different than a building for human comfort, or for non-agricultural, commercial use.

As proposed by CE 25, Florida already exempts agricultural buildings, including greenhouses, from energy and building code requirements because they are not within the scope of the code requirements for human habitation, safety, use, or comfort.

These proposals do not exempt greenhouses from other provisions of the codes, only for the thermal envelope requirements of IECC, which are those that, without caution, would negatively affect greenhouse growing conditions for plants. The other building and energy code provisions would still apply, while the growers and greenhouse designers would have the flexibility to the final decisions about the optimum conditions for light and temperature based on the crop and the climate zone.

As a member of the faculty of the Agricultural and Biological Engineering Department of the University of Florida I have over thirty years of experience working with teaching, research and extension education programs involving Florida's greenhouse industry. I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

Public Comment 4:

Richard S. Gates, Ph.D, P.E., University of Illinois at Urbana-Campaign, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter's Reason: I am requesting that you please fully consider the information provided by the National Greenhouse

Manufacturers Association, with regards to energy code applications to greenhouse systems.

A greenhouse is a highly specialized system that must provide specific (but variable) indoor conditions of temperature, humidity and light to optimally manage the crops. The optimal management is a balance of numerous factors, including energy use, market forces, season, disease pressure, labor costs and a myriad of other issues that must be accommodated so as to obtain the production and quality of product for specific markets. A greenhouse environment must be controlled to meet the needs of the various crops in production by offsetting the various climate conditions of the particular region where it resides. Therefore it should not be considered equal in code requirements to other traditional buildings. Similarly it is questionable that a baseline code for all of the U.S. would even be feasible.

One troublesome outcome of such an (ill-advised) revision would be the encouragement of even more non-domestic vegetable and floral crops sold in the U.S. for cases where lower nondomestic labor and optimal climate can compete vigorously with higher cost, domestic, greenhouse-produced crops. Look no further than your local grocery store's floral section for evidence of this long-term reality. I would be concerned about an energy code revision that further promotes this erosion of domestic food security. I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

Public Comment 5:

Dr. Gene Giacomelli, University of Arizona, Controlled Environment Agricultural Center, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter's Reason: In your deliberations for the revisions for the 2015 ICC Energy Conservation Code I ask that the information provided by the National Greenhouse Manufacturers Association be given your full consideration and approval. The NGMA is the leading organization in the USA representing an association of companies providing greenhouse designs, materials, hardware, supplies and equipment which represents all the major aspects of greenhouse systems for the crop producers.

A greenhouse is a specialized building for plant production, and therefore it should not be considered an equal to other more general building designs in its code requirements. The greenhouse must orchestrate numerous climate control and crop supportive sub-systems to provide a particular and necessary greenhouse environment to manage specific crops with the goal of obtaining the production quantity and quality of product to meet the market demands. This is much different than a building for human comfort, or for non-agricultural, commercial use.

These proposals do not exempt greenhouses from other provisions of the codes, only for the thermal envelope and interior lighting requirements of IECC, which are those that, without caution, would negatively affect the greenhouse growing conditions for the plants. The other building and energy code provisions would still apply, while the growers and greenhouse designers would have the flexibility to the final decisions about the optimum conditions for light and temperature based on the crop and the climate zone.

As Director of the Controlled Environment Agricultural Center at the University of Arizona, I have more than 35 years of experience in the development, design and education within greenhouses for crop production.

I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

Public Comment 6:

David S. Kulina, Vice President, Engel Architects, LLC, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter's Reason: This Public Comment is intended to express my support for the committee action on CE24-13 for "Approved as Modified."

As the architect of record for numerous greenhouses used for plant propagation, horticultural education, campus maintenance, and wholesale and retail sales, we (Engel Architects) are very familiar with and have experienced the conflicts between provisions of the IECC and maintaining healthy plants.

We have typically been fortunate to have code officials that have understood the conflicts and our concerns. However, the fact remains that even retail greenhouses must be able to allow plants to thrive despite some level of human discomfort; else the plants will suffer and become unhealthy, and the appearance of the foliage will decline. As for growing greenhouses, the product is what is critical, not worker comfort.

We also are involved with the construction of agricultural buildings. Once again, the needs of the animals take precedence over the comfort of workers. The need for extremely large amounts of fresh air often precludes any thermal barriers from being effective.

Neither of these changes would affect the structural, life safety, and other features within the codes that remain important for the people that use these buildings.

I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

Public Comment 7:

Mark Lefsrud, McGill University, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action hearing.

Commenter's Reason: This letter is intended to express my support for the committee action on CE24-13 for "Approved as

Modified.”

I wish you would consider and approve the information provided by the National Greenhouse Manufacturers Association for the revisions for the 2015 ICC Energy Conservation Code. The NGMA is the leading organization in the USA representing an association of companies providing greenhouse designs, materials, hardware, supplies and equipment which represents all the major aspects of greenhouse systems for the crop producers. This group also represents a number of Canadian greenhouse companies and it uses a critical resource in the development of industry and government code within Canada.

Greenhouse designers and operators in Canada are very aware of the requirements of energy management and thermal envelope and we are worried that if this revision is not accepted it will severely limit greenhouse development and operation in cold northern climates, including Canada. Designing for a greenhouse in a cold climate is a challenge. Using numerous climate controls and crop systems provides a necessary greenhouse environment to manage production quantity and quality of product to meet the market demands. The energy balancing is significantly different than a building for human comfort. These proposals do not exempt greenhouses from other provisions of the codes, only for the thermal envelope requirements of IECC. Without this exception the growers and greenhouse designers would not have the flexibility to make the final decisions about the optimum conditions for light and temperature based on the crop and the climate zone.

As an Assistant Professor at McGill University, I have more than 15 years of experience managing greenhouses for crop production.

I urge the ICC voting membership to sustain the committee and vote for “Approved as Modified”.

Public Comment 8:

David Mears, Professor Emeritus, Rutgers University, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter’s Reason: This Public Comment is intended to express my support for the committee action on CE24-13 for “Approved as Modified.”

In your deliberations for the revisions for the 2015 ICC Energy Conservation Code I ask that the information provided by the National Greenhouse Manufacturers Association be given your full consideration and approval. The NGMA is the leading organization in the USA representing an association of companies providing greenhouse designs, materials, hardware, supplies and equipment which represents all the major aspects of greenhouse systems for the crop producers.

A greenhouse is a specialized building for plant production, and therefore it should not be considered an equal to other more general building designs in its code requirements. The greenhouse must orchestrate numerous climate control and crop supportive sub-systems to provide a particular and necessary greenhouse environment to manage specific crops with the goal of obtaining the production quantity and quality of product to meet the market demands. This is much different than a building for human comfort, or for non-agricultural, commercial use.

These proposals do not exempt greenhouses from other provisions of the codes, only for the thermal envelope requirements of IECC, which are those that, without caution, would negatively affect the greenhouse growing conditions for the plants. The other building and energy code provisions would still apply, while the growers and greenhouse designers would have the flexibility to the final decisions about the optimum conditions for light and temperature based on the crop and the climate zone.

We developed a very strong greenhouse engineering program at Rutgers University from the late 1960’s and much of the research was focused on energy conservation and alternatives to fossil fuel use. Major developments in our program included the double layer poly type greenhouses, movable thermal curtains, floor heating and IR absorbing film, all of which have made substantial reductions in energy consumption for commercial greenhouses. Several of my students currently direct similar academic research efforts in the U.S. and abroad, continuing the progress on energy efficiency

I urge the ICC voting membership to sustain the committee and vote for “Approved as Modified.”

Public Comment 9:

Clare Miflin, R.A. Leed AP, Kiss + Cathcart, Architects, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter’s Reason: This Public Comment is intended to express my support for the committee action on CE24-13 for “Approved as Modified.”

As an architect with a specialty in sustainable design, I think it is very important that food production is also sustainable. Greenhouses allow for local sustainable food production, and we (Kiss + Cathcart, Architects) think should be as energy efficient as possible. Fully glazed buildings such as greenhouses are almost impossible to construct under current energy codes, which is why we think there should be an exemption for them under the energy code.

We have been architects for greenhouses for local food production in New York City, and have communicated with code officials in New York State and NYC about how the energy code views greenhouses. Michael Burnetter from NYS DOE’s response was as follows:

Question:

Does the adoption of the 2009 IECC based code which does not address any specific exceptions for agricultural or greenhouse buildings mean that New York will now require the insulation of barns and greenhouses?

Answer:

No, as the 2007 (a permitted compliance path in the 2010 ECCCNY) ASHRAE standard 90.1 states in section 2.3 (c) that all provisions of that standard do not apply to certain buildings and “portions of building systems that use

energy primarily to provide for industrial, manufacturing, or commercial processes". The Department of State Codes Division opinion considers all buildings used primarily for agricultural purposes as commercial processes and hence do not need to comply with the energy codes of the state based upon the ASHRAE exemption. This includes any greenhouse whether built on a commercial or residential building property site since the greenhouse or barn is not designed for occupancy and only falls under our view of a "commercial processes". The code official would need to agree that the intent of the use is primarily for agricultural purposes only.

We feel that the IECC should also have a permitted compliance path and are concerned that this particular path is in jeopardy. We support CE24 as it defines greenhouses, a currently undefined term per code. This will prevent "sunrooms" and other spaces not used for plant production from being portrayed as greenhouses.

I have been a presenter of the NY State "Cracking the Code" course on the 2010 NYS Energy Code, and am fully aware of how a building can comply with energy code. I see no way, other than a large renewable energy source to supply most energy needs, that a greenhouse can comply with energy code using current building materials. This is beyond the means of an agricultural business that has to compete with much lower cost food production trucked or flown from warmer locations. I think that the code officials should consider the broader sustainable picture, and food miles contribute substantially to the environmental cost of food production.

Greenhouses are not buildings designed primarily for human habitation, and plants have much greater need of daylight than humans, and arbitrarily applying the same energy code requirements is a misapplication of the code.

I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

Public Comment 10:

David S. Ross, Professor Emeritus, University of Maryland, representing self, requests Approval as Modified by the Code Committee as Published in the Report of the Committee Action Hearing.

Commenter's Reason: In your discussions of revisions for the 2015 ICC Energy Conservation Code I ask that the proposals provided by the National Greenhouse Manufacturers Association be given your full consideration and approval. The NGMA is the leading USA organization representing companies providing greenhouse designs, materials, hardware, supplies and equipment and therefore represents all the major aspects of greenhouse systems for the crop producers.

I am an agricultural engineer with 37 years of experience in greenhouse environmental control and systems. I urge the ICC voting membership to sustain the committee and vote for "Approved as Modified."

CE24-13

Final Action: AS AM AMPC_____ D

CE27-13
C101.5.3 (NEW)

Proposed Change as Submitted

Proponent: Eric Makela, Britt/Makela Group, Inc., representing Northwest Energy Codes Group (eric@brittmakela.com)

Add new text as follows:

C101.5.3 Equipment buildings. Buildings that comply with all of the following shall be exempt from the *building thermal envelope* provisions of this code:

1. Are separate buildings with floor area no more than 500 square feet (50 m²).
2. Are intended to house electronic equipment with installed equipment power totaling at least 7 watts per square foot and not intended for human occupancy.
3. Have heating system capacity is no greater than 5 kW (17,000 Btu/hr) and heating thermostat setpoint is restricted to no more than 50°F (10°C).
4. Have an average wall and roof U-factor less than 0.120 in climate zones 1-5 and less than 0.200 in climate zones 6 through 8.
5. Comply with the roof solar reflectance and thermal emittance provisions for Climate Zone 1.

Reason: The application of energy codes and standards to buildings not intended primarily for human occupancy and use continue to pose increasing challenges to the strict application of the code. Equipment buildings, shelters, or sheds are installed to protect electronic equipment from the weather and provide primarily cooling conditioning. Heating is installed for emergency backup operation and is typically limited to 40°F or less by a setpoint. Due to the high density of electronic equipment installed, heat is rarely needed and cooling predominates. In this situation, less insulation is actually desirable from an annual energy use standpoint. This exemption is limited to stand alone equipment buildings no more than 500 square feet in area. Simplified insulation requirements that apply to an average of the roof and wall insulation are provided. This type of building is often made with 3" concrete, internal foam insulation, and a plywood interior with similar construction for roof and walls. To reduce insulation requirements, the ASHRAE 90.1 option may be pursued, as the building would qualify as a semi-heated space. The U-factors required for semi-heated spaces and available in standard construction are listed below, along with the U-factors required in the proposal. The proposed requirements can be met by readily available concrete, wood, or steel frame construction.

Target U-Factors for Equipment Shelters	U-factor
<i>Semi-heated U-factors from ASHRAE 90.1-2010</i>	
CZ-1 Semi-heated average wall/roof U-factor	0.251
CZ-5 Semi-heated average wall/roof U-factor	0.097
CZ-8 Semi-heated average wall/roof U-factor	0.087
<i>Wall U-factors based on Appendix A, ASHRAE 90.1-2010</i>	
Industry Standard: 3" Concrete with R-10	0.114
Metal studs, R-13, no continuous insulation	0.113
Wood studs, R-11, no continuous insulation	0.096
3" Concrete with R-5 insulation	0.195
Metal studs, R-6 insulation, no continuous insulation	0.184
<i>Proposed Equipment Shelter Average Wall & Roof U-factor</i>	
Climate Zone 1-5; Average U-factor shall be less than	0.200
Climate Zone 6-8; Average U-factor shall be less than	0.120

The basis of the exemption is that there is significant equipment installed that needs cooling most of the year. In this situation, less insulation reduces annual energy cost because it allows for beneficial heat loss. At around 7 watts per square foot of equipment load, the heat loss is offset by the equipment load, with the proposed insulation resulting in very little heating load. It is important to note that this exemption applies to the building thermal envelope provisions only. Any HVAC, service water heating, and/or lighting systems in such buildings would still be required to meet the provisions of the code. Through this code change it is hoped that additional clarity can be provided for equipment buildings as to when they are or are not required to meet the building thermal envelope provisions of the code.

Cost Impact: The code change proposal will not increase the cost of construction.

C101.5.3 (NEW)-EC-MAKELA.doc

Committee Action Hearing Results

Committee Action:

Approved as Modified

Modify the proposal as follows:

4. Have an average wall and roof U-factor less than ~~0.120~~ 0.200 in climate zones 1 through 5 and less than ~~0.200~~ 0.120 in climate zones 6 through 8.

(Portions of proposal not shown remain unchanged)

Committee Reason: Small equipment buildings are usually not intended for more than intermittent occupancy and such need to be provided with specific provisions. This proposal doesn't fully waive the envelope requirements, but provides a limited and qualified exemption. The modification corrected the U-factor numbers which had been reversed in the published proposal.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, Manager Building Inspections, Clark County Development Services, representing ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C101.5.3 C402.1.2 Equipment buildings. Buildings that comply with all of the following shall be exempt from the *building thermal envelope* provisions of this code:

1. Are separate buildings with floor area no more than 500 square feet (50 m²).
2. Are intended to house electronic equipment with installed equipment power totaling at least 7 watts per square foot and not intended for human occupancy.
3. Have heating system capacity is no greater than 5 kW (17,000 Btu/hr) and heating thermostat setpoint is restricted to no more than 50°F (10°C).
4. Have an average wall and roof U-factor less than 0.200 in climate zones 1-5 and less than 0.120 in climate zones 6 through 8.
5. Comply with the roof solar reflectance and thermal emittance provisions for Climate Zone 1.

Commenter's Reason: The intent of the public comment is to simply relocate the proposed text from Chapter 1 to Chapter 4 of the Commercial IECC. CE23-13 was approved by the committee. It moved provisions for low energy building from Chapter 1 to be located within the envelop provisions of Chapter 4. The low energy provisions are an exception to complying with the envelop requirements which are found in Section C402. CE23 establishes low energy buildings as Section C402.1.1. CE27-13 is a similar concept and is also a detailed exception to the envelop standards. It should be relocated to Chapter 4 and be located after the low energy building provisions.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE27-13

Final Action:

AS

AM

AMPC _____

D

CE28-13, Part I

C102.1, R102.1

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships **(Part II)** Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition.

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the ~~intent~~ requirements of this code.

Reason: The purpose of this code change is to clarify the code. This proposal removes uncertainty from the IECC by clarifying that alternative materials, methods of construction, designs, or systems still must meet the actual requirements, not just the “intent” of the IECC.

The current code language is vague because of the reference to the “intent” of the code. Presumably this is a reference to Section R101.3, which provides no guidance as to specific compliance requirements. Alternately, some may claim that this language permits a subjective interpretation of “intent” by the authority enforcing the IECC. Neither interpretation is a suitable substitute for the specific requirements of the code.

The current language may be viewed by some as creating a loophole that allows a code user to avoid meeting the requirements of the IECC while claiming that a product or system meets a subjective interpretation of the IECC’s “intent.” The lack of specificity places the code official in a difficult, and potentially risky position of making judgments based on a subjective interpretation of the code’s “intent.”

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: Consistent with the action taken on CE22-13. Intent is essential wording for this provision.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Stephen Turchen, Fairfax County, VA, representing Virginia Building and Code Officials Association, requests Approval as Submitted.

Commenter's Reason: This code change proposal should be approved for exactly the reasons stated in the proponent's original submittal.

"Intent" is highly subjective; the requirements of the IECC are not, as they are clearly stated in the text of the code.

The IECC does have an "Intent" paragraph: R101.3 in the residential section, C101.3 in the commercial section. We believe that the Intent paragraph is supposed to guide the development and scope of the code: to (paraphrasing) ensure that *buildings are designed and constructed to effectively use and conserve energy over their useful lives*. Each such specific provision added into the code should be able to meet this test of Intent. However, it is the specific provisions, once finalized, that are enforced.

If a designer is converting unconditioned space to conditioned space and the code requirement for the walls is R13, should he be allowed to install R11 in the walls because he is "effectively conserving energy" (relative to the R0 that was there previously)? Potential situations like this do not provide a workable framework within which code officials can effectively do their jobs. Intent is a legitimate subject for debate at the ICC code development hearings. It is not a workable criterion for enforcing a building code on a daily basis.

CE8-13, Part I

Final Action: AS AM AMPC____ D

CE28-13, Part II

C102.1, R102.1

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships **(Part II)** Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition.

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the ~~intent~~ requirements of this code.

Reason: The purpose of this code change is to clarify the code. This proposal removes uncertainty from the IECC by clarifying that alternative materials, methods of construction, designs, or systems still must meet the actual requirements, not just the “intent” of the IECC.

The current code language is vague because of the reference to the “intent” of the code. Presumably this is a reference to Section R101.3, which provides no guidance as to specific compliance requirements. Alternately, some may claim that this language permits a subjective interpretation of “intent” by the authority enforcing the IECC. Neither interpretation is a suitable substitute for the specific requirements of the code.

The current language may be viewed by some as creating a loophole that allows a code user to avoid meeting the requirements of the IECC while claiming that a product or system meets a subjective interpretation of the IECC’s “intent.” The lack of specificity places the code official in a difficult, and potentially risky position of making judgments based on a subjective interpretation of the code’s “intent.”

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: Consistent with the committee’s disapproval of CE22.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Stephen Turchen, Fairfax County, VA, representing Virginia Building and Code Officials Association, requests Approval as Submitted.

Commenter's Reason: This code change proposal should be approved for exactly the reasons stated in the proponent's original submittal.

"Intent" is highly subjective; the requirements of the IECC are not, as they are clearly stated in the text of the code.

The IECC does have an "Intent" paragraph: R101.3 in the residential section, C101.3 in the commercial section. We believe that the Intent paragraph is supposed to guide the development and scope of the code: to (paraphrasing) ensure that *buildings are designed and constructed to effectively use and conserve energy over their useful lives*. Each such specific provision added into the code should be able to meet this test of Intent. However, it is the specific provisions, once finalized, that are enforced.

If a designer is converting unconditioned space to conditioned space and the code requirement for the walls is R13, should he be allowed to install R11 in the walls because he is "effectively conserving energy" (relative to the R0 that was there previously)? Potential situations like this do not provide a workable framework within which code officials can effectively do their jobs. Intent is a legitimate subject for debate at the ICC code development hearings. It is not a workable criterion for enforcing a building code on a daily basis.

CE28-13, Part II

Final Action: AS AM AMPC____ D

CE29-13, Part I

C102.1, C102.1.1, C102.1.2 (New), R102.1, R102.1.1 (IRC N1101.7), R102.1.2 (New)

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C102.1 General. ~~This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code.~~

C102.1.1 Above code Alternate programs. ~~The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to meet or exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 shall be met.~~

C102.1.2 Accredited programs and designs. The code official or other authority having jurisdiction shall be permitted to accept alternative national programs and designs that have received accreditation by an independent accreditation body. The independent accreditation body shall certify programs or designs as meeting or exceeding the energy efficiency required by this code. Buildings and designs that have received approval in writing and are verified by an approved party shall be considered in compliance with this code.

Reason: The last section is most important. It sets the stage for accrediting programs outside the code as at least as good as code. Some programs, such as RESNET's HERS are currently too proprietary to name in the code; however, they might be accredited, perhaps with restrictions, then that existing infrastructure can help deliver efficient homes. Just as important, there will be a variety of good programs that can help deliver energy efficiency. Some local, some national, some public, some private, some focused on specific types of homes, others broad; all can help. The code official does not have time to look at all the individual programs. We need a mechanism to accredit those programs or their energy efficient designs, This is a way to help deliver verified energy efficiency where this is acceptable to the code official. Code officials need a chance to catch their breath.

The “General” section lifts code text from the IRC to better describe the flexibility in the IECC.

In the middle section above, the IECC is made consistent with the I-code concept of potentially approving an alternative that is at least as good as the code, “meet or exceed”, as in this change. It makes no sense to meet an alternative then go back and say to meet the code too, so the “mandatory” sentence was removed.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1-EC-CONNER.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Modified

Modify the proposal as follows:

C102.1.1 Alternate programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to meet or exceed the energy efficiency required by this code. Buildings approved in writing in such an energy efficiency program shall be considered in compliance with this code. The requirements identified as 'mandatory' in Chapter 4 shall be met.

(Portions of proposal not shown remain unchanged)

Committee Reason: While the code does provide the code official with the authority to approve alternate compliance methods, this proposal provides text which allows the code official to rely on the review and accreditation by others of equivalent or above code programs. This would be helpful to code officials and save their limited time. The text could help drive the development of accredited programs. Each such program provides flexibility for designers.

Assembly Action:

Disapproved

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Disapproved and because public comments were submitted.

Public Comment 1:

Tim Ryan, International Association of Building Officials (IABO), Don Surrena, National Association of Home Builders, request Approved as Submitted.

Commenter's Reason: The floor modification made to this proposal significantly takes away the benefit of having alternate programs being deemed equivalent to the energy code by the jurisdiction. Having to do all the mandatory requirements essentially infers that you can perform whatever alternative program you like, but then be sure that you comply with the IECC; thereby defeating the purpose of the section.

This is a very important proposal to increase the adoptability, usability and enforceability of the IECC.

Public Comment 2:

Brian Dean, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc, request Disapproval.

Commenter's Reason: We recommend disapproval of CE29, Part I. The residential energy committee correctly recommended disapproval of CE29, Part II. Although the commercial energy committee improved CE29 Part I by adding back the requirement that all mandatory requirements be met, CE29 Part I still vastly expands the range of programs or designs that "shall be considered in compliance with [the IECC]." If, as the proponent acknowledges, "some programs, such as RESNET's HERS are currently too proprietary to name in the code," then why should the IECC encourage certification to these programs as acceptable compliance alternatives? CE29 Part I provides no backstops or limitations, and provides no means of determining whether these programs are actually equivalent to the IECC or whether they are acceptable as compliance alternatives. Instead, CE29 Part I invites proponents of programs other than the IECC to claim equivalence. This forces the code official to make determinations on potentially dozens of different programs or designs – many of which will be proprietary and not developed through an open, consensus-based process like the IECC – instead of simply enforcing the code requirements.

Although the proponent may argue that under Section C102.1.1, a code official already has the authority to deem another “national, state or local energy efficiency program to exceed the efficiency required by [the IECC],” CE29 Part I expands the reach of this section to include “alternative national programs and designs,” and leaves it up to the accreditation body to determine whether the programs exceed the efficiency of the code. Code compliance should be rooted in the IECC, and exceptions to these requirements should be narrowly applied by the authority having jurisdiction. Because CE29 Part I broadens these alternatives well beyond the scope of the current IECC, CE29 Part I should be disapproved.

CE29-13, Part I

Final Action: AS AM AMPC_____ D

CE29-13, Part II

C102.1, C102.1.1, C102.1.2 (NEW), R102.1, R102.1.1 (IRC N1101.7), R102.1.2 (NEW)

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R102.1 General. ~~This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code.~~

R102.1.1 (N1101.7) Above-code Alternate programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to meet or exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. ~~The requirements identified as “mandatory” in Chapter 4 shall be met.~~

R102.1.2 Accredited programs and designs. The code official or other authority having jurisdiction shall be permitted to accept alternative national programs and designs that have received accreditation by an independent accreditation body. The independent accreditation body shall certify programs or designs as meeting or exceeding the energy efficiency required by this code. Buildings and designs that have received approval in writing and are verified by an approved party shall be considered in compliance with this code.

Reason: The last section is most important. It sets the stage for accrediting programs outside the code as at least as good as code. Some programs, such as RESNET’s HERS are currently too proprietary to name in the code; however, they might be accredited, perhaps with restrictions, then that existing infrastructure can help deliver efficient homes. Just as important, there will be a variety of good programs that can help deliver energy efficiency. Some local, some national, some public, some private, some focused on specific types of homes, others broad; all can help. The code official does not have time to look at all the individual programs. We need a mechanism to accredit those programs or their energy efficient designs, This is a way to help deliver verified energy efficiency where this is acceptable to the code official. Code officials need a chance to catch their breath.

The “General” section lifts code text from the IRC to better describe the flexibility in the IECC.

In the middle section above, the IECC is made consistent with the I-code concept of potentially approving an alternative that is at least as good as the code, “meet or exceed”, as in this change. It makes no sense to meet an alternative then go back and say to meet the code too, so the “mandatory” sentence was removed.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1-EC-CONNER.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposal would remove mandatory requirements of this code. In addition, the committee believed the language of R102.2 to be open ended.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Tim Ryan, International Association of Building Officials (IABO), Don Surrena, National Association of Home Builders, request Approval as Submitted.

Commenter's Reason: This proposal provides four significant fixes to the IECC. First, it modifies the General section to include the "alternate materials and methods" section from the IRC.

Second, it renames "Above Code" to "Alternate Programs"- the revised wording maintains that a building at least meet the energy efficiency required by the code. This wording still meets the intent of the IECC.

Third, mandatory requirements of this code should only be in effect for buildings using the performance path, not alternate programs. The initial reason that items were labeled as mandatory was that there was no performance trade-off such as HVAC controls and lighting requirements. Reputable alternate energy programs have their own way of dealing with these issues, and often more.

Fourth, additional criteria, "Accredited Programs," is specified in order to provide guidance to the authority having jurisdiction. This is a very important proposal to increase the adoptability, usability and enforceability of the IECC.

Public Comment 2:

Shaunna Mozingo, City of Cherry Village, CO, representing Colorado Chapter of ICC, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R102.1.1(N1101.7) Alternate programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to meet or exceed the energy efficiency required by this code. Buildings approved in writing in such an energy efficiency program shall be considered in compliance with this code. The requirements identified as 'mandatory' in Chapter 4 shall be met.

Commenter's Reason: At the Dallas hearings there were several Part I and Part II proposals that rendered different results because of the different committees hearing them. While it is understandable that in rare instances it is ok to have results be different for commercial verses residential, many of these items need to have the same requirement for both applications and we feel that this is one of those items.

We completely agreed with the committee's reason for approval in Part I, "While the code does provide the code official with the authority to approve alternate compliance methods, this proposal provides text which allows the code official to rely on the review and accreditation by others of equivalent or above code programs. This would be helpful to code officials and save their limited time. The text could help drive the development of accredited programs. Each such program provides flexibility for designers."

However, we also agreed with some of the committee's reason for disapproval in Part II because the proponent had removed the language regarding mandatory requirements. We feel as though the modification brought that back and this proposal is an improvement to the existing code language, therefore we ask for approval as modified by this public comment, which brings the residential provisions in line with what happened in the commercial section.

CE29-13, Part II

Final Action:

AS

AM

AMPC____

D

CE31-13, Part I

C102.1.1, R102.1.1 (IRC N1101.7)

Proposed Change as Submitted

Proponent: Don Surrena, CBO, National Association of Home Builders (NAHB) (dsurrena@nahb.org) and Craig Conner, Building Quality, representing self (craig.conner@mac.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. ~~The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Reason: (Surrena): The key element of an above code program is that it must meet or exceed the energy efficiency requirements of the IECC. Requiring such a program to also meet the detailed prescriptive requirements labeled as “mandatory” in the IECC defeats the purpose of performance based above code program. This code change proposal will allow flexibility in the methodology used for any above code program to meet or exceed the minimum energy efficiency requirements of the IECC.

(Conner): This change corrects the erroneous use of the term “*mandatory*”. This moves the specification of what can be traded off with the performance approach into the code text about the performance approach, rather than spreading that information throughout the code, as was in energy codes prior to 2006.

The word “*shall*” and the concept of “*mandatory*” is woven throughout the I-codes. It is important that the energy code use “*shall*” correctly. The IRC definition is

SHALL. *The term, when used in this code, is construed to mean “mandatory”.*

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1-EC-CONNER-SURRENA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Disapproved

Committee Reason: The text is essential to making sure above code programs meet the minimum of the 'mandatory' code provisions. This text was also retained in the committee's approval of CE29-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Don Surrena, CBO, National Association of Home Builders (NAHB), requests Approval as Submitted.

Commenter's Reason: The key element of an above code program is that it must meet or exceed the energy efficiency performance of the IECC. Requiring such a program to also meet the detailed prescriptive requirements labeled as "mandatory" in the IECC defeats the purpose of performance-based above code programs. This code change proposal will allow flexibility in the methodology used for any above code program to meet or exceed the minimum energy efficiency requirements of the IECC.

Mandatory requirements of this code should only be in effect for buildings using the performance path, not alternate programs. The initial reason that items were labeled as mandatory was that there was no performance trade-off such as HVAC controls and lighting requirements. Reputable alternate energy programs have their own way of dealing with these issues, and often more.

CE31-13, Part I

Final Action: AS AM AMPC____ D

CE31-13, Part II

C102.1.1, R102.1.1 (IRC N1101.7)

Proposed Change as Submitted

Proponent: Don Surrena, CBO, National Association of Home Builders (NAHB) (dsurrena@nahb.org) and Craig Conner, Building Quality, representing self (craig.conner@mac.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R102.1.1 (N1101.7) Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. ~~The requirements identified as “mandatory” in Chapter 4 shall be met.~~

Reason: (Surrena): The key element of an above code program is that it must meet or exceed the energy efficiency requirements of the IECC. Requiring such a program to also meet the detailed prescriptive requirements labeled as “mandatory” in the IECC defeats the purpose of performance based above code program. This code change proposal will allow flexibility in the methodology used for any above code program to meet or exceed the minimum energy efficiency requirements of the IECC.

(Conner): This change corrects the erroneous use of the term “*mandatory*”. This moves the specification of what can be traded off with the performance approach into the code text about the performance approach, rather than spreading that information throughout the code, as was in energy codes prior to 2006.

The word “*shall*” and the concept of “*mandatory*” is woven throughout the I-codes. It is important that the energy code use “*shall*” correctly. The IRC definition is

SHALL. *The term, when used in this code, is construed to mean “mandatory”.*

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1-EC-CONNER-SURRENA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposal would remove mandatory requirements of this code, which the committee believes are necessary to the approval of above code programs.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Don Surrena, CBO, National Association of Home Builders (NAHB), requests Approval as Submitted.

Commenter's Reason: The key element of an above code program is that it must meet or exceed the energy efficiency performance of the IECC. Requiring such a program to also meet the detailed prescriptive requirements labeled as "mandatory" in the IECC defeats the purpose of performance based above code program. This code change proposal will allow flexibility in the methodology used for any above code program to meet or exceed the minimum energy efficiency requirements of the IECC.

Mandatory requirements of this code should only be in effect for buildings using the performance path, not alternate programs. The initial reason that items were labeled as mandatory was that there was no performance trade-off such as HVAC controls and lighting requirements. Reputable alternate energy programs have their own way of dealing with these issues, and often more.

CE31-13, Part II

Final Action:	AS	AM	AMPC_____	D
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CE32-13, Part I

C102.1.1, R102.1.1, (N1101.7)

Proposed Change as Submitted

Proponent: (Part I) Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships **(Part II)** Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to ~~deem~~ approve a national, state or local energy efficiency program as an additional method of demonstrating compliance with this code, provided that:

1. The program is administered by a party who is independent from the parties involved in the construction or ownership of the *building*;
2. A review of all program requirements is conducted;
3. Documentation and analysis shows that the requirements of this program ~~to~~ meet or exceed all of the energy efficiency requirements of required by this code; and
4. Program compliance is verified by a party who is independent from the parties involved in the construction or ownership of the *building*.

Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. Under such a program, the requirements identified as “mandatory” in Chapter 4 shall be met.

Reason: The purpose of the proposed code change is to establish new requirements for above code programs and to otherwise clarify the code. This proposal outlines specific criteria that must be applied in the determination of whether an alternative program is an “above code program” that may be allowed as a substitute for IECC compliance and code official enforcement.

Since section C102.1.1 allows buildings to opt out of local energy code compliance and enforcement (except as to mandatory measures) where they are approved by an “above code program,” there should be a high standard for such programs. The proposed changes ensure that any alternative program will have the following crucial elements:

- Third-party administration of the alternative program
- Requirements that meet or exceed the IECC requirements
- Documentation and analysis to support equivalence
- Independent verification of compliance

By contrast, the current language of section C102.1.1 gives no guidance to the authority having jurisdiction regarding how to determine whether a program is “above code” and should qualify as acceptable as an alternative compliance path. Given the recent flood of programs around the country that claim to be “above-code” and/or “green,” it is important that the IECC set the ground rules for how jurisdictions should evaluate these programs as alternatives to traditional code compliance and enforcement.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1 #2-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proposal did not provide any clarification to the code. The committee felt that first listed requirement would make the provisions too restrictive. The proponent acknowledged that the 3rd item was unclear and would need to be revised.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing Energy Efficient Codes Coalition, Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to approve a national, state or local energy efficiency program as an additional method of demonstrating compliance with this code, provided that:

1. The program is administered by a party who is independent from the parties involved in the construction or ownership of the *building*;
2. A review of all program requirements is conducted;
3. Documentation and analysis shows that the requirements of this program to meet or exceed all of the energy efficiency requirements of this code; and
4. Program compliance is verified by a party who is independent from the parties involved in the construction or ownership of the *building*.

Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. Under such a program, the requirements identified as “mandatory” in Chapter 4 shall be met.

Commenter’s Reason: We recommend approval of CE32, Part I, as modified by this public comment. The Residential Energy Committee approved CE32, Part II with a modification. While we believe that the original language of CE32, Part I is reasonable, we do not object to the approved modification to Part II. As a result, we propose that CE32, Part I, reflect the same modification. In this case, there is no good reason to create an inconsistency between the residential and commercial energy provisions of the IECC.

The original reason statement for CE32, Part I still applies, so we will not repeat it again here. This code change will clarify the standard that must be met by above code programs that may be approved as alternatives to compliance with the IECC and, in particular, establishes requirements that the program be administered and compliance be determined by entities independent from the builder or owner, which are crucial requirements considering that code official enforcement under this section has been replaced by enforcement by those who administer the above-code program.

CE32-13, Part I

Final Action:

AS

AM

AMPC ____

D

CE32-13, Part II

C102.1.1, R102.1.1, (N1101.7)

Proposed Change as Submitted

Proponent: (Part I) Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships **(Part II)** Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; and Bill Prindle, Energy Efficient Codes Coalition

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R102.1.1 (N1101.7) Above code programs. The *code official* or other authority having jurisdiction shall be permitted to ~~deem~~ approve a national, state or local energy efficiency program as an additional method of demonstrating compliance with this code, provided that:

1. The program is administered by a party who is independent from the parties involved in the construction or ownership of the *building*;
2. A review of all program requirements is conducted;
3. Documentation and analysis shows that the requirements of this program ~~to~~ meet or exceed all of the energy efficiency requirements of required by this code; and
4. Program compliance is verified by a party who is independent from the parties involved in the construction or ownership of the *building*.

Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. Under such a program, the requirements identified as “mandatory” in Chapter 4 shall be met.

Reason: The purpose of the proposed code change is to establish new requirements for above code programs and to otherwise clarify the code. This proposal outlines specific criteria that must be applied in the determination of whether an alternative program is an “above code program” that may be allowed as a substitute for IECC compliance and code official enforcement.

Since section C102.1.1 allows buildings to opt out of local energy code compliance and enforcement (except as to mandatory measures) where they are approved by an “above code program,” there should be a high standard for such programs. The proposed changes ensure that any alternative program will have the following crucial elements:

- Third-party administration of the alternative program
- Requirements that meet or exceed the IECC requirements
- Documentation and analysis to support equivalence
- Independent verification of compliance

By contrast, the current language of section C102.1.1 gives no guidance to the authority having jurisdiction regarding how to determine whether a program is “above code” and should qualify as acceptable as an alternative compliance path. Given the recent flood of programs around the country that claim to be “above-code” and/or “green,” it is important that the IECC set the ground rules for how jurisdictions should evaluate these programs as alternatives to traditional code compliance and enforcement.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1 #2-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Modified

Modify the proposal as follows:

3. Documentation and analysis shows that the requirements of this program to meet or exceed all of the energy efficiency requirements of this code; and

(Portions of proposal not shown remain unchanged)

Committee Reason: The proposal will provide some criteria for the code official to follow in approving above code programs. The modification was simply to remove language that could be incorrectly interpreted to mean that everything in the IECC is mandatory.

Assembly Action:

Disapproved

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Disapproved and because a public comment was submitted.

Public Comment:

Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, requests Disapproval

Commenter's Reason: At the Dallas hearings there were several Part I and Part II proposals that rendered different results because of the different committees hearing them. While it is understandable that in rare instances it is ok to have results be different for commercial verses residential, many of these items need to have the same requirement for both applications and we feel that this is one of those items.

We agree with the commercial energy committee and would expand on that reason statement for their disapproval in Part I by saying that Item 1 of this proposal is not needed. If I am an energy expert or a certified rater or a LEED qualified professional, etc, I now cannot administer the program on my own building? I have to hire someone else to administer the program? We can see having someone different verify the requirements as called out in Item 4, but I should be able to oversee and administer my own program on my own building as long as I meet all of the requirements.

Some of the wording is also unneeded because "approved" is a defined term in this code, thus a lot of what they are trying to say is already spelled out in the existing language.

CE32-13, Part II

Final Action:

AS

AM

AMPC____

D

CE33-13, Part I
C102, C102.1.1 (NEW), R102, R102.1.1 (NEW)

Proposed Change as Submitted

Proponent: Don Surrena, CBO, National Association of Home Builders (NAHB) (dsurrena@nahb.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

SECTION C102
ALTERNATE MATERIALS METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS
APPLICABILITY - DUTIES AND POWERS OF THE BUILDING OFFICIAL

C102.1.1 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.

Reason: The proposed new Section R102.1.1 is the exact same language used in IRC Section 104.11, IBC Section 104.11, IFC Section 104.9, IMC Section 105.2, IPC Section 105.2, and IFGC Section 105.2 and this code change proposal is needed to correlate and be consistent with the other I-Codes.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1 (NEW)-EC-SURRENA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART I – IECC - Commercial
Committee Action:

Disapproved

Committee Reason: The committee felt this additional text was unneeded. The activities described are part of administration of the code on daily basis.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC, request Approval as Modified by this Public Comment.

Revise the proposal as follows:

SECTION C102 APPLICABILITY - DUTIES AND POWERS OF THE BUILDING CODE OFFICIAL

C102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code.

C102.1.4 C102.1 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The code official shall be permitted to approve an alternative material, design or method of construction shall be approved where the building code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.

Commenter's Reason: We recommend approval of CE33, Part I, as modified by this public comment. The proposed language in CE33, Part I provides more specificity than the current code regarding the conditions for approval of the use of alternative materials and may be helpful to users of the IECC.

However, we propose to modify this language because the original language is likely to be confusing to users of the IECC and is inconsistent with the approach and defined terms in the IECC. In the IECC, "code official" is a defined term, but "building official" is not. Similarly, consistent with current IECC language (see current section C102.1.1) the code official should be "permitted to approve" the alternative material, ensuring that the code official can exercise discretion in this process.

Finally, and most importantly, it is unclear what "specific performance based provisions" are being referenced in the last sentence. Unlike other I-codes, the performance approach for the IECC is not contained in another code. It is found in the IECC itself (see section C401.2 and C405; in addition the IECC allows a performance approach under ASHRAE 90.1). We are concerned that code users may misinterpret the final sentence in the proposed Section C102, since the reference to "performance-based provisions" is not limited to energy performance, as is the IECC's performance approach. As a result, we believe that this language in the context of the energy code is far too broad, ambiguous and unnecessary and we recommend its deletion.

CE33-13, Part I

Final Action: AS AM AMPC____ D

CE33-13, Part II
C102, C102.1.1 (NEW), R102, R102.1.1 (NEW)

Proposed Change as Submitted

Proponent: Don Surrena, CBO, National Association of Home Builders (NAHB) (dsurrena@nahb.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

SECTION R102

ALTERNATE MATERIALS—METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS
APPLICABILITY - DUTIES AND POWERS OF THE BUILDING OFFICIAL

R102.1.1 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.

Reason: The proposed new Section R102.1.1 is the exact same language used in IRC Section 104.11, IBC Section 104.11, IFC Section 104.9, IMC Section 105.2, IPC Section 105.2, and IFGC Section 105.2 and this code change proposal is needed to correlate and be consistent with the other I-Codes.

Cost Impact: The code change proposal will not increase the cost of construction.

C102.1.1 (NEW)-EC-SURRENA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART II – IECC – Residential
Committee Action:

Approved as Submitted

Committee Reason: The proposal installs a provision that is consistent with other I-Codes.

Assembly Action:

Disapproved

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Disapproved and because public comments were submitted.

Public Comment 1:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC, request Approval as Modified by this Public Comment.

Revise the proposal as follows:

SECTION R102 APPLICABILITY - DUTIES AND POWERS OF THE BUILDING CODE OFFICIAL

R102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code.

R102.1.1 R102.1 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The code official shall be permitted to approve an alternative material, design or method of construction shall be approved where the building code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.

Commenter's Reason: We recommend approval of CE33, Part II, as modified by this public comment. The modification is necessary because the original language of the proposed code change is likely to be confusing to users of the IECC and is inconsistent with defined terms in the IECC. In the IECC, "code official" is a defined term, but "building official" is not. Similarly, consistent with current IECC language (see current section R102.1.1) the code official should be "permitted to approve" the alternative material, ensuring that the code official can exercise discretion in this process. Finally, and most importantly, it is unclear what "specific performance based provisions" are being referenced in the last sentence. Unlike other I-codes, the performance approach for the IECC is not contained in another code. It is found in the IECC itself (see section R401.2 and R405). We are concerned that code users may misinterpret the final sentence in the proposed Section R102, since the reference to "performance-based provisions" is not limited to energy performance, as is the IECC's performance approach. As a result, we believe that this language in the context of the energy code is far too broad, ambiguous and unnecessary and we recommend its deletion.

Public Comment 2:

Donald Vigneau, AIA, representing Northeast Energy Efficiency Partnerships Inc., requests Disapproval.

Commenter's Reason: OVERTURN THE RESIDENTIAL ENERGY CODE COMMITTEE RECOMMENDATION FOR APPROVAL AS SUBMITTED AND DISAPPROVE PART II CONSISTENT WITH THE COMMERCIAL ENERGY CODE COMMITTEE Part I ACTION.

This proposal intentionally duplicates Section R104.11 language and overrides Section 102.1.1 Alternative Energy Programs without any indication for whether the overridden language is deleted or relocated. Such language is inconsistent with a prior proposal on the same section successfully modified by CE29-Part 1 and will be brought forward for coordination. The original proposal and hearing testimony both leave unanswered the question of retention or deletion of the existing Above Code requirements. As such, the proposal comes to this hearing flawed, with many unanswered questions.

Inclusion of the language would add another administrative requirement to the residential requirements for a code that is already governed by the administrative provisions of the IRC and IBC respectively; it is duplicative and unnecessary. The report of the Commercial Energy Committee states:

Committee Reason: The committee felt this additional text was unneeded. The activities described are part of administration of the code on a daily basis.

CE33-13, Part II

Final Action: AS AM AMPC _____ D

CE35-13, Part I

C103.2, C103.2.1 (NEW), C103.2.1.1 (NEW), C103.2.1.2 (NEW), C103.2.2 (NEW), C103.2.2.1 (NEW), C103.2.2.2 (NEW), C103.2.3 (NEW), C103.2.4 (NEW), C103.2.5 (NEW), C103.3, C104.2, C104.8, C202 (NEW), R103.2 (IRC N1101.8), R103.2.1 (NEW) (IRC N1101.8.1), R103.2.1.1 (NEW) (IRC N1101.8.1.1), R103.2.1.2 (NEW) (IRC N1101.8.1.2), R103.2.2 (NEW) (IRC N1101.8.2), R103.2.2.1 (NEW) (IRC N1101.8.2.1), C103.2.2.2 (NEW) (IRC N1101.8.2.2), R103.2.3 (NEW) (IRC N1101.8.3), R103.2.4 (NEW) (IRC N1101.8.4), R103.2.5 (NEW) (IRC N1101.8.5), R103.3, R104.2, R104.8, R202 (NEW)

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C103.2 Information on construction documents. ~~Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their R-values; fenestration U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details. required for a building permit shall include a statement by one or more registered design professionals that the project design complies with or is exempt from this code, an *energy analysis* for the building design based on the chosen compliance strategy, the design itself, utilizing the specific energy values indicated by the *energy analysis*, a commissioning plan for mechanical and electrical systems where required and a description of the progress, commissioning and final inspections and tests required by this code for the project. Electronic media documents are permitted to be submitted when approved by the *code official*.~~

Exception: Project designs that are entirely exempt in accordance with this code are not required to provide either the *energy analysis*, supporting design documentation, commissioning plan or inspections listing required by this code.

C103.2.1 Registered design professional statement of compliance or exemption. Construction documents submitted for a building permit shall include a statement by at least one registered design professional that the project design complies with or is exempt from this code. If the project design is exempt or partially exempt from this code, the citation shall be provided that allows the exemption.

C103.2.1.1 Statements of compliance or exemption. The statement of compliance shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this application is in compliance with this code." The statement of exemption shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this application is exempt from this code in

accordance with Section . If the proposed work is partially exempt, the registered design professional shall use the statement of compliance and note the exempted work, providing the code citation allowing the exemption.

C103.2.1.2 Responsible registered design professional. If the project design team utilizes no energy trade-offs among design disciplines, each registered design professional of record may sign a statement of compliance with this code for the respective discipline. If the project design team utilizes energy trade-offs among design disciplines, at least one registered design professional shall sign the statement of compliance with this code for the entire project, including all disciplines.

C103.2.2 Energy analysis. The construction documents shall include an *energy analysis* showing the strategy for determining project design compliance with this code, and shall indicate the specific values for each unit of material, equipment and system that such analysis indicates must be met in the completed construction. The *code official* may require that the registered design professional show the values determined by the energy analysis in a table indicating, for each material, system or equipment type, the item, its required energy value, the citation from this code and the drawing reference where the item is drawn or described.

C103.2.2.1 Prescriptive approach. If the compliance strategy uses the prescriptive approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-2, or from provisions referenced in Section R401.2.

C103.2.2.2 Performance approach. If the compliance strategy uses the performance approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-3, or from provisions referenced in Section R405.

C103.2.3 Supporting design documentation. The construction documents shall indicate materials, systems and equipment for the proposed design as identified in the *energy analysis*, and shall specify the energy values determined by the analysis. Construction documents shall be fully coordinated and of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, materials, systems and equipment as herein governed. Details shall include as applicable, but are not limited to, envelope assembly U-factors; insulation materials and their R-values; fenestration areas, U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with input wattage, ballast type and control narrative; lighting power densities; and air sealing details for the *building thermal envelope* and penetrations through it.

C103.2.4 Commissioning plan. Where applicable, a commissioning plan shall be provided in the construction documents in accordance with Section C408. Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with such section. Copies of all documentation shall be made available to the *code official* upon request in accordance with Sections C408.2.4 and C408.2.5.

C103.2.5 Listing and description of required inspections and testing. The construction documents shall include a listing of the applicable progress, commissioning and final inspections and testing required by this code, when and how often each should be required in the project schedule, whether and what percentage of sampling will be permitted, applicable reference standards and the citation for the inspection or test.

C103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the proposed construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

C10402. Required approvals. Required inspections and testing shall be as provided in the approved construction documents, in accordance with Section C103.2.5. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.

C104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code as described in the *approved energy analysis*, a notice of approval shall be issued by the *code official*.

Add new definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

ENERGY ANALYSIS. An analysis of this code as it affects a proposed building design, using the prescriptive or performance approach in conjunction with mandatory values, that results in the required values for each energy-related material, equipment or system in the construction. The energy analysis identifies whether the design team is using the International Energy Conservation Code or ANSI/ASHRAE/IESNA Standard 90.1 for compliance and, if applicable, where trade-offs are used.

Reason: The text added by this proposal establishes a protocol for what is required of the registered design professional to show compliance. This protocol identifies compliance or exemption; how the energy values were derived, what code or standard is being used and whether the prescriptive or performance path is being followed; what is required in construction documents to show that the appropriate values are being specified for construction; and the commissioning and inspections program by which the construction will be inspected, tested and evaluated. In addition, it provides guidance on how to state compliance when there are trade-offs among the envelope, mechanical and electrical systems.

Cost Impact: The code change proposal will not increase the cost of construction. Registered design professionals should already be providing the information required herein in some format; this proposal articulates the compliance process and sets a standard for code officials to evaluate.

C103.2-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee felt the proposal would add too much detail to the code regarding the review of construction documents submitted in a permit application as well as the inspection process. Each jurisdiction needs to be able to construct their program within the broad parameters currently provided in the code. The committee felt it is inappropriate to have the design professional determine the inspections to be made.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C103.1 General. [Unchanged]

C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their R-values; fenestration U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details. required for a building permit shall include the following:

1. A statement by one or more registered design professionals that the project design complies with or is exempt from this code;
 2. An *energy analysis* for the new building or alteration design based on the chosen compliance strategy;
 3. The design itself, utilizing the specific energy values indicated by the *energy analysis*;
 4. A commissioning plan for mechanical and electrical systems where required; and
 5. A description of the progress, commissioning and final inspections and tests required by this code for the project.
- Electronic media documents are permitted to be submitted when approved by the *code official*.

Exception: Project designs that are entirely exempt in accordance with this code are not required to provide either the *energy analysis*, supporting design documentation, commissioning plan or inspections listing required by this code.

C103.2.1 Registered design professional statement of compliance or exemption. Construction documents submitted for a building permit shall include a statement by at least one registered design professional that the project design complies with or is exempt from this code. If the project design is exempt or partially exempt from this code, the citation shall be provided that allows the exemption.

C103.2.1.1 Statements of compliance or exemption. The statement of compliance shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this new building or alteration application is in compliance with this code." The statement of exemption shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this new building or alteration application is exempt from this code in accordance with Section [provide citation]." If the proposed work is partially exempt, the registered design professional shall use the statement of compliance and note the exempted work, providing the code citation allowing the exemption.

C103.2.1.2 Responsible registered design professional. If the project design team utilizes no energy trade-offs among design disciplines, each registered design professional of record may sign a statement of compliance with this code for the respective discipline. If the project design team utilizes energy trade-offs among design disciplines, at least one registered design professional shall sign the statement of compliance with this code for the entire project, including all disciplines.

C103.2.2 Energy analysis. The construction documents shall include an *energy analysis* showing the strategy for determining project design compliance with this code, and shall indicate the specific values for each unit of material, equipment and system that such analysis indicates must be met in the completed construction. The *code official* may require that the registered design professional show the values determined by the energy analysis in a table indicating, for each material, system or equipment type, the item, its required energy value, the citation from this code and the drawing reference where the item is drawn or described.

C103.2.2.1 Prescriptive approach. If the compliance strategy uses the prescriptive approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-2.

C103.2.2.2 Performance approach. If the compliance strategy uses the performance approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-3.

C103.2.3 Supporting design documentation. The construction documents shall indicate materials, systems and equipment for the proposed design as identified in the *energy analysis*, and shall specify the energy values determined by the analysis. Construction documents shall be fully coordinated and of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, materials, systems and equipment as herein governed. Details shall include as applicable, but are not limited to, envelope assembly U-factors; insulation materials and their R-values; fenestration areas, U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with input wattage, ballast type and control narrative; lighting power densities; and air sealing details for the *building thermal envelope* and penetrations through it.

C103.2.4 Commissioning plan. Where applicable, a commissioning plan shall be provided in the construction documents in accordance with Section C408. Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with such section. Copies of all documentation shall be made available to the *code official* upon request in accordance with Sections C408.2.4 and C408.2.5.

C103.2.5 Listing and description of required inspections and testing. The construction documents shall include a listing of the applicable progress, commissioning and final inspections and testing required by this code, when and how often each should be required in the project schedule, whether and what percentage of sampling will be permitted, applicable reference standards and the citation for the inspection or test.

C103.3 Examination of documents. The code official shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the proposed construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

[Remaining text in Section 103 unchanged]

C104.2 Required approvals. Required inspections and testing shall be as provided in the approved construction documents, in accordance with Section C103.2.5. Work shall not be done.... *[remainder of Section 104.2 unchanged]*

C104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code and as described in the approved energy analysis, a notice of approval shall be issued by the *code official*.

C202 GENERAL DEFINITIONS

ENERGY ANALYSIS. A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use. The analysis shows how the design team, using the prescriptive or performance approach in conjunction with mandatory values, has determined the requisite values for each energy-related material, equipment or system in the construction that together will enable the proposed design to use less energy annually than the standard reference design. The energy analysis identifies whether the design team is using the International Energy Conservation Code or ANSI/ASHRAE/IESNA Standard 90.1 for compliance and, if applicable, where trade-offs are used.

Commenter's Reason: This proposal sets forth a protocol for construction drawings and inspections that will guide practitioners and will assist code officials in sifting through the various methods of arriving at code compliance, including prescriptive or performance, area-weighted calculations, trade-offs and the complexity of mechanical and lighting systems including their controls. The protocol includes a set of steps of presentation of the design (professional statement, energy analysis, supporting documentation) and requires the professional, or residential applicant, to identify what inspections are required to ensure compliance of the construction with the design documents. The energy code is complex, and these procedures, which are used in New York City, effectively guide architect, engineer, contractor, design-builder and code official to a set of information about the design that they can evaluate and discuss. In accordance with the Technical Committee's comments in the Code Development Hearing, "or applicant" has been added to the Residential Provisions in Part II each time "registered design professional" is used in order to accommodate jurisdictions that do not require licensed professionals to perform the design.

CE35-13, Part II

Final Action: AS AM AMPC____ D

CE35-13, Part II

C103.2, C103.2.1 (NEW), C103.2.1.1 (NEW), C103.2.1.2 (NEW), C103.2.2 (NEW), C103.2.2.1 (NEW), C103.2.2.2 (NEW), C103.2.3 (NEW), C103.2.4 (NEW), C103.2.5 (NEW), C103.3, C104.2, C104.8, C202 (NEW), R103.2 (IRC N1101.8), R103.2.1 (NEW) (IRC N1101.8.1), R103.2.1.1 (NEW) (IRC N1101.8.1.1), R103.2.1.2 (NEW) (IRC N1101.8.1.2), R103.2.2 (NEW) (IRC N1101.8.2), R103.2.2.1 (NEW) (IRC N1101.8.2.1), C103.2.2.2 (NEW) (IRC N1101.8.2.2), R103.2.3 (NEW) (IRC N1101.8.3), R103.2.4 (NEW) (IRC N1101.8.4), R103.2.5 (NEW) (IRC N1101.8.5), R103.3, R104.2, R104.8, R202 (NEW)

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dfconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R103.2 (N1101.8) Information on construction documents. ~~Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their R-values; fenestration U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details. required for a building permit shall include a statement by one or more registered design professionals that the project design complies with or is exempt from this code, an *energy analysis* for the building design based on the chosen compliance strategy, the design itself, utilizing the specific energy values indicated by the *energy analysis*, a commissioning plan for mechanical and electrical systems where required and a description of the progress, commissioning and final inspections and tests required by this code for the project. Electronic media documents are permitted to be submitted when approved by the *code official*.~~

Exception: Project designs that are entirely exempt in accordance with this code are not required to provide either the *energy analysis*, supporting design documentation, commissioning plan or inspections listing required by this code.

R103.2.1 (N1101.8.1) Registered design professional statement of compliance or exemption.

Construction documents submitted for a building permit shall include a statement by at least one registered design professional that the project design complies with or is exempt from this code. If the project design is exempt or partially exempt from this code, the citation shall be provided that allows the exemption.

R103.2.1.1 (N1101.8.1.1) Statements of compliance or exemption. The statement of compliance shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this application is in compliance with this code." The statement of exemption shall read as follows: "To the

best of my knowledge, belief and professional judgment, all work under this application is exempt from this code in accordance with Section . If the proposed work is partially exempt, the registered design professional shall use the statement of compliance and note the exempted work, providing the code citation allowing the exemption.

R103.2.1.2 (N1101.8.1.2) Responsible registered design professional. If the project design team utilizes no energy trade-offs among design disciplines, each registered design professional of record may sign a statement of compliance with this code for the respective discipline. If the project design team utilizes energy trade-offs among design disciplines, at least one registered design professional shall sign the statement of compliance with this code for the entire project, including all disciplines.

R103.2.2 (N1101.8.2) Energy analysis. The construction documents shall include an *energy analysis* showing the strategy for determining project design compliance with this code, and shall indicate the specific values for each unit of material, equipment and system that such analysis indicates must be met in the completed construction. The *code official* may require that the registered design professional show the values determined by the energy analysis in a table indicating, for each material, system or equipment type, the item, its required energy value, the citation from this code and the drawing reference where the item is drawn or described.

R103.2.2.1 (N1101.8.2.1) (Prescriptive approach). If the compliance strategy uses the prescriptive approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-2, or from provisions referenced in Section R401.2.

R103.2.2.2 (N1101.8.2.2) Performance approach. If the compliance strategy uses the performance approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in either Section C401.2-1 or Section C401.2-3, or from provisions referenced in Section R405.

R103.2.3 (N1101.8.3) Supporting design documentation. The construction documents shall indicate materials, systems and equipment for the proposed design as identified in the *energy analysis*, and shall specify the energy values determined by the analysis. Construction documents shall be fully coordinated and of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, materials, systems and equipment as herein governed. Details shall include as applicable, but are not limited to, envelope assembly U-factors; insulation materials and their R-values; fenestration areas, U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with input wattage, ballast type and control narrative; lighting power densities; and air sealing details for the *building thermal envelope* and penetrations through it.

R103.2.4 (N1101.8.4) Commissioning plan. Where applicable, a commissioning plan shall be provided in the construction documents in accordance with Section C408. Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with such section. Copies of all documentation shall be made available to the *code official* upon request in accordance with Sections C408.2.4 and C408.2.5.

R103.2.5 (N1101.8.5) Listing and description of required inspections and testing. The construction documents shall include a listing of the applicable progress, commissioning and final inspections and testing required by this code, when and how often each should be required in the project schedule, whether and what percentage of sampling will be permitted, applicable reference standards and the citation for the inspection or test.

R103.3 Examination of documents. The code official shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the proposed construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

R104.2 Required approvals. Required inspections and testing shall be as provided in the approved construction documents, in accordance with Section C103.2.5. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.

R104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code as described in the approved energy analysis, a notice of approval shall be issued by the *code official*.

Add new definition as follows:

**SECTION R202 (N1101.9)
GENERAL DEFINITIONS**

ENERGY ANALYSIS. An analysis of this code as it affects a proposed building design, using the prescriptive or performance approach in conjunction with mandatory values, that results in the required values for each energy-related material, equipment or system in the construction. The energy analysis identifies whether the design team is using the International Energy Conservation Code or ANSI/ASHRAE/IESNA Standard 90.1 for compliance and, if applicable, where trade-offs are used.

Reason: The text added by this proposal establishes a protocol for what is required of the registered design professional to show compliance. This protocol identifies compliance or exemption; how the energy values were derived, what code or standard is being used and whether the prescriptive or performance path is being followed; what is required in construction documents to show that the appropriate values are being specified for construction; and the commissioning and inspections program by which the construction will be inspected, tested and evaluated. In addition, it provides guidance on how to state compliance when there are trade-offs among the envelope, mechanical and electrical systems.

Cost Impact: The code change proposal will not increase the cost of construction. Registered design professionals should already be providing the information required herein in some format; this proposal articulates the compliance process and sets a standard for code officials to evaluate.

C103.2-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: This implies that a Registered Design Professional always be involved in the construction. This would require an RDP to state that an RDP is not required. The provisions are not necessary.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

R103.1 General. [Unchanged]

R103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building systems and equipment as herein governed. Details shall include, but are not limited to, as applicable, insulation materials and their R-values; fenestration U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details. required for a building permit shall include the following:

1. A statement by one or more registered design professionals, or applicant, that the project design complies with or is exempt from this code;
2. An *energy analysis* for the new building or alteration design based on the chosen compliance strategy;
3. The design itself, utilizing the specific energy values indicated by the *energy analysis*; and
4. A description of the progress and final inspections and tests required by this code for the project.

Electronic media documents are permitted to be submitted when approved by the *code official*.

Exception: Project designs that are entirely exempt in accordance with this code are not required to provide either the *energy analysis*, supporting design documentation or inspections listing required by this code.

R103.2.1 Registered design professional, or other applicant, statement of compliance or exemption. Construction documents submitted for a building permit shall include a statement by at least one registered design professional, or the applicant, that the project design complies with or is exempt from this code. If the project design is exempt or partially exempt from this code, the citation shall be provided that allows the exemption.

R103.2.1.1 Statements of compliance or exemption. The statement of compliance shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this new building or alteration application is in compliance with this code." The statement of exemption shall read as follows: "To the best of my knowledge, belief and professional judgment, all work under this new building or alteration application is exempt from this code in accordance with Section [provide citation]." If the proposed work is partially exempt, the registered design professional, or applicant, shall use the statement of compliance and note the exempted work, providing the code citation allowing the exemption.

R103.2.1.2 Responsible registered design professional, or applicant. If the project design team utilizes no energy trade-offs among design disciplines, each registered design professional of record, or applicant, may sign a statement of compliance with this code for the respective discipline. If the project design team utilizes energy trade-offs among design disciplines, at least one registered design professional, or applicant, shall sign the statement of compliance with this code for the entire project, including all disciplines.

R103.2.2 Energy analysis. The construction documents shall include an *energy analysis* showing the strategy for determining project design compliance with this code, and shall indicate the specific values for each unit of material, equipment and system that such analysis indicates must be met in the completed construction. The *code official* may require that the registered design professional, or applicant, show the values determined by the energy analysis in a table indicating, for each material, system or equipment type, the item, its required energy value, the citation from this code and the drawing reference where the item is drawn or described.

R103.2.2.1 Prescriptive approach. If the compliance strategy uses the prescriptive approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in Section R401.2.

R103.2.2.2 Performance approach. If the compliance strategy uses the performance approach in conjunction with the mandatory requirements, such values will be derived from provisions referenced in Section R405.

R103.2.3 Supporting design documentation. The construction documents shall indicate materials, systems and equipment for the proposed design as identified in the *energy analysis*, and shall specify the energy values determined by the analysis. Construction documents shall be fully coordinated and of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, materials, systems and equipment as herein governed. Details shall include as applicable, but are not limited to, envelope assembly U-factors; insulation materials and their R-values; fenestration areas, U-factors and SHGCs; area-weighted U-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location;

schedule of lighting fixture lamping demonstrating 75% high-efficacy lamps; and air sealing details for the *building thermal envelope* and penetrations through it.

R103.2.4 Listing and description of required inspections and testing. The construction documents shall include a listing of the applicable progress and final inspections and testing required by this code, when and how often each should be required in the project schedule, whether and what percentage of sampling will be permitted, applicable reference standards and the citation for the inspection or test.

R103.3 Examination of documents. The code official shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the proposed construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

[Remaining text in Section 103 unchanged]

R104.2 Required approvals. Required inspections and testing shall be as provided in the *approved* construction documents, in accordance with Section R103.2.4. Work shall not be done.... *[remainder of Section 104.2 unchanged]*

R104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code and as described in the *approved energy analysis*, a notice of approval shall be issued by the *code official*.

R202 (N1101.9) GENERAL DEFINITIONS

ENERGY ANALYSIS. A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use. The analysis shows how the design team, using the prescriptive or performance approach in conjunction with mandatory values, has determined the requisite values for each energy-related material, equipment or system in the construction that together will enable the proposed design to use less energy annually than the standard reference design. The energy analysis identifies where trade-offs are used.

Commenter's Reason: This proposal sets forth a protocol for construction drawings and inspections that will guide practitioners and will assist code officials in sifting through the various methods of arriving at code compliance, including prescriptive or performance, area-weighted calculations, trade-offs and the complexity of mechanical and lighting systems including their controls. The protocol includes a set of steps of presentation of the design (professional statement, energy analysis, supporting documentation) and requires the professional, or residential applicant, to identify what inspections are required to ensure compliance of the construction with the design documents. The energy code is complex, and these procedures, which are used in New York City, effectively guide architect, engineer, contractor, design-builder and code official to a set of information about the design that they can evaluate and discuss. In accordance with the Technical Committee's comments in the Code Development Hearing, "or applicant" has been added to the Residential Provisions in Part II each time "registered design professional" is used in order to accommodate jurisdictions that do not require licensed professionals to perform the design.

CE35-13, Part II

Final Action: AS AM AMPC_____ D

CE37-13, Part I

C103.2.1 (NEW), R103.2.1 (NEW)

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C103.2.1. Thermal envelope definition. The building's thermal envelope shall be defined on the construction documents as the alignment of the air barrier and insulation systems separating conditioned space from unconditioned space. Where it is not possible to define the alignment of the air barrier and thermal barrier systems on the construction documents inspection shall determine success of accomplishing this requirement.

Reason: The single most important energy and performance aspect of the home is the buildings thermal envelope and the alignment of the air barrier and thermal barrier systems. It is crucial that the design professional demonstrate an understanding of location of the thermal envelope and that they make an effort to draw its location so that the construction personnel can successfully implement the construction of the building in accordance with the code and the specifications that have been drawn. The air sealing details help make this possible but understanding where the details will be implemented helps ensure better implementation and enforcement.

Cost Impact: The code change proposal will not increase the cost of construction.

C103.2.1 (NEW)-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proponent requested disapproval in order to address issues raised by the Residential Energy Code Development Committee in its disapproval of the proposal.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C103.2.1. Building thermal envelope depiction. The building's thermal envelope shall be represented on the construction documents.

Commenter's Reason: Representing the building's thermal envelope on the construction documents ensures that the design professional of the building understands how the thermal envelope will separate conditioned space from unconditioned space. This is a crucial step in ensuring not only the energy efficiency of the building but also the safety, durability, and comfort created in the structure.

The simplification of the requirement allows for flexibility in how the building's thermal envelope is depicted but clearly forces the design professional to understand how what they are drawing will ultimately be constructed.

CE37-13, Part I

Final Action:	AS	AM	AMPC_____	D
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CE37-13, Part II C103.2.1 (NEW), R103.2.1 (NEW)

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R103.2.1. Thermal envelope definition. The building's thermal envelope shall be defined on the construction documents as the alignment of the air barrier and insulation systems separating conditioned space from unconditioned space. Where it is not possible to define the alignment of the air barrier and thermal barrier systems on the construction documents inspection shall determine success of accomplishing this requirement.

Reason: The single most important energy and performance aspect of the home is the buildings thermal envelope and the alignment of the air barrier and thermal barrier systems. It is crucial that the design professional demonstrate an understanding of location of the thermal envelope and that they make an effort to draw its location so that the construction personnel can successfully implement the construction of the building in accordance with the code and the specifications that have been drawn. The air sealing details help make this possible but understanding where the details will be implemented helps ensure better implementation and enforcement.

Cost Impact: The code change proposal will not increase the cost of construction.

C103.2.1 (NEW)-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: This is confusing language that would serve to make application of the code more difficult.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

R103.2.1. Thermal envelope depiction. The building's thermal envelope shall be represented on the construction documents.

Commenter's Reason: Representing the building's thermal envelope on the construction documents ensures that the design professional of the building understands how the thermal envelope will separate conditioned space from unconditioned space. This is a crucial step in ensuring not only the energy efficiency of the building but also the safety, durability, and comfort created in the structure.

The simplification of the requirement allows for flexibility in how the building's thermal envelope is depicted but clearly forces the design professional to understand how what they are drawing will ultimately be constructed.

CE37-13, Part II

Final Action: AS AM AMPC_____ D

CE38-13, Part I

C103.3, C104.1, C104.2 (NEW), C104.3, C104.3.1 (NEW), C104.3.2 (NEW), C104.3.3 (NEW), C104.3.4 (NEW), C104.3.5 (NEW), C104.3.6 (NEW), C104.5, R103.3, R104.1, R104.2 (NEW), R104.3, R104.3.1 (NEW), R104.3.2 (NEW), R104.3.3 (NEW), R104.3.4 (NEW), R104.3.5 (NEW), R104.3.6 (NEW), R104.5

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. In causing the documents to be examined to verify compliance with this code, the *code official* shall be permitted to utilize a registered design professional or other *approved* entity not affiliated with the *building* design or construction in conducting the review of the plans and specifications for compliance with the code.

~~**C104.1 General.** Construction or work for which a permit is required shall be subject to inspection by the *code official*.~~

C104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* or his designated agent, and such construction or work shall remain accessible and exposed for inspection purposes until *approved*. Approved as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the *code official* nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

~~**C104.2 Required approvals.** Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.~~

C104.2 Preliminary Inspection. Before issuing a permit, the *code official* is authorized to examine or cause to be examined the *building site*, and in the case of work to or on an existing building the *building*, for which an application has been filed.

~~**C104.3 Final inspection.** The building shall have a final inspection and not be occupied until *approved*.~~

C104.3 Required inspections. The *code official* or his designated agent, upon notification, shall make the inspections set forth in Sections C104.3.1 through C104.3.6.

C104.3.1 Footing and foundation inspection. Inspections associated with footings and foundations shall be made before backfilling and shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and *approved* plans and specifications for:

1. Basement or crawl space walls having insulation applied exterior to or integral with the walls
2. Slabs on grade
3. Buried duct systems associated with HVAC systems
4. Piping systems associated with HVAC or service hot water systems
5. Freeze protection/snow melt systems.

C104.3.2 Framing and rough-in inspection. Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding R-values and their correct location and proper installation, fenestration thermal properties (U-factor, SHGC and VT) and proper installation of fenestration, and air leakage controls as required by the code and approved plans and specifications for:

1. Opaque walls and wall assemblies
2. Floors and floor assemblies
3. Roof/ceilings and roof/ceiling assemblies
4. Fenestration
5. Required vestibules

C104.3.3 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications for:

1. The R-value, location, thickness, depth of burial and protection of insulation on hot water piping
2. The existence of required temperature controls on potable hot water systems
3. The installation of automatic time switches on circulating hot water systems or heat trace
4. The installation of heat traps on hot water storage tanks associated with non-circulating systems.

C104.3.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications for:

1. Installed HVAC equipment type, efficiency and size
2. Installation of gravity and motorized dampers where required and leakage rates of the dampers
3. Installation of required demand control ventilation
4. Required insulation type, R-value, thickness and proper installation of insulation for ducts, plenums and piping associated with the HVAC system
5. Sealing and any required leakage testing of ducts and plenums
6. Installation of required economizers and associated controls
7. Installation of required temperature, humidity and zone controls
8. Required sizing of HVAC system fans and motors
9. Required energy recovery capability
10. Existence of a means to balance HVAC systems
11. Installation of required controls for HVAC and hydronic systems
12. Required limitations on hot gas bypass for cooling systems
13. Installation of radiant heating systems where not allowed

C104.3.5 Electrical rough-in inspection. Inspections at electrical rough-in shall verify compliance as required by the code and *approved* plans and specifications for:

1. Proper installation of all required lighting controls
2. Installation of all lighting system components (fixtures and lamps)
3. Installation of individual electric meters for each dwelling unit in multi-family residential buildings.

C104.3.6 Final inspection. The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building controls* and their proper operation as well as documentation verifying the activities associated with required *building commissioning* have been conducted and the findings of non-compliance corrected. *Buildings*, or portions thereof, shall not be considered for a final inspection until the *code official* has received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report as required in Section C408.2.4.

~~**C104.5 Approved inspection agencies.** The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.~~

C104.5 Approved Inspection agencies. The *code official* is authorized to accept reports of third party inspection agencies not affiliated with the *building* design or construction, provided such agencies are *approved* as to qualifications and reliability relevant to the building components and systems they are inspecting.

Reason: This proposal improves and enhances the details governing inspections of construction and examination of documents associated with compliance verification.

The current provisions of Sections R 103.1 and C103.3 require the code official to examine the construction documents to verify compliance with the code. Those provisions also allow the code official to delegate that authority to another party (e.g., cause to be examined) but are not specific as to the qualifications of that party. Depending on the type and size of a residential or commercial building, the plans and specifications can be very complex and an appropriate level of review challenging for a jurisdiction that may not see many large commercial projects in a given year and/or have a unique or large residential building. Currently there is no specificity in the code about the qualifications of any third party reviewer, so the permittee could argue against the imposition of a registered design professional requirement by the jurisdiction. The proposed language makes it clear that, should the code official decide to delegate their authority to another party, such third party must be approved (a defined term in the code) by the code official; something very important because that party is acting on behalf of the code official.

The current provisions of Sections R104 and C104 covering inspections are not as specific as they could be with respect to energy efficiency. The proposed revisions to Sections R104 and C104, which are consistent with Section 109 of the International Existing Building Code (IEBC), provide the required detail to better ensure compliance with the code and through compliance delivery of the energy efficiency potential associated with the provisions of the code. It is important to point out that the provisions currently in Sections R104 and C104 are not being eliminated but instead enhanced.

- Sections R104.1 and C104.1 in the current code remain the same but have been enhanced to provide the additional detail provided in Section 109.1 of the IEBC, which is equally relevant to the IECC. In addition an allowance for the code official to have a designated agent conduct inspections has been added to recognize the ability for the code official should they so choose have a designated entity act on their behalf in conducting required inspections.
- New Sections R104.2 and C104.2 are added to the code and covers the issue of preliminary approvals. This provision appears for instance in the IEBC (109.2) and appears equally relevant to the IECC Residential and the IECC Commercial provisions.
- Sections R104.3 and C104.3 currently address a final inspection. There are, however, no provisions in the IECC that address the inspections that are necessary during the course of construction to ensure compliance with the IECC. The proposed Sections R104.3 and C104.3 include a provision for a final inspection but, as is the case in other ICC codes such as the IEBC (109), includes a number of other code-relevant inspections detailing by name what is to be assessed for compliance during key stages of construction. Having this direction, and notification to designers, builders and contractors via publication in the code, is intended to foster increased compliance with the IECC. Note also, as covered in the revisions to Sections R104.1 and C104.1, the code official can also have a designated agent conduct these inspections.
- Sections R104.5 and C104.5 as currently worded are circular in nature. They provide the code official certain authorization to accept reports from approved inspection agencies. The definition of the term approved is such that the end result of this criterion is that the code official is authorizing something based on his authority to authorize it. The proposed revisions provide the additional detail needed as to how approval of such third parties is to be addressed and the general criteria upon which they would be evaluated for acceptability.

Cost Impact: The code change proposal does not increase the cost of construction.

C103.3-EC-WILLIAMS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The lists introduce confusion. Not all of the items listed are available for inspection at rough-in. The provision is overall too specific and doesn't allow the jurisdiction to determine its program based on available staffing.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. ~~In causing the documents to be examined to verify compliance with this code, The code official shall be permitted is~~ authorized to utilize a registered design professional or other *approved* entity not affiliated with the *building* design or construction in conducting the review of the plans and specifications for compliance with the code.

C104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* or his designated agent, and such construction or work shall remain accessible and exposed for inspection purposes until *approved*. ~~Approved as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the code official nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.~~

C104.2 Preliminary Inspection. ~~Before issuing a permit, the code official is authorized to examine or cause to be examined the building site, and in the case of work to or on an existing building the building, for which an application has been filed.~~

C104.3 2 Required inspections. The *code official* or his designated agent, upon notification, shall make the inspections set forth in Sections C104.3.1 through C104.3.6 ~~C104.2.1 through 104.2.6.~~

C104.3.1 C104.2.1 Footing and foundation inspection. Inspections associated with footings and foundations ~~shall be made before backfilling and shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and approved plans and specifications, for:~~

- ~~1. Basement or crawl space walls having insulation applied exterior to or integral with the walls~~
- ~~2. Slabs on grade~~
- ~~3. Buried duct systems associated with HVAC systems~~
- ~~4. Piping systems associated with HVAC or service hot water systems~~
- ~~5. Freeze protection/snow melt systems.~~

C104.3.2 C104.2.2 Framing and rough-in inspection. Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding R-values and their correct location and proper installation,; fenestration thermal-properties (U-factor, SHGC and VT) and proper installation of fenestration,; and air leakage controls as required by the code and approved plans and specifications, for:

- ~~1. Opaque walls and wall assemblies~~
- ~~2. Floors and floor assemblies~~

3. ~~Roof/ceilings and roof/ceiling assemblies~~
4. ~~Fenestration~~
5. ~~Required vestibules~~

C104.3.3 C104.2.3 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications as to types of insulation and corresponding R-values and protection, required controls and required heat traps. for:

1. ~~The R-value, location, thickness, depth of burial and protection of insulation on hot water piping~~
2. ~~The existence of required temperature controls on potable hot water systems~~
3. ~~The installation of automatic time switches on circulating hot water systems or heat trace~~
4. ~~The installation of heat traps on hot water storage tanks associated with non-circulating systems.~~

C104.3.4 C104.2.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system and damper air leakage and required energy recovery and/or economizers. for:

1. ~~Installed HVAC equipment type, efficiency and size~~
2. ~~Installation of gravity and motorized dampers where required and leakage rates of the dampers~~
3. ~~Installation of required demand control ventilation~~
4. ~~Required insulation type, R-value, thickness and proper installation of insulation for ducts, plenums and piping associated with the HVAC system~~
5. ~~Sealing and any required leakage testing of ducts and plenums~~
6. ~~Installation of required economizers and associated controls~~
7. ~~Installation of required temperature, humidity and zone controls~~
8. ~~Required sizing of HVAC system fans and motors~~
9. ~~Required energy recovery capability~~
10. ~~Existence of a means to balance HVAC systems~~
11. ~~Installation of required controls for HVAC and hydronic systems~~
12. ~~Required limitations on hot gas bypass for cooling systems~~
13. ~~Installation of radiant heating systems where not allowed~~

C104.3.5 C104.2.5 Electrical rough-in inspection. Inspections at electrical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to installed lighting systems, components and controls and installation of an electric meter for each dwelling unit. for:

1. ~~Proper installation of all required lighting controls~~
2. ~~Installation of all lighting system components (fixtures and lamps)~~
3. ~~Installation of individual electric meters for each dwelling unit in multi-family residential buildings.~~

C104.3.6 C104.2.6 Final inspection. The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building* controls and their proper operation as well as documentation verifying the activities associated with required *building commissioning* have been conducted and the findings of non-compliance corrected. *Buildings*, or portions thereof, shall not be considered for a final inspection until the *code official* has received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report as required in Section C408.2.4.

C104.5 Approved Inspection agencies. The *code official* is authorized to accept reports of third party inspection agencies not affiliated with the *building* design or construction, provided such agencies are *approved* as to qualifications and reliability relevant to the building components and systems they are inspecting.

Commenter's Reason: All this proposal and public comment do is make clear to both code officials and code users the types of inspections that should be expected. At the code development hearing there was considerable testimony in support of the code change proposal from city building departments as well as industry. Supporting testimony mentioned the value of and need for the reorganization provided in addition to the value of the detail provided regarding inspections. Points in opposition focused primarily on the depth of detail provided in the inspection criteria proposed.

No adverse comments were provided regarding examining of documents (e.g. allowing the code official to use approved third parties during this activity just as the code currently allows third parties to conduct inspections). The resulting language covering other than the inspection details shown in the public comment will simply better organize what is currently in the code. These changes are important. They will make it easier for code officials to ensure code compliance. More importantly they more clearly advise code users what to expect and what authority the code official has to ensure compliance.

Regarding inspections, points raised at the first hearing indicated that while the list of inspection items was good commentary and guidance, it went beyond the level of detail that belongs in Chapter 1 of the code. It was also noted that the inspections as outlined in the code change proposal were an unfunded mandate. In response, DOE noted that the inspection items listed came directly from the code, and their listing in Chapter 1 did not add any new criteria or change the current code requirements. As originally proposed, their delineation simply placed what is already required by the code in one location focused on inspections during construction. Whether listed in section 1 or not, the current code requires that compliance with the listed items be verified. It is clearer to have these expectations listed in one location, as opposed to trying to find them throughout the code.

DOE has further reviewed the current code, the code change proposal and the comments at the code development hearing. The current code does not provide sufficient detail for the code official or those responsible for compliance –Section C104.3

essentially provides for code officials to call for inspections when needed, with a final inspection completed before occupancy. DOE believes this is insufficient and does not give code officials what is needed for them to most effectively enforce the code. DOE does agree, however, that the original proposal may have been too detailed, and so has suggested a reduction in detail in this public comment.

- The proposed text associated with a preliminary inspection has been deleted – it is agreed that what was proposed could be construed as beyond the current scope of the energy code.
- The required inspections are retained, but the detail associated with each is significantly reduced. DOE agrees the detail originally provided may have been more appropriate for a commentary. DOE also recognizes that, as was stated at the code development hearing, adopting entities need more detail than is currently in the code in this area and often adopt amendments to the code. It seems more logical for the IECC to provide better guidance in the model code.
- The portion of the code change proposal covering a final inspection, however, has not been revised through this public comment, and remains as originally proposed. The current code simply says to provide a final inspection, but gives no detail about what is within the scope of the inspection.

Without this enhancement to the code regarding inspections, there is nothing in the code that the code official can reference when advising those who are required to comply what they need to do and can expect. Without this additional detail, the code official is powerless, at worst, to enforce compliance with the code, and, at best, has to debate the issue of inspections with those required to comply. DOE believes the appropriate level of detail is provided regarding inspections in this public comment.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE38-13, Part I

Final Action: AS AM AMPC_____ D

CE38-13, Part II

C103.3, C104.1, C104.2 (NEW), C104.3, C104.3.1 (NEW), C104.3.2 (NEW), C104.3.3 (NEW), C104.3.4 (NEW), C104.3.5 (NEW), C104.3.6 (NEW), C104.5, R103.3, R104.1, R104.2 (NEW), R104.3, R104.3.1 (NEW), R104.3.2 (NEW), R104.3.3 (NEW), R104.3.4 (NEW), R104.3.5 (NEW), R104.3.6 (NEW), R104.5

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. In causing the documents to be examined to verify compliance with this code, the *code official* shall be permitted to utilize a registered design professional or other *approved* entity not affiliated with the *building* design or construction in conducting the review of the plans and specifications for compliance with the code.

~~**R104.1 General.** Construction or work for which a permit is required shall be subject to inspection by the *code official*.~~

R104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* or his designated agent, and such construction or work shall remain accessible and exposed for inspection purposes until *approved*. Approved as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the *code official* nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

~~**R104.2 Required approvals.** Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.~~

R104.2 Preliminary Inspection. Before issuing a permit, the *code official* is authorized to examine or cause to be examined the *building site*, and in the case of work to or on an existing building the *building*, for which an application has been filed.

~~**R104.3 Final inspection.** The building shall have a final inspection and not be occupied until *approved*.~~

R104.3 Required inspections. The *code official* or his designated agent, upon notification, shall make the inspections set forth in Sections R104.3.1 through R104.3.6.

R104.3.1 Footing and foundation inspection. Inspections associated with footings and foundations shall be made before backfilling and shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and *approved* plans and specifications for:

1. Basement or crawl space walls having insulation applied exterior to or integral with the walls
2. Slabs on grade
3. Buried duct systems associated with HVAC systems
4. Piping systems associated with HVAC or service hot water systems
5. Freeze protection/snow melt systems .

R104.3.2 Framing and rough-in inspection. Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding R-values and their correct location and proper installation, fenestration thermal properties (U-factor and SHGC) and proper installation of fenestration, and air leakage controls as required by the code and approved plans and specifications for:

1. Opaque walls and wall assemblies
2. Floors and floor assemblies
3. Roof/ceilings and roof/ceiling assemblies
4. Fenestration

R104.3.3 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and *approved* plans and specifications for:

1. The R-value, location, thickness, depth of burial and protection of insulation on hot water piping
2. The installation of automatic or manual switches on circulating hot water systems

R104.3.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications for:

1. Installed HVAC equipment type, efficiency and size
2. Installation of require programmable thermostats
3. Required heat pump supplementary heat controls
4. Installation of automatic or gravity dampers on outdoor air intakes and exhausts
5. Required insulation type, R-value, thickness and proper installation of insulation for ducts, air handlers and piping associated with the HVAC system
6. Sealing and any required leakage testing of ducts and plenums
7. Required sealing of and manufacturer's designation for air handlers
8. Required whole house ventilation and minimum fan efficacy

Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C104.3.4.

R104.3.6 Final inspection. The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building* systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures.

R104.5 Approved inspection agencies. ~~The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.~~

R104.5 Approved Inspection agencies. The *code official* is authorized to accept reports of third party inspection agencies not affiliated with the *building* design or construction, provided such agencies are

approved as to qualifications and reliability relevant to the building components and systems they are inspecting.

Reason: This proposal improves and enhances the details governing inspections of construction and examination of documents associated with compliance verification.

The current provisions of Sections R 103.1 and C103.3 require the code official to examine the construction documents to verify compliance with the code. Those provisions also allow the code official to delegate that authority to another party (e.g., cause to be examined) but are not specific as to the qualifications of that party. Depending on the type and size of a residential or commercial building, the plans and specifications can be very complex and an appropriate level of review challenging for a jurisdiction that may not see many large commercial projects in a given year and/or have a unique or large residential building. Currently there is no specificity in the code about the qualifications of any third party reviewer, so the permittee could argue against the imposition of a registered design professional requirement by the jurisdiction. The proposed language makes it clear that, should the code official decide to delegate their authority to another party, such third party must be approved (a defined term in the code) by the code official; something very important because that party is acting on behalf of the code official.

The current provisions of Sections R104 and C104 covering inspections are not as specific as they could be with respect to energy efficiency. The proposed revisions to Sections R104 and C104, which are consistent with Section 109 of the International Existing Building Code (IEBC), provide the required detail to better ensure compliance with the code and through compliance delivery of the energy efficiency potential associated with the provisions of the code. It is important to point out that the provisions currently in Sections R104 and C104 are not being eliminated but instead enhanced.

- Sections R104.1 and C104.1 in the current code remain the same but have been enhanced to provide the additional detail provided in Section 109.1 of the IEBC, which is equally relevant to the IECC. In addition an allowance for the code official to have a designated agent conduct inspections has been added to recognize the ability for the code official should they so choose have a designated entity act on their behalf in conducting required inspections.
- New Sections R104.2 and C104.2 are added to the code and covers the issue of preliminary approvals. This provision appears for instance in the IEBC (109.2) and appears equally relevant to the IECC Residential and the IECC Commercial provisions.
- Sections R104.3 and C104.3 currently address a final inspection. There are, however, no provisions in the IECC that address the inspections that are necessary during the course of construction to ensure compliance with the IECC. The proposed Sections R104.3 and C104.3 include a provision for a final inspection but, as is the case in other ICC codes such as the IEBC (109), includes a number of other code-relevant inspections detailing by name what is to be assessed for compliance during key stages of construction. Having this direction, and notification to designers, builders and contractors via publication in the code, is intended to foster increased compliance with the IECC. Note also, as covered in the revisions to Sections R104.1 and C104.1, the code official can also have a designated agent conduct these inspections.
- Sections R104.5 and C104.5 as currently worded are circular in nature. They provide the code official certain authorization to accept reports from approved inspection agencies. The definition of the term approved is such that the end result of this criterion is that the code official is authorizing something based on his authority to authorize it. The proposed revisions provide the additional detail needed as to how approval of such third parties is to be addressed and the general criteria upon which they would be evaluated for acceptability.

Cost Impact: The code change proposal does not increase the cost of construction.

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Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART II – IECC – Residential

Committee Action:

Disapproved

Committee Reason: This amount of detail is not required in the code. This material would be good for a handbook or commentary.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. ~~In causing the documents to be examined to verify compliance with this code, the~~ The code official shall be permitted ~~is authorized~~ to utilize a registered design professional or other *approved* entity not affiliated with the building design or construction in conducting the review of the plans and specifications for compliance with the code.

R104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* or his designated agent, and such construction or work shall remain accessible and exposed for inspection purposes until *approved*. ~~Approved as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid.~~ It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the *code official* nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

R104.2 Preliminary Inspection. ~~Before issuing a permit, the code official is authorized to examine or cause to be examined the building site, and in the case of work to or on an existing building the building, for which an application has been filed.~~

R104.3 R104.2 Required inspections. The *code official* or his designated agent, upon notification, shall make the inspections set forth in Sections R104.2.1 through R104.2.5~~R104.3.1 through R104.3.6.~~

R104.3.1 R104.2.1 Footing and foundation inspection. ~~Inspections associated with footings and foundations shall be made before backfilling and shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and approved plans and specifications, for:~~

- ~~1. Basement or crawl space walls having insulation applied exterior to or integral with the walls~~
- ~~2. Slabs on grade~~
- ~~3. Buried duct systems associated with HVAC systems~~
- ~~4. Piping systems associated with HVAC or service hot water systems~~
- ~~5. Freeze protection/snow melt systems.~~

R104.3.2 R104.2.2 Framing and rough-in inspection. ~~Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding R-values and their correct location and proper installation, fenestration thermal properties (U-factor and SHGC) and proper installation of fenestration, and air leakage controls as required by the code and approved plans and specifications, for:~~

- ~~1. Opaque walls and wall assemblies~~
- ~~2. Floors and floor assemblies~~
- ~~3. Roof/ceilings and roof/ceiling assemblies~~
- ~~4. Fenestration~~

R104.3.3 R104.2.3 Plumbing rough-in inspection. ~~Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to types of insulation and corresponding R-values and protection, and required controls, for:~~

- ~~1. The R-value, location, thickness, depth of burial and protection of insulation on hot water piping~~
- ~~2. The installation of automatic or manual switches on circulating hot water systems~~

R104.3.4 R104.2.4 Mechanical rough-in inspection. ~~Inspections at mechanical rough-in shall verify compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation, and minimum fan efficiency, for:~~

- ~~1. Installed HVAC equipment type, efficiency and size~~
- ~~2. Installation of require programmable thermostats~~
- ~~3. Required heat pump supplementary heat controls~~

1. ~~Installation of automatic or gravity dampers on outdoor air intakes and exhausts~~
2. ~~Required insulation type, R-value, thickness and proper installation of insulation for ducts, air handlers and piping associated with the HVAC system~~
3. ~~Sealing and any required leakage testing of ducts and plenums~~
4. ~~Required sealing of and manufacturer's designation for air handlers~~
5. ~~Required whole house ventilation and minimum fan efficacy~~

Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C104.3.4.

R104.3.6 R104.2.5 Final inspection. The *building* shall have a final inspection and shall not be occupied until *approved*. The final inspection shall include verification of the installation of all required *building* systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures.

R104.5 Approved Inspection agencies. The *code official* is authorized to accept reports of third party inspection agencies not affiliated with the *building* design or construction, provided such agencies are *approved* as to qualifications and reliability relevant to the building components and systems they are inspecting.

Commenter's Reason: All this proposal and public comment do is make clear to both code officials and code users the types of inspections that should be expected. At the code development hearing there was considerable testimony in support of the code change proposal from city building departments as well as industry. Supporting testimony mentioned the value of and need for the reorganization provided in addition to the value of the detail provided regarding inspections. Points in opposition focused primarily on the depth of detail provided in the inspection criteria proposed.

No adverse comments were provided regarding examining of documents (e.g. allowing the code official to use approved third parties during this activity just as the code currently allows third parties to conduct inspections). The resulting language covering other than the inspection details shown in the public comment will simply better organize what is currently in the code. These changes are important. They will make it easier for code officials to ensure code compliance. More importantly they more clearly advise code users what to expect and what authority the code official has to ensure compliance.

Regarding inspections, points raised at the first hearing indicated that while the list of inspection items was good commentary and guidance, it went beyond the level of detail that belongs in Chapter 1 of the code. It was also noted that the inspections as outlined in the code change proposal were an unfunded mandate. In response, DOE noted that the inspection items listed came directly from the code, and their listing in Chapter 1 did not add any new criteria or change the current code requirements. As originally proposed, their delineation simply placed what is already required by the code in one location focused on inspections during construction. Whether listed in section 1 or not, the current code requires that compliance with the listed items be verified. It is clearer to have these expectations listed in one location, as opposed to trying to find them throughout the code.

DOE has further reviewed the current code, the code change proposal and the comments at the code development hearing. The current code does not provide sufficient detail for the code official or those responsible for compliance –Section C104.3 essentially provides for code officials to call for inspections when needed, with a final inspection completed before occupancy. DOE believes this is insufficient and does not give code officials what is needed for them to most effectively enforce the code. DOE does agree, however, that the original proposal may have been too detailed, and so has suggested a reduction in detail in this public comment.

- The proposed text associated with a preliminary inspection has been deleted – it is agreed that what was proposed could be construed as beyond the current scope of the energy code.
- The required inspections are retained, but the detail associated with each is significantly reduced. DOE agrees the detail originally provided may have been more appropriate for a commentary. DOE also recognizes that, as was stated at the code development hearing, adopting entities need more detail than is currently in the code in this area and often adopt amendments to the code. It seems more logical for the IECC to provide better guidance in the model code.
- The portion of the code change proposal covering a final inspection, however, has not been revised through this public comment, and remains as originally proposed. The current code simply says to provide a final inspection, but gives no detail about what is within the scope of the inspection.

Without this enhancement to the code regarding inspections, there is nothing in the code that the code official can reference when advising those who are required to comply what they need to do and can expect. Without this additional detail, the code official is powerless, at worst, to enforce compliance with the code, and, at best, has to debate the issue of inspections with those required to comply. DOE believes the appropriate level of detail is provided regarding inspections in this public comment.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE38-13, Part II

Final Action: AS AM AMPC____ D

CE39-13, Part I

C104.1.1 (NEW), C104.2.1 (NEW), C104.2.2 (NEW), C104.3 (NEW), C104.3.1 (NEW), C104.4, C104.5, C104.6, C104.7, C104.8, C104.8.1, R104.1.1 (NEW), R104.2.1 (NEW), R104.2.2 (NEW), R104.3 (NEW), R104.3.1 (NEW), R104.4, R104.5, R104.6, R104.7, R104.8, R104.8.1

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C104.1.1 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies, including *approved* commissioning agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

C104.2.1 Inspection requests. It shall be the duty of the holder of the permit or the holder's duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

C104.2.2 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

~~C104.3~~ C104.2.3 Final inspection. The building shall have a final inspection and not be occupied until approved.

C104.3 Notice of approval. After the prescribed tests and inspections, including but not limited to applicable commissioning tests and inspections as prescribed in Section C408, indicate that work complies in all respects with this code, and required documentation, including but not limited to the final commissioning report, has been accepted by the *code official*, a notice of approval shall be issued by the *code official*.

C104.3.1 Revocation. The *code official* is authorized to suspend or revoke in writing a notice of approval issued under the provisions of this code wherever the certificate has been issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

~~C104.4~~ C104.3.2 Reinspection. A building shall be reinspected when determined necessary by the *code official*.

~~C104.5 Approved inspection agencies.~~ ~~The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.~~

~~C104.6 Inspection requests.~~ ~~It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.~~

~~**C104.7 Reinspection and testing.** Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.~~

~~**C104.8 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.~~

~~**C104.8.1 Revocation.** The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.~~

Reason: The proposal better organizes this section and eliminates redundancy.

Cost Impact: The code change proposal will not increase the cost of construction.

C104.1.1 (NEW)-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proponent requested disapproval based on issues identified during the consideration of CE39-13 Part II.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C104.1 General. *[Unchanged]*

C104.1.1 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies, including *approved* commissioning agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

C104.2 Required approvals. *[Unchanged.]*

C104.2.1 Inspection requests. It shall be the duty of the holder of the permit or the holder's duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

C104.2.2 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

C104.3 C104.2.3 Final inspection. The building shall have a final inspection and not be occupied until approved.

C104.3 Notice of approval. After the prescribed tests and inspections, including but not limited to applicable commissioning tests and inspections as prescribed in Section C408, indicate that work complies in all respects with this code, and required

documentation, including but not limited to the final commissioning report, has been accepted by the *code official*, a notice of approval shall be issued by the *code official*.

C104.3.1 Revocation. ~~The *code official* is authorized to suspend or revoke in writing a notice of approval issued under the provisions of this code wherever the certificate has been issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.~~

C104.4 C104.3.2 Reinspection. A building shall be reinspected when determined necessary by the code official.

C104.5 Approved inspection agencies. ~~The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.~~

C104.6 Inspection requests. ~~It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.~~

C104.7 Reinspection and testing. ~~Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.~~

C104.8 Approval. ~~After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.~~

C104.8.1 Revocation. ~~The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.~~

Commenter's Reason: This proposal reorganizes, simplifies and clarifies the text in the 2012 IECC. It neither adds nor deletes content, but it does eliminate redundancy.

CE39-13, Part I

Final Action: AS AM AMPC_____ D

CE39-13, Part II

C104.1.1 (NEW), C104.2.1 (NEW), C104.2.2 (NEW), C104.3 (NEW), C104.3.1 (NEW), C104.4, C104.5, C104.6, C104.7, C104.8, C104.8.1, R104.1.1 (NEW), R104.2.1 (NEW), R104.2.2 (NEW), R104.3 (NEW), R104.3.1 (NEW), R104.4, R104.5, R104.6, R104.7, R104.8, R104.8.1

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R104.1.1 Approved inspection agencies. The code official is authorized to accept reports of approved inspection agencies, including approved commissioning agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

R104.2.1 Inspection requests. It shall be the duty of the holder of the permit or the holder's duly authorized agent to notify the code official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

R104.2.2 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the code official for inspection and testing.

R104.3 R104.2.3 Final inspection. The building shall have a final inspection and not be occupied until approved.

R104.3 Notice of approval. After the prescribed tests and inspections, including but not limited to applicable commissioning tests and inspections as prescribed in Section C408, indicate that work complies in all respects with this code, and required documentation, including but not limited to the final commissioning report, has been accepted by the code official, a notice of approval shall be issued by the code official.

R104.3.1 Revocation. The code official is authorized to suspend or revoke in writing a notice of approval issued under the provisions of this code wherever the certificate has been issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

R104.4 R104.3.2 Reinspection. A building shall be reinspected when determined necessary by the code official.

R104.5 Approved inspection agencies. The code official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

R104.6 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the code official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

~~**R104.7 Reinspection and testing.** Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.~~

~~**R104.8 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.~~

~~**R104.8.1 Revocation.** The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.~~

Reason: The proposal better organizes this section and eliminates redundancy.

Cost Impact: The code change proposal will not increase the cost of construction.

C104.1.1 (NEW)-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: Disapproval was requested by the proponent.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

R104.1 General. [Unchanged]

R104.1.1 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies provided such agencies satisfy the requirements as to qualifications and reliability.

R104.2 Required approvals. [Unchanged.]

R104.2.1 Inspection requests. It shall be the duty of the holder of the permit or the holder's duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

R104.2.2 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing. [Text unchanged]

~~R104.3~~ R104.2.3 Final inspection. The building shall have a final inspection and not be occupied until approved.

R104.3 Notice of approval. After the prescribed tests and inspections indicate that work complies in all respects with this code, and required documentation has been accepted by the *code official*, a notice of approval shall be issued by the *code official*.

R104.3.1 Revocation. The *code official* is authorized to suspend or revoke in writing a notice of approval issued under the provisions of this code wherever the certificate has been issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

R104.4 R104.3.2 Reinspection. A building shall be reinspected when determined necessary by the code official.

R104.5 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

R104.6 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

R104.7 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

R104.8 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

R104.8.1 Revocation. The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Commenter's Reason: This proposal reorganizes, simplifies and clarifies the text in the 2012 IECC. It neither adds nor deletes content, but it does eliminate redundancy.

CE39-13, Part II

Final Action: AS AM AMPC _____ D

**CE40-13, Part I
C104.3.1 (NEW), R104.3.1 (NEW)**

Proposed Change as Submitted

Proponent: Hope Medina, Cherry Hills Village, representing self (hmedina@coloradocode.net)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C104.3.1 Energy inspections. Requirements of this code shall pass inspection prior to issuance of a certificate of occupancy for the building. Inspections shall be performed by the code official or a third party approved by the code official.

Reason: We are requiring for more energy efficient buildings to be built, but we do not require for any type of energy inspections to be performed. With the Federal government’s energy mandates that our current building practices must increase energy conservation we are needing alter our current point of view . Section 110.3 of the IBC and section 109 of the IRC state that certain inspections are required to be done prior to obtaining a Certificate of Occupancy. Currently there are no energy code requirements listed that must be verified, but they are tied to many financial requirements, utility incentives, and local, state, and federal tax credits or incentives. There becomes a time when we can no longer over look this omission, and jump into the fire to start requiring that energy inspections be performed.

An example of a current issue is as follows. A construction services company is designing and constructing a green community affordable senior living facilities as a 2 phase project. The jurisdiction it was being built in does not perform plan reviews or inspections under the IECC. The two buildings were designed under the 2006 International Codes. With current lending requirements they were not able to obtain financing for the entire project under one loan. The project was split into two phases with two different financial loans procured. When submitting the second phase for finance they were informed that the money loaned is requiring for the building to be energy star certified. Due to the jurisdiction not performing energy plan reviews or inspections it may cost the builder it's financing or increase their budget to become compliant.

Cost Impact: This code change will not increase the cost of construction.

C109.1.5-EC-MEDINA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: Clearly and specifically states that inspections are required. Clearly allows the code official to use third party inspectors.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Duan Jonlin, City of Seattle Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C104.3.1 Energy inspections. ~~Requirements of this code shall pass inspection prior to issuance of a certificate of occupancy for the building. Inspections shall be performed by the code official or a third party approved by the code official. The Certificate of Occupancy for a building shall not be issued unless the code official inspects the building or structure and finds no violations of the provisions of this code or other laws enforced by the code official.~~

Commenter's Reason: We support the concept of this code provision, and request that the wording be modified for clarity. A "requirement" cannot technically be inspected. In addition, it is already clear in the code that inspections may be performed by the code official or some approved third party, so that additional language is not necessary.

CE40-13, Part I

Final Action: AS AM AMPC____ D

CE40-13, Part II

C104.3.1 (NEW), R104.3.1 (NEW)

Proposed Change as Submitted

Proponent: Hope Medina, Cherry Hills Village, representing self (hmedina@coloradocode.net)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R104.3.1 Energy inspections. Requirements of this code shall pass inspection prior to issuance of a certificate of occupancy for the building. Inspections shall be performed by the code official or a third party approved by the code official.

Reason: We are requiring for more energy efficient buildings to be built, but we do not require for any type of energy inspections to be performed. With the Federal government’s energy mandates that our current building practices must increase energy conservation we are needing alter our current point of view . Section 110.3 of the IBC and section 109 of the IRC state that certain inspections are required to be done prior to obtaining a Certificate of Occupancy. Currently there are no energy code requirements listed that must be verified, but they are tied to many financial requirements, utility incentives, and local, state, and federal tax credits or incentives. There becomes a time when we can no longer over look this omission, and jump into the fire to start requiring that energy inspections be performed.

An example of a current issue is as follows. A construction services company is designing and constructing a green community affordable senior living facilities as a 2 phase project. The jurisdiction it was being built in does not perform plan reviews or inspections under the IECC. The two buildings were designed under the 2006 International Codes. With current lending requirements they were not able to obtain financing for the entire project under one loan. The project was split into two phases with two different financial loans procured. When submitting the second phase for finance they were informed that the money loaned is requiring for the building to be energy star certified. Due to the jurisdiction not performing energy plan reviews or inspections it may cost the builder it's financing or increase their budget to become compliant.

Cost Impact: This code change will not increase the cost of construction.

C109.1.5-EC-MEDINA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This clarifies that compliance with this code must be demonstrated prior to issuance of a certificate of occupancy.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Duan Jonlin, City of Seattle Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R104.3.1 Energy inspections. ~~Requirements of this code shall pass inspection prior to issuance of a certificate of occupancy for the building. Inspections shall be performed by the code official or a third party approved by the code official. The Certificate of Occupancy for a building shall not be issued unless the code official inspects the building or structure and finds no violations of the provisions of this code or other laws enforced by the code official.~~

Commenter's Reason: We support the concept of this code provision, and request that the wording be modified for clarity. A "requirement" cannot technically be inspected. In addition, it is already clear in the code that inspections may be performed by the code official or some approved third party, so that additional language is not necessary.

CE40-13, Part II

Final Action: AS AM AMPC____ D

CE41-13, Part I

C104.5, C104.5.1 (NEW), C202 (NEW), R104.5, R104.5.1 (NEW), R202 (NEW) (IRC N1101.9 (NEW))

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C104.5 Approved inspection agencies. ~~The code official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability. or other authority having jurisdiction shall be permitted to designate an approved agency to determine compliance with any, some or all requirements of this code. Such approved agency shall:~~

1. Administer all necessary tests, review all relevant construction documents, and conduct all required inspections related to any code requirement where such agency is providing certification of compliance.
2. Produce a written report addressing all tests, inspections, review and analysis conducted and certifying compliance with such specific requirements of this code.

C104.5.1 Standard for approved agencies. An approved agency shall be approved after the code official or other authority having jurisdiction has determined that the agency meets the applicable requirements. An approved agency shall provide all of the information necessary to make such a determination. An approved agency shall:

1. Be objective, competent and independent from all interested parties, including all contractors responsible for the work being inspected, and disclose possible conflicts of interest so that objectivity can be confirmed.
2. Have adequate equipment to perform any required test or inspections.
3. Employ experienced personnel educated and qualified to conduct the necessary review, tests, inspections and other actions to determine compliance.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

Reason: The purpose of the proposed code change is to establish new requirements for *approved agencies* and to otherwise clarify the code -- this proposal will improve the potential for approved agencies to assist in code compliance and enforcement efforts. The proposal imports the definition of "approved agency" from the 2012 *IBC* into the *IECC*, clarifies the role of approved agencies in verifying aspects of energy code compliance and establishes standards for such agencies to be approved. The *IECC*

currently does not give enough direction about the role of such approved agencies or the minimum requirements for these entities. This proposal improves the code by outlining the requirements for approved agencies, including:

- Third-party administration of the verification activities
- Quality and reliability of the approved agency
- Written reports of code compliance

These requirements are all common-sense and already may be employed by jurisdictions that delegate testing or inspection authority to third parties. We believe that it makes sense to include these requirements in the IECC so that jurisdictions can apply more uniform criteria to approved agencies, and so that third parties can better tailor their compliance and enforcement programs to meet the expectations of the state or locality.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The term 'approved agency' is defined in other International Codes including IBC, IRC, IMC, IPC and IgCC. The definition proposed here is the same as that found in these other code.

C104.5-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee felt there were too many concerns regarding the text to consider approving it rather than keeping the current very clear and concise text. Requiring each agency to do 'all' of the tests, etc, was too encompassing and would prevent specialized agencies to conduct specific aspects. There was concern that this would expose testing agencies to inappropriate release of proprietary information.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C104.5 Approved agencies. The *code official* or other authority having jurisdiction shall be permitted to designate an *approved agency* to determine compliance with any, some or all requirements of this code. Such *approved agency* shall:

1. Administer ~~all~~ necessary tests, review ~~all~~ relevant construction documents, and conduct ~~all~~ required inspections related to any code requirement where such agency is approved to provide providing certification of compliance with the code requirement;
2. Produce a written report detaileding the results of ~~addressing all tests, any~~ inspections, review and analysis related to the code compliance requirements for the building conducted; and
3. Certify certifying compliance with such specific requirements of this code.

C104.5.1 Standard for approved agencies. An *approved agency* shall be *approved* after the *code official* or other authority having jurisdiction has determined that the agency meets the applicable requirements. An *approved agency* shall provide all of the information necessary to make such a determination. An *approved agency* shall:

1. Be objective, competent and independent from all interested parties involved in the design, construction, ownership or operation of the building, including all contractors responsible for the work being to be inspected, and disclose possible conflicts of interest so that objectivity can be confirmed;:-
2. Have adequate equipment to perform any required test or inspections;:- and
3. Employ experienced personnel educated and qualified to conduct the necessary review, tests, inspections and other actions to determine compliance.

(Portions of proposal not shown remain unchanged.)

Committer's Reason: We recommend approval of CE41, Part I, as modified by this public comment. Although the original reason statement adequately outlines the reasons why the IECC should include these additional details on the role and responsibilities of an "approved agency," we have addressed concerns raised during the committee hearings:

- The modifications clarify that approved agencies may be approved for specific limited purpose.
- Similarly, reports are now specifically limited to building-specific inspections and analyses and would not apply to product certifications.
- Independence from "interested" parties has been clarified to specifically identify the parties from whom independence must be maintained – those involved in the design, construction, ownership or operation of the building.

CE41-13, Part I

Final Action: AS AM AMPC ____ D

CE41-13, Part II

C104.5, C104.5.1 (NEW), C202 (NEW), R104.5, R104.5.1 (NEW), R202 (NEW) (IRC N1101.9 (NEW))

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R104.5 Approved inspection agencies. ~~The code official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability. or other authority having jurisdiction shall be permitted to designate an approved agency to determine compliance with any, some or all requirements of this code. Such approved agency shall:~~

1. Administer all necessary tests, review all relevant construction documents, and conduct all required inspections related to any code requirement where such agency is providing certification of compliance.
2. Produce a written report addressing all tests, inspections, review and analysis conducted and certifying compliance with such specific requirements of this code.

R104.5.1 Standard for approved agencies. An approved agency shall be approved after the code official or other authority having jurisdiction has determined that the agency meets the applicable requirements. An approved agency shall provide all of the information necessary to make such a determination. An approved agency shall:

1. Be objective, competent and independent from all interested parties, including all contractors responsible for the work being inspected, and disclose possible conflicts of interest so that objectivity can be confirmed.
2. Have adequate equipment to perform any required test or inspections.
3. Employ experienced personnel educated and qualified to conduct the necessary review, tests, inspections and other actions to determine compliance.

Add new definition as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

Reason: The purpose of the proposed code change is to establish new requirements for *approved agencies* and to otherwise clarify the code -- this proposal will improve the potential for approved agencies to assist in code compliance and enforcement efforts. The proposal imports the definition of "approved agency" from the 2012 *IBC* into the *IECC*, clarifies the role of approved agencies in verifying aspects of energy code compliance and establishes standards for such agencies to be approved. The *IECC*

currently does not give enough direction about the role of such approved agencies or the minimum requirements for these entities. This proposal improves the code by outlining the requirements for approved agencies, including:

- Third-party administration of the verification activities
- Quality and reliability of the approved agency
- Written reports of code compliance

These requirements are all common-sense and already may be employed by jurisdictions that delegate testing or inspection authority to third parties. We believe that it makes sense to include these requirements in the IECC so that jurisdictions can apply more uniform criteria to approved agencies, and so that third parties can better tailor their compliance and enforcement programs to meet the expectations of the state or locality.

Cost Impact: The code change proposal will not increase the cost of construction.

Note: The term 'approved agency' is defined in other International Codes including IBC, IRC, IMC, IPC and IgCC. The definition proposed here is the same as that found in these other code.

C104.5-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: This expands the code requirements beyond the original intent of this section, and is unnecessary. This also causes problems in areas where some flexibility is needed, such as small jurisdictions where testing agencies might not be easily attained, and testing might be appropriately performed by the HVAC Contractor.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc. , request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R104.5 Approved agencies. The *code official* or other authority having jurisdiction shall be permitted to designate an *approved agency* to determine compliance with any, some or all requirements of this code. Such *approved agency* shall:

1. Administer ~~all~~ necessary tests, review ~~all~~ relevant construction documents, and conduct ~~all~~ required inspections related to any code requirement where such agency is approved to provide ~~providing~~ certification of compliance with the code requirement;
2. Produce a written report detailed the results of ~~addressing all tests, any~~ inspections, review and analysis related to the code compliance requirements for the building conducted; and
3. Certify certifying compliance with such specific requirements of this code.

R104.5.1 Standard for approved agencies. An *approved agency* shall be *approved* after the *code official* or other authority having jurisdiction has determined that the agency meets the applicable requirements. An *approved agency* shall provide all of the information necessary to make such a determination. An *approved agency* shall:

1. Be objective, competent and independent from all interested parties involved in the design, construction, ownership or operation of the building, including all contractors responsible for the work being to be inspected, and disclose possible conflicts of interest so that objectivity can be confirmed;:-
2. Have adequate equipment to perform any required test or inspections; and.
3. Employ experienced personnel educated and qualified to conduct the necessary review, tests, inspections and other actions to determine compliance.

(Portions of proposal not shown remain unchanged.)

Commenter's Reason: We recommend approval of CE41, Part II, as modified by this public comment. Although the original reason statement adequately outlines the reasons why the IECC should include these additional details on the role and responsibilities of an "approved agency," we have addressed concerns raised during the committee hearings:

- The modifications clarify that approved agencies may be approved for specific limited purpose.
- Similarly, reports are now specifically limited to building-specific inspections and analyses and would not apply to product certifications.
- Independence from "interested" parties has been clarified to specifically identify the parties from whom independence must be maintained – those involved in the design, construction, ownership or operation of the building.

CE41-13, Part II

Final Action: AS AM AMPC_____ D

CE42-13
C106.1.2, C106.2

Proposed Change as Submitted

Proponent: Shirley Ellis, Energy Systems Laboratory, Texas A&M Engineering Experiment Station, Texas A&M University System (shirleyellis@tamu.edu)

Revise as follows:

C106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

Exception. Where using ANSI/ASHRAE/IESNA 90.1 as a compliance path as allowed in Section C401.2 Item 1 or Section C401.2.1 Item 2.

~~**C106.2 Conflicting requirements.** Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.~~

Reason: Adding the exception to C106.1.2 clarifies the intent in Section C401.2 that commercial buildings shall comply with either ANSI/ASHRAE/IESNA 90.1 in its entirety or the requirements of the IECC Sections in its entirety.

Section C106.2 is unnecessary as it simply restates the requirements in C106.1.1 and C106.1.2 and adds confusion in which section to cite.

Cost Impact: The code change proposal will not increase the cost of construction.

C106.1.2-EC-ELLIS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee found the language of the proposal confusing. It doesn't add any clarity not provided by the current text.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shirley Ellis, Energy Systems Laboratory, Texas A&M University System, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

Exception. Where using ANSI/ASHRAE/IESNA 90.1 as a compliance path as allowed in Section C401.2 Item 1 or Section C401.2.1 Item 2. Where ANSI/ASHRAE/IESNA 90.1 is used as the compliance path as allowed in Sections C401.2 and C401.2.1, the provisions of the standard take precedence over the provisions of Chapter C4.

Commenter's Reason: Adds an exception to C106.1.2. Section C401 states that the requirements contained in Chapter 4 are applicable to all commercial buildings and that said buildings shall comply with either ANSI/ASHRAE/IESNA 90.1 or the requirements of the IECC. This exception will allow the provisions of the standard to take precedence over the provisions of the code as they relate to Chapter 4 Commercial Energy Efficiency requirements when the ANSI/ASHRAE/IESNA 90.1 is the method of compliance.

One of the concerns voiced at the committee hearing was that this exception could be applied to other chapters and sections of the IECC. The added language in this modification address that concern. This exception specifically references Chapter 4 provisions and therefore does not apply to conflicts in the remaining chapters of the IECC.

CE42-13

Final Action: AS AM AMPC_____ D

CE43-13, Part I

C106.2, R106.2

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Delete without substitution as follows:

~~**C106.2 Conflicting requirements.** Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.~~

Reason: Section C106.2 is redundant of Section C106.1.1.

Cost Impact: The code change proposal will not increase the cost of construction.

C106.2-EC-TAYLOR.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC – Commercial
Committee Action:**

Disapproved

Committee Reason: The committee was unsure that the text was redundant and whether it was this text that needed to be removed, or the text in Section C106.1.1.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment

Deborah F. Taylor, Principal, Deborah F. Taylor Consulting, LLC, representing self; Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Approval as Submitted.

Commenter's Reason:

(Taylor): Sections C106.1.1 and C106.2 have the same meaning. Section C106.1.1 elaborates on Sections C106.1, along with an additional paragraph. Therefore standalone Section C106.2 is redundant and should be eliminated from the code. There is no Part II for this public comment as Part II was approved as submitted in the Code Development Hearing.

(Mozingo): At the Dallas hearings there were several Part I and Part II proposals that rendered different results because of the different committees hearing them. While it is understandable that in rare instances it is ok to have results be different for commercial verses residential, many of these items need to have the same requirement for both applications and we feel that this is one of those items.

We agree with the residential committee when they said that this was redundant language. The commercial committee said that they were confused over this issue and wondered if the language in 106.1.1 should be changed instead. Section 106.1.1 mentions conflicts between the energy code and both the provisions of other codes as well as referenced standards. Section 106.1.2 mentions the conflicts with referenced standards again. It seems as though everything is already covered in both of these sections so why do we need yet another section (106.2) to address standards again?

CE43-13, Part I

Final Action: AS AM AMPC_____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE43-13, PART II – IECC-RESIDENTIAL PROVISIONS

Delete without substitution as follows:

~~**R106.2 Conflicting requirements.** Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.~~

Reason: Section C106.2 is redundant of Section C106.1.1.

Cost Impact: The code change proposal will not increase the cost of construction.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This removes redundant language from the code.

Assembly Action:

None

CE44-13, Part I

C108.4, R108.4

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

Proponent: Shirley Ellis, Energy Systems Laboratory, Texas A&M Engineering Experiment Station, Texas A&M University System (shirleyellis@tamu.edu)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine ~~of not less than {AMOUNT} dollars or more than {AMOUNT} dollars, as set by the applicable governing authority.~~

Reason: Codes are adopted in various ways by varying entities, federal agencies, states, counties, or municipalities. Often one level of government will adopt the code, while the enforcement is at a different level. Some of the adopting entities do not have the means to insert a specific fine amount, in some instances the enforcement may be by several entities that have fine amounts that vary and in some cases the fine amount may unknown to the adopting agency.

This proposal will also eliminate the need to amend the code ordinance when the fine structure is revised. This change allows the code to be adopted without relying on the amount to be determined at the time of adoption.

Cost Impact: The code change proposal will not increase the cost of construction.

C108.4-EC-ELLIS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: Simplifies adoption of the code. Often it is not code officials, or even the jurisdiction that sets fine amounts.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC; Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable subject to a fine as set by the applicable governing authority.

Commenter's Reason:

Mozingo: At the Dallas hearings there were several Part I and Part II proposals that rendered different results because of the different committees hearing them. While it is understandable that in rare instances it is ok to have results be different for commercial verses residential, many of these items need to have the same requirement for both applications and we feel that this is one of those items.

We agree with the modification that the residential committee made by changing the word "liable" to "subject" because liable could imply that if I hand a red tag to the laborer on site, he is liable for the fine, when he really may be subject to the fine but more likely his company is subject to the fine. Liable is too harsh of a word for this section. We would like to see consistency between residential and commercial provisions by bringing in the modification made by the residential proposal.

Thompson: Both parts of CE44 were approved, however, Part II was approved with a minor revision to the text – changing 'liable' to 'subject'. The SEHPCAC agrees with the overall intent of the change and believes that both parts of the code should read the same. The language approved in Part II is the better language for this 'legal' part of the code.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE44-13, Part I

Final Action: AS AM AMPC ____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE44-13, PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine ~~of not less than {AMOUNT} dollars or more than {AMOUNT} dollars~~ as set by the applicable governing authority.

Reason: Codes are adopted in various ways by varying entities, federal agencies, states, counties, or municipalities. Often one level of government will adopt the code, while the enforcement is at a different level. Some of the adopting entities do not have the means to insert a specific fine amount, in some instances the enforcement may be by several entities that have fine amounts that vary and in some cases the fine amount may unknown to the adopting agency.

This proposal will also eliminate the need to amend the code ordinance when the fine structure is revised. This change allows the code to be adopted without relying on the amount to be determined at the time of adoption.

Cost Impact: The code change proposal will not increase the cost of construction.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Modified

Modify the proposal as follows:

R108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable subject to a fine as set by the applicable governing authority.

Committee Reason: This inset by the governing authority is often forgotten at the time of adoption. The language proposed accomplishes the intent of the code. The modification is simply to use language appropriate to the context.

Assembly Action:

None

**CE46-13, Part I
C202, R202 (IRC N1101.9)**

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Part I – IECC - COMMERCIAL

Revise definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope between conditioned space and unconditioned space, including necessary sealing to block air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. An air barrier may be a single material or a combination of materials that are in continuous alignment throughout the 3D structure of the air barrier and the thermal barrier of the building. The air barrier system is constructed of materials that are impermeable to the movement of air and are strong and durable to perform throughout the serviceable life of the building. An interior and exterior continuous air barrier system is utilized and installed in alignment with all fibrous cavity insulation systems. i.e. six sided encapsulation is walls and floor systems.

Reason: The air barrier system is a crucial element of the buildings structure in creation of efficient homes. If they it is not clearly defined then identification, implementation, and enforcement of the energy code will continue to be ambiguous. The language here is intended clarify what is meant by the term so that implementation and enforcement of the code is less ambiguous.

Cost Impact: This code change proposal will not increase the cost of construction.

C202-AIR BARRIER-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The text of the proposed definition doesn't bring clarity to the meaning of air barrier. The proposal also brings a technical requirement into the definition. Technical provisions do not belong in definitions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION C202 GENERAL DEFINITIONS

AIR BARRIER. Material(s) Materials assembled and joined together to provide a barrier to air leakage through the building envelope between conditioned space and unconditioned space, including necessary sealing to block air flow at edges and seams and adequate support to resist air moving with positive and negative pressures from inside or outside the building from entering the building's thermal envelope without displacement or damage. An air barrier ~~may be~~ is either a single material or is a combination of materials, which is installed on the interior of the building, on the exterior of the building, or on both the interior and exterior of the building, depending on the climate zone or the configuration of the building, that are in continuous alignment throughout the 3D structure of the air barrier and the thermal barrier of the building. The air barrier system is constructed of materials that are impermeable to the movement of air, and are strong and durable to perform throughout the serviceable life of the building. An interior and exterior continuous air barrier system is utilized and installed in alignment with all fibrous cavity insulation systems, i.e. six-sided encapsulation in walls and floor systems.

Commenter's Reason: Air is like a freight train transporting energy, moisture and pollutants around the building and through the building's thermal envelope. Clearly understanding that the air barrier separates conditioned space from unconditioned space, that it must be durable and last the life of the house, and that it may not be on just one plain of the building is important. The code may not be intended to be a building manual but it is often used that way and promoting sound building science and building practices ensure not only efficiency but durability and safety in the building. The rewording of this proposal better demonstrates the intent by eliminating language that is ambiguous and unenforceable. Stating that the air barrier must be strong, durable, and last the serviceable life of the building further defines the types of material that can be used to construct the system. It belongs in the definition to demonstrate that although some material can stop the movement of air they are not suitable because they will not last over time.

CE46-13, Part I

Final Action: AS AM AMPC____ D

CE46-13, Part II

C202, R202 (IRC N1101.9)

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Part II – IECC - RESIDENTIAL

Revise definition as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope between conditioned space and unconditioned space, including necessary sealing to block air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. An air barrier may be a single material or a combination of materials that are in continuous alignment throughout the 3D structure of the air barrier and the thermal barrier of the building. The air barrier system is constructed of materials that are impermeable to the movement of air and are strong and durable to perform throughout the serviceable life of the building. An interior and exterior continuous air barrier system is utilized and installed in alignment with all fibrous cavity insulation systems. i.e. six sided encapsulation is walls and floor systems.

Reason: The air barrier system is a crucial element of the buildings structure in creation of efficient homes. If they it is not clearly defined then identification, implementation, and enforcement of the energy code will continue to be ambiguous. The language here is intended clarify what is meant by the term so that implementation and enforcement of the code is less ambiguous.

Cost Impact: This code change proposal will not increase the cost of construction.

C202-AIR BARRIER-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposed definition for air barrier is written with detail requirements that do not belong in a definition, In addition, the term "thermal barrier" is used, which is a term used in the building code for a flame resistant assembly.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, Inc, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

AIR BARRIER. ~~Material(s) Materials assembled and joined together to provide a barrier to air leakage through the building envelope between conditioned space and unconditioned space, including necessary sealing to block air flow at edges and seams and adequate support to resist air moving with positive and negative pressures from inside or outside the building from entering the building's thermal envelope without displacement or damage. An air barrier may be is either a single material or is a combination of materials, which is installed on the interior of the building, on the exterior of the building, or on both the interior and exterior of the building, depending on the climate zone or the configuration of the building, that are in continuous alignment throughout the 3D structure of the air barrier and the thermal barrier of the building. The air barrier system is constructed of materials that are impermeable to the movement of air, and are strong and durable to perform throughout the serviceable life of the building. An interior and exterior continuous air barrier system is utilized and installed in alignment with all fibrous cavity insulation systems, i.e. six-sided encapsulation in walls and floor systems.~~

Commenter's Reason: Air is like a freight train transporting energy, moisture and pollutants around the building and through the building's thermal envelope. Clearly understanding that the air barrier separates conditioned space from unconditioned space, that it must be durable and last the life of the house, and that it may not be on just one plain of the building is important. The code may not be intended to be a building manual but it is often used that way and promoting sound building science and building practices ensure not only efficiency but durability and safety in the building. The rewording of this proposal better demonstrates the intent by eliminating language that is ambiguous and unenforceable. Stating that the air barrier must be strong, durable, and last the serviceable life of the building further defines the types of material that can be used to construct the system. It belongs in the definition to demonstrate that although some material can stop the movement of air they are not suitable because they will not last over time.

CE46-13, Part II

Final Action: AS AM AMPC____ D

**CE48-13, Part I
C202, R202 (IRC N1101.9), IRC R202**

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART III WILL BE HEARD BY THE IRC BUILDING CODE DEVELOPMENT COMMITTEE.

PART I - IECC – COMMERCIAL PROVISIONS

Revise definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

BUILDING THERMAL ENVELOPE. The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

Reason: The thermal envelope is a crucial elements of the buildings structure in creation of efficient homes. If it not clearly defined then identification of the thermal boundary and implementation and enforcement of the energy code will continue to be ambiguous. The language here is intended to clarify what is meant by the term so that implementation and enforcement of the code is less ambiguous.

Cost Impact: This code change proposal will not increase the cost of construction.

R202-BUILDING THERMAL ENVELOPE-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee; Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Building Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Disapproved

Committee Reason: The proposal was related to CE37-13 which was also disapproved. The proposal needs additional clarity as the alignment suggested doesn't always occur.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION C202 GENERAL DEFINITIONS

BUILDING THERMAL ENVELOPE. ~~The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space. Building assemblies that provide a continuous air barrier and thermal barrier separating conditioned space from unconditioned space.~~

Commenter's Reason: Simple and straight forward not ambiguous and very enforceable. When one asks someone to define the Buildings thermal envelope they realize that the envelope is not just insulation or merely the air barrier system. It is both, together, separating conditioned space from unconditioned space.

CE48-13, Part I

Final Action: AS AM AMPC____ D

CE48-13, Part II

C202, R202 (IRC N1101.9), IRC R202

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART III WILL BE HEARD BY THE IRC BUILDING CODE DEVELOPMENT COMMITTEE.

PART II - IECC – RESIDENTIAL PROVISIONS

SECTION R202 (N1101.9) GENERAL DEFINITIONS

Revise definition as follows:

BUILDING THERMAL ENVELOPE. The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

Reason: The thermal envelope is a crucial elements of the buildings structure in creation of efficient homes. If it not clearly defined then identification of the thermal boundary and implementation and enforcement of the energy code will continue to be ambiguous. The language here is intended to clarify what is meant by the term so that implementation and enforcement of the code is less ambiguous.

Cost Impact: This code change proposal will not increase the cost of construction.

R202-BUILDING THERMAL ENVELOPE-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee; Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Building Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The proposed revision to text is poorly worded. The proponent had good intentions, but the text does not clearly accomplish the intent.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, Inc, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

**SECTION R202 (N1101.9)
GENERAL DEFINITIONS**

BUILDING THERMAL ENVELOPE. The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose ~~conditioned space~~ or provide a boundary between ~~conditioned space~~ and exempt or unconditioned space. Building assemblies that provide a continuous air barrier and thermal barrier separating conditioned space from unconditioned space.

Commenter's Reason: Simple and straight forward not ambiguous and very enforceable. When one asks someone to define the Buildings thermal envelope they realize that the envelope is not just insulation or merely the air barrier system. It is both, together, separating conditioned space from unconditioned space.

CE48-13, Part II

Final Action: AS AM AMPC _____ D

CE48-13, Part III
C202, R202 (IRC N1101.9), IRC R202

Proposed Change as Submitted

Proponent: Robby Schwarz, EnergyLogic, Inc., (robby@nrglogic.com)

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART III WILL BE HEARD BY THE IRC BUILDING CODE DEVELOPMENT COMMITTEE.

PART III – IRC

Revise definition as follows:

SECTION 202
GENERAL DEFINITIONS

BUILDING THERMAL ENVELOPE. The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

Reason: The thermal envelope is a crucial elements of the buildings structure in creation of efficient homes. If it not clearly defined then identification of the thermal boundary and implementation and enforcement of the energy code will continue to be ambiguous. The language here is intended to clarify what is meant by the term so that implementation and enforcement of the code is less ambiguous.

Cost Impact: This code change proposal will not increase the cost of construction.

R202-BUILDING THERMAL ENVELOPE-EC-SCHWARZ.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee; Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Building Code Development Committee.

PART III – IRC

Committee Action:

Disapproved

Committee Reason: The term 'alignment' is ambiguous and unenforceable. Also, the term 'thermal barrier' is confusing with the term already in use in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robby Schwarz, EnergyLogic, Inc, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION 202
GENERAL DEFINITIONS

BUILDING THERMAL ENVELOPE. . The continuous alignment of the air barrier and thermal barrier in basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space. Building assemblies that provide a continuous air barrier and thermal barrier separating conditioned space from unconditioned space.

Commenter's Reason: Simple and straight forward not ambiguous and very enforceable. When one asks someone to define the Buildings thermal envelope they realize that the envelope is not just insulation or merely the air barrier system. It is both, together, separating conditioned space from unconditioned space.

CE48-13, Part III

Final Action: AS AM AMPC_____ D

**CE49-13, Part I
C202 (New), R202 (New) (IRC N1101.9 (New)), IPC 202 (New)**

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, LEED AP BD+C Grundfos representing Grundfos (gtowsley@grundfos.com)

PART I – IECC-COMMERCIAL PROVISIONS

Add new definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

C202-CIRCULATING HOT WATER SYSTEM (NEW)-EC-TOWLSEY.doc

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: The proposal provides a good definition for terms used in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures ~~the fixture supply~~ and back to the water-heating equipment.

Commenter's Reason: The initial proposal was not intended to mean to recirculate to the actual fixture, but to supply the pipe serving the fixture. This modification clarifies the intent and identifies the correct connecting point ("fixture supply") between the circulation line and the actual fixture which is already defined in the IPC.

CE49-13, Part I

Final Action: AS AM AMPC_____ D

CE49-13, Part II

C202 (New), R202 (New) (IRC N1101.9 (New)), IPC 202 (New)

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, LEED AP BD+C Grundfos representing Grundfos (gtowsley@grundfos.com)

PART II – IPC

Add new definition as follows:

SECTION 202 GENERAL DEFINITIONS

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

C202-CIRCULATING HOT WATER SYSTEM (NEW)-EC-TOWLSEY.doc

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Approved as Submitted

Committee Reason: The proposal provides a good definition for terms used in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures ~~the fixture supply~~ and back to the water-heating equipment.

Commenter's Reason: The initial proposal was not intended to mean to recirculate to the actual fixture, but to supply the pipe serving the fixture. This modification clarifies the intent and identifies the correct connecting point ("fixture supply") between the circulation line and the actual fixture which is already defined in the IPC.

CE49-13, Part II

Final Action: AS AM AMPC_____ D

**CE49-13, Part III
C202 (New), R202 (New) (IRC N1101.9 (New)), IPC 202 (New)**

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, LEED AP BD+C Grundfos representing Grundfos (gtowsley@grundfos.com)

PART III – IECC-RESIDENTIAL PROVISIONS

Add new definition as follows:

**SECTION R202 (N1101.9)
GENERAL DEFINITIONS**

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

Reason: A definition of a “circulating hot water system” does not exist in the code, yet it is referenced in the IRC and other ICC codes. This definition brings clarity to how a “circulating hot water system” should be designed and operated. In the codes and sections where “circulating hot water system” is used, this definition would also reduce the probability of confusion between hot water systems used for space heating or tempered water. Currently, the only place that the term CIRCULATING HOT WATER SYSTEM shows up in the code is IECC Section C404.6, IPC [E] 607.2.1 and IECC Section R403.4.1 (IRC N1103.4.1). Other proposals by other proponents will most likely be adding language that uses this term so it is important to have the term defined.

As referenced in CHAPTER 50 - SERVICE WATER HEATING of *ASHRAE Handbook-HVAC Applications* (2011, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.), “Some recirculation-loop systems...are equipped with circulating pumps to force water through the piping and back to the water heater, thus keeping water in the piping hot.” Adding this definition in the code will be consistent with industry’s understanding.

Cost Impact: The code change proposal will not increase the cost of construction.

C202-CIRCULATING HOT WATER SYSTEM (NEW)-EC-TOWLSEY.doc

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

**PART III – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This is an important definition to have in the code because these types of systems are used in buildings.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures ~~the~~ the fixture supply and back to the water-heating equipment.

Commenter's Reason: The initial proposal was not intended to mean to recirculate to the actual fixture, but to supply the pipe serving the fixture. This modification clarifies the intent and identifies the correct connecting point ("fixture supply") between the circulation line and the actual fixture which is already defined in the IRC.

CE49-13, Part III

Final Action: AS AM AMPC____ D

CE51-13, Part I

C202

Proposed Change as Submitted

Proponent: Shaunna Mozingo, City of Cherry Hills Village, representing Colorado Chapter of ICC, Inc (smozingo@coloradocode.net), Brent Ursenbach, Salt Lake County, representing Utah Chapter ICC and Utah Association of Plumbing and Mechanical Officials Chapter ICC (bursenbach@slco.org)

Delete and substitute as follows:

SECTION C202 GENERAL DEFINITIONS

~~**CONDITIONED SPACE.** An area or room within a building being heated or cooled, containing un-insulated ducts, or with a fixed opening directly into an adjacent conditioned space.~~

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or that is indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by un-insulated walls, floors or ceilings, or where they contain un-insulated ducts, piping or other sources of heating or cooling.

Reason: (Mozingo) Currently the definition for conditioned space differs in each code. The proposed change to the definition would bring the IECC and IRC in line with what was approved in Group A for the 2015 IMC as proposal M2-12. This proposal shows the modifications that were made by the committee and then went on to the consent agenda as there were no public comments received. This proposed change is similar to the definition in ASHRAE 90.1 – 2010.

(Ursenbach) (Part I) Confusion exists between the definitions in the IMC, IRC and IECC. The IECC attempts to define how a space may be indirectly conditioned; however, further clarification is needed. The definition for conditioned space as proposed above is the definition approved in the Group A hearings for the IMC under M2-12. This proposed change is similar to the definition in ASHRAE 90.1 – 2010. **(Part II)** Confusion exists between the definitions in the IMC, IRC and IECC. The IECC attempts to define how a space may be indirectly conditioned; however, further clarification is needed. The definition for conditioned space as proposed above is the definition approved for the IMC in the Group A hearings under M2-12. This proposed change is similar to the definition in ASHRAE 90.1 – 2010.

Cost Impact: This code change proposal will not increase the cost of construction.

C202-CONDITIONED SPACE-EC-MOZINGO-URSENBACH.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal doesn't clarify, but was felt to add confusion to the definition. There was concern that the text would have unintended consequences. The committee preferred the current, concise text.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Brent Ursenbach, Salt Lake County, representing Utah Chapter ICC and Hope Medina, Cherry Hills Village, CO, representing self, requests Approval as Submitted

Commenter's Reason: This proposal has been submitted to clarify the definition of conditioned space, specifically defining *indirect conditioning*. Consider a storage room or closet, located completely within the interior of an office. These spaces are surrounded by conditioned space, resulting in indirect conditioning through the un-insulated walls surround the room. Based on the previous definition in the IMC, code official often required direct conditioning of these spaces with supply air outlets, return air inlets or other conditioning methods. The alternative has been, insulate the storage room, placing it outside the thermal envelope, considering it unconditioned. The added expense is un-necessary, as these spaces are easily and sufficiently *indirectly conditioned*.

This proposal provides consistency with the definition in other I Codes. This proposal was submitted and approved by final action for the 2015 IMC, likewise approved by the committee for 2015 IRC - R202 and approved by assembly action for the 2015 IECC- R202. The opposition at the commercial hearings was based on a definition read by an opponent from ASHRAE 90.1 for *conditioned space*, when the appropriate similar definition in ASHRAE 90.1 is the definition for *indirectly conditioned space*. ASHRAE 90.1 defines.

indirectly conditioned space: an enclosed space within a building that is not a heated space or a cooled space, which is heated or cooled indirectly by being connected to adjacent space(s) provided:

- a. the product of the U-factor(s) and surface area(s) of the space adjacent to connected space(s) exceeds the combined sum of the product of the U-factor(s) and surface area(s) of the space adjoining the outdoors, unconditioned spaces, and to or from semiheated spaces (e.g., corridors) or
- b. that air from heated or cooled spaces is intentionally transferred (naturally or mechanically) into the space at a rate exceeding 3 ach.

In essence, 'a.' in ASHRAE 90.1 is stating; *if there is little or no insulation in the components/surfaces surrounding this spaces, compared to that in the thermal envelope, indirect conditioning will occur.*

Public Comment 2:

Donald Vigneau AIA, representing Northeast Energy Efficiency Partnerships Inc., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled or that is indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by un-insulated walls, floors or ceilings, or where they contain un-insulated ducts, piping or other sources of heating or cooling.

Commenter's Reason: Definitions should be succinct but also encompassing, the essence of the original proposal that improves upon the current definition. The proponent's change included unnecessary language that belongs in the commentary that is proposed here to be deleted. Although disapproved by the committees, the original proposed change had support from a successful Floor Action after the Residential Part II Disapproval decision which occurred first. Request is for Approved as Modified by this Public Comment (AMPC).

CE51-13, Part I

Final Action: AS AM AMPC _____ D

CE51–13, Part II

C202, R202 (IRC N1101.9)

Proposed Change as Submitted

Proponent: Shaunna Mozingo, City of Cherry Hills Village, representing Colorado Chapter of ICC, Inc (smozingo@coloradocode.net), Brent Ursenbach, Salt Lake County, representing Utah Chapter ICC and Utah Association of Plumbing and Mechanical Officials Chapter ICC (bursenbach@slco.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC RESIDENTIAL PROVISIONS

Delete and substitute as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

~~**CONDITIONED SPACE.** For energy purposes, space within a building that is provided with heating and/or cooling equipment or systems capable of maintaining, through design or heat loss/gain, 50°F (10°C) during the heating season and 85°F (29°C) during the cooling season, or communicates directly with a conditioned space. For mechanical purposes, an area, room or space being heated or cooled by any equipment or appliance.~~

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or that is indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by un-insulated walls, floors or ceilings, or where they contain un-insulated ducts, piping or other sources of heating or cooling.

Reason: (Mozingo) Currently the definition for conditioned space differs in each code. The proposed change to the definition would bring the IECC and IRC in line with what was approved in Group A for the 2015 IMC as proposal M2-12. This proposal shows the modifications that were made by the committee and then went on to the consent agenda as there were no public comments received. This proposed change is similar to the definition in ASHRAE 90.1 – 2010.

(Ursenbach) (Part I) Confusion exists between the definitions in the IMC, IRC and IECC. The IECC attempts to define how a space may be indirectly conditioned; however, further clarification is needed. The definition for conditioned space as proposed above is the definition approved in the Group A hearings for the IMC under M2-12. This proposed change is similar to the definition in ASHRAE 90.1 – 2010. **(Part II)** Confusion exists between the definitions in the IMC, IRC and IECC. The IECC attempts to define how a space may be indirectly conditioned; however, further clarification is needed. The definition for conditioned space as proposed above is the definition approved for the IMC in the Group A hearings under M2-12. This proposed change is similar to the definition in ASHRAE 90.1 – 2010.

Cost Impact: This code change proposal will not increase the cost of construction.

C202-CONDITIONED SPACE-EC-MOZINGO-URSENBACH.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The present definition of conditioned space is appropriate for the IECC.

Assembly Action:

Approved as Submitted

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Submitted and because a public comment was submitted.

Public Comment:

Donald Vigneau AIA, representing Northeast Energy Efficiency Partnerships Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled or that is indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by un-insulated walls, floors or ceilings, or where they contain un-insulated ducts, piping or other sources of heating or cooling.

Commenter's Reason: Definition should be succinct but also encompassing, the essence of the original proposal that improves upon the current definition. The proponent's change included unnecessary language that belongs in the commentary that is proposed here to be deleted. Although disapproved by the committees, the original proposed change had support from a successful Floor Action after the Residential Part II Disapproval decision which occurred first. Request is for Approved as Modified by this Public Comment (AMPC).

CE51-13, Part II

Final Action: AS AM AMPC_____ D

**CE54-13
202 (NEW)**

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new definitions as follows:

**SECTION C202
GENERAL DEFINITIONS**

LINER SYSTEM (Ls). A continuous vapor barrier liner membrane is installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the liner membrane between the purlins. For multilayer installations, the last *rated R-value of insulation* is for unfaced insulation draped over purlins and then compressed when the metal roof panels are attached.

FILLED CAVITY (FC). The first *rated R-value of insulation* represents faced or unfaced insulation installed between the purlins. The second *rated R-value of insulation* represents unfaced insulation installed above the first layer, perpendicular to the purlins and compressed when the metal roof panels are attached. A supporting structure retains the bottom of the first layer at the prescribed depth required for the full thickness of insulation.

Reason: Liner systems and filled cavity metal building roof assemblies can be used for compliance with the Opaque assemblies in table C402.2. This adds definitions for the terms, which are identical to the already existing definition in ANSI/ASHRAE/IES Standard 90.1-2010

Cost Impact: The code change proposal will not increase the cost of construction.

C202-LINEAR SYSTEM (Ls) (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Because CE90-13 was not approved, both of these definitions are not needed in the code. In addition, the committee found the proposed text needed improvement to reflect actual practice.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment:

Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

LS = *Liner System*—A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

(Balance of the table and original proposal remain unchanged)

Commenter's Reason: Regardless of the action on CE90, the term "Liner System" is used in Table C402.2, and should be defined. It is currently defined in footnote a of table C402.2, but defined terms should be in the definition section, not buried in a footnote of a table. CE90-13 includes the term 'filled cavity'. . If CE90-13 is approved, the term filled cavity needs to be defined.

Analysis: The term 'liner system' is already used in the code. The term 'filled cavity' is not currently in the code, but would be added to the code if CE90-13 is approved. If CE54 is approved, but CE90-13 is not approved, the term 'filled cavity' would not be included in the next code.

CE54-13

Final Action: AS AM AMPC____ D

CE59-13, Part I

C202, R202 (IRC N1101.9)

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

SECTION C202 GENERAL DEFINITIONS

Revise definitions as follows:

FENESTRATION VERTICAL FENESTRATION. ~~Skylights, roof windows, vertical w~~ Windows (fixed or movable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of Fenestration includes products with glass and nonglass or other transparent or translucent glazing materials and installed at a slope of at least 60 degrees from horizontal.

SKYLIGHT SKYLIGHT. Glass or other transparent or translucent glazing material installed with a slope of less than 60 degrees (1.05 rad) from horizontal. ~~Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.~~

Reason: The code currently has no thermal provisions (U-factor or SHGC) for any fenestration material or product installed at an angle of greater than 0 up to and including 30 degrees from vertical. This proposal clarifies the application of thermal provisions (U-factor or SHGC) for fenestration materials or products installed at an angle greater than 0 up to and including 30 degrees from vertical.

There are a number of commercial and residential building designs in which sloped glazing is used, and as such is clearly not vertical but in addition does not meet the greater than 30 degrees from vertical (at least 60 degrees from horizontal) criterion to consider it a skylight. While it may be inferred that vertical fenestration is intended to include all fenestration other than skylights, technically the code does not apply to the fenestration in question. Vertical fenestration is used in Sections C402.3.1, C402.3.1.1, C402.3.3, C402.3.3.1, C402.3.3.2, R402.5 and Table C402.3. This loophole needs to be corrected and rather than change the term in the code from vertical fenestration to some other term, it is considered more appropriate to define what is intended when using the term "vertical fenestration" even though it is not truly vertical. Another change makes it clear that fenestration can be either glass or nonglass glazing materials and does not need to include both glass and nonglass glazing materials. The last sentence in the current definition of skylight can be deleted because the terms for the products are added to the previous sentence and it is not necessary to indicate the location of the skylights as they will always be in a roof or wall assembly. The focus of both definitions is simply the angle of the fenestration as installed.

Cost Impact: This code change proposal will not increase the cost of construction.

Note: The IBC, IRC and the IgCC have two defined terms related to skylights. They are 'skylights and sloped glazing' and 'skylight unit' as follows

SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through and opening in the roof assembly while preserving the weather-resistant barrier of the roof.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing materials in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls, are included in this definition.

C202-FENESTRATION-EC-WILLIAMS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: The proposal fills in a gap in the definitions of fenestration.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION C202 GENERAL DEFINITIONS

FENESTRATION. Products classified as either vertical fenestration or skylights.

Vertical fenestration. Windows (fixed or movable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of at least 60 degrees from horizontal.

Skylight. Glass or other transparent or translucent glazing material installed with a slope of less than 60 degrees from horizontal.

Commenter's Reason: In the process of creating needed definition of vertical fenestration, the definition of fenestration, while embodied in the definition of vertical fenestration and skylight in the code change, is technically lost. That is, there is nothing to specifically define fenestration or tie that term to the two types of fenestration (vertical and skylights). The Code needs such an introduction, because the code still uses the term 'fenestration' in addition to the terms vertical fenestration and skylight.

By definition, fenestration is essentially anything non-opaque of any material in any location and then a subset of fenestration is a skylight. Then when you get into the technical requirements of the code you find that criteria are provided specifically for vertical fenestration and then for skylights. This public comment takes care of that by retaining the approved definitions of vertical fenestration and skylight, keeps them under the term 'fenestration' but then fills in the missing piece – a leading introductory definition of fenestration since that term is also used in the code in Chapter 2 and Chapter 3.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

Public Comment 2:

Jeff Inks, Window & Door Manufacturers Association requests Disapproval.

Commenter's Reason: While the revised definition is not problematic in and of itself (although we do not believe a loophole exists or that a revised definition is necessary), we do not support the inclusion of two different definitions in the IECC for fenestration that is not classified as a skylight. Given Part I was approved as submitted and Part II was disapproved, an inconsistency has been created that needs to be resolved. We are therefore submitting this public comment to ensure both parts are slated for individual consideration at the PCH.

Public Comment 3:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair, requests Disapproval.

Committer's Reason: By approving CE59 Part I, the committee created a definition of Vertical Fenestration, but it eliminated the only definition of fenestration. Both definitions are needed, but the approval creates a gap in definitions. We understand that the proponent of CE59 will be submitting a public comment to restore the definition of Fenestration as well as adding a definition of vertical fenestration. The SEHPCAC supports the concept of having both definitions. If DOE or similar public comment is not successful, then the proposal must be disapproved to restore the definition of fenestration.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE59-13, Part I

Final Action: AS AM AMPC____ D

CE59-13, Part II

C202, R202 (IRC N1101.9)

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise definitions as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

FENESTRATION. VERTICAL FENESTRATION. ~~Skylights, roof windows, vertical w-~~Windows (fixed or movable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of Fenestration includes products with glass and nonglass or other transparent or translucent glazing materials and installed at a slope of at least 60 degrees (1.05 rad) from horizontal.

SKYLIGHT SKYLIGHT. Glass or other transparent or translucent glazing material installed with a slope of less than 60 degrees from horizontal. ~~Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.~~

Reason: The code currently has no thermal provisions (U-factor or SHGC) for any fenestration material or product installed at an angle of greater than 0 up to and including 30 degrees from vertical. This proposal clarifies the application of thermal provisions (U-factor or SHGC) for fenestration materials or products installed at an angle greater than 0 up to and including 30 degrees from vertical.

There are a number of commercial and residential building designs in which sloped glazing is used, and as such is clearly not vertical but in addition does not meet the greater than 30 degrees from vertical (at least 60 degrees from horizontal) criterion to consider it a skylight. While it may be inferred that vertical fenestration is intended to include all fenestration other than skylights, technically the code does not apply to the fenestration in question. Vertical fenestration is used in Sections C402.3.1, C402.3.1.1, C402.3.3, C402.3.3.1, C402.3.3.2, R402.5 and Table C402.3. This loophole needs to be corrected and rather than change the term in the code from vertical fenestration to some other term, it is considered more appropriate to define what is intended when using the term “vertical fenestration” even though it is not truly vertical. Another change makes it clear that fenestration can be either glass **or** nonglass glazing materials and does not need to include both glass **and** nonglass glazing materials. The last sentence in the current definition of skylight can be deleted because the terms for the products are added to the previous sentence and it is not necessary to indicate the location of the skylights as they will always be in a roof or wall assembly. The focus of both definitions is simply the angle of the fenestration as installed.

Cost Impact: This code change proposal will not increase the cost of construction.

Note: The IBC, IRC and the igCC have two defined terms related to skylights. They are ‘skylights and sloped glazing’ and ‘skylight unit’ as follows

SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through and opening in the roof assembly while preserving the weather-resistant barrier of the roof.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing materials in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls, are included in this definition.

C202-FENESTRATION-EC-WILLIAMS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The IECC-Residential Provisions do not use the term “vertical fenestration.” In addition, the proposal would remove the definition of “fenestration”, which is a term used extensively in the Code.-

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R202 (N1101.9) GENERAL DEFINITIONS

FENESTRATION. Products classified as either *vertical fenestration* or *skylights*.

VERTICAL FENESTRATION. Windows (fixed or movable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of at least 60 degrees from horizontal.

SKYLIGHT. Glass or other transparent or translucent glazing material installed with a slope of less than 60 degrees from horizontal.

Commenter’s Reason: The published reason for disapproval from the Committee Action Hearings is that the “IECC-Residential Provisions do not use the term ‘vertical fenestration’.” This is incorrect, as section R402.5 of the 2012 IECC uses the words “vertical fenestration.” The IECC does not define “vertical” and a definition is needed, as fenestration on surfaces such as A-frame houses may not be purely 90 degrees vertical but may be steeper than the 60 degree angle in the skylight definition and therefore not be classified as skylights.

The published reason for disapproval from the Committee Action Hearings also states, “the proposal would remove the definition of ‘fenestration’, which is a term used extensively in the Code.” This Public Comment resolves this by adding a simple definition of fenestration. The definitions of “vertical fenestration” and “skylight” proposed here are identical to definitions in CE59 Part 1, which was approved by the IECC-Commercial committee in Dallas in April.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

Public Comment 2:

Jeff Inks, Window & Door Manufacturers Association, requests Disapproval.

Commenter’s Reason: While the revised definition is not problematic in and of itself (although we do not believe a loophole exists or that a revised definition is necessary), we do not support the inclusion of two different definitions in the IECC for fenestration that is not classified as a skylight. Given Part I was approved as submitted and Part II was disapproved, an inconsistency has been

created that needs to be resolved. We are therefore submitting this public comment to ensure both parts are slated for individual consideration at the PCH.

CE59-13, Part II

Final Action: AS AM AMPC____ D

CE60-13

C301, C301.1, Figure C301.1, Table C301.1, C301.2, C301.3

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

Delete and substitute as follows:

~~SECTION C301 CLIMATE ZONES~~

~~**C301.1 General.** Climate zones from Figure C301.1 or Table C301.1 shall be used in determining the applicable requirements from Chapter 4. Locations not in Table C301.1 (outside the United States) shall be assigned a climate zone based on Section C301.3.~~

~~FIGURE C301.1 CLIMATE ZONES~~

~~TABLE C301.1 CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY~~

~~**C301.2 Warm humid counties.** Warm humid counties are identified in Table C301.1 by an asterisk.~~

~~**C301.3 International climate zones.** The climate zone for any location outside the United States shall be determined by applying Table C301.3(1) and then Table C301.3(2).~~

~~TABLE C301.3(1) INTERNATIONAL CLIMATE ZONE DEFINITIONS~~

~~TABLE C301.3(2) INTERNATIONAL CLIMATE ZONE DEFINITIONS~~

~~C301 CLIMATE ZONES~~

~~**C301.1** Climates zones shall be as specified in Section R301.~~

Reason: If multiple climate zone maps are retained within the I-codes, these maps may diverge over time. It is best to have one climate zone map that all use for the I-codes.

Cost Impact: The code change proposal will not increase the cost of construction.

C301 (NEW)-EC-CONNER.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The parallel code format requires that both Residential and Commercial Codes be complete. The two codes will diverge, but the maps shouldn't. The committees will just need to be diligent in keeping the maps consistent.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self; Hope Medina City of Cherry Hills Village, CO representing self, requests Approval as Submitted.

Commenter's Reason: As part of separating the residential and commercial requirements two copies of the same map and table were created. It is important to keep the codes consistent. If the climate zone maps diverge, which is correct? For the non-code users that reference the IECC climate zone map for other purposes, which should they use? Can a jurisdiction really be in two climate zones? What happens with a mixed use residential/commercial building, is the building itself in two climate zones?

Some argued that it was a problem to have items on the commercial map that were not used in commercial energy code, or items on the residential map that are not used in residential energy code. However that is part of keeping the two maps the same. In fact we are already there. The climate zones 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B are defined in residential, but not used. Similarly the "warm-humid" counties are defined in commercial but never used. Let's keep one climate zone map.

CE60-13

Final Action:	AS	AM	AMPC_____	D
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CE64-13, Part I

C202 (NEW), C303.1.1, C303.1.1.1 (NEW), C303.1.1.2 (NEW), C303.1.1.3 (NEW), Chapter 5, R202 (NEW) (IRC N1101.9 (NEW)), R303.1.1 (IRC N1101.12.1), R303.1.1.1 (NEW) (IRC N1101.12.1.1 (NEW)), R303.1.1.2 (NEW) (IRC N1101.12.1.1.2 (NEW)), R303.1.1.3 (NEW) (IRC N1101.12.1.1.3 (NEW)), Chapter 5

Proposed Change as Submitted

Proponent: Vickie Lovell, InterCode Incorporated, representing Reflective Insulation manufacturers Association International (Vickie@intercodeinc.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C303.1.1 Building thermal envelope insulation. An *R* value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. ~~For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification.~~ The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

C303.1.1.1 Blown or sprayed fiberglass and cellulose insulation. For blown or sprayed fiberglass and cellulose insulation the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification.

C303.1.1.2 Sprayed polyurethane foam insulation. For sprayed polyurethane foam (SPF) insulation the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification.

C303.1.1.3 Reflective insulation. Reflective insulation shall be labeled with the number of reflective sheets and the number and thickness of the enclosed air spaces to attain the product *R*-value as determined in accordance with ASTM C1224.

Add new definitions as follows:

ENCLOSED AIR SPACE. An unventilated cavity between two continuous surfaces (sheets) with a continuous border of building components.

REFLECTIVE INSULATION. An assembly with one or more surfaces with emittance of 0.1 or less with at least one low emittance surface that faces an enclosed air space.

Add new standard to Chapter 5 as follows:

ASTM

C1224-11 Standard Specifications for Reflective Insulation for Building Applications

Reason: The section at present incorporates requirements that are specific to blown or sprayed fiberglass and cellulose insulation and to sprayed polyurethane foam insulation together with general requirements for building thermal envelope insulation materials. This proposal separates the generic and specific requirements.

The proposal also adds specific requirements similar to those for the other insulation materials (as well as appropriate definitions) for a type of material that has been in the market place for over 20 years and has had nationwide distribution and installation, namely reflective insulation. These products are well established and have two associated ASTM Standards, namely ASTM C727, Standard Practice for Installation and Use of Reflective Insulation in Building Constructions, and ASTM C1224, Standard Specification for Reflective Insulation for Building Applications. ASTM C1224 should be included in the IECC to provide the appropriate product specifications for reflective insulations.

ASTM C1224 can be viewed at: <http://reflectixinc.com/literature/securedpdfs/C1224.pdf>.

The products are currently included in the following state codes:

- FL – 2007 Florida Building Code, Section 719.1; 719.2.1 & Table 13-C1.2.3 & ASTM References Subchapter 13-3 (C1224)
- FL – 2010 Florida Building Code, Table 303.2 (ASTM Standards)
- MN - Thermal Insulation Standards, Section 7641.0130, Subpart 7

The purpose of this proposal is to incorporate into the IECC language that clarifies the pertinent requirements regarding reflective insulation R-values that are based on ASTM standards and shall be listed on certifications.

A companion proposal is being provided for section C303.

Cost Impact: This code change proposal will not increase the cost of construction.

Note: The two terms defined in this proposal are not found in other International Codes. However, the IBC does define 'reflective plastic core foil insulation' as follows:

REFLECTIVE PLASTIC CORE FOIL INSULATION. An insulation material packaged in rolls, that is less than 0.5 inches thick, with at least one exterior low emittance surface (0.1 or less) and a core material containing voids or cells.

Analysis: A review of the standard proposed for inclusion in the code, C1224-2011 Standard Specifications for Reflective Insulation for Building Applications, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C303.1.1-EC-LOVELL.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

For staff analysis of the content of ASTM C1224-11 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee was concerned that this product was going to be approved by a unique testing standard distinct from other products. The proposal lacked a requirement that installation be per manufacturer's installation instructions.

Outside of the intent of this proposal to add an additional category of insulation to the two currently listed, the committee expressed concern that the code shouldn't be a listing service and that perhaps none of the specific products be included in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Vickie Lovell, INTERCODE, INC, representing Reflective Insulation Manufacturer's Association – International, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C303.1.1.3 Reflective insulation. Reflective insulation shall be labeled with the number of reflective sheets and the number and thickness of the enclosed reflective air spaces to attain the product R-value as determined in accordance with ASTM C1224. Product shall be installed in accordance with the manufacturer's installation instructions.

Revise definitions as follows:

ENCLOSED REFLECTIVE AIR SPACE. ~~An unventilated unvented cavity between two continuous surfaces (sheets) with a continuous border of building components–~~ bounded by building components on all sides with at least one side being a continuous air-barrier and at least one surface having an emittance of 0.10 or less.

REFLECTIVE INSULATION. An assembly with one or more surfaces with emittance of 0.10 or less with at least one low emittance surface that faces an enclosed reflective air space.

(Portions of proposal not show remain unchanged)

Commenter's Reason: The committee comments were helpful in improving the language and those revisions have been incorporated into this Public Comment. This was great feedback, but there were some misconceptions that need clarified. These products are tested to the FTC approved hot box testing method of ASTM C1363. The word emittance is included in the ASHRAE fundamentals handbook and pertains to cool roofs, windows and reflective insulation. As far as a product category, these products have been in the market for 20+ years, have three ASTM Standards and are recognized by the FTC, ICC and ASHRAE.

The committee had two suggestions on text revisions:

- Clarify the definition for an enclosed air space as it pertains to this product type
- Include a reference to "manufacturer's installation instructions"

This language is a useful enforcement tool. It identifies key features for a product that is widely utilized and has been in the market for over 20 years.

The products are currently included in the following state codes:

- FL – 2007 Florida Building Code, Section 719.1; 719.2.1 & Table 13-C1.2.3 & ASTM References Subchapter 13-3 (C1224)
- FL – 2010 Florida Building Code, Table 303.2 (ASTM Standards)
- MN - Thermal Insulation Standards, Section 7641.0130, Subpart 7

The purpose of this proposal is to incorporate into the IECC language that clarifies the pertinent requirements regarding reflective insulation R-values that are based on ASTM standards and shall be listed on certifications.

Public Comment 2:

Jay H. Crandell, ARES Consulting, representing Sheathing Committee of the American Chemistry Council, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

ENCLOSED AIR SPACE. An unventilated cavity located to the interior side of a continuous air-barrier and bounded on all sides with between two continuous surfaces (sheets) with a continuous border of building components assembled together in a manner that prevents indoor or exterior air leakage into or from the cavity or between adjacent cavities, including sealing of penetrations.

(Portions of proposal not show remain unchanged)

Commenter's Reason: This public comment addresses the need to ensure that an enclosed air space is described and detailed in such a manner to prevent air leakage, not just to avoid intentionally ventilating the air space. This addresses one of the concerns which prompted the committee's reason for disapproval.

As written in the original proposal, the definition does not prevent the location and detailing (or lack of detailing) of airspaces such that R-values comparable to the method by which they are tested per ASTM C1224 can be nominally achieved in practice. Concerns documented in the literature with regard to dust exposure and accumulation which impact the long-term (or short term) performance of reflective air spaces are not addressed in this public comment, particularly with regard to horizontal enclosed airspace applications. This public comment and the original proposal still do not address other concerns such as the significant difference in thermal performance with regard to seasonal changes in heat flow direction for horizontal airspaces. While these other concerns should be addressed, the main concern of this public comment is with the significant impact of air leakage on the thermal performance of airspaces. The modified definition provides an adequate and enforceable description of the characteristics of an airspace that is suitable for consideration of thermal properties, whether the enclosed airspace includes a reflective insulation or not. A review of the scientific literature on this topic was conducted to guide this public comment and will be made available at fsc.americanchemistry.com.

CE64-13, Part I

Final Action: AS AM AMPC____ D

CE64-13, Part II

C202 (NEW), C303.1.1, C303.1.1.1 (NEW), C303.1.1.2 (NEW), C303.1.1.3 (NEW), Chapter 5, R202 (NEW) (IRC N1101.9 (NEW)), R303.1.1 (IRC N1101.12.1), R303.1.1.1 (NEW) (IRC N1101.12.1.1 (NEW)), R303.1.1.2 (NEW) (IRC N1101.12.1.1.2 (NEW)), R303.1.1.3 (NEW) (IRC N1101.12.1.1.3 (NEW)), Chapter 5

Proposed Change as Submitted

Proponent: Vickie Lovell, InterCode Incorporated, representing Reflective Insulation manufacturers Association International (Vickie@intercodeinc.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R303.1.1 (N1101.12.1) Building thermal envelope insulation. An *R* value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and R-value of insulation installed in each element of the *building thermal envelope*. ~~For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R-value of installed thickness shall be listed on the certification.~~ The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

R303.1.1.1 (N1101.12.1.1) Blown or sprayed fiberglass and cellulose insulation. For blown or sprayed fiberglass and cellulose insulation the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be *listed* on the certification.

R303.1.1.2 (N1101.12.1.2) Sprayed polyurethane foam insulation. For sprayed polyurethane foam (SPF) insulation the installed thickness of the areas covered and R-value of installed thickness shall be *listed* on the certification.

R303.1.1.3 (N1101.12.1.3) Reflective insulation. Reflective insulation shall be labeled with the number of reflective sheets and the number and thickness of the enclosed air spaces to attain the product R-value as determined in accordance with ASTM C1224.

Add new definitions as follows:

ENCLOSED AIR SPACE. An unventilated cavity between two continuous surfaces (sheets) with a continuous border of building components.

REFLECTIVE INSULATION. An assembly with one or more surfaces with emittance of 0.1 or less with at least one low emittance surface that faces an enclosed air space.

Add new standard to Chapter 5 as follows:

ASTM

C1224-11 Standard Specifications for Reflective Insulation for Building Applications

Reason: The section at present incorporates requirements that are specific to blown or sprayed fiberglass and cellulose insulation and to sprayed polyurethane foam insulation together with general requirements for building thermal envelope insulation materials. This proposal separates the generic and specific requirements.

The proposal also adds specific requirements similar to those for the other insulation materials (as well as appropriate definitions) for a type of material that has been in the market place for over 20 years and has had nationwide distribution and installation, namely reflective insulation. These products are well established and have two associated ASTM Standards, namely ASTM C727, Standard Practice for Installation and Use of Reflective Insulation in Building Constructions, and ASTM C1224, Standard Specification for Reflective Insulation for Building Applications. ASTM C1224 should be included in the IECC to provide the appropriate product specifications for reflective insulations.

ASTM C1224 can be viewed at: <http://reflectixinc.com/literature/securedpdfs/C1224.pdf>.

The products are currently included in the following state codes:

- FL – 2007 Florida Building Code, Section 719.1; 719.2.1 & Table 13-C1.2.3 & ASTM References Subchapter 13-3 (C1224)
- FL – 2010 Florida Building Code, Table 303.2 (ASTM Standards)
- MN - Thermal Insulation Standards, Section 7641.0130, Subpart 7

The purpose of this proposal is to incorporate into the IECC language that clarifies the pertinent requirements regarding reflective insulation R-values that are based on ASTM standards and shall be listed on certifications.

A companion proposal is being provided for section C303.

Cost Impact: This code change proposal will not increase the cost of construction.

Note: The two terms defined in this proposal are not found in other International Codes. However, the IBC does define 'reflective plastic core foil insulation' as follows:

REFLECTIVE PLASTIC CORE FOIL INSULATION. An insulation material packaged in rolls, that is less than 0.5 inches thick, with at least one exterior low emittance surface (0.1 or less) and a core material containing voids or cells.

Analysis: A review of the standard proposed for inclusion in the code, C1224-2011 Standard Specifications for Reflective Insulation for Building Applications, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C303.1.1-EC-LOVELL.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

For staff analysis of the content of ASTM C1224-11 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: There is unclear language in definition of reflective insulation— what is emittance? There is apparently some doubt regarding the efficacy of this product.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Vickie Lovell, Intercode, Inc, representing Reflective Insulation Manufacturers Association – International, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R303.1.1.3 (N1101.12.1.3) Reflective insulation. Reflective insulation shall be labeled with the number of reflective sheets and the number and thickness of the enclosed reflective air spaces to attain the product R-value as determined in accordance with ASTM C1224. Product shall be installed in accordance with the manufacturer's installation instructions.

Revise definitions as follows:

ENCLOSED REFLECTIVE AIR SPACE. ~~An unventilated unvented cavity between two continuous surfaces (sheets) with a continuous border of building components–~~ bounded by building components on all sides with at least one side being a continuous air-barrier and at least one surface having an emittance of 0.10 or less.

REFLECTIVE INSULATION. An assembly with one or more surfaces with emittance of 0.10 or less with at least one low emittance surface that faces an enclosed reflective air space.

(Portions of proposal not show remain unchanged)

Commenter's Reason: The committee comments were helpful in improving the language and those revisions have been incorporated into this Public Comment. This was great feedback, but there were some misconceptions that need clarified. These products are tested to the FTC approved hot box testing method of ASTM C1363. The word emittance is included in the ASHRAE fundamentals handbook and pertains to cool roofs, windows and reflective insulation. As far as a product category, these products have been in the market for 20+ years, have three ASTM Standards and are recognized by the FTC, ICC and ASHRAE.

The committee had two suggestions on text revisions:

- Clarify the definition for an enclosed air space as it pertains to this product type
- Include a reference to "manufacturer's installation instructions"

This language is a useful enforcement tool. It identifies key features for a product that is widely utilized and has been in the market for over 20 years.

The products are currently included in the following state codes:

- FL – 2007 Florida Building Code, Section 719.1; 719.2.1 & Table 13-C1.2.3 & ASTM References Subchapter 13-3 (C1224)
- FL – 2010 Florida Building Code, Table 303.2 (ASTM Standards)
- MN - Thermal Insulation Standards, Section 7641.0130, Subpart 7

The purpose of this proposal is to incorporate into the IECC language that clarifies the pertinent requirements regarding reflective insulation R-values that are based on ASTM standards and shall be listed on certifications.

Public Comment 2:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

ENCLOSED AIR SPACE. An unventilated cavity located to the interior side of a continuous air-barrier and bounded on all sides with between two continuous surfaces (sheets) with a continuous border of building components assembled together in a manner that prevents indoor or exterior air leakage into or from the cavity or between adjacent cavities, including sealing of penetrations.

(Portions of proposal not show remain unchanged)

Commenter's Reason: This public comment addresses the need to ensure that an enclosed air space is described and detailed in such a manner to prevent air leakage, not just to avoid intentionally ventilating the air space. This addresses one of the concerns which prompted the committee's reason for disapproval.

As written in the original proposal, the definition does not prevent the location and detailing (or lack of detailing) of airspaces such that R-values comparable to the method by which they are tested per ASTM C1224 can be nominally achieved in practice. Concerns documented in the literature with regard to dust exposure and accumulation which impact the long-term (or short term) performance of reflective air spaces are not addressed in this public comment, particularly with regard to horizontal enclosed airspace applications. This public comment and the original proposal still do not address other concerns such as the significant difference in thermal performance with regard to seasonal changes in heat flow direction for horizontal airspaces. While these other concerns should be addressed, the main concern of this public comment is with the significant impact of air leakage on the thermal performance of airspaces. The modified definition provides an adequate and enforceable description of the characteristics of an airspace that is suitable for consideration of thermal properties, whether the enclosed airspace includes a reflective insulation or not. A review of the scientific literature on this topic was conducted to guide this public comment and will be made available at fsc.americanchemistry.com.

CE64-13, Part II

Final Action: AS AM AMPC ____

CE66-13, Part I

C301.4 (NEW), R301.4 (NEW) (IRC N1101.10.3 (NEW)), R406 (NEW) (IRC N1106 (NEW))

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com), Agustin Mujica, Levitt Homes, Puerto Rico

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C301.4 Tropical climate zone. The tropical climate zone shall be defined as:

1. Hawaii, Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, Commonwealth of Northern Mariana Islands, and
2. Islands in the area between the Tropic of Cancer and the Tropic of Capricorn

Reason: This creates a Chapter 4 alternative for residences in the tropical climates as a new section. Tropical areas are quite different from the US mainland in climate, construction techniques, traditional construction, and energy prices. The IECC treats tropical climates as if they were simply a southern extension of the US mainland. Traditional residences, especially the less expensive residences, have evolved inexpensive ways to work with the tropical climates to provide comfortable interior spaces without the need for substantial space conditioning. Tropical electrical prices, usually over 20 cents per kWh, provide a substantial incentive for energy conservation. Solar water heating works particularly well in tropical climates.

This proposed change is meant to add a simple option for a newly defined climate zone, the “tropical zone”. The area between the Tropic of Cancer and the Tropic of Capricorn is the area between 23.5° northern and southern latitude of the equator. A zone that recognizes the unusually constant and unique climate of this region would help make the ICC Codes more of an “international code”.

Traditional construction, especially with solar water heating, is usually more energy efficient than the construction style assumed in the IECC, as is shown by an analysis done for Puerto Rico.¹ Using energy efficient versions of traditional construction saves more energy and is much more cost-effective than pushing those in tropical climates to adopt mainland construction practices. Traditional tropical construction focuses on greatly reducing or eliminating the need for space conditioning by making a living space that is comfortable without space conditioning.

The requirements proposed here are based on informal conversations with those who live in tropical regions. The proponent does not live in the proposed tropical zone and will continue to solicit the input of those who do. Some items were taken from energy codes proposed or in place in the tropical regions. This is not intended as a replacement for existing tropical codes, such as the energy codes recently adopted in Hawaii and Puerto Rico. This is meant as a simple climate-appropriate alternative for tropical climates.

Reason by item:

#1 Air conditioning only a portion of the residence is common in some residences and saves energy compared to air conditioning the whole occupied space.

#2 Heating is seldom needed.

#3 Consistently warm temperatures and high power costs make solar water heating very attractive. Solar water heating is widely used. Water heating is often 35% or more of the residential energy use.^{1,2} Substantial energy savings come from solar water heating.

#4 Limiting solar gains and providing ventilation is the energy focus for windows. Window U-factor has little impact. Window air tightness is of little value when the important feature of the windows is their ability to be operable and provide ventilation.

#5 High efficiency lighting makes sense with tropical energy prices.

#6 This references the “cool roof” provisions. This is similar to an option in Hawaii’s code and the Puerto Rico Energy Center’s analysis. Insulation is less valuable in mild climates where the outside temperature is often comfortable as an inside temperature.

#7 Even flat roofs need to drain.

#8 Ventilation provided by tropical winds makes occupied spaces more comfortable. 14% is an option for unconditioned residences in Hawaii’s new energy code.

#9 When bedroom walls facing two directions are available, ventilation on both walls will be more effective.

#10 Interior doors should not block bedroom ventilation. This is similar to Hawaii’s new energy code and recommended by the Puerto Rico Energy Center.

#11 Ceiling fans increase comfort without conditioning the air. This is similar to Hawaii's new energy code and recommended by the Puerto Rico Energy Center.

1. "Energy Modeling of Low Income Residencies" by C. G. Morales & A. J. Malavé
<http://library.witpress.com/pages/PaperInfo.asp?PaperID=22547>
The paper above is not free. The proponents will send a Puerto Rico Energy Center presentation done for DOE that summarizes that work to anyone who requests this by email.
2. Typical Hawaii energy use for hot water: <http://www.hawaiienergy.com/16/water-heating>

Cost Impact: The code change proposal will not increase the cost of construction.

C301.4 (NEW)-CONNER-MUJICA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: Without any specific provisions which would apply uniquely to a tropical climate zone, there is no need for it to be created. Applying such a tropical zone to all of the island of Hawai'i is inappropriate as the range of elevations on the island result in a range of climate zones.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self; Howard C. Wiig, Energy Analyst, Department of Business, Economic Development, and Tourism, representing State of Hawaii, request Approval as Submitted.

Commenter's Reason: The climate in tropical islands is uniquely constant, with moderate temperatures year around. Parts I and II of CE66 create a tropical climate zone, which is a subset of IECC climate zone 1. Part II also creates a residential "deemed to comply" option for the tropical island climate based on their traditional residential construction.

Part II of this change was approved by the residential IECC committee with the reason that the "*options are appropriate to a unique climate zone*". Part II included the option for traditional construction that lowers energy use by taking advantage of the moderate tropical climate. The modifications to Part II in this public comment do not apply to Part I, so Part I is simply "as submitted".

These changes were made based on comments received, both at the hearing and afterwards.

1. The first modification deals with high elevations in Hawaii, where a 2400 feet above sea level limit was added. Commenters noted the difference between inland Hawaiian climates at higher elevations and the coastal Hawaiian climates. (By far the highest tropical island elevations occur in Hawaii.) Commenters noted that the traditional construction that might work well in coastal Hawaii and other islands, but would not work well at the higher Hawaiian elevations. Therefore, the "deemed to comply" option is limited to elevations below 2400 feet above sea level; because that elevation is already used in the Hawaiian energy code. In reality this has limited effect because less than 2% of the Hawaiian population lives above that level.

Two other comments resulted in changes.

2. The term "roof" was changed to "roof/ceiling" to cover both possible locations for insulation (item #6).
3. The "bedroom walls" became "exterior bedroom walls" which was implied, but not stated (item #9). Exterior walls are the best source of the tropical breezes that help keep the residences comfortable and lessen the need for energy. Other comments did not result in changes.

Overall, the largest criticism of the tropical climate zone was that it was arbitrary, unjustified and not related to the existing IECC climate zones. The existing climate zones were developed at the Pacific Northwest National Laboratory (PNNL, a US

Department of Energy lab) as part of the rewrite and simplification of the IECC that become the 2006 IECC. The development of the climate zones is documented in two publications^{1,2}.

PNNL staff went through an extended analysis to try to group climates for the IECC. Grouping climates turned out to be difficult. After an extensive analysis PNNL stated "... boundaries were found in the Köppen classification that served as good approximations for the divisions that emerged from the ... analysis .."³ The Köppen Climate Classification is the mostly widely used system for classifying the world's climates⁴. In particular PNNL took the primary criteria for IECC zone 1 from Köppen (Köppen's tropical climate)⁵.

PNNL adapted the Köppen system for use as a building energy code (IECC). Adaptations included using the political boundaries of jurisdictions (counties, occasionally states) and classifying large counties based on the locations in the county where building occurs rather than the extreme climates where few people live.

As in the existing IECC climate zones, the proposed tropical climate zone is based on Köppen's classification of climates. Köppen divided the earth's climates into five major types of climates, one of the climate types being "tropical". According to Köppen, tropical climates are characterized by constant high temperature (at sea level and low elevations) — all twelve months of the year in the proposed zone in question have average temperatures of 18 °C (64.4 °F) or higher⁶. The existing IECC zone 1 boundary and the proposed tropical climate zone are based on the Köppen temperature criteria for Köppen's "tropical zone".

Traditional tropical construction works best where temperatures are relatively constant and relatively warm. Köppen's tropical climates define a region with a large solar radiation that is relatively constant from month to month, ensuring both high temperatures and almost an absence of seasons. Typically, the temperature difference between day and night is greater than that between the warmest and the coolest month, the opposite of other climate zones⁷.

There were a few other comments that are being addressed here.

Some argued that the proposed "deemed to comply" option might not be as energy efficient as the current zone 1 code. An energy analysis for Puerto Rico was reference #1 in the original proposal. Many parts of the "deemed to comply" option are taken from or adapted from the current Hawaiian energy code and/or the Puerto Rican energy code. Specifying that half the occupied space is neither cooled nor heated is a significant reduction in energy use. Specifying 80% of the water heating is solar water heating (renewable energy) saves considerable energy in a region where water heating is a big end use for energy (see reference #2 in the original comment).

Some argued that the tropical zone SHGC should be the same as the Zone 1 SHGC in the IECC, which is an SHGC of 0.25. SHGCs of 0.25 usually mean double pane windows. Due to the warm and constant outdoor temperature, these windows are not remotely cost-effective in the tropical zone. The current Puerto Rico Energy Code has a requirement for 0.40 SHGC. The Tropical Energy Code, in use in Guam and elsewhere, has no requirement for residential SHGC. A jalousie window or louvered windows, common in the tropics and often constructed locally, often have no low SHGC coating, so this is an increased requirement for most of them.

Some argued that the climate zone map in the commercial IECC should not include features that are not used in the commercial energy code. However, for both residential and commercial use the same IECC climate map is used and it is important to keep that consistency. Because both chapters use copies of the same map, they both already include features not used in their respective portions of the IECC. The climate zones 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B are not used in residential. Similarly the "warm-humid" counties are not used in commercial. Let's keep one climate zone map.

Some commented that the term "occupied space" was unclear. The term occupied space is defined by the IRC. The term is used because some of the "occupied space" is not "conditioned space".

A "deemed to comply" option for the tropical island climate based on their traditional residential construction would provide an economical option for improving energy efficiency in the tropical island climate.

References:

1. Climate classification for building energy codes and standards: Part 1—Development Process. ASHRAE Transactions 109(1). Briggs, R.S., R.G. Lucas, and Z.T. Taylor. 2003. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
2. Climate classification for building energy codes and standards: Part 2—Zone definitions, maps, and comparisons. ASHRAE Transactions 109(1). Briggs, R.S., R.G. Lucas, and Z.T. Taylor. 2003. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
3. From reference 1 above, page 116.
4. There are many academic papers on the "Köppen Climate Classification". A more understandable mildly humorous YouTube video is at <http://www.youtube.com/watch?v=GBuQc1OL1xE>
5. From reference 1 above, page 119. "The 5000 CDD10° C (9000 CDD50° F) dividing line for the lower limit of the hottest zone (also a 90.1 bin boundary) was selected because it corresponds in the United States with the dividing line between tropical and subtropical climates in the Köppen-Geiger system."
6. There is a short description of tropical climates in http://en.wikipedia.org/wiki/Tropical_climates
7. Weather Channel data demonstrates the constant temperatures in the tropical islands.

Google "weather channel average monthly temperature city_name state_name".

For example "weather channel average monthly temperature San Juan Puerto Rico"

Click first Google hit. Click boxes for "extreme high" and "extreme low". Compare tropical and non-tropical cities if you like.

CE66-13, Part I

Final Action: AS AM AMPC_____ D

CE66-13, Part II

C301.4 (NEW), R301.4 (NEW) (IRC N1101.10.3 (NEW)), R406 (NEW) (IRC N1106 (NEW))

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com), Agustin Mujica, Levitt Homes, Puerto Rico

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R301.4 (N1101.10.3) Tropical climate zone. The tropical climate zone shall be defined as:

1. Hawaii, Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, Commonwealth of Northern Mariana Islands, and
2. Islands in the area between the Tropic of Cancer and the Tropic of Capricorn.

R406. (N1106) Tropic zone option. *Residential buildings* in the tropical zone shall be deemed to comply with this Chapter where the following conditions are met:

1. Not more than one half of the *occupied space* is air conditioned.
2. The *occupied space* is not heated.
3. Solar, wind, or other renewable energy source supplies at least 80 percent of the energy for service water heating.
4. Glazing in *conditioned space* has a *solar heat gain coefficient* of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.2.1.1, or the roof has insulation with an *R-value* of R-15 or greater. If present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a minimum slope of one quarter inch per foot of run. The finished roof does not have water accumulation areas.
8. Operable fenestration provides ventilation area equal to a minimum of 14% of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with walls facing two different directions have operable fenestration facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest non-bedroom space.

Reason: This creates a Chapter 4 alternative for residences in the tropical climates as a new section. Tropical areas are quite different from the US mainland in climate, construction techniques, traditional construction, and energy prices. The IECC treats tropical climates as if they were simply a southern extension of the US mainland. Traditional residences, especially the less expensive residences, have evolved inexpensive ways to work with the tropical climates to provide comfortable interior spaces without the need for substantial space conditioning. Tropical electrical prices, usually over 20 cents per kWh, provide a substantial incentive for energy conservation. Solar water heating works particularly well in tropical climates.

This proposed change is meant to add a simple option for a newly defined climate zone, the “tropical zone”. The area between the Tropic of Cancer and the Tropic of Capricorn is the area between 23.5° northern and southern latitude of the equator. A zone that recognizes the unusually constant and unique climate of this region would help make the ICC Codes more of an “international code”.

Traditional construction, especially with solar water heating, is usually more energy efficient than the construction style assumed in the IECC, as is shown by an analysis done for Puerto Rico.¹ Using energy efficient versions of traditional construction

saves more energy and is much more cost-effective than pushing those in tropical climates to adopt mainland construction practices. Traditional tropical construction focuses on greatly reducing or eliminating the need for space conditioning by making a living space that is comfortable without space conditioning.

The requirements proposed here are based on informal conversations with those who live in tropical regions. The proponent does not live in the proposed tropical zone and will continue to solicit the input of those who do. Some items were taken from energy codes proposed or in place in the tropical regions. This is not intended as a replacement for existing topical codes, such as the energy codes recently adopted in Hawaii and Puerto Rico. This is meant as a simple climate-appropriate alternative for tropical climates.

Reason by item:

#1 Air conditioning only a portion of the residence is common in some residences and saves energy compared to air conditioning the whole occupied space.

#2 Heating is seldom needed.

#3 Consistently warm temperatures and high power costs make solar water heating very attractive. Solar water heating is widely used. Water heating is often 35% or more of the residential energy use.^{1,2} Substantial energy savings come from solar water heating.

#4 Limiting solar gains and providing ventilation is the energy focus for windows. Window U-factor has little impact. Window air tightness is of little value when the important feature of the windows is their ability to be operable and provide ventilation.

#5 High efficiency lighting makes sense with tropical energy prices.

#6 This references the "cool roof" provisions. This is similar to an option in Hawaii's code and the Puerto Rico Energy Center's analysis. Insulation is less valuable in mild climates where the outside temperature is often comfortable as an inside temperature.

#7 Even flat roofs need to drain.

#8 Ventilation provided by tropical winds makes occupied spaces more comfortable. 14% is an option for unconditioned residences in Hawaii's new energy code.

#9 When bedroom walls facing two directions are available, ventilation on both walls will be more effective.

#10 Interior doors should not block bedroom ventilation. This is similar to Hawaii's new energy code and recommended by the Puerto Rico Energy Center.

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1. "Energy Modeling of Low Income Residencies" by C. G. Morales & A. J. Malavé
<http://library.witpress.com/pages/PaperInfo.asp?PaperID=22547>

The paper above is not free. The proponents will send a Puerto Rico Energy Center presentation done for DOE that summarizes that work to anyone who requests this by email.

2. Typical Hawaii energy use for hot water: <http://www.hawaiienergy.com/16/water-heating>

Cost Impact: The code change proposal will not increase the cost of construction.

C301.4 (NEW)-CONNER-MUJICA.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This installs energy saving options appropriate for a unique climate zone.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Craig Conner, Building Quality, representing self; Howard C. Wiig, Energy Analyst, Department of Business, Economic Development, and Tourism, representing State of Hawaii, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R406. (N1106) Tropic zone option. Residential buildings in the tropical zone at elevations below 2400 feet above sea level shall be deemed to comply with this Chapter where the following conditions are met:

1. Not more than one half of the *occupied space* is air conditioned.
2. The *occupied space* is not heated.
3. Solar, wind, or other renewable energy source supplies at least 80 percent of the energy for service water heating.
4. Glazing in *conditioned space* has a *solar heat gain coefficient* of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.2.1.1, or the roof/ceiling has insulation with an *R-value* of R-15 or greater. If present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a minimum slope of one quarter inch per foot of run. The finished roof does not have water accumulation areas.
8. Operable fenestration provides ventilation area equal to a minimum of 14% of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest non-bedroom space.

(Portions of proposal not show remain unchanged)

Commenter's Reason: The climate in tropical islands is uniquely constant, with moderate temperatures year around. Parts I and II of CE66 create a tropical climate zone, which is a subset of IECC climate zone 1. Part II also creates a residential "deemed to comply" option for the tropical island climate based on their traditional residential construction.

Part II of this change was approved by the residential IECC committee with the reason that the "*options are appropriate to a unique climate zone*". Part II included the option for traditional construction that lowers energy use by taking advantage of the moderate tropical climate. The modifications to Part II in this public comment do not apply to Part I, so Part I is simply "as submitted".

These changes were made based on comments received, both at the hearing and afterwards.

1. The first modification deals with high elevations in Hawaii, where a 2400 feet above sea level limit was added. Commenters noted the difference between inland Hawaiian climates at higher elevations and the coastal Hawaiian climates. (By far the highest tropical island elevations occur in Hawaii.) Commenters noted that the traditional construction that might work well in coastal Hawaii and other islands, but would not work well at the higher Hawaiian elevations. Therefore, the "deemed to comply" option is limited to elevations below 2400 feet above sea level; because that elevation is already used in the Hawaiian energy code. In reality this has limited effect because less than 2% of the Hawaiian population lives above that level.

Two other comments resulted in changes.

2. The term "roof" was changed to "roof/ceiling" to cover both possible locations for insulation (item #6).
3. The "bedroom walls" became "exterior bedroom walls" which was implied, but not stated (item #9). Exterior walls are the best source of the tropical breezes that help keep the residences comfortable and lessen the need for energy. Other comments did not result in changes.

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PNNL staff went through an extended analysis to try to group climates for the IECC. Grouping climates turned out to be difficult. After an extensive analysis PNNL stated "... boundaries were found in the Köppen classification that served as good approximations for the divisions that emerged from the ... analysis ..."³ The Köppen Climate Classification is the mostly widely used system for classifying the world's climates⁴. In particular PNNL took the primary criteria for IECC zone 1 from Köppen (Köppen's tropical climate)⁵.

PNNL adapted the Köppen system for use as a building energy code (IECC). Adaptations included using the political boundaries of jurisdictions (counties, occasionally states) and classifying large counties based on the locations in the county where building occurs rather than the extreme climates where few people live.

As in the existing IECC climate zones, the proposed tropical climate zone is based on Köppen's classification of climates. Köppen divided the earth's climates into five major types of climates, one of the climate types being "tropical". According to Köppen, tropical climates are characterized by constant high temperature (at sea level and low elevations) — all twelve months of the year in the proposed zone in question have average temperatures of 18 °C (64.4 °F) or higher⁶. The existing IECC zone 1 boundary and the proposed tropical climate zone are based on the Köppen temperature criteria for Köppen's "tropical zone".

Traditional tropical construction works best where temperatures are relatively constant and relatively warm. Köppen's tropical climates define a region with a large solar radiation that is relatively constant from month to month, ensuring both high temperatures and almost an absence of seasons. Typically, the temperature difference between day and night is greater than that between the warmest and the coolest month, the opposite of other climate zones⁷.

There were a few other comments that are being addressed here.

Some argued that the proposed "deemed to comply" option might not be as energy efficient as the current zone 1 code. An energy analysis for Puerto Rico was reference #1 in the original proposal. Many parts of the "deemed to comply" option are taken from or adapted from the current Hawaiian energy code and/or the Puerto Rican energy code. Specifying that half the occupied space is neither cooled nor heated is a significant reduction in energy use. Specifying 80% of the water heating is solar water heating (renewable energy) saves considerable energy in a region where water heating is a big end use for energy (see reference #2 in the original comment).

Some argued that the tropical zone SHGC should be the same as the Zone 1 SHGC in the IECC, which is an SHGC of 0.25. SHGCs of 0.25 usually mean double pane windows. Due to the warm and constant outdoor temperature, these windows are not remotely cost-effective in the tropical zone. The current Puerto Rico Energy Code has a requirement for 0.40 SHGC. The Tropical Energy Code, in use in Guam and elsewhere, has no requirement for residential SHGC. A jalousie window or louvered windows, common in the tropics and often constructed locally, often have no low SHGC coating, so this is an increased requirement for most of them.

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Some commented that the term "occupied space" was unclear. The term occupied space is defined by the IRC. The term is used because some of the "occupied space" is not "conditioned space".

A "deemed to comply" option for the tropical island climate based on their traditional residential construction would provide an economical option for improving energy efficiency in the tropical island climate.

References:

1. Climate classification for building energy codes and standards: Part 1—Development Process. ASHRAE Transactions 109(1). Briggs, R.S., R.G. Lucas, and Z.T. Taylor. 2003. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
2. Climate classification for building energy codes and standards: Part 2—Zone definitions, maps, and comparisons. ASHRAE Transactions 109(1). Briggs, R.S., R.G. Lucas, and Z.T. Taylor. 2003. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
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4. There are many academic papers on the "Köppen Climate Classification". A more understandable mildly humorous YouTube video is at <http://www.youtube.com/watch?v=GBuQc1OL1xE>
5. From reference 1 above, page 119. "The 5000 CDD10° C (9000 CDD50° F) dividing line for the lower limit of the hottest zone (also a 90.1 bin boundary) was selected because it corresponds in the United States with the dividing line between tropical and subtropical climates in the Köppen-Geiger system."
6. There is a short description of tropical climates in http://en.wikipedia.org/wiki/Tropical_climates
7. Weather Channel data demonstrates the constant temperatures in the tropical islands.

Google "weather channel average monthly temperature city_name state_name".

For example "weather channel average monthly temperature San Juan Puerto Rico"

Click first Google hit. Click boxes for "extreme high" and "extreme low". Compare tropical and non-tropical cities if you like.

Public Comment 2:

Greg Thielen, President, Building Industry Association of Hawaii (BIA-Hawaii); Tim Waite, Code Committee Chair, request Approval as Submitted.

Commenter's Reason: BIA-Hawaii supports this amendment, as submitted, because it proposes to create a Tropical Climate Zone in the IECC and include the State of Hawaii.

Hawaii's Unique Climate

Currently, Hawaii is included in Climate Zone 1A (Table 301.1, IECC). However, Hawaii's climate includes 11 of the world's 13 climate zones, making us vastly unique from the southern tip of Florida. Due to this unique climate, most homes are built with **NO CONDITIONED SPACE**. This is because most of Hawaii has only two seasons – summer, from May to October, and

winter, from November to April.¹ Temperatures at sea level range from highs of 85-90°F in the summer to 79-83°F in the winter. Temperatures rarely rise above 90°F or drop below 60°F; most of the State's population reside in this moderate temperature area.

Hawaii also enjoys steady and cool breezes, or trade winds, brought from the northeast, that sweep through the Islands at an average of 12 miles per hour. Trade winds are generally steady during the summer months and weaker and inconsistent in the winter. These trade winds serve as Hawaii's natural air conditioning, keeping the islands cool in the summer and warm in the winter.

IECC Provisions Increase Costs of Construction in Hawaii

Our year-round comfortable temperatures, coupled with trade winds, allows for homes to be built using passive cooling. Traditionally, homes were built on "post and piers" (or crawlspaces), with jalousie windows, to take advantage of the cool breezes. Requiring homes to be sealed or mechanically ventilated is counterproductive to achieving energy conservation and consumption goals. Not recognizing this unique climate also imposes a financial burden on Hawaii's builders and consumers. Mechanically conditioned space represents a large, unnecessary investment in the cost of home construction. Production builders on Oahu cite initial A/C construction costs at under \$15,000 per home. This cost can be three times more for custom or infill homes. Typical split AC units start at \$2,000 per room.

It is already very difficult for families to qualify for a mortgage; adding unnecessary construction costs will make it even more difficult.

IECC Impact on Housing Affordability in Hawaii

Increased construction costs increase home prices, which impact affordability by the consumer. Median sales prices of single-family homes in Hawaii are as follows: City and County of Honolulu: \$677, 250; Maui County: \$615,000; Kauai County: \$530,000; and Hawaii County: \$355,000.² By stark contrast, median household incomes by Counties are as follows: Honolulu: \$71,263; Maui: \$64,583; Kauai: \$64,422; and Hawaii: \$53,591.³ Adding unnecessary construction costs make it more difficult for families to qualify for a mortgage.

1. Hawaii's Climate. Hawaii Tourism Authority. Retrieved July 15, 2013, from <http://www.gohawaii.com>.
2. June 2013 MLS Statistics. Realtors Association of Hawaii.
3. State and County QuickFacts. U.S. Department of Commerce, U.S. Census Bureau. Retrieved July 15, 2013, from <http://www.quickfacts.census.gov>.

The proposal to create a Tropical Climate Zone is essential and makes tremendous sense, as the existing climate Zone 1A does not take into consideration Hawaii's unique environment, imposes an unneeded and unwanted mandate on the home construction process, and increases the cost of home ownership.

Public Comment 3:

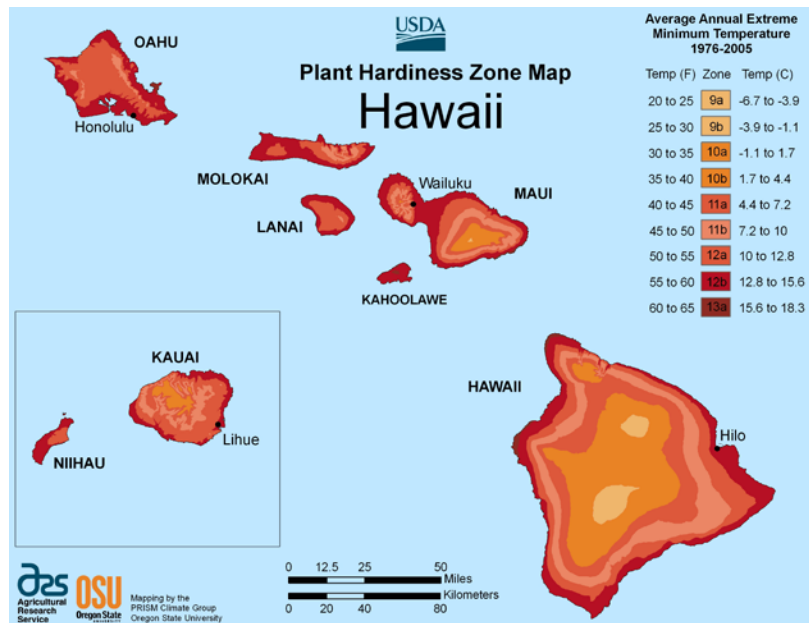
Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Disapproval.

Commenter's Reason: We recommend disapproval of CE66, Part II. CE66, Part II should be disapproved because it creates an alternative compliance option that is weaker than the current IECC and is weaker than the code currently in place in Hawaii -- one of the jurisdictions it intends to cover. The proposed alternative path contains some interesting concepts, but also contains unnecessary weakening provisions. The failure to use "good code language" creates too many ambiguities to be used as an enforceable code, and building code officials will have great difficulty enforcing the requirements. In addition, the failure to technically justify the proposed climate zone or provide energy analysis of any type to support the proposal renders the proposal insufficient. "Informal conversations with those who live in tropical regions" is simply not enough to justify creating a new climate zone and compliance path that would affect all tropical locations whether the building is located in a hot, cold or temperate micro-climates. The following are some more specific reasons for disapproval:

- **Glazed Fenestration SHGC Requirement is Too Weak.** CE66 Part II permits up to 0.40 SHGC for glazing. Even though the proponent asserts that "limiting solar gains and providing ventilation is the energy focus for windows," this proposal would actually increase the allowable SHGC of the current IECC by 60%. The proponent also claims that tropical electrical prices are "usually over 20 cents per kWh." Allowing a 60% increase in SHGC will substantially increase energy use (and utility bills) for homeowners in these sun-soaked islands. And in at least one jurisdiction that CE66 Part II intends to cover -- Hawaii -- the current prescriptive SHGC requirement is 0.30 (based on the 2009 IECC). This proposal would create a significantly weaker alternative where it is unwise and completely unnecessary.
- **Exemption from SHGC Requirements for Overhangs is Bad for Energy Conservation.** CE66 Part II also includes a complete exemption from SHGC as long as glazing "has an overhang with a projection factor equal to or greater than 0.30." There has never been an overhang requirement or SHGC-overhang trade-off in the residential chapter of the IECC, and the proponent does not give any indication how this is to be calculated. Does the overhang apply to each

window? Which orientations must have overhangs? Is area-weighted averaging allowed? Even under the commercial chapter of the 2012 IECC, where an adjustment to SHGC is permitted for overhangs, a 0.30 projection factor would still only permit an increase in SHGC to 0.275 or 0.30, depending on orientation – not a complete exemption from the SHGC requirements altogether.

- Proposal Language Creates More Questions than Answers.** The language of proposal CE66 Part II is confusing and unenforceable. For example, Section R406(1) specifies that “not more than half of the *occupied space* is air conditioned.” It is not clear whether any thermal isolation is required between conditioned and unconditioned space (to ensure that air conditioning operates as intended). It is also not clear how this is to be calculated -- *occupied space* is not a defined term in the IECC. Section R406(9) requires that “[b]edrooms with walls facing two different directions have operable fenestration facing two directions.” It is unclear mathematically how to construct a bedroom with walls facing only two directions – bedrooms typically have at least four walls, facing at least four different directions. If the intent was to require operable fenestration on two walls facing *opposite* directions or some other configuration, the language does not make that clear. Section R406(10) requires interior doors to bedrooms to be “capable of being secured in the open position.” Could this provision be satisfied by tying a shoestring to the doorknob or placing a spare brick on the floor?
- The Proposed New Climate Zone Has Not Been Justified.** The need for a new “tropical” climate zone has not been justified. Nor has the delineation of the zone for certain islands been justified. The climate zones currently in the code are the result of intensive research and analysis and the caretaker role for assuring that these climate zones are valid and correct has been assumed by US DOE for a number of years. New climate zones should not be created willy-nilly so that reduced requirements may be established for those zones. Moreover, the inclusion of Hawaii in the zone, which has numerous micro-climates as illustrated by the minimum temperature map shown below, is not justified. A more comprehensive climate zone definition is needed to account for the climate conditions in tropical zones with annual average minimum temperatures ranging from 20°F near the center of the islands to 60°F at the coastal locations.



Proposal CE66, Part II should be disapproved, just as CE66, Part I was correctly recommended for disapproval by the commercial energy committee. The proponent has not adequately demonstrated that a compliance option is needed in this particular region, and the proposed alternative significantly weakens and confuses the current code requirements.

CE66-13, Part II

Final Action: AS AM AMPC_____ D

CE67-13, Part I

C303.1.4.1 (NEW), Chapter 5, R303.1.4.1 (N1101.12.4) (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Matt Dobson, Vinyl Siding Institute (mdobson@vinylsiding.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C303.1.4 Insulation product rating. The thermal resistance (*R*-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R*-value rule (CFR Title 16, Part 460) in units of $\text{ft}^2 \times \text{°F}/\text{Btu}$ at a mean temperature of 75°F (24°C).

C303.1.4.1 Insulated siding. The thermal resistance (*R*-value) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's installation instructions.

Add new standard to Chapter 5 as follows:

ASTM

C1363 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

Reason: This additional requirement is necessary so that the testing protocol is spelled out clearly as the valid method for testing of *R*-value for insulated siding.

The Federal Trade Commission agrees that ASTM C1363 is the appropriate test method for insulated siding and further supported specific protocol as a part of ASTM C1363, established in ASTM D7793, is in the spirit of the home insulation rule.

Without adding this information to the energy code, manufacturers could try to enter the home insulation/insulated siding marketplace with product that has not been tested appropriately for *R*-value. This addition will ensure that proper, close to field condition testing, is required for any type of insulated siding to qualify as home insulation and in the energy code. This will ultimately result in a manufacturer compliance requirement and create easy enforcement for the building official and energy specialists. It will also further ensure that insulated siding's determined *R*-value will be legitimate in determining energy performance calculations and consumer confidence that it will provide specific energy performance.



This is a photo of a test chamber and insulated siding being tested to ASTM C1363.

Cost Impact: The code change proposal will have minimal cost impact as many insulated siding products are on the market and are certified and labeled in the way.

C303.1.4.1 (NEW)-EC-DOBSON.doc

Committee Action Hearing Results

For staff analysis of the content of ASTM C1363-11 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: The proposal establishes, in the code, the proper test method for these products. It is consistent for this class of materials.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C303.1.4.1 Insulated siding. The assembly thermal resistance (R-value) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's installation instructions. The manufacturer's labeled insulation R-Value for insulated siding shall be the assembly R-value reduced by 0.6.

(Portions of code change proposal not shown remain unchanged)

Commenter's Reason: Inspectors rely on the R-value on the insulation label. The IECC specifies R-values that are insulation only and does not include the R-value for other materials. Inspectors should not have to do a calculation, even a simple calculation, to get to the insulation R-value. Instead of requiring the inspector to do a calculation to get to the insulation R-value, as was approved in RE195, this requires that the correct insulation R-value be on the insulation.

The C1363 test measures the insulated siding as an assembly, including insulation and non-insulation layers. The C1363 test is fine for an assembly. However, when complying based on R-value, the IECC counts only the insulation R-value, not an R-value that includes the non-insulation material part of an assembly. The IECC is clear. Note the **bold sentence** in IECC Section R402.1.2 "R-value computation" which says

"Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. **Computed R-values shall not include an R-value for other building materials or air films.**" (Emphasis mine).

Insulation should be labeled with the insulation R-value, as required for use with the IECC.

CE67-13, Part I

Final Action: AS AM AMPC_____ D

CE67-13, Part II

C303.1.4.1 (NEW), Chapter 5, R303.1.4.1 (N1101.12.4) (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Matt Dobson, Vinyl Siding Institute (mdobson@vinylsiding.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R303.1.4 (N1101.12.4) Insulation product rating. The thermal resistance (*R-value*) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R-value* rule (CFR Title 16, Part 460) in units of h xft² x °F/Btu at a mean temperature of 75°F (24°C).

R303.1.4.1 (N1101.12.4.1) Insulated siding. The thermal resistance (*R-value*) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's installation instructions.

Add new standard to Chapter 5 as follows:

ASTM

C1363 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

Reason: This additional requirement is necessary so that the testing protocol is spelled out clearly as the valid method for testing of *R-value* for insulated siding.

The Federal Trade Commission agrees that ASTM C1363 is the appropriate test method for insulated siding and further supported specific protocol as a part of ASTM C1363, established in ASTM D7793, is in the spirit of the home insulation rule.

Without adding this information to the energy code, manufacturers could try to enter the home insulation/insulated siding marketplace with product that has not been tested appropriately for *R-value*. This addition will ensure that proper, close to field condition testing, is required for any type of insulated siding to qualify as home insulation and in the energy code. This will ultimately result in a manufacturer compliance requirement and create easy enforcement for the building official and energy specialists. It will also further ensure that insulated siding's determined *R-value* will be legitimate in determining energy performance calculations and consumer confidence that it will provide specific energy performance.



This is a photo of a test chamber and insulated siding being tested to ASTM C1363.

Cost Impact: The code change proposal will have minimal cost impact as many insulated siding products are on the market and are certified and labeled in the way.

C303.1.4.1 (NEW)-EC-DOBSON.doc

Committee Action Hearing Results

For staff analysis of the content of ASTM C1363-11 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This proposal adds requirements for a product that is currently referenced in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R303.1.4.1 Insulated siding. The assembly thermal resistance (R-value) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's installation instructions. The manufacturer's labeled insulation R-Value for insulated siding shall be the assembly R-value reduced by 0.6.

Commenter's Reason: Inspectors rely on the R-value on the insulation label. The IECC specifies R-values that are insulation only and does not include the R-value for other materials. Inspectors should not have to do a calculation, even a simple calculation, to get to the insulation R-value. Instead of requiring the inspector to do a calculation to get to the insulation R-value, as was approved in RE195, this requires that the correct insulation R-value be on the insulation.

The C1363 test measures the insulated siding as an assembly, including insulation and non-insulation layers. The C1363 test is fine for an assembly. However, when complying based on R-value, the IECC counts only the insulation R-value, not an R-value that includes the non-insulation material part of an assembly. The IECC is clear. Note the **bold sentence** in IECC Section R402.1.2 "R-value computation" which says

"Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. **Computed R-values shall not include an R-value for other building materials or air films.**" (Emphasis mine).

Insulation should be labeled with the insulation R-value, as required for use with the IECC.

CE67-13, Part II

Final Action:

AS

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AMPC ____

D

CE69-13 C401.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C401.1 Scope. The ~~provisions requirements contained~~ in this chapter are applicable to commercial buildings and their building sites ~~or portions of commercial buildings.~~

Reason: This proposal includes building sites in the scope of the IECC (consistent with C101.2). The other ICC codes use the terminology "provisions in this chapter...." The code was revised during the last code development cycle to clarify that building sites associated with the building are included due to the scope of the provisions in the lighting chapter. There is no need to include "or portions of commercial buildings" because that higher level scope is covered in Chapter 1.

Cost Impact: The code change proposal will not increase the cost of construction.

C401.1-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was concerned that adding 'building sites' was too broad and might be confusing. They did not want to see site elements regulated not currently covered by the code, but they recognized that the site may be the location of systems or portions of systems that service the building.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Submitted.

Commenter's Reason: At the code development hearing, the reason statement for the code change proposal was presented. There was one party in opposition to the change who indicated that this would be confusing as the provisions in Chapter 4 deal with buildings and not building sites. DOE replied that there are currently provisions in Chapter 4 that are not in or on the building but are on the building site and that these provisions have been there for some time. Further, during the code development cycle leading to the 2012 IECC, a definition of building site was added to the code and Section 101.2 of the code (scope) was clarified to specifically include building sites, as follows:

C101.2 Scope. This code applies to *commercial buildings* and the **buildings sites** and associated systems and equipment. *[emphasis added]*

The reason for disapproval was a concern by the committee that building "sites" might be too broadly interpreted or confusing. This scope is in the current code (as noted above), and DOE is not aware of any resulting confusion. As discussed during the prior code development cycle, there are provisions in Chapter 4 of the IECC that apply to items not in or on buildings (i.e., not associated with the building footprint). These include exterior lighting, snow melt systems, outdoor pools and spas, and, in some cases, any HVAC or SWH equipment and associated systems that are located on the site but remote from the building. In disapproving the code change, the committee recognized that such regulated items are located on the building site. This change is not focused on other items associated with the building site, such as solar access, trees, grading or other items associated with a building site. The change is strictly intended to recognize the validity of certain items already included in Chapter 4, and to make Chapter 4 consistent with Section 101.2 of the current code. There have been and are items covered by the code that are technically outside the scope of the code. Without this clarification of scope, a loophole exists: systems and equipment serving the building could be located outside the building and considered unregulated. In recommending disapproval, the committee noted a concern about regulating site elements that are not currently covered by the code. This should not be a concern, because where there are actual criteria in the code for items on the site rather than in the

building, the items covered by the criteria would be regulated, and if no requirements are provided in the code for these items, there is nothing to regulate.

The current code has in its scope buildings and building sites, both of those terms are defined and the provisions in the code are applicable to one or the other. There is no reason why the scope of Chapter 4, Commercial Energy Efficiency, should not be consistent with Section C101.2 of the IECC and officially recognize those current items in Chapter 4 that occur outside the building footprint but are already addressed in the code.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE69-13

Final Action: AS AM AMPC_____ D

CE70-13

C401.2, C401.2.1

Proposed Change as Submitted

Proponent: Larry Spielvogel, PE, FASHRAE, representing self

Revise as follows:

C401.1 Scope. The requirements contained in this chapter are applicable to commercial buildings, or portions of commercial buildings.

C401.2 Application. Commercial buildings shall comply with one of the following:

- ~~1. The requirements of ANSI/ASHRAE/IESNA 90.1.~~
2. 1. The requirements of Sections C402, C403, C404 and C405. In addition, commercial buildings shall comply with either Section C406.2, C406.3 or C406.4.
3. 2. The requirements of Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

C401.2.1 Application to existing buildings. Additions, alterations and repairs to existing buildings shall comply with one of the following:

1. Sections C402, C403, C404 and C405; or
- ~~2. ANSI/ASHRAE/IESNA 90.1.~~

Reason: The purpose of this code change is to delete the current option that exists to use ASHRAE 90.1 in lieu of all of the requirements in Chapter 4 of the Commercial Provisions in the IECC. This code change will make the IECC simpler, less expensive to use, easier to learn, and will prevent people from using ASHRAE 90.1 to get around the provisions of IECC Chapter 4 and other I Codes, such as the IMC.

1. ASHRAE 90.1-2013 Is Not and Will Not Be Available. Just like in previous code cycles, ASHRAE is not likely to publish an ANSI approved version of 90.1-2013 until just before or during the Final Action Hearings in Atlantic City in October 2013. Thus, it is not possible to see even a working draft of 90.1-2013 by the Committee Action Hearing in Dallas in April, and it may not even be possible to see the final published and ANSI approved 90.1 before the Final Action Hearings in October.

Therefore, any proposal to allow ASHRAE 90.1-2013 or even a working draft to be used by anyone in lieu of all of the specific requirements in IECC Chapter 4 is just not fair or equitable. ASHRAE must follow the ICC rules, just like all other consensus documents that are referenced, by providing ANSI approved and published copies well before the hearings. Otherwise, it is not possible for the IECC Committee or the ICC Members and the public to adequately review, comment, and testify on the content and provisions of the specific version of ASHRAE 90.1 that will be adopted.

2. ASHRAE 90.1 Circumvents IECC Requirements. The current option to use the less stringent ASHRAE 90.1 in lieu of all of the requirements in IECC Chapter 4 provides any user with multiple ways to circumvent many of the IECC and other I Code requirements. Thus, compliance with ASHRAE 90.1 can be less stringent than with IECC Chapter 4 compliance. It will not be possible for anyone to know until after all changes are made and adopted at the Final Action Hearings whether ASHRAE 90.1 is at least as stringent as Chapter 4 of the IECC. If 90.1 is not at least as stringent as Chapter 4, then you will allow these less stringent requirements in 90.1 to be used at will, defeating the purpose of having an energy code.

At least some of the lighting provisions in ASHRAE 90.1 (as yet unknown) are likely to be less stringent than those in C405.5.2(1) and (2) of IECC. ASHRAE 90.1 also allows additional lighting power allowances in that can be much higher than those in the footnotes to IECC Table C405.5.2(2). The IECC should not allow people to unilaterally circumvent IECC voted and adopted lighting power allowances without justification and public hearings. As another example, IECC C402.4.5.1 and C402.4.5.2 require the use of the 2010 AMCA standard 500D for dampers in Chapter 4, while ASHRAE 90.1-2010 requires the use of the 2007 AMCA Standard 500D in Section 12, and then only for damper leakage, while IECC requires AMCA 500-D-2010 for both damper leakage and for stairway and shaft vents. Thus, the option to use ASHRAE 90.1 circumvents the IECC required use of the current 2010 AMCA damper standard and ASHRAE 90.1 does not require its use in as many places as does the IECC.

3. ASHRAE 90.1 Is Unenforceable. ASHRAE 90.1 is unenforceable because the requirements are so numerous and so complex that most code officials do not have and cannot readily or economically get the extensive training and experience to be able to understand and enforce the ASHRAE 90.1 requirements. ASHRAE 90.1 has many more requirements than the IECC. The 2012 IECC is 89 pages, while 90.1-2010 is already 228 pages, with over 100 more new addenda to be included in the 2013 edition. The ASHRAE 90.1-2010 User's Manual is another 469 pages long. There are almost no local training courses or training programs on ASHRAE 90.1 at the many locations and jurisdictions where the IECC is adopted that are specifically for code officials. At best, there may be a dozen or so competent and comprehensive training programs on ASHRAE 90.1 each year in the entire country,

mostly in a few major cities, and none of those is specifically for code officials. Learning and completely understanding ASHRAE 90.1 is also difficult even for most practicing architects, engineers, and contractors, making it difficult for them to comply, thus imposing an even greater burden on code officials to verify compliance.

Even the ASHRAE 90.1 committee itself has difficulty writing and understanding the standard, since they issue hundreds of addenda, errata, formal interpretations, and informal interpretations every year in attempts to change or clarify their intent and rectify their own numerous errors. The one-year-old addenda for ASHRAE 90.1-2010 is 44 pages long and many more pages are coming. So far, ASHRAE has issued 14 errata sheets to 90.1-2010. The addenda to 90.1-2007 that were incorporated into 90.1-2010 are designated from a to dr. The addenda so far to 90.1-2010 that will be incorporated into 90.1-2013 are designated from a to cr. Thus, the criteria, requirements, and corrections for ASHRAE 90.1 change almost weekly. Nor are the changes from the prior edition clearly marked by ASHRAE, as they are in the IECC, so the reader can readily see the changes and deletions. Which of these many documents and provisions are to be applied and enforced for any specific permit application on any specific day?

4. ASHRAE 90.1 is Not Coordinated. The IECC is carefully coordinated with the other International Codes, and ASHRAE 90.1 is not. This results in conflicts and contradictions. For example, just Chapter 4 of the IECC has at least eleven references to and requirements for compliance with the other International Codes, while ASHRAE 90.1 has not one. While some of the provisions in IECC are similar to ASHRAE 90.1, ASHRAE 90.1 has many more requirements and exceptions that do not exist in the IECC, providing more latitude and less stringency for users than in the IECC and other I Codes.

5. ASHRAE 90.1 is Not Unified. Providing the option to use ASHRAE 90.1 in lieu of IECC Chapter 4 diverts efforts from pursuing a unified and comprehensive set of International Codes. The option to use ASHRAE 90.1 in lieu of IECC Chapter 4 provides an unsupervised and unmonitored path for special and vested interests to include their provisions in ASHRAE 90.1 that would never be accepted in the IECC. For example, ASHRAE does not hold any public hearings on any changes to or on the entire standard. Thus, the "back door" to ASHRAE 90.1 opens wider than that for the IECC, especially since so many of the ASHRAE 90.1 voting members work for or represent special interests, so they can pursue those interests from the inside. For example, a significant percentage of the members of the ASHRAE 90.1 Mechanical Subcommittee are employed by manufacturers of heating, air conditioning, and water heating equipment, or by their trade associations. Most of the other voting members of the ASHRAE 90.1 Committee do not know enough to debate and vote intelligently on those issues, which are then adopted and included in the Standard. As another example, the majority of the voting members of the ASHRAE 90.1 Committee know little or nothing about lighting, so there is a great tendency to "rubber stamp" recommendations that come from the Lighting Subcommittee. Accordingly, many provisions in ASHRAE 90.1 diverge from those in IECC.

6. ASHRAE 90.1 Copies Unavailable. ASHRAE does not normally offer and provide free copies of 90.1 (\$125 per copy last year plus another \$99 for the User's Manual) to code officials. Very few code jurisdictions have budgets to purchase copies of the ASHRAE documents for each plan checker and inspector; much less the estimated thousands of dollars per user to purchase the many mandatory ASHRAE references (beyond those in the IECC) needed to determine compliance. Few code jurisdictions, and similarly few architectural, engineering, or construction firms have the sophisticated software, training, and experience, much less the time and computers required to run and check the 90.1 Section 11 Energy Cost Budget (ECB) Method calculations allowed by ASHRAE 90.1 for further compliance options.

7. The Use of ASHRAE 90.1 is Not Precluded. Most, if not all relevant provisions of ASHRAE 90.1 can still be used at the discretion of the user, so long as they are at least as stringent as Chapter 4 of IECC. People who wish to comply with ASHRAE 90.1 for any other reasons, such as, but not limited to LEED® certification can still easily do so, provided they also meet the requirements of Chapter 4 of IECC.

Cost Impact: This code change proposal will not increase the cost of construction. There will be a very substantial cost savings since code officials and users of the IECC will not have to buy additional standards and references or spend the time and pay for additional training. The provisions proposed in this code change for deletion are simply optional already in the IECC, and no other provisions in the IECC will be changed or affected.

C401.2-EC-SPIELVOGEL.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that ASHRAE 90.1 needs to be retained as a compliance option as a total document. There are also many segments of the code that rely on ASHRAE 90.1 as a background. De-coupling the Standard from the code is more complex than a simple deletion in this section.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Larry Spielvogel, P.E., FASHRAE, representing self, requests Approval as Submitted.

Commenter's Reason: This public comment asks approval as submitted for code change proposal CE70 – 13. This proposal was disapproved at the Dallas hearings in April. No reasons or support was provided for the disapproval statement in the Committee Action Report, "There are also many segments of the code that rely on ASHRAE 90.1 as a background." The content of the IECC is substantially independent of ASHRAE 90.1. By voting to disapprove this public comment, you are voting to approve the automatic option for anyone to use ASHRAE 90.1-2013 that no one has seen or has been able to review before coming to Atlantic City in lieu of the 2015 IECC.

There are now more than one hundred new addenda to ASHRAE Standard 90.1-2010, some as much as 24 pages of fine print that substantially modify and expand what is required. These addenda will appear in ASHRAE Standard 90.1-2013 when it is published. Even though most of those addenda have been approved by ASHRAE and ANSI, they are still not publicly available as of this date, and probably will not be available in advance for the Atlantic City October Final Action Hearings. ASHRAE refuses to publish or make available many of these approved addenda. Therefore, by rejecting code change proposal CE70 – 13, you will be automatically condoning and approving hundreds of pages of ASHRAE addenda that no one outside of the ASHRAE committees has seen or reviewed.

Some of the many changes and addenda that will appear in ASHRAE Standard 90.1-2013, which will be automatically appear as an automatic option in the 2015 IECC, have been explicitly disapproved for the 2015 IECC at the Dallas Committee Action hearings in April. Therefore, depending on each particular project, the optional use of ASHRAE 90.1 will be less stringent than the IECC.

ASHRAE and ANSI approve and publish some of the Standard 90.1 addenda, "with knowledge of unresolved comments," thus not providing an open process or due process. While ASHRAE claims that Standard 90.1 is prepared in an ANSI approved consensus process that is hardly the case. ASHRAE has no public hearings on any of their addenda nor any public reviews on the complete content of Standard 90.1.

ASHRAE does not include markings in their published standard showing all changes and deletions, like the IECC. Rather, they do offer a separate redline version of Standard 90.1, currently at a cost of an additional \$156. In the past, this has shown the hundreds of changes and deletions from the prior published version. There is no evidence that ASHRAE provides the redline version to Code Officials at no cost.

CE70-13

Final Action: AS AM AMPC____ D

**CE71-13
C401.2, C406**

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402, C403, C404 and C405. ~~In addition, commercial buildings shall comply with either Section C406.2, C406.3 or C406.4.~~
3. The requirements of Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy cost shall be equal to or less than ~~85~~ 90 percent of the standard reference design building.

Delete without substitution as follows:

**~~SECTION C406
ADDITIONAL EFFICIENCY PACKAGE OPTIONS~~**

Reason: Stringency increases in the energy codes don't necessarily mean energy savings. Parts of the energy code are usually ignored. The sections eliminated here were added primarily to increase stringency, not because they solve a problem.

Most parts of Section C406 are problematic. As the Federally required equipment efficiency changes, the heating and cooling equipment in Section C406.2 will become out of date. As Federal minimum equipment efficiency requirements change the tables in Section 406.2 will become out of date; for example, the minimum air conditioner and heat pump efficiencies just changed. The minimum furnace efficiencies are expected to change in the next few years. Efficiencies sufficiently above the Federal requirements to be in that table may not even be available for some types of equipment. The solar renewable option in C406.4 will be difficult in dense urban settings, for example when buildings shade other buildings, or worse, when future buildings end up shading existing buildings where the renewables were dependent on sunshine. If efficient equipment is unavailable and renewables are impractical due to shading, the only remaining option is a lower lighting power density (LPD) in Section C406.3. The LPDs could be quite a challenge-- most required LPDs in Section C406.3 are more restrictive than ASHRAE's green standard (ASHRAE 189.1).

The goal of Section C406 was to reduce energy use by 5%. The 85% factor in Section C401.2 includes that 5%, so it is increased to 90% by this change to align it with the deletion of Section C406.

The IECC is changing too fast and becoming too complicated. We need to let code enforcement and those using the code catch up. The code complexity has outpaced the code enforcement community's ability to absorb more and more requirements. At some point we have to ask what is the contribution to energy efficiency for requirements that are not implemented? Or worse, what is the contribution for requirements that alienate potential users of the energy code to the point that they don't enforce, or even adopt, the IECC?

Cost Impact: The code change proposal will not increase the cost of construction.

C401.2-EC-CONNER

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was not convinced that the provisions requiring additional savings should be removed. The provisions provide choices to the designers in meeting the additional stringency that is not present in other portions of the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Craig Conner, Building Quality, representing self, requests Approval as Submitted.

Commenter's Reason: There seems to be a discouraging trend to add more and more requirements and words to the code, move words around without making real changes, add calculations and tables that are not well understood, and to add sections that are often eliminated or at least not enforced. Then we declare victory and calculate the energy savings. I believe the energy savings in the real world are negative. The cost of complexity in the code world is a lack of compliance and enforcement. We need to get back to a simpler code that is actually used and enforced. This section is often deleted. The whole of Section C406 should be removed from the code.

Public Comment 2:

Steve Rosenstock, Edison Electric Institute, requests Approval as Submitted.

Commenter's Reason: This proposal should be approved as submitted for the following reasons:

-In the Dallas hearings, the code development committee approved many measures that will increase the energy efficiency of all commercial buildings in the areas of lighting, envelope, heating equipment efficiency, cooling equipment efficiency, motor efficiency, transformer efficiency, exhaust system efficiency, commercial refrigeration efficiency, and controls (for lighting and mechanical equipment).

-The additional efficiency package for the 2012 IECC was designed to improve building energy efficiency by about 3%. All of the actions taken by the code development committee for the 2015 IECC have achieved that goal.

-There are many above code programs and standards, such as the ICC *International Green Construction Code*, LEED, ASHRAE Standard 189.1, ICC-700 *National Green Building Standard*, and several others that result in buildings that are more energy efficient than buildings built to baseline codes.

CE71-13

Final Action: AS AM AMPC____ D

CE74-13

C401.2, C401.2.1, Chapter 5

Proposed Change as Submitted

Proponent: Michael A. Anthony, P.E., University of Michigan, representing US Education Facilities Industry – APPA.ORG – Leadership in Education

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections 502, 503, 504 and 505. In addition, commercial buildings shall comply with either Section 506.2, 506.3 or 506.4.
3. The requirements of Section 507, 502.4, 503.2, 504, 505.2, 505.3, 505.4, 505.6 and 505.7. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.
4. The requirements of ISO 50001.

401.2.1 Application to existing buildings. Additions, alterations and repairs to existing buildings shall comply with one of the following:

1. Sections 502, 503, 504 and 505; or
2. ANSI/ASHRAE/IESNA 90.1.
3. The requirements of ISO 50001.

Add new standard to Chapter 5 as follows:

ISO

50001-2011 Energy management systems – Requirements with guidance for use.

Reason: The US education facilities industry believes that a performance standard such as ISO 50001 is a more economical and faster path to meet our industry's energy conservation goals for the following reasons:

1. ISO 50001 provides a flexible template for states and local jurisdiction to implement local energy conservation programs that are most effective for their climates, risk aggregations and economy. For example, Section 4.4.4 of ISO 50001 states:

“The organization shall establish an energy baseline(s) using the information from the initial energy review, considering a data period suitable to the organization's energy use and consumption. Change in energy performance shall be measured against the energy baseline(s)”

2. The US Department of Energy (DOE) supports the ISO 50001 Standard as a proven approach for U.S. industrial and commercial facilities to plan, manage, measure, and continually improve energy performance.

Note to Committee: release of restricted copies of ISO 50001 for committee examination is in process

Cost Impact: The code change proposal will not increase the cost of construction. Lower cost because local jurisdictions will be able to a) establish their own baselines, and b) scale into energy conservation measures as technical and budget conditions allow as long as they meet established goals.

Analysis: A review of the standard proposed for inclusion in the code, ISO 50001-2011 Energy management systems – Requirements with guidance for use, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C401.2-EC-ANTHONY

Committee Action Hearing Results

For staff analysis of the content of ISO50001-2011 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf.

Committee Action:

Disapproved

Committee Reason: The proposed standard is only an energy management standard that would apply to a building once constructed. It contains no standards for the construction of a building.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mike Anthony, University of Michigan, representing APPA.org Standards and Code Council, requests Approval as Submitted.

Commenter's Reason: The Committee's reason for rejection – "*The proposed standard is only an energy management standard that would apply to a building once constructed. It contains no standards for the construction of a building*" – does not take into consideration the following passage:

4.5.6 Design

The organization shall consider energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities, equipment, systems and processes that can have a significant impact on its energy performance.

The results of the energy performance evaluation shall be incorporated where appropriate into the specification, design and procurement activities of the relevant project(s)

The results of the design activity shall be recorded.

The strength of ISO 50001 document lies in how it establishes the broad contours of solutions for the energy conservation problem but permits industries and organizations to set their own benchmarks. By treaty, ISO documents should at least be referenced in US standards where appropriate.

CE74-13

Final Action:

AS

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AMPC ____

D

CE75-13
C401.2.2 (NEW)

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Add new text as follows:

C401.2.2 Application to replacement fenestration products. Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U-factor* and *SHGC* in Table C402.3.

Exception: An area-weighted average of the *U-factor* of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.3 shall be permitted to satisfy the *U-factor* requirements for each fenestration product category listed in Table C402.3. Individual fenestration products from different product categories listed in Table C402.3 shall not be combined in calculating the area-weighted average *U-factor*.

Reason: The purpose of this code change is to create a new code section to clarify that whenever an entire new fenestration product or assembly replaces some or all of an existing fenestration product (typically in the remodeling or modernizing of an existing building), the new fenestration product must meet the U-factor and SHGC requirements of the fenestration table. Section C401.2.1 of the 2012 IECC already requires that additions, alterations and repairs comply with C402 (thermal building envelope) – as a result this proposal does not add any additional requirements. However, this proposal will further clarify the application of the requirements, increase effective enforcement, and reduce the likelihood of confusion and differing interpretations:

- This proposed commercial fenestration requirement is identical to the residential requirement in Section R402.3.6. This specific requirement has been in the residential chapter of the IECC since at least the 2000 IECC. The exception adds additional flexibility by allowing the U-factor requirement to be satisfied on a weighted average basis by product category consistent with the current area-weighting approach to U-factor in section C402.3.4.
- Existing buildings represent one of the greatest untapped sources of energy efficiency, yet there are few ways to effectively require improvements to these buildings. This section does not mandate the replacement of windows; however, if windows are going to be replaced, the code should expressly require that the replacement windows achieve the same efficiency level as windows in newly constructed buildings.
- There is no valid reason why replacement windows cannot meet the same thermal efficiency requirements as windows installed in new buildings, so there is no reason to have separate requirements for them.
- Common repairs to damaged windows, such as the replacement of a broken pane of glass, would not be covered under C401.2.2.

Cost Impact: The code change proposal will not increase the cost of construction.

C401.2.2-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal was approved so that the code provides direction on replacement fenestration. The committee did express concern that provision was overly restrictive where only one or a few windows were replaced, resulting in unmatched fenestration on a building's facade.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~C401.2.2~~ **C101.4.3.1 Application to Replacement fenestration products.** Where some or all of an existing *fenestration* unit is replaced with a new *fenestration* product, including sash and glazing, the replacement *fenestration* unit shall meet the applicable requirements for *U-factor* and *SHGC* in Table C402.3.

Exception: An area-weighted average of the *U-factor* of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.3 shall be permitted to satisfy the *U-factor* requirements for each fenestration product category listed in Table C402.3. Individual fenestration products from different product categories listed in Table C402.3 shall not be combined in calculating the area-weighted average *U-factor*.

Commenter's Reason: The intent of the proposed modification is to relocate the proposed text to be located with other existing building provisions of the Commercial IECC. At present that is Section C101.4.3. This is a special provision regarding alteration of fenestration. It should not be located in provisions applying to new construction. CE4 was approved which creates an Existing Buildings chapter. Assuming CE4 receives final approval from the membership, the provisions of C101.4.3 are relocated into Chapter 5. These provisions would move along with it to be placed in the provisions addressing the alteration of buildings.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE75-13

Final Action: AS AM AMPC _____ D

CE82-13

C402.1.1, C402.1.2, C402.2.4

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

C402.1.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Tables C402.2 and C402.3, based on the climate zone specified in Chapter 3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *R*-values from the “Group R” column of Table C402.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *R*-values from the “All other” column of Table C402.2. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table C402.3 shall comply with the building envelope provisions of ANSI/ASHRAE/IESNA 90.1. The thermal resistance or *R*-value of the insulating material installed in, or continuously on, below grade exterior walls of the building envelope required in accordance with Table C402.2 shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.

C402.1.2 *U*-factor alternative. An assembly with a *U*-factor, *C*-factor, or *F*-factor equal or less than that specified in Table C402.1.2 shall be permitted as an alternative to the *R*-values in Table C402.2. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *U*-factor, *C*-factor, or *F*-factor from the “Group R” column of Table C402.1.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *U*-factor, *C*-factor or *F*-factor from the “All other” column of Table C402.1.2. The *C*-factor for the below grade exterior walls of the building envelope, as required in accordance with Table C402.1.2, shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.

~~**C402.2.4 Thermal resistance of below grade walls.** The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below grade walls shall be as specified in Table C402.2, and shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.~~

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal is intended to clarify the use and application of the codes prescriptive building thermal envelope provisions and does not contain changes to the technical requirements of the code. Detailed reasons are as follows:

This proposal moves and clarifies, but does not delete the provisions of Section C402.2.4 of the 2012 IECC.

As originally written, Section C402.2.4 requires that both the *R*-value and the *U*-factor methods of Sections C402.1.1 and C402.1.2 comply with the *R*-values for above grade wall insulation indicated in Table C402.2. However, only *R*-values are listed in Table R402.2. It does not make sense to require the *U*-factors method of Table R401.1.1, which contains values for below grade insulation, to also comply with the *R*-value method for below grade insulation. Section C402.2.4 is really intended to require that the thermal properties required for below-grade walls under either method extend at least 10 feet below grade or to the floor level, whichever is less. This proposal clarifies that by adding footnotes to the tables associated with both of these methods. It is only by the application of these tables that this information becomes relevant. Where these requirements are currently located they become disconnected and their application to the tables becomes unclear and unlikely.

Note that the *R*-values in Table C402.2 are based on analysis of the insulation components only. Although a wall without any insulation would have an *R*-value of 0, it has a *C*-factor of 0.1140. This is because the *U*-values for walls in Table C402.1.2 are based on the impact of all components of the building envelope assembly, not just the insulation components. The values in Table C402.1.2 consider the impact of all materials that compose each building envelope

assembly, including whether block, wood stud, metal stud, solid concrete or other materials are used, and the amount of and location of the insulation components. Because Tables C402.1.2 and C402.2 evaluate thermal properties in different ways, it is important that the thermal resistance of below grade walls are addressed in a manner that consistent with the manner that they are addressed in each table. This proposal accomplishes that goal and preserves the potential application of each table to below grade walls.

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: This code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.1.1 #4-EC-THOMPSON-SEHPCAC.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal clarifies the code by making sure that both methodologies include text regarding the below grade walls.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shaunna Mazingo, City of Cherry Hills Village, representing Colorado Chapter of ICC, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.1.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Tables C402.2 and C402.3, based on the climate zone specified in Chapter 3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *R*-values from the "Group R" column of Table C402.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *R*-values from the "All other" column of Table C402.2. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table C402.3 shall comply with the building envelope provisions of ANSI/ASHRAE/IESNA 90.1. ~~The thermal resistance or R-value of the insulating material installed in, or continuously on, below grade exterior walls of the building envelope required in accordance with Table C402.2 shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.~~

C402.1.2 U-factor alternative. An assembly with a *U*-factor, *C*-factor, or *F*-factor equal or less than that specified in Table C402.1.2 shall be permitted as an alternative to the *R*-values in Table C402.2. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *U*-factor, *C*-factor, or *F*-factor from the "Group R" column of Table C402.1.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *U*-factor, *C*-factor or *F*-factor from the "All other" column of Table C402.1.2. ~~The C-factor for the below grade exterior walls of the building envelope, as required in accordance with Table C402.1.2, shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.~~

C402.2.4 Thermal resistance or conductance of below grade walls. The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table C402.2. Alternatively, The C-factor for the below grade exterior walls of the building envelope shall be as specified in Table C402.1.2. Either shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.

Commenter's Reason: It has long been understood that each component in both the residential and commercial tables have their own text section to go with them. This is why the application sections states that you have to comply with the listed Sections and not just the Table. We understand what the SEHPCAC Committee was trying to do here in clarifying the difference between the requirements in Tables C402.1.2 and 402.2 but they could have easily done it within the below grade wall Section so that we could keep the component section that accompanies the table. Placing the items in already wordy Sections C402.1.1 and C402.1.2 allows the verbiage to actually get lost in all of the text instead of clarifying it.

We would request this modification so that the component section stays intact while adding the language that the committee was worried about. The title has been changed to reflect the change to add C Factor, which is thermal conductance, as well.

CE82-13

Final Action:

AS

AM

AMPC_____

D

CE83-13
C402.1.2

Proposed Change as Submitted

Proponent: Deborah Taylor, RA, LEED AP, Deborah F. Taylor Consulting, LLC, representing self (taylor@dftconsultingny.com)

Revise as follows:

C402.1.2 U-factor alternative. An assembly with a U-factor, C-factor, or F-factor equal to or less than that specified in Table C402.1.2 shall be permitted as an alternative to the R-value in Table C402.2. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the U-factor, C-factor, or F-factor from the "Group R" column of Table C402.1.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the U-factor, C-factor or F-factor from the "All other" column of Table C402.1.2. All U-factor and C-factor calculations shall take into account as applicable exposed edges of floor slabs.

Reason: Slab edges are a location for heat loss and are frequently omitted from calculations.

Cost Impact: The change proposal will not increase the cost of construction. It adds no new energy requirement.

C402.1.2-EC-TAYLOR.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal introduces confusing text. The existing text already sufficiently addresses the issue.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Deborah F. Taylor, Deborah F. Taylor Consulting, LLC, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.1.2 U-factor alternative. An assembly with a U-factor, C-factor, or F-factor equal to or less than that specified in Table C402.1.2 shall be permitted as an alternative to the R-value in Table C402.2. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the U-factor, C-factor, or F-factor from the "Group R" column of Table C402.1.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the U-factor, C-factor or F-factor from the "All other" column of Table C402.1.2. Calculations of all U-factors and C-factors shall take into account as applicable exposed edges of floor slabs where applicable.

Commenter's Reason: Exposed slab edges transfer significant heat energy and are often overlooked in UA calculations. This is an alert that they must be addressed.

CE83-13

Final Action:

AS

AM

AMPC____

D

CE84-13, Part I

C202 (NEW), C402.1.2.1 (NEW), R202 (NEW) (IRC N1101.9 (NEW)), R402.1.3.1 (NEW) (IRC N1102.1.3.1 (NEW)), R402.1.4 (IRC N1102.1.4)

Proposed Change as Submitted

Proponent: Jay Crandell, ARES Consulting, representing American Chemistry Council- Foam Sheathing Committee (jcrandell@aresconsulting.biz)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

SECTION C202 GENERAL DEFINITIONS

C402.1.2.1 Airspace U-factor. Where the U-factor of an airspace enclosed within an assembly is used as part of the calculation of the assembly U-factor, the airspace shall be constructed as an *ideal airspace*. The thermal resistance of the air-space shall be determined in accordance with the ASHRAE *Handbook of Fundamentals* or tested in accordance with Section C303.1.4 for the applicable direction of heat flow. Where the air-space is not constructed as an *ideal airspace*, thermal resistance of the air-space shall not be included in the assembly U-factor.

Add new definition as follows:

IDEAL AIRSPACE. An airspace contained within a cavity of a field-built assembly that, where used to contribute to thermal resistance of the assembly, is bounded on all sides by solid materials with joints and gaps between bounding materials or holes in bounding materials sealed to prevent air movement into or out of the airspace.

Reason: The ASHRAE Handbook of Fundamentals, Chapter 26, Table 3 lists the allowable thermal properties for airspaces in a variety of configurations. Footnote b to this table says in part “... Values apply for ideal conditions (i.e., air spaces of uniform thickness bounded by plane, smooth, parallel surfaces with no air leakage to or from the space).”. This concern is unique to the use of an air-space for thermal resistance for a number of reasons. First, an air-space creates a path of least resistance for any air infiltration and this makes air-space thermal performance particularly susceptible to loss of thermal performance due to air infiltration. The test basis and analytical basis of these airspace thermal values are based on ideal conditions or an “ideal airspace” that, most importantly, allows for no air leakage to or from the airspace. In essence, a field-built air-space is intended to trap air as well as sealed or manufactured mass insulation products that provide at least some resistance to air-movement. Furthermore, air-space thermal performance is dynamic, dependent on both heat flow direction and temperature difference. As such, use of the ASHRAE Fundamentals values for thermal resistance of airspaces requires the user to use boundary conditions similar to those used to establish the thermal values. Alternatively, the performance of non-ideal air spaces which allow some amount of air-leakage into or out of the airspace must have reduced (non-ideal) thermal performance qualified by appropriate testing with representative boundary conditions. Unfortunately, such a standardized test method does not currently exist. Without this proposal to provide clear enforceable language consistent the technical basis of airspace thermal performance, use of air-space thermal properties will continue to be determined based on ideal conditions that are often far from those actually provided in practice, resulting in performance that can be, in worst case, as little as 15% of that claimed based on ideal airspace conditions (refer to independent lab test data reported at <http://fsc.americanchemistry.com/Energy-Code/Energy-Code-Compliance.pdf>).

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.2.1 (NEW)-EC-CRANDELL.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proponent requested disapproval in order to develop a public comment which will address issues raised during the consideration of Part II.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.1.2.1 Enclosed airspaces. Where used to comply with building thermal envelope requirements, the thermal resistance of an enclosed air space shall be determined in accordance with the ASHRAE *Handbook of Fundamentals* or the assembly including the enclosed air space shall be tested in accordance with Section C303.1.4 in a manner representative of the materials and conditions of use and direction of heat flow. Where the thermal performance of an enclosed air space is determined by use of the ASHRAE *Handbook of Fundamentals*, the enclosed air space construction shall be of uniform thickness bounded by plane, smooth, parallel surfaces. In all cases, enclosed air spaces shall comply with the following:

1. Located to the interior side of a continuous air barrier installed in accordance with Section C402.4.1.2.
2. Separated from the interior of the building by an air-barrier material complying with Section C402.4.1.2.1.
3. Penetrations into or through the enclosed air space shall comply with Section C402.4.2.
4. Venting of the enclosed air space shall not be permitted.
5. Reflective surfaces, if used, shall face the enclosed airspace and shall be installed in a manner that prevents dust accumulation on the reflective surface during construction and use. In a horizontal enclosed air space, reflective surfaces shall be installed above the enclosed airspace facing downward.

C202 GENERAL DEFINITIONS

ENCLOSED AIR SPACE. An unventilated cavity located to the interior side of a continuous air-barrier and bounded on all sides with building components assembled together in a manner that prevents indoor or exterior air leakage into or from the cavity or between adjacent cavities, including sealing of penetrations.

Committer's Reason: This proposal follows direction given by the code development committee at the first hearing in agreement that "better guidance is needed on the description of an air space that qualifies as contributing to the U-factor of an assembly."

Air-spaces are a viable means of contributing to compliance with thermal envelope requirements, but lack important and enforceable guidance in the code to ensure appropriate use. The ACC/FSC includes manufacturer members that have products capable of taking advantage of airspace thermal performance. But, the thermal resistance of field-built airspaces are particularly vulnerable to loss of performance if they are not adequately enclosed to prevent air-leakage into or out of the airspace as clearly required in the ASHRAE *Handbook of Fundamentals* and the scientific literature. A review of the scientific literature on this topic was conducted to guide this public comment and will be made available at fsc.americanchemistry.com.

While test methods for all insulation materials are conducted under conditions of no air leakage or pressure differentials that drive air-leakage into, through, and out of building assemblies, airspaces provide no resistance to air movement and they are particularly vulnerable to significant loss of thermal performance when air leakage is not adequately controlled. For example, one test report referenced in the original proposal's reason statement shows that only 15% of the normally claimed thermal performance may be achieved when air-spaces are not adequately enclosed, even when tested under conditions of no pressure differential to drive air movement through an assembly as would be typically experienced in end use due to building ventilation, HVAC pressure

imbalances, buoyancy effects of interior air, and wind. In addition, the sensitivity of reflective surfaces (which are required to be used in conjunction with an airspace to provide any thermal value) to dust accumulation and heat flow direction are well-documented in the scientific literature. This proposal is coordinated with various existing provisions in the code to address the above concerns and to provide needed guidance for building officials to knowledgeably enforce and users to properly implement the appropriate use of airspaces for their ability to contribute to the thermal performance of buildings rather than erode the thermal performance intent of the code.

CE84-13, Part I

Final Action: AS AM AMPC____ D

CE84-13, Part II

C202 (NEW), C402.1.2.1 (NEW), R202 (NEW) (IRC N1101.9 (NEW)), R402.1.3.1 (NEW) (IRC N1102.1.3.1 (NEW)), R402.1.4 (IRC N1102.1.4)

Proposed Change as Submitted

Proponent: Jay Crandell, ARES Consulting, representing American Chemistry Council- Foam Sheathing Committee (jcrandell@aresconsulting.biz)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

SECTION R202 (N1101.9) GENERAL DEFINITIONS

Revise as follows:

R402.1.3.1 (N1102.1.3.1) Airspace U-factor. Where the U-factor of an airspace enclosed within an assembly is used as part of the calculation of the assembly U-factor, the airspace shall be constructed as an *ideal airspace*. The thermal resistance of the air-space shall be determined in accordance with the *ASHRAE Handbook of Fundamentals* or tested in accordance with Section R303.1.4 for the applicable direction of heat flow. Where the air-space is not constructed as an *ideal airspace*, thermal resistance of the air-space shall not be included in the assembly U-factor.

R402.1.4 (N1102.1.4) Total UA alternative. If the total *building thermal envelope* UA (sum of U-factor times assembly area) is less than or equal to the total UA resulting from using the U-factors in Table R402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table R402.1.1. The UA calculation shall be done using a method consistent with the *ASHRAE Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. The U-factor contribution of airspaces enclosed within an assembly shall comply with Section R402.1.3.1. The SHGC requirements shall be met in addition to UA compliance.

Add new definition as follows:

IDEAL AIRSPACE. An airspace contained within a cavity of a field-built assembly that, where used to contribute to thermal resistance of the assembly, is bounded on all sides by solid materials with joints and gaps between bounding materials or holes in bounding materials sealed to prevent air movement into or out of the airspace.

Reason: The ASHRAE Handbook of Fundamentals, Chapter 26, Table 3 lists the allowable thermal properties for airspaces in a variety of configurations. Footnote b to this table says in part " ... Values apply for ideal conditions (i.e., air spaces of uniform thickness bounded by plane, smooth, parallel surfaces with no air leakage to or from the space)..". This concern is unique to the use of an air-space for thermal resistance for a number of reasons. First, an air-space creates a path of least resistance for any air infiltration and this makes air-space thermal performance particularly susceptible to loss of thermal performance due to air infiltration. The test basis and analytical basis of these airspace thermal values are based on ideal conditions or an "ideal airspace" that, most importantly, allows for no air leakage to or from the airspace. In essence, a field-built air-space is intended to trap air as well as sealed or manufactured mass insulation products that provide at least some resistance to air-movement. Furthermore, air-space thermal performance is dynamic, dependent on both heat flow direction and temperature difference. As such, use of the ASHRAE Fundamentals values for thermal resistance of airspaces requires the user to use boundary conditions similar to those used to establish the thermal values. Alternatively, the performance of non-ideal air spaces which allow some amount of air-leakage into or out of the airspace must have reduced (non-ideal) thermal performance qualified by appropriate testing with representative boundary conditions. Unfortunately, such a standardized test method does not currently exist. Without this proposal to provide clear enforceable language consistent the technical basis of airspace thermal performance, use of air-space thermal properties will

continue to be determined based on ideal conditions that are often far from those actually provided in practice, resulting in performance that can be, in worst case, as little as 15% of that claimed based on ideal airspace conditions (refer to independent lab test data reported at <http://fsc.americanchemistry.com/Energy-Code/Energy-Code-Compliance.pdf>).

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.2.1 (NEW)-EC-CRANDELL.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The committee agrees that better guidance is needed on the description of an airspace that qualifies as contributing to a U-Factor of an assembly. However, there seems to be differences of opinion as to whether the details need to be so restrictive as described for an “ideal airspace” in the proposal. In addition, this information is better placed in a handbook or commentary.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R402.1.3.1 (N1102.1.3.1) Airspace U-factor. Where used to comply with building thermal envelope requirements, the thermal resistance of an enclosed air space shall be determined in accordance with the ASHRAE *Handbook of Fundamentals* or tested in accordance with Section R303.1.4 for the applicable conditions of use and direction of heat flow. Where the thermal performance of an enclosed air space is determined by use of the ASHRAE *Handbook of Fundamentals*, the enclosed air space construction shall be of uniform thickness bounded by plane, smooth, parallel surfaces. In all cases, enclosed air spaces shall comply with the following:

1. Located to the interior side of a continuous air barrier installed in accordance with Section R402.4.1.
2. Separated from the interior of the building by a continuous, non-air permeable material such as gypsum wall board.
3. Penetrations into or through the enclosed air space shall be sealed.
4. Venting of the enclosed airspace to the interior, exterior, or building cavities shall not be permitted.
5. Reflective surfaces, if used, shall face the enclosed air space and shall be installed in a manner that prevents dust accumulation on the reflective surface during construction and use. In a horizontal enclosed air space, reflective surfaces shall be installed above the enclosed airspace facing downward.

SECTION R202 (N1101.9) GENERAL DEFINITIONS

ENCLOSED AIR SPACE. An unventilated cavity located to the interior side of a continuous air-barrier and bounded on all sides with building components assembled together in a manner that prevents indoor or exterior air leakage into or from the cavity or between adjacent cavities, including sealing of penetrations.

Commenter’s Reason: This proposal follows direction given by the code development committee at the first hearing in agreement that “better guidance is needed on the description of an air space that qualifies as contributing to the U-factor of an assembly.”

Air-spaces are a viable means of contributing to compliance with thermal envelope requirements, but lack important and enforceable guidance in the code to ensure appropriate use. The ACC/FSC includes manufacturer members that have products capable of taking advantage of airspace thermal performance. But, the thermal resistance of field-built airspaces are particularly vulnerable to loss of performance if they are not adequately enclosed to prevent air-leakage into or out of the airspace as clearly

required in the AHSRAE *Handbook of Fundamentals* and the scientific literature. A review of the scientific literature on this topic was conducted to guide this public comment and will be made available at fsc.americanchemistry.com.

While test methods for all insulation materials are conducted under conditions of no air leakage or pressure differentials that drive air-leakage into, through, and out of building assemblies, airspaces provide no resistance to air movement and they are particularly vulnerable to significant loss of thermal performance when air leakage is not adequately controlled. For example, one test report referenced in the original proposal's reason statement shows that only 15% of the normally claimed thermal performance may be achieved when air-spaces are not adequately enclosed, even when tested under conditions of no pressure differential to drive air movement through an assembly as would be typically experienced in end use due to building ventilation, HVAC pressure imbalances, buoyancy effects of interior air, and wind. In addition, the sensitivity of reflective surfaces (which are required to be used in conjunction with an airspace to provide any thermal value) to dust accumulation and heat flow direction are well-documented in the scientific literature. This proposal is coordinated with various existing provisions in the code to address the above concerns and to provide needed guidance for building officials to knowledgeably enforce and users to properly implement the appropriate use of airspaces for their ability to contribute to the thermal performance of buildings rather than erode the thermal performance intent of the code.

CE84-13, Part II

Final Action: AS AM AMPC_____ D

CE85-13

C402.1.2.1 (NEW), Table C402.2.3 (NEW)

Proposed Change as Submitted

Proponent: Mark Nowak, M. Nowak Consulting LLC, representing Steel Framing Alliance

Add new text as follows:

C402.1.2.1 Thermal resistance of cold-formed steel walls. U-factors of walls with cold-formed steel studs shall be permitted to be determined in accordance with Equation 4-X:

$$U = 1/[R_s + (R_{ins} \times F_c)] \quad \text{Equation 4-x}$$

Where:

R_s = The cumulative R-value of the wall components along the path of heat transfer, excluding the cavity insulation and steel studs.

R_{ins} = The R-value of the cavity insulation.

F_c = The correction factor from Table 402.2.3

TABLE C402.2.3
F_c VALUES FOR STEEL STUD WALL ASSEMBLIES

<u>Nominal stud depth (inches)</u>	<u>Spacing of framing (inches)</u>	<u>Cavity R-Value</u>	<u>Correction factor (F_c)</u>
<u>3-1/2</u>	<u>16</u>	<u>13</u>	<u>0.46</u>
		<u>15</u>	<u>0.43</u>
<u>3-1/2</u>	<u>24</u>	<u>13</u>	<u>0.55</u>
		<u>15</u>	<u>0.52</u>
<u>6</u>	<u>16</u>	<u>19</u>	<u>0.37</u>
		<u>21</u>	<u>0.35</u>
<u>6</u>	<u>24</u>	<u>19</u>	<u>0.45</u>
		<u>21</u>	<u>0.43</u>
<u>8</u>	<u>16</u>	<u>25</u>	<u>0.31</u>
<u>8</u>	<u>24</u>	<u>25</u>	<u>0.38</u>

Reason: This proposal addresses a gap in the code in regard to calculating U-factors for steel stud wall assemblies. The proposed equation and correction factors are the same as those in the 2003 IECC residential section. They were removed in favor of simplistic prescriptive solutions in the 2004 and later editions. The code has lacked direction in the commercial section for determining U factors of cold-formed steel assemblies. Although the 2003 edition only contained this equation in the residential section, the assumptions underlying the methodology are equally applicable to commercial buildings. The same calculation procedure is recognized in ASHRAE 90.2. It is also the same methodology used by the ASHRAE 90.1 envelope subcommittee in developing the U factor tables in Appendix Table A.3.3 (Assembly U-Factors for Steel-Framed Walls) for non-residential buildings. Inclusion of the equation and correction factors in this section of the IECC will provide users with a calculation method without the need to refer to additional references for U-factors of conventional C-shaped steel stud walls. It will enable calculations with varying levels of cavity and continuous insulation for compliance with the envelope requirements in Section C402.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.2.1 (NEW)-EC-NOWAK.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Provides a methodology to calculate U-factors not currently in the code for steel frame construction.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Duane Jonlin, City of Seattle, Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.1.2.1 Thermal resistance of cold-formed steel walls. U-factors of walls with cold-formed steel studs shall be permitted to be determined in accordance with Equation 4-X:

$$U = 1/[R_s + (ER) (R_{ins} \times F_c)]$$

Where:

Equation 4-X

R_s = The cumulative R-value of the wall components along the path of heat transfer, excluding the cavity insulation and steel studs.

ER = The effective R-value of the cavity insulation with steel studs

R_{ins} = The R-value of the cavity insulation.

F_c = The correction factor from Table 402.2.3

**TABLE C402.2.3
EFFECTIVE R-VALUES FOR STEEL STUD WALL ASSEMBLIES**

Nominal stud depth (inches)	Spacing of framing (inches)	Cavity R-Value (insulation)	Correction factor (F _c)	Effective R-Value (ER) (Cavity R-Value x F _c)
3-1/2	16	13	0.46	<u>5.98</u>
		15	0.43	<u>6.45</u>
3-1/2	24	13	0.55	<u>7.15</u>
		15	0.52	<u>7.80</u>
6	16	19	0.37	<u>7.03</u>
		21	0.35	<u>7.35</u>
6	24	19	0.45	<u>8.55</u>
		21	0.43	<u>9.03</u>
8	16	25	0.31	<u>7.75</u>
	24	25	0.38	<u>9.50</u>

Commenter's Reason: We support the concept of this code change. However, it will be clearer and more effective if a new "effective R-Value" column is added to the table, so that applicants and code officials are not required to do the arithmetic each time they use the table. They will be able to see the effective R-value of insulated metal stud walls at a glance. This will reduce calculation errors and save time for everyone.

CE85-13

Final Action:

AS

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AMPC ____

D

CE86-13
C402.1, C402.1.3 (NEW)

Proposed Change as Submitted

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

Revise as follows:

C402.1 General (Prescriptive). The building thermal envelope shall comply with Section C402.1.1. Section C402.1.2 or Section C402.1.3 shall be permitted as an alternative to the *R*-values specified in Section C402.1.1.

C402.1.3 Total UA alternative. Proposed buildings with a total building UA equal or less than the code-target total building UA shall be considered in compliance with Section C402.1. The UA for each assembly is the area or perimeter of that assembly times the applicable U-factor, C-factor or F-factor for that assembly. The building total UA is the sum of UAs for the assemblies. The area or perimeter for each assembly shall be as proposed. The code-target U-factor, C-factor or F-factor shall be the applicable value from Tables C402.1.2 and C402.3. The proposed building U-factor, C-factor or F-factor shall be that of the proposed assembly.

The code-target U-factors for skylight areas greater than 3 percent of the roof and above-grade wall fenestration areas greater than 30 percent shall be the U-factors of the surrounding opaque assembly.

C402.3.4 Area-weighted SHGC. An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Reason: The commercial IECC does not specifically allow a UA tradeoff. This UA tradeoff similar to the residential UA tradeoff in Section R402.1.4 in the residential IECC. This change explicitly allows an area-weighted average of fenestration SHGC as is currently allowing for residential in Section R402.3.2.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1-EC-CONNER

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Committee expressed early preferences for either CE87-13 or CE88-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self, requests Approval as Submitted.

Commenter's Reason: The three submitting options for a UA calculation in commercial (CE86, CE87, CE88) agreed that something needed to be done. We also agreed that any of them was probably better than the existing code. Somehow we

managed to get them all disapproved. Although we have favorites, I'd suggest the approval of the option that seems the clearest. Personally I like brevity so proposed this.

CE86-13

Final Action: AS AM AMPC____ D

CE88-13

C402.1, C402.1.3 (NEW)

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

Revise as follows:

C402.1 General (Prescriptive). The building thermal envelope shall comply with Section C402.1.1. Section C402.1.2 or Section C402.1.3 shall be permitted as an alternative to the R-values specified in Section C402.1.1.

C402.1.3 Component performance alternative. Building envelope values and fenestration areas determined in accordance with Equation 4-3 shall be permitted in lieu of compliance with the U-factors, F-factors and C-factors in Tables C402.1.2 and C402.3 and the maximum allowable fenestration areas in Section C402.3.1.

$$(UA \text{ Sum}) + (FL \text{ Sum}) + (CA \text{ Sum}) + (XVG) + (XSky) \leq \text{Zero.} \quad \text{(Equation 4-3)}$$

Where:

UA Sum = Sum of the (UA Dif) values for each assembly that comprises a portion of the building thermal envelope.

UA Dif = (UA Proposed) – (UA Table).

UA Table = (Maximum allowable U-factor specified in Table C402.1.2 or Table C402.3) x (Area).

UA Proposed = (Proposed U-value) x (Area).

FL Sum = Sum of the (FL Dif) values for each slab on grade assembly that comprises a portion of the building thermal envelope.

FL Dif = (FL Proposed) – (FL Table).

FL Table = (Maximum allowable F-factor specified in Table C402.1.2) x (Perimeter length).

FL Proposed = (Proposed F-value) x (Perimeter length) .

CA Sum = Sum of the (CA Dif) values for each below-grade wall assembly that comprises a portion of the building thermal envelope.

CA Dif = (CA Proposed) – (CA Table).

CA Table = (Maximum allowable C-factor specified in Table C402.1.2) x (area).

CA Proposed = (Proposed C-value) x (area).

XVG (Excess Vertical Glazing Value) = (XVGArea x UVG) – (XVGArea x UWall), but not less than zero.

XVGArea (Excess Vertical Glazing Area) = (Proposed Vertical Glazing Area) – (Allowable Vertical Glazing Area determined in accordance with Section C402.3.1).

UA Wall = Sum of the (UA Proposed) values for each opaque assembly comprising a portion of the exterior wall.

UWall = UA Wall / total opaque exterior wall area.

UA VG = Sum of the (UA Proposed) values for each vertical glazing assembly.

UVG = UA VG / total vertical glazing area.

XSky (Excess Skylight Value) = (XSArea X USky) – (XSArea x U Roof), but not less than zero.

XSArea (Excess Skylight Area) = (Proposed Skylight Area) – (Allowable Skylight Area determined in accordance with Section C402.3.1).

UA Roof = Sum of the (UA Proposed) values for each opaque assembly comprising a portion of a roof.

URoof = UA Roof / total opaque roof area.

UA Sky = Sum of the (UA Proposed) values for each skylight assembly.

USky = UA Sky / total skylight area.

Reason: This proposal provides an Alternative component performance path for commercial buildings parallel to the “Total UA Alternative” for residential buildings in Section R402.1.4, but accounting for slab edge F-factors, basement wall C-Factors, and fenestration areas in excess of the code limits.

This optional path provides significant additional flexibility for design teams, allowing them to trade off the U values of various building envelope components, without having to do a full Total Building Performance computation. The calculation can be done by an architect or engineer using a simple calculator. It is variation of a widely-used method in the Washington State code, and results in lower overall costs and more design freedom without any sacrifice of energy conservation.

The formula allows various envelope components to be traded off against each other, provided that the overall calculated building heat loss of the proposed design is no greater than a code-compliant design. Thus, greater window area might be acceptable with lower window U-values, or wall insulation might be reduced in certain areas while roof insulation is increased.

The five principal factors in the equation are:

- (UA Sum) The sum of the U-value for each envelope assembly times its area.
- (FL Sum) The sum of the F-value for each slab edge assembly times its length.
- (CA Sum) The sum of the C-value for each basement wall assembly times its area.
- (XSky) Additional amount for skylight area in excess of code maximum – Substitutes the average roof U-value for the average skylight U-value in the base case for the excess skylight area.
- (XVG) Additional amount for vertical glazing area in excess of maximum – Substitutes the average wall U-value for the average vertical glazing U-value in the base case for the excess vertical glazing area

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.3 (NEW)-EC-KRANZ.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Three proposals (CE86 through CE88-13) proposed different ways to allow a UA tradeoff approach. The committee felt that the formula may be too complicated for those without engineering background to be able to enforce. There was concern that not all elements of the design are properly captured.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.1 General (Prescriptive). The building thermal envelope shall comply with Section C402.1.1. Section C402.1.2 or Section C402.1.3 shall be permitted as an alternative to the R-values specified in Section C402.1.1.

C402.1.3 Component performance alternative. Building envelope values and fenestration areas determined in accordance with Equation 4-3 shall be permitted in lieu of compliance with the U-factors, F-factors and C-factors in Tables C402.1.2 and C402.3 and the maximum allowable fenestration areas in Section C402.3.1.

$A + B + C + D + E \leq \text{Zero}$ **(Equation 4-3)**

Where:

A = Sum of the (UA Dif) values for each distinct assembly type of the building thermal envelope, other than slabs on grade and below-grade walls

UA Dif = UA Proposed – UA Table

UA Proposed = Proposed U-value x Area

UA Table = (U-factor from Table C402.1.2 or Table C402.3) x Area

B = Sum of the (FL Dif) values for each distinct slab on grade perimeter condition of the building thermal envelope

FL Dif = FL Proposed – FL Table

FL Proposed = Proposed F-value x Perimeter length

FL Table = (F-factor specified in Table C402.1.2) x Perimeter length

C = Sum of the (CA Dif) values for each distinct below-grade wall assembly type of the building thermal envelope

CA Dif = CA Proposed – CA Table

CA Proposed = Proposed C-value x Area

CA Table = (Maximum allowable C-factor specified in Table C402.1.2) x Area

Where the proposed vertical glazing area is less than or equal to the maximum vertical glazing area allowed by Section C402.3.1, the value of D (Excess Vertical Glazing Value) shall be zero. Otherwise:

D = (DA x UVG) – (DA x UWall), but not less than zero.

DA = (Proposed Vertical Glazing Area) – (Vertical Glazing Area allowed by Section C402.3.1)

UWall = Sum of the (UA Proposed) values for each opaque assembly of the exterior wall

UWall = Area-weighted average U-value of all above-grade wall assemblies

UAV = Sum of the (UA Proposed) values for each vertical glazing assembly

UV = UAV / total vertical glazing area

Where the proposed skylight area is less than or equal to the skylight area allowed by Section C402.3.1, the value of E (Excess Skylight Value) shall be zero. Otherwise:

E = (EA X US) – (EA x URoof), but not less than zero.

EA = (Proposed Skylight Area) – (Allowable Skylight Area from Section C402.3.1)

URoof = Area-weighted average U-value of all roof assemblies

UAS = Sum of the (UA Proposed) values for each skylight assembly

US = UAS / total skylight area

Commenter’s Reason: Please see the example calculation at the end of this comment. This formula was revised and simplified in response to Committee and membership concerns that it appeared too complex.

The component performance path is clearly valuable for commercial buildings. The evidence is straightforward: in Washington State, where a similar UxA calculation has been available for decades, almost every commercial project in the state makes use of it. It allows envelope heat loss to be calculated using a simple spreadsheet (see attached for example) instead of using either COMcheck or a full-blown Total Building Performance analysis. It provides design flexibility and cost savings while maintaining the same limits on heat loss. It provides a compliance path that does not depend on continued DOE funding for COMcheck.

This proposal provides a component performance path for commercial buildings similar to the “Total UA Alternative” for residential buildings in Section R402.1.4, but accounting for slab edge F-factors, basement wall C-Factors, and fenestration areas in excess of the code limits.

Component Performance									
Example building: 2-story building with 10,000 SF each floor, 10,000 SF exterior wall area, 5,000 SF floor over parking, no basement walls, and 40% vertical glazing (instead of code max 30%). In this case, the extra glazing area is accommodated in the design by use of a triple-glazed curtain wall.									
Formula: (A + B + C + D + E ≤ Zero)									
		Area	Proposed U-value	Proposed UA (U xArea)	Table U-factor	Table UA (U x Area)	UA Dif (Proposed UA - Table UA)	Totals	
	roof - insul above deck	10000	0.03	300	0.034	340	-40		
	wall 1 - mass wall	6000	0.09	540	0.078	468	72		
	wall 2 - steel stud	4000	0.055	220	0.055	220	0		
	floor - framed	5000	0.029	145	0.029	145	0		
	skylight	100	0.5	50	0.5	50	0		
	VG 1 - alum curtain wall	3000	0.22	660	0.38	1140	-480		
	VG 2 - wood framed	1000	0.3	300	0.3	300	0		
A	Sum of the (UA Dif) values for envelope assemblies							-448	-448

		Length of slab edge	Proposed F-value	Proposed FxLength	Table F-factor	Table FxLength	FL Dif		
	slab edge - perimeter	200	0.54	108	0.528	105.6	2.4		
	slab edge - at garage	100	0.62	62	0.528	52.8	<u>9.2</u>		
B	Sum of the (FL Dif) values for both slab-on-grade perimeter conditions						11.6	11.6	
C	(no basement walls in this design)							0	
	Uwall	0.076	= Area-weighted avg U-value of above-grade wall assemblies						
	UAV	960	= Sum of the (UA Proposed) values for each vertical glazing assembly						
	UV	0.24	= UAV / total vertical glazing area						
	DA	1000	= (Proposed VG Area) – (VG Area allowed by Section C402.3.1)						
	VGA	4000	= Proposed Vertical Glazing Area						
	Allow VG Area	3000	= 30% max from Section C402.3.1						
	Wall Area	10000	= Gross wall area						
	UA Wall	760	= Uwall x Wall Area						
D	Excess vert glazing area	164	(DA x UVG) – (DA x UWall) - Zero if ≤ zero						164
E	Excess skylight area	(Proposed skylight area is less than allowable area, so value is zero)						0	
Component Performance: (A + B + C + D + E) - OK since less than zero.								-272	

CE88-13

Final Action: AS AM AMPC____ D

CE89-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

**Table C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS**

Climate Zone	1		2		3		4		5		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.039 0.032	U-0.039 0.032	U-0.039 0.032	U-0.039 0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044 0.041	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031 0.029	U-0.029	U-0.029	U-0.029 0.026	U-0.029 0.026
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027 0.021	U-0.027 0.021	U-0.027 0.021	U-0.021	U-0.021	U-0.021	U-0.021 0.017	U-0.021 0.017	U-0.021 0.017	U-0.021 0.017
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061 0.048	U-0.061 0.048
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.044	U-0.039	U-0.052 0.039	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064 0.055	U-0.064 0.055	U-0.064 0.049	U-0.057 0.049	U-0.064 0.049	U-0.052 0.042	U-0.045 0.037
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064 0.051	U-0.064 0.051	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036 0.032
Walls, Below Grade																
Below-grade wall	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.119 0.092	C-0.119	C-0.119 0.092	C-0.119 0.092	C-0.119 0.063	C-0.092 0.063	C-0.092 0.063	C-0.092 0.063	C-0.092 0.063
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076 0.057	U-0.074 0.051	U-0.074 0.057	U-0.064 0.051	U-0.064 0.051	U-0.057 0.051	U-0.055 0.042	U-0.054 0.042	U-0.055 0.038	U-0.054 0.038

Climate Zone	1		2		3		4		5		6		7		8	
Joist/framing	U-0.066	U-0.066	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-Grade Floors																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73 0.54	F-0.54 0.52	F-0.54 0.52	F-0.54 0.52	F-0.54 0.51	F-0.54 0.51	F-0.52 0.434	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.65	F-0.65	F-0.58	F-0.58	F-0.58	F-0.58	F-0.55	F-0.55	F-0.55	F-0.55 0.373

(Footnotes not shown remain unchanged.)

**Table C402.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS**

Climate Zone	1		2		3		4		5		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
Roofs																	
Insulation entirely above deck	R-20ci	R-20 25ci	R-20 25ci	R-20 25ci	R-20 25ci	R-20 25ci	R-25 30ci	R-25 30ci	R-25 30ci	R-25 30ci	R-30ci	R-30ci	R-30 35ci	R-35ci	R-35ci	R-35ci	
Metal buildings (with R-5 thermal blocks)	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-19+ R-11 LS	R-25+ R-11 LS	R-2530+ R-11 LS	R-30+ R-11 LS	R-30+ R-11 LS	R-30-25+ R-11+ R-11 LS	R-30-25+ R-11+ R-11 LS	
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38 49	R-38 49	R-38 49	R-49	R-49	R-49	R-49 60	R-4960	R-49 60	R-49 60	
Walls, Above Grade																	
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci	
Metal Building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13 19ci	R-13 + R-13 19ci	R-13 + R-13 19ci	R-13 + R-13 19ci	R-13 + R-13 22.1ci	R-13 + R-19.5ci	R-13 + R-43 25ci	R-13 + R-49.5 25ci	
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + 7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5 10ci	R-13 + R-7.5 10ci	R-13 + R-7.5 12.5ci	R-13 + R-7.5 12.5ci	R-13 + R-7.5 12.5ci	R-13 + R-15.6ci	R-13 + R-7.5 18.8ci	R-13 + R-17.5 18.8ci	
Wood framed & other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8 7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-3.8-5ci	R-13 + R-7.5ci or R-20 + R-3.8-5ci	R-13 + R-7.5ci or R-20 + R-3.8-5ci	R-13 + R-7.5ci or R-20 + R-3.8-5ci	R-13 + R-7.5ci or R-20 + R-3.8-5ci	R-13 + R-15.6 18.8ci or R-20 + R-10 ci	R-13 + R-15.6 18.8ci or R-20 + R-10 ci
Walls, Below Grade																	
Below-grade wall	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5 10ci	R-7.5ci	R-7.5 10ci	R-7.5 10ci	R-7.5 15ci	R-7.5 15ci	R-7.5 15ci	R-10 15ci	R-12.5 15ci	
Floors																	
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10 14.6ci	R-10.4 16.7ci	R-10 14.6ci	R-12.5 16.7ci	R-12.5 16.7ci	R-12.5 16.7ci	R-15 20.9ci	R-16.7 20.9ci	R-15 23ci	R-16.7 23ci	
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 38	R-30 38	R-30 38	R-30 38	R-30 38	
Slab-on-Grade Floors																	
Unheated slabs	NR	NR	NR	NR	NR	NR	NR R-10 for 24"	R-1015 for 24" below	R-1015 for 24" below	R-1020 for 24" below	R-1020 for 24" below	R-1020 for 24" below	R-1420 for 24" below	R-1520 for 24" below	R-1520 for 24" below	R-1520 for 24" below	R-2025 for 24" below

Climate Zone	1		2		3		4		5		6		7		8	
						below						below		below	below	below
Heated slabs	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 10 for 12"24" below	R-7.5 15 for 12"24" below	R-10 15 for 24" below	R-10 15 for 24" below	R-15 20 for 24" below	R-15 20 for 24"24"48" below	R-15 20 for 36"48" below	R-15 20 for 36"48" below	R-15 20 for 36"48" below	R-20 25 for 48" below	R-20 25 for 24"48" below	R-20 25 for 48" below	R-20 25 for 48" below	R-20 for 48" below full slab

(Footnotes not shown remain unchanged.)

Reason: The purpose of this proposed code change is to update and increase the stringency of the opaque thermal envelope insulation tables in the *IECC* based on the values in *ANSI/ASHRAE/IES Addendum bb to ANSI/ASHRAE/IES Standard 90.1-2010* (approved in 2012). Specifically, where *IECC* values remain more stringent and energy efficient, the proposal retains the *IECC* values. Where the *ASHRAE* values are more stringent and energy efficient, those values have replaced the current *IECC* values. Since *ASHRAE 90.1* and the *IECC* use similar approaches to opaque envelope criteria, *ASHRAE 90.1* is an option for compliance under the *IECC*, and *ASHRAE 90.1* is the federal baseline commercial energy code standard, it is reasonable at this time to update *IECC* values to reflect improved *ASHRAE* values in the absence of a separate comprehensive analysis of opaque envelope values. However, where the *IECC* remains more stringent, *IECC* values should be retained to avoid backsliding and reductions in energy efficiency, in order to keep the *IECC* a premier commercial energy code.

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

C402.1.2T-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Three proposals (CE86 through CE88-13) proposed different ways to allow a UA tradeoff approach. The committee felt that the formula may be too complicated for those without engineering background to be able to enforce. There was concern that not all elements of the design are properly captured.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

Table C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS

Climate Zone	1		2		3		4		5		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044 0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.029	U-0.029	U-0.029	U-0.026	U-0.026
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.017	U-0.017	U-0.017	U-0.017
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078 0.090	U-0.078	U-0.078	U-0.074 0.061	U-0.061	U-0.061	U-0.048	U-0.048
Metal building	U-0.079	U-0.079	U-0.079	U-0.079 0.052	U-0.079	U-0.052	U-0.052	U-0.050	U-0.050	U-0.050	U-0.050	U-0.050	U-0.044	U-0.039	U-0.039	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.055	U-0.055	U-0.049	U-0.049	U-0.049	U-0.042	U-0.037	U-0.037
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.051	U-0.051	U-0.032	U-0.032
Walls, Below Grade																
Below-grade wall	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.092	C-0.119	C-0.092	C-0.092	C-0.063	C-0.063	C-0.063	C-0.063	C-0.063
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.057	U-0.051	U-0.057	U-0.051	U-0.051	U-0.051	U-0.042	U-0.042	U-0.038	U-0.038
Joist/framing	U-0.066	U-0.066	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-Grade Floors																

Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.54	F-0.52	F-0.52	F-0.52	F-0.51 0.505	F-0.51 0.505	F-0.434	F-0.40 0.505	F-0.40 0.434	F-0.40 0.434	F-0.40 0.424
Heated slabs	F-0.70 1.020	F-0.70 1.020	F-0.70 0.900	F-0.70 0.860	F-0.70 0.860	F-0.70 0.860	F-0.65 0.843	F-0.65 0.688	F-0.58 0.688	F-0.58 0.688	F-0.58 0.688	F-0.58 0.671	F-0.55 0.671	F-0.55 0.671	F-0.55 0.671	F-0.373

(Portions of Table not shown remain unchanged)

**Table C402.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS**

Climate Zone	1		2		3		4		5		6		7		8			
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R		
Roofs																		
Insulation entirely above deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci	
Metal buildings (with thermal blocks) R-5	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-19+R-11 LS	R-25+R-11 LS	R-30+R-11 LS	R-30+R-11 LS	R-30+R-11 LS	R-25+R-11+R-11 LS	R-25+R-11+R-11 LS	
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49	R-60	R-60	R-60	R-60	
Walls, Above Grade																		
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci	R-25ci	
Metal Building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-130 + R-19ci	R-130 + R-19ci	R-130 + R-19ci	R-130 + R-19ci	R-130 + R-19ci	R-130 + R-22.1ci	R-130 + R-19.5ci	R-130 + R-25ci	R-130 + R-25ci	
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-10ci	R-13 + R-10ci	R-13 + R-12.5ci	R-13 + R-12.5ci	R-13 + R-12.5ci	R-13 + R-15.6ci	R-13 + R-18.8ci	R-13 + R-18.8ci	
Wood framed & other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-7.5ci or R-20 + R-5ci	R-13 + R-18.8ci	R-13 + R-18.8ci	
Walls, Below Grade																		
Below-grade wall	NR	NR	NR	NR	NR	NR	R-7.5ci	R-10ci	R-7.5ci	R-10ci	R-10ci	R-15ci	R-15ci	R-15ci	R-15ci	R-15ci	R-15ci	
Floors																		
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-14.6ci	R-16.7ci	R-14.6ci	R-16.7ci	R-16.7ci	R-16.7ci	R-20.9ci	R-20.9ci	R-23ci	R-23ci	R-23ci	
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38	R-38	
Slab-on-Grade Floors																		
Unheated slabs	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-25 for 48" below	
Heated slabs	R-7.5 for 12" below	R-7.5 for 12" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-25 for 48" below	R-25 for 48" below	R-25 for 48" below	R-25 for 48" below	R-20-full slab

(Portions of Table not shown remain unchanged)

Committer's Reason: We recommend approval of CE89, as modified. CE89 will ensure that the opaque envelope table of the IECC is no less efficient in all categories than the current ASHRAE 90.1 addendum bb, while retaining increased efficiency already included in the IECC.

It is important to continue to improve the IECC commercial opaque building envelope; while there were some improvements made in 2012, much was left on the table. CE89 incorporates the progress made by ASHRAE in improving opaque envelope energy efficiency through ASHRAE 90.1 addendum bb, without weakening the current 2012 IECC requirements in cases where they are already more efficient. Since ASHRAE developed addendum bb through a consensus process with technical and cost effectiveness analysis, it is reasonable to adopt these values into the IECC, where the IECC is weaker. Similarly, where current values in the IECC are already more efficient, it is reasonable not to change the values already vetted in previous code cycles and contained in the code. As a result, rather than adopt addendum bb values across the board (some of which are weaker than the 2012 IECC requirements), CE89 takes the most efficient values of both tables. While we could have developed our own improved values, we thought it would reduce controversy and ease approval if we simply used ASHRAE values where they were better.

The committee claimed in its reason for not supporting this proposal that "the metrics used to determine the values in the table were not consistently applied, therefore there were errors." In response to this criticism, this public comment revises the values that were identified as "incorrect" during the debate or upon further review.

The table modifications in this public comment include (1) four U-factor changes that were originally internally inconsistent in the 2012 IECC and were originally not changed in the CE89 proposal, (2) twenty-one F-factor changes that were incorrectly included in the 2012 IECC, were inconsistent with ASHRAE 90.1 table A6.3 and were not changed in the CE89 proposal, (3) eight R-Values that originally were not changed in the CE89 proposal from R-13 cavity insulation to R-0 to be consistent with ASHRAE 90.1 addendum bb and (4) the R-Value edit in climate zone 7 to have the consistent continuous insulation values for the 0.039 U-factor already included the CE89 proposal.

The values proposed in CE89 have already been thoroughly vetted and approved through the ICC or ASHRAE process – and in many cases – both. These are not new calculations and are not biased toward weakening the IECC. As a result, there is no need to further address the specific individual values that appear in this table. This is not a case of "cherry picking" values (as opponents suggested at the committee hearing). These are simply the most efficient values justified by the ICC and/or ASHRAE code development processes.

CE89-13

Final Action: AS AM AMPC _____

CE90-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (sferguson@ashrae.org)

Revise as follows:

TABLE C402.1.2 OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.048 0.039	U-0.039 0.032	U-0.039 0.032	U-0.039 0.032	U-0.039 0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044 0.041	U-0.035 0.041	U-0.035 0.041	U-0.035 0.041	U-0.035 0.041	U-0.035 0.041	U-0.035 0.037	U-0.035 0.037	U-0.035 0.037	U-0.035 0.037	U-0.031	U-0.034 0.029	U-0.029	U-0.029	U-0.029 0.026	U-0.029 0.026
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027 0.021	U-0.027 0.021	U-0.027 0.021	U-0.027 0.021	U-0.021	U-0.021	U-0.024 0.017	U-0.024 0.017	U-0.024 0.017	U-0.024 0.017
Walls, Above Grade																
Mass	U-0.142 0.580	U-0.142 0.151 ^g	U-0.142 0.151 ^g	U-0.123	U-0.110 0.123	U-0.104	U-0.104	U-0.090	U-0.078 0.090	U-0.078 0.080	U-0.078 0.080	U-0.071	U-0.064 0.071	U-0.064 0.071	U-0.064 0.048	U-0.064 0.048
Metal building	U-0.079 0.094	U-0.079 0.094	U-0.079 0.094	U-0.079 0.094	U-0.079 0.094	U-0.052 0.071	U-0.052 0.060	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.050	U-0.052 0.044	U-0.039 0.044	U-0.052 0.039	U-0.039
Metal framed	U-0.077 0.124	U-0.077 0.124	U-0.077 0.084	U-0.064	U-0.064 0.077	U-0.064	U-0.064	U-0.064	U-0.064 0.055	U-0.064 0.055	U-0.064 0.049	U-0.057 0.049	U-0.064 0.049	U-0.052 0.042	U-0.045 0.037	U-0.045 0.037
Wood framed and other	U-0.064 0.089	U-0.064 0.089	U-0.064 0.089	U-0.064	U-0.064 0.089	U-0.064	U-0.064	U-0.064	U-0.064 0.051	U-0.064 0.051	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036 0.032	U-0.036 0.032
Walls, Below Grade																
Below-grade wall ^b	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.119 0.092	C-0.119	C-0.119 0.092	C-0.119 0.092	C-0.119 0.063	C-0.092 0.063	C-0.092 0.063	C-0.092 0.063	C-0.092 0.063
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076 ₄	U-0.076 ₄	U-0.076 0.057	U-0.074 0.051	U-0.074 0.057	U-0.064 0.051	U-0.064 0.051	U-0.057 0.051	U-0.055 0.042	U-0.051 0.042	U-0.055 0.038	U-0.051 0.038

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Metal Joist/framing	U-0.066 0.350	U-0.066 0.350	U-0.033 0.038	U-0.033 0.038	U-0.033 0.038	U-0.033 0.032	U-0.033 0.038	U-0.033 0.038	U-0.033 0.038	U-0.033 0.038	U-0.033 0.032	U-0.033 0.032	U-0.033 0.032	U-0.033 0.032	U-0.033 0.032	U-0.033 0.032
Wood Framed and Other	U-0.282	U-0.282	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027
Slab-on-Grade Floors																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.7354	F-0.54 0.52	F-0.54 0.52	F-0.54 0.520	F-0.54 0.510	F-0.54 0.510	F-0.52 0.434	F-0.40 0.510	F-0.40 0.434	F-0.40 0.434	F-0.40 0.424
Heated slabs	F-0.70 1.020	F-0.70 1.020	F-0.70 0.900	F-0.70 0.860	F-0.70 0.860	F-0.70 0.860	F-0.65 0.843	F-0.65 0.688	F-0.58 0.688	F-0.58 0.688	F-0.58 0.688	F-0.58 0.671	F-0.55 0.671	F-0.55 0.671	F-0.55 0.671	F-0.55 0.373

- a. Use of opaque assembly *U*-factors, *C*-factors, and *F*-factors from ANSI/ASHRAE/IESNA 90.1 Appendix A shall be permitted, provided the construction complies with the applicable construction details from ANSI/ASHRAE/IESNA 90.1 Appendix A.
- b. Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h·f °F.

TABLE C402.2 OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
Roofs																	
Insulation entirely above deck	R-20ci	R-20ci R-25ci	R-20ci R-25ci	R-20ci R-25ci	R-20ci R-25ci	R-20ci R-25ci	R-25ci R-30ci	R-25ci R-30ci	R-25ci R-30ci	R-25ci R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci	
Metal buildings (with R-5 thermal blocks) ^{a, b}	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS R-10+ R-19 FC	R-19+ R-11 LS or R-25+ R-8 LS	R-19+ R-11 LS or R-25+ R-8 LS	R-19+ R-11 LS or R-25+ R-8 LS	R-19+ R-11 LS or R-25+ R-8 LS	R-25+ R-11 LS	R-25ci R-30+ R-11 LS	R-30+ R-11 LS	R-30+ R-11 LS	R-30+ R-11 LS ± R-11 LS	R-30+ R-11 LS ± R-11 LS	
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38 R-49	R-38 R-49	R-38 R-49	R-49	R-49	R-49	R-49 R-60	R-49 R-60	R-49 R-60	R-49 R-60	
Walls, Above Grade																	
Mass	R-5.7ci NR	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25.19ci	R-25.19ci	
Metal building	R-13+ R-6.5ci R-0+	R-13+ R-6.5ci R-0+	R-13+ R-6.5ci R-0+	R-13+ R-6.5ci R-0+	R-13+ R-6.5ci R-0+	R-13+ R-6.5ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-13ci R-0+	R-13+ R-19.5ci R-0+	R-130+ R-19.5ci R-25ci	R-130+ R-19.5ci R-25ci

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
	<u>R-9.8 c.i.</u>	<u>R-9.8 c.i.</u>	<u>R-9.8 ci</u>	<u>R-9.8 ci</u>	<u>R-9.8 ci</u>	<u>R-13 ci</u>	<u>R-15.8 ci</u>	<u>R-19 ci</u>	<u>R-19 ci</u>	<u>R-19 ci</u>	<u>R-19 ci</u>	<u>R-19 ci</u>	<u>R-19 ci</u>	<u>R-22.1 ci</u>	<u>R-22.1 ci</u>		
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-53.8ci	R-13 + R-7.5ci	R-13 + R-7.5 5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci R-10ci	R-13 + R-7.5ci R-10ci	R-13 + R-7.5ci 12.5 ci	R-13 + R-7.5ci 12.5 ci	R-13 + R-7.5ci 12.5 ci	R-13 + R-15.6ci	R-13 + R-7.5ci R-18.8ci	R-13 + R-17.5ci R-18.8ci	
Wood framed and other	R-13 R-3.8ci or R-20	R-13 R-3.8ci or R-20	R-13 R-3.8ci or R-20	R-13 R-3.8ci or R-20	R-13 R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci R-3.8ci or R-20u R-19 + R-5ci	R-13 + R-7.5ci R-3.8ci or R-20u R-19 + R-5ci	R-13 + R-7.5ci or R-20 + R-3.8ci R-19 + R-5ci	R-13 + R-7.5ci or R-20 + R-3.8ci R-19 + R-5ci	R-13 + R-7.5ci or R-20 + R-3.8ci R-19 + R-5ci	R-13 + R-7.5ci or R-20 + R-3.8ci R-19 + R-5ci	R-13 + R-15.6ci 18.8ci or R-20 + R-40ci	R-13 + R-15.6ci 18.8ci or R-20 + R-40ci	
Walls, Below Grade																	
Below-grade wall	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci R-10ci	R-7.5ci	R-7.5ci R-10ci	R-7.5ci R-10ci	R-7.5ci R-15ci	R-10cii R-15ci	R-10ci R-15ci	R-10cii R-15ci	R-12.5cii R-15ci	
Floors																	
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci R-14.6ci	R-10ci R-16.7ci	R-10ci R-14.6ci	R-10ci R-16.7ci	R-12.5ci R-16.7ci	R-12.5ci R-16.7ci	R-15cii R-20.9ci	R-16.7cii R-20.9ci	R-15ci R-23ci	R-16.7ci R-23ci	
Metal Joist/framing	NR	NR	R-30	R-30	R-30	R-30 R-38	R-30	R-30	R-30	R-30	R-30 R-38	R-30 ^e R-38	R-30 ^e R-38	R-30 ^e R-38	R-30 ^e R-38	R-30 ^e R-38	
Wood Framed and Other	<u>NR</u>	<u>NR</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-30</u>	<u>R-38</u>	<u>R-38</u>	<u>R-38</u>	<u>R-38</u>	<u>R-38</u>	<u>R-38</u>	
Slab-on-Grade Floors																	
Unheated slabs	NR	NR	NR	NR	NR	NR R-10 for 24" below	R-10 for 24" below R-15 for 24" below	R-10 for 24" below R-15 for 24" below	R-10 for 24" below R-15 for 24" below	R-10 for 24" below R-15 for 24" below	R-10 for 24" below R-20 for 24" below	R-15 for 24" below R-20 for 48" below	R-15 for 24" below R-20 for 24" below	R-15 for 24" below R-20 for 48" below	R-15 for 24" below R-20 for 48" below	R-15 for 24" below R-20 for 48" below	R-20 for 24" below R-25 for 48" below
Heated slabs	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below R-10 for 24" below	R-7.5 for 12" below R-15 for 24" below	R-10 for 24" below R-15 for 24" below	R-10 for 24" below R-15 for 24" below	R-15 for 24" below R-20 for 24" below	R-15 for 24" below R-20 for 48" below	R-15 for 36" below R-20 for 48" below	R-15 for 36" below R-20 for 48" below	R-15 for 36" below R-20 for 48" below	R-20 for 48" below R-25 for 48" below	R-20 25 for 24 48" below	R-20 25 for 48" below	R-20 25 for 48" below	R-20 for 48" below-full slab	
Opaque Doors																	

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Swinging	<u>U-0.64</u> <u>U-0.70</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.64</u> <u>U-0.70</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.64</u> <u>U-0.70</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.64</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>	<u>U-0.37</u> <u>U-0.50</u>
Roll-up or sliding	<u>R-4.75</u> <u>U-1.45</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>	<u>R-4.75</u> <u>U-0.50</u>

For SI: 1 inch = 25.4 mm. ci = Continuous insulation. NR = No requirement.

LS = *Liner System*— *Liner systems* shall have a minimum R-3 thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor. A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

FC = *Filled Cavity* – *Filled Cavity* assemblies shall have a minimum R-5 thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor

- Assembly descriptions can be found in ANSI/ASHRAE/IESNA 90.1 Appendix A.
- Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.2
- R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-f °F.
- Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- Steel floor joist systems shall be insulated to R-38.

Reason: This proposal will make the fenestration requirements consistent with those published in addendum bb to ANSI/ASHRAE/IES Standard 90.1. This addendum was a result of much investigations into the cost effectiveness of various assembly types. There was also additional research done for different types of metal building assemblies. This proposal incorporates corrections to the current IECC for those building types.

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

C402.1.2T-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was uncomfortable with the reductions in stringency included in the proposal. The committee was also not willing to approve increases in stringency at this time. There was uncertainty if the cost analysis looked at each change, up or down, or whether it looked at the combined effect.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

TABLE C402.1.2 OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4		5		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Floors																
Metal Joist/framing	U-0.350	U-0.350	U-0.038	U-0.038	U-0.038	U-0.032 0.038	U-0.038	U-0.038	U-0.038	U-0.038	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032

(Portions of Table not shown remain unchanged)

TABLE C402.2 OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4		5		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Floors																
Metal Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
Slab-on-Grade Floors																
Unheated slabs	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 48" below	R-20 for 24" below	R-20 for 48" below	R-20 for 48" below	R-25 for 48" below

(Portions of Table not shown remain unchanged)

Commenter's Reason: Regarding the original proposal as submitted:

This proposal aligns the IECC with ASHRAE 90.1-2013. The ASHRAE tables were the result of 4 years of work resulting in 4 public review drafts and resolving over 100 comments. The basis of the first public review draft was a cost analysis and the subsequent public review drafts were based on additional cost analyses and changes due to public comments. The analyses used updated costs and economic parameters compared to previous versions of ASHRAE 90.1. Each of the public review drafts considered each assembly for each climate. They also looked at each assembly relative to other assemblies and other climates. The result is the tables in this code change proposal, which show an increase in stringency for some assemblies and a decrease in stringency for other assemblies compared to the 2012 IECC. For metal building roofs and walls, these tables incorporate revised assemblies that are more commonly used and more economically feasible than those in the IECC. These tables also correct U-factors used in the IECC to match the R-Values. The U-factors have been determined using a common methodology that is explained in Appendix A of ASHRAE 90.1.

Specifically, R-values have been increased for roof insulation entirely above deck in five climate zones. Attic insulation R-values have been increased in four climate zones. For other assemblies (other than roofs and metal buildings), the decreases in R-values have been in warmer climate zones where additional insulation has less effect on energy savings and is therefore not as cost effective. The increases in stringency have been in the colder climate zones where additional insulation saves more energy and is more cost-effective. PNNL has reported that these changes to 90.1-2013 compared to 90.1-2010 save a significant 4% energy on a total building energy load basis.

Climate Zone (CZ) Marine 4 has milder summers than the rest of CZ 4; therefore, the criteria for Marine 4 belong with CZ4 and not CZ5. There is no technical, economic, or weather-related basis for placing CZ Marine 4 criteria with CZ5 criteria.

Regarding the change in this public comment: The values in three cells have been corrected.

CE90-13

Final Action: AS AM AMPC____ D

CE91-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Michael D. Fischer, Kellen Company, representing Polyisocyanurate Insulation Manufacturers Association (mfischer@kellencompany.com)

Revise as follows:

**Table C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS**

Climate Zone	1		2		3		4		5		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048 U-0.039	U-0.048 U-0.039	U-0.048 U-0.039	U-0.048 U-0.039	U-0.048 U-0.039	U-0.039 U-0.032	U-0.039 U-0.032	U-0.039 U-0.032	U-0.039 U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028

(Portions of Table not shown remain unchanged)

**Table C402.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS**

Climate Zone	1		2		3		4		5		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation entirely above deck	R-20ci	R-20 25ci	R-20 25ci	R-20 25ci	R-20 25ci	R-20 25ci	R-25 30ci	R-25 30ci	R-25 30ci	R-25 30ci	R-30ci	R-30ci	R-30 35ci	R-35ci	R-35ci	R-35ci

(Portions of Table not shown remain unchanged)

Reason: This proposal modifies the thermal envelope requirements for above-deck roof insulation to be consistent with the recently revised ASHRAE 90.1 Addendum bb. The change is necessary to ensure that the IECC is at least as efficient as 90.1

Cost Impact: The code change proposal will increase the cost of construction. This proposal will increase the initial cost of construction, but will result in reduced energy costs that will result in a short payback.

C402.1.2T-EC-FISCHER

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee concluded that the current minimums in the code are adequate and there is no need to increase stringency at this time.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Michael D. Fischer, Kellen Company, representing Polyisocyanurate Insulation Manufacturers Association, requests Approval as Submitted.

Commenter's Reason: Each year about 2.5 billion square feet of roof coverings are installed on existing buildings, representing about 75% of the overall roofing market. Unlike other opaque envelope components, roofing is unique with so much of the market in existing buildings. Because most roof replacement projects do not involve alterations to other portions of the building envelope, the code should provide consistent R-Value requirements. With IECC and ASHRAE 90.1 values diverging in some climate zones, permit applicants can look for the lesser insulation requirement and pick an R-Value from either set of requirements.

It seems illogical that permit applicants can complete their design in this manner. And, since the overall envelope requirements for the IECC and ASHRAE 90.1 are evaluated based on whole building design using new construction as the baseline assumption, it makes no sense to allow roofing applicants to shop the code for the lowest R-Value when replacing the roof. With the selection of roof insulation resulting in a decision that will determine building energy usage for decades, we have to get it right.

CE91-13

Final Action:

AS

AM

AMPC_____

D

CE92-13
Table C402.1.2

Proposed Change as Submitted

Proponent: Hal Robbins, Lamtec Corporation (halr@lamtec.com)

Revise as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	<u>U-0.035</u> <u>U-0.037</u>	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029

(Portions of Table not shown remain unchanged)

Reason: During the development of the ANSI/ASHRAE/IES 90.1-2013, “Energy Standard for Buildings except Low-Rise Residential Buildings”, there was significant debate regarding the U-Factor associated with the thermal performance of the R-19 + R-11Ls (Liner System). The debate focused on the proposed 0.035 U-Factor for the Liner System, and related to the accuracy of this value due to the variability of the test methodology and the range of data supplied to the committee for this system. Specifically:

- The initial 0.035 U-factor was adopted for this Liner Systems based upon a single test report generated in 2007.
- In 2010 the R-19+R-11 Liner System was retested by an accredited testing laboratory, and a U-Factor of 0.039 was achieved. (a copy of the test report is attached)
- Based upon the range of values provided to the 90.1 Envelope Committee, and their understanding of the variability for this type of thermal testing, the Committee decided to adjust the U-factor being shown for the R-19+R-11 Ls from 0.035 to 0.037.

Our request to change the Metal Building Roof U-Factor being shown for the R-19+R11 Ls from 0.035 to 0.37 in Table C402.1.2 of the 2015 edition of the IECC is necessary to prevent the confusion that will arise if the U-Value assembly requirements do not agree between IECC and ASHRAE. Please keep in mind the following:

- Footnote “a” in IECC tables C402.1.2 and C402.2 references the assemblies shown in the 90.1, Table A.
- In 90.1-2013, Table A2.3 will show the U-Value for the R-19+R-11Liner Systems as 0.037
- If IECC - 2015 is not changed, it will require a U-Value of 0.035 for Climate Zones, 1 (Group R), 2, 3, 4 and 5, and there will not be a corresponding U-Value in 90.1 -Table A.
- As such, by default, the user will be driven to the next lower U-Value in the table, a far more expensive system and one that far exceeds the needs of the project.
- This request to change the U-Value for the Liner System from 0.035 to 0.037, should essentially be considered “editorial”, as the same insulation levels are being specified.

Cost Impact: This code change proposal will not increase the cost of construction. There should be no cost impact, this is strictly an editorial change.

C402.1.2T-EC-ROBBINS.doc

Committee Action Hearing Results

Committee Action:

Committee Reason: The committee concluded that the proposal, like CE91-13 was increasing stringency which they could not support.

Assembly Action:

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Hal Robbins, Lamtec Corporation, requests Approval as Submitted

Commenter's Reason: This is an editorial request to eliminate potential confusion relating to the U-Factor specified in Table C402.1.2 for the R-19 + R11 Liner System, and the U-Factor for the same system as shown in ASHRAE Table A2.3(in Appendix A of the 90.1 std).

According to footnote "a" at the bottom of IECC Table C402.1.2, construction details for the various insulation assemblies can be found in ASHRAE Table A.

However, Table A2.3 in the 90.1-2013 Standard will show the U-Factor for the R-19 + R-11 Liner Systems as 0.037, not 0.035 as currently shown in IECC 2012. This will be extremely confusing to the users of the standard and the Code officials.

This proposal request that the 0.035 U-value shown in Table C402.1.2 be changed to 0.037 to establish agreement between Table C402.1.2 and the ASHRAE Table A2.3. See modified table below.

It is important to note that this is not a change in the prescribed system or a reduction in stringency; it is an editorial change to establish agreement and avoid future confusion.

CE92-13

Final Action: AS AM AMPC_____ D

CE94-13
Table C402.1.2

Proposed Change as Submitted

Proponent: Martha G. VanGeem, representing Masonry Alliance for Codes and Standards

Revise as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Walls, Above Grade																
Mass	<u>U-0.142</u> <u>U-0.151</u>	<u>U-0.142</u> <u>U-0.151</u>	<u>U-0.142</u> <u>U-0.151</u>	U-0.123	<u>U-0.110</u> <u>U-0.123</u>	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	<u>U-0.078</u> <u>U-0.080</u>	U-0.071	<u>U-0.061</u> <u>U-0.071</u>	U-0.061	U-0.061	U-0.061

Portions of Table not shown remain unchanged)

Reason: According to Section 402.1 of the IECC, the criteria are the R-values specified in Section 402.1.1. The U-factors in Section 402.1.2 are an alternate compliance path. IECC Section 402.1.1 states that the R-values are in Tables C402.2 and C402.3. Therefore, the values in Table 402.2 are the main requirements and Table C402.1.2 lists alternates that should correspond to values in Table C402.2. Most of the mass wall criteria in both of these tables, C402.2 and C402.1.2, are based on the criteria in *ASHRAE/IES Standard 90.1-2010*.

In the last edition of the IECC, errors were introduced into Table C402.1.2 for Climate Zones 1, 2, 3, 6, and 7 for “Mass Walls, Above Grade.” (Corrections to values in Climate Zone 5 are submitted in a separate proposal.)

- For Climate Zone 6, in the governing criteria table C402.2, the requirement is R-13.3ci for the row for “Mass Walls, Above Grade” and the column “Climate Zone 6, All Other.”

According to *ASHRAE/IES Standard 90.1-2010*, Table 5.5-6, the U-factor that corresponds to an R-value of R-13.3ci is 0.080, not 0.078.

- For Climate Zone 7, the corresponding U-factor for R-15.2ci is 0.071 not 0.061. This is shown in Table 5.5-7 of *ASHRAE 90.1-2010*. This is also demonstrated by the U-factor for Climate Zone 6 “Group R”, which also has a requirement for R-15.2ci in Table 402.2 and a U-factor of 0.071 in Table 402.1.2 as shown above.

- For Climate Zone 3 “All other”, the corresponding U-factor for R-7.6ci is 0.123, not 0.110. This is shown in Table 5.5-3 for Climate Zone 3 of *ASHRAE 90.1-2010*. This is also demonstrated by the U-factor for Climate Zone 2 “Group R”, which also has a requirement for R-7.6ci in Table 402.2 and a U-factor of 0.123 in Table 402.1.2 as shown above.

- For Climate Zones 1 “All other” and “Group R” as well as Climate Zone 2 “All other,” the corresponding U-factor for R-5.7ci is 0.151, not 0.142. This is shown in Tables 5.5-1 and 5.5-2 of *ASHRAE 90.1-2010*.

Correcting these U-factors will make the IECC less confusing and thereby simplify it and increase its use.

Therefore, the U-factors should be changed as shown in Table 402.1.2 for the row for “Mass Walls, Above Grade” for the Climate Zones 1, 2, 3, 6, and 7 to correct these errors.

Cost Impact: This code change proposal will not increase the cost of construction.

C402.1.2T #1-EC-VANGEEM.doc

Committee Action Hearing Results

Committee Action:

Committee Reason: The proposal corrects values in the table.

Assembly Action:

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Disapproval.

Commenter's Reason: We recommend disapproval of CE94. CE94 increases the U-factors for mass walls in climate zones 1, 2, 3, 6 and 7, which amounts to a reduction in energy efficiency and stringency for these types of buildings under this compliance option. We do not support backsliding on the energy efficiency requirements of the code, particularly without a compelling justification. This proposal also creates a new inconsistency in climate zone 7 between the U-factors for "All other" and "Group R" while the R-values are identical. While the proponent and the committee identified these changes as "corrections," they mistakenly start from the premise that the U-factors must be directly and exactly calculated from the comparable R-values. In our view, the baseline efficiency required by the code for opaque walls begins with the U-factor, since it is a far more precise number. If the R-values and U-factors are not comparable, then the R-value should be adjusted to greater efficiency rather than making the U-factor less efficient.

CE94-13

Final Action: AS AM AMPC____ D

CE95-13
Table C402.1.2

Proposed Change as Submitted

Proponent: Martha G. VanGeem, representing Masonry Alliance for Codes and Standards

Revise as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078 U-0.090	U-0.078 U-0.080	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061

(Portions of Table not shown remain unchanged)

Reason: According to Section 402.1 of the IECC, the criteria are the R-values specified in Section 402.1.1. The U-factors in Section 402.1.2 are an alternate compliance path. IECC Section 402.1.1 states that the R-values are in Tables C402.2 and C402.3. Therefore, the values in Table 402.2 are the main requirements and Table C402.1.2 lists alternates that should correspond to values in Table C402.2.

In the last edition of the IECC, errors were introduced into Table C402.1.2 for Climate Zones 5 and Marine 4 for "Mass Walls, Above Grade." In the governing criteria table C402.2, the requirement is R-11.4ci for the row for "Mass Walls, Above Grade" and the column "Climate Zones 5 and Marine 4, All Other." This is the same criteria as for one cell to the left, "Mass Walls, Above Grade" and the column "Climate Zones 4 except Marine, Group R." The U-factor that corresponds to an R-value of R-11.4ci is 0.090, not 0.078, as indicated by the value in "Climate Zones 4 except Marine, Group R."

Most of the mass wall criteria in both of these tables, C402.2 and C402.1.2, are based on the criteria in *ASHRAE/IES Standard 90.1-2010*. For "All other," the corresponding R-value in *90.1-2010* for nonresidential in Table 5.5-5 for Climate Zone 5 on page 30 is R-11.4ci and the corresponding U-factor is 0.90. Therefore the U-factor in C402.1.2 for "All other" should be 0.090 for mass walls in "Climate Zones 5 and Marine 4". In addition, for "Group R," the corresponding R-value in *90.1-2010* in Table 5.5-5 for Climate Zone 5 on page 30 is R-13.3ci and the corresponding U-factor is 0.80. Therefore the U-factor in C402.1.2 for "Group R" should be 0.080. These values will remain the same in *90.1-2013*. Correcting these U-factors will make the IECC less confusing and thereby simplify it and increase its use.

Therefore, in Table 402.1.2 for the row for "Mass Walls, Above Grade" and the column "Climate Zones 5 and Marine 4," the U-factor should be changed to 0.090 for "All other" and the U-factor should be changed to 0.080 for "Group R" to correct these errors.

Cost Impact: This code change proposal will not increase the cost of construction.

C402.1.2T #2-EC-VANGHEM.doc

Committee Action Hearing Results

Committee Action:

Committee Reason: The proposal corrects values in the table. Action consistent with approval of CE95-13.

Assembly Action:

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing Energy Efficiency Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc. , request Disapproval.

Commenter's Reason: We recommend disapproval of CE95. CE95 increases the U-factors for mass walls in climate zone 5, which amounts to a reduction in energy efficiency and stringency for these types of buildings under this compliance option. In particular, we disagree with the 0.080 U-factor for Group R. We do not support backsliding on the energy efficiency requirements of the code, particularly without a compelling justification. If the R-values and U-factors are not comparable, then the R-value should be adjusted to greater efficiency rather than making the U-factor less efficient.

CE95-13

Final Action: AS AM AMPC____ D

CE96-13

Table C402.1.2, Table C402.2, C402.2.5

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Floors																
Mass ^e	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.057	U-0.055	U-0.051	U-0.055	U-0.051

(Portions of Table not shown remain unchanged)

- Opaque assembly U-factors, C-factors, and F-factors from ASHRAE 90.1 Appendix A shall be permitted provided the construction complies with the applicable construction details from ASHRAE 90.1 Appendix A.
- Where heated slabs are below grade, below-grade walls shall comply with the F-factor requirements for heated slabs.
- "Mass floors" shall include floors weighing not less than:
 - 35 psf (170 kg/m²) of floor surface area; or
 - 25 psf (120 kg/m²) of floor surface area where the material weight is not more than 12 pounds per cubic foot (pcf) (1900 kg/m³).

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Floors																
Mass ^b	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-16.7ci

(Portions of Table not shown remain unchanged)

For SI: 1 inch = 25.4 mm ci = Continuous insulation. NR = No requirement.
 LS = Liner System- A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, un-faced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ASHRAE 90.1 Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block is required, otherwise use the *U*-factor compliance method in Table C402.1.2.
- c. R-5.7 ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in./h-² F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. Steel floor joist systems shall be insulated to R-38.
- a. "Mass floors" shall include floors weighing not less than:
 1. 35 psf (170 kg/m²) of floor surface area; or
 2. 25 psf (120 kg/m²) of floor surface area where the material weight is not more than 12 pounds per cubic foot (pcf) (1900 kg/m³).

C402.2.5 Floors over outdoor air or unconditioned space. The thermal properties (component *R*-values or assembly *U*-, *C*- or *F*-factors) resistance (*R*-value) of the insulating material installed either between the floor framing or continuously on the floor assembly of floor assemblies over outdoor air or unconditioned space shall be as specified in Table C402.1.2 or C402.2, based on the construction materials used in the floor assembly.

"Mass floors" shall include floors weighing not less than:

1. 35 psf (170 kg/m²) of floor surface area; or
2. 25 psf (120 kg/m²) of floor surface area if the material weight is not more than 12 pcf (1,900 kg/m³).

Reason: This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 2 open meetings and over 15 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal is intended to clarify the use and application of the codes prescriptive building thermal envelope provisions and does not contain changes to the technical requirements of the code. Detailed reasons for this proposal are as follows:

- a) This proposal moves and clarifies, but does not delete the requirements of Section C402.2.5 of the 2012 IECC.
- b) In the I-Codes, text should not rely on section titles for application. Therefore, the information in the title was added to the code text.
- c) The first sentence in Section C402.2.5 is revised to clarify that the provisions for floors over outdoor air or unconditioned space are also applicable to the assembly *U*-, *C*- and *F*-factors of Table C402.1.2.
- d) The original language of Section C402.2.4 did not clearly indicate what the "mass floor" requirements were relevant or related to. These requirements are more appropriately and clearly applied as footnotes to Tables C402.1.2 and C402.2. By moving the information to the appropriate tables, unintentional non compliance will decrease (compliance will increase).

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: This code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.1.2T #1-EC-THOMPSON-SEHPCAC.doc

Committee Action Hearing Results

Committee Action:

The following errata were not posted to the ICC website. The first printing of the 2012 IECC has an incorrect value in the second 'definition' of mass floors. It shows 12 pcf where 120 is the correct value. The changes below reflect the correct value.

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

- c. "Mass floors" shall include floors weighing not less than:
 1. 35 psf (170 kg/m²) of floor surface area; or
 2. 25 psf (120 kg/m²) of floor surface area where the material weight is not more than 42 120 pounds per cubic foot (pcf) (1900 kg/m³).

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

f. "Mass floors" shall include floors weighing not less than:

1. 35 psf (170 kg/m²) of floor surface area; or
2. 25 psf (120 kg/m²) of floor surface area where the material weight is not more than ~~42~~ 120 pounds per cubic foot (pcf) (1900 kg/m³).

C402.2.5 Floors over outdoor air or unconditioned space. The thermal properties (component R-values or assembly U-, C- or F-factors) resistance (R-value) of the insulating material installed either between the floor framing or continuously on the floor assembly of floor assemblies over outdoor air or unconditioned space shall be as specified in Table C402.1.2 or C402.2, based on the construction materials used in the floor assembly.

"Mass floors" shall include floors weighing not less than:

1. ~~35~~ psf (170 kg/m²) of floor surface area; or
2. ~~25~~ psf (120 kg/m²) of floor surface area if the material weight is not more than ~~42~~ 120 pcf (1,900 kg/m³).

(Portions of proposal not shown remain unchanged)

Committee Reason: The proposal clarifies the application of the values in both tables, by providing a description of what are mass walls as a footnote to the tables. It replaces text which is somewhat disconnected in a section of the code.

Assembly Action:

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment 1:

Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC; requests Disapproval.

Commenter's Reason: It has long been understood that each component in both the residential and commercial tables have their own text section to go with them. The code tells us in Section 401.2 Application, that you have to comply with the listed code sections, not just the tables. In fact, it doesn't even reference the tables directly; the individual code sections reference the tables, not vice versa. We aren't supposed to find code requirements in the footnotes; they are in those specific sections. The footnotes are supposed to be used to just call out or clarify small items within the table.

Every code cycle we try to take code language out of the footnotes and keep them in the text sections so that the footnotes remain understandable. This proposal removes the verbiage in the actual code text dealing with Mass Floors and puts it in the footnote, making a long footnote without much justification for doing it. Does it really make it more understandable by it being in a long footnote than being in the body of the code? A better use of this footnote might be to reference back to Section C402.2.5, where the reader could find all of the requirements for mass floors if they felt there was confusion dealing with those requirements. However, then we would set a precedence for referring the reader to the associated text when we don't do that for any of the other components in any of the tables.

We would ask for disapproval of this proposal because we do not feel as though it has made the code any better as it pertains to understanding the requirements for Mass Floors.

Public Comment 2:

Martha VanGeem, representing self, requests Disapproval.

Commenter's Reason: Adding the text from Section 402.2.5 to a footnote in the table will create too many unnecessary footnotes to the table, especially when combined with other proposals such as CE106 that take text and add it as footnotes to the table.

Also, the footnote is only added to Table C402.2 and not Table C402.1.2. This could create confusion because mass floor criteria are also specified in C402.1.2. The defining terminology for mass floors should remain in Section 402.2.5 because it is used in more than one place; it is used in the two tables.

CE96-13

Final Action: AS AM AMPC____ D

CE97-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.054	U-0.054	U-0.054	U-0.054	U-0.036

(Portions of Table not shown remain unchanged)

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Walls, Above Grade																
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R6.5ci	R-13 + R13ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + +R13ci	R-13+ R19.5ci	R-13 + R13ci	R-13+ R- 19.5ci
Metal Framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13+ R17.5ci
Wood Framed and Other	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci 3.8ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci; or R22	R-13 + R-7.5ci; or R20 + 3.8ci; or R22	R-13 + R-7.5ci; or R20 + 3.8ci; or R27	R-13 + R-7.5ci; or R20 + 3.8ci; or R27	R-13 + R-15.6ci; or R20 + 10ci; or R32	R-13 + R-15.6ci; or R20 + 10ci; or R32

(Portions of Table not shown remain unchanged.)

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal is intended to correct anomalies in these tables and present additional options to increase the usability and effectiveness of the codes prescriptive building envelope requirements. Detailed reasons for this proposal are as follows:

- 1) Table C402.1.2
 - a. In Table C402.1.2, some of the U-factors in CZ7 seem to be disjointed without reason. In the both the “Group R” and the “All Other” cells in CZ7, wood stud walls and steel stud walls have identical values except that the “All Other” cell for steel studs differs significantly. It seems reasonable to simply make all four cells values identical. Preliminary PNNL modeling has shown that merging U-factors to one performance level for all materials for building envelopes is an effective strategy for gaining more efficiency in codes. Certainly, it meets the intent of the cost effectiveness mandate from the Energy Act.
 - b. In Table C402.1.2, the U-factors for both wood stud and steel stud walls are disjointed to an even greater extent than those in CZ7 or CZ8. The SEHPCAC believes that bringing these U-factors into closer alignment with each other and with adjacent climate zones makes this code more enforceable, more readily achieved and more understandable. In achieving those objectives, the SEHPCAC believes that the biggest goal, adoptability, is also achieved. Any efficiency improvement is unimportant if the model code in which it is embodied is never adopted.
 - c. In the CZ8 columns of Table C402.1.2, U-factors were used that were simply in line with the descending values for the cells in CZ 1-7.
- 2) Table C402.2
 - a. For Table C402.2 this proposal provides “cavity only” insulation options for each climate zone entry in the “Wood Framed and Other” row. This is proposed in order to provide a practical solution for energy efficiency with which builders are familiar and that they can readily execute to a satisfactory level. Buy “cavity only,” it is meant that the insulation will be placed only in the cavities between studs and that c.i. (continuous insulation, such as foam insulation sheathing applied on the exterior side of studs) is not required in association with it. These “cavity only” options make compliance with, and effectiveness of, the code more likely by offering choices to designers and builders that are readily implementable.

Please note that the cavity only insulation option is just that: it is an option. As the existing cavity plus continuous insulation (ci) options also remain in place, the cavity only options do not necessarily increase costs, they simply provide added flexibility.

Also note that the cavity only option R-values, as minimum values, do not preclude the use of insulation with higher R-values where insulation materials are not readily available in the exact R-values provided in the Table. This is intentional. R-values differ for various insulation types and this puts all types on a level playing field. The R-values proposed for cavity only insulation Table C402.2 are derived from the U-factors for equivalent building envelope assemblies in Table C402.1.2.

Design professionals and builders have asked ICC, Code Trainers, and other professionals “what is the option in wood framed walls for cavity only insulation.” This addition provides that design flexibility and information to builders to understand the cavity only insulation requirements option. The third R-value listed in the row for wood framed wall climate zone 6 – 8, is a calculated value and may not represent thermal insulation products available off the shelf at building supply centers. Achieving the R-value in a cavity only installation may require a mix of insulation materials to achieve these values.
 - b. Beginning with Climate Zones 5 and Marine 4, the second option in each cell in the “Wood Framed and Other” row has been restored to “cavity-only”. In CZ5-M4, the residential cell R-values were made similar to the “All Other” cell because the U-factor values in Table C402.1.2 are the same for the corresponding table entries.
 - c. The R-values in both cells of Climate Zone 6 in the “Wood Framed and Other” row were revised to reflect equivalency calculations, as performed by the American Wood Council, that were based on U-factors for corresponding entries in Table C402.1.2.

Below is the summary page of the Excel spreadsheet used to determine R-value equivalents to U-factor inputs. This is the system by which the R-values in Table C402.2 were determined from the U-factors in Table C402.1.2.

U-factor to R-value equivalency spreadsheet

Material	R	Framing Factor	25%
inside air film	0.68	Stud Path 2x4	6.30
1/2" Gyp.	0.45	Stud Path 2x6	8.80
2x4 @ 16" o.c.	4.375	Cavity - Insulation	1.92
2x6 @ 16" o.c.	6.875		
7/16" OSB	0.62		
outside air film	0.17		

Siding Type	Average Thickness	R _{siding}	Stud Size							
			2 x 4				2 x 6			
			Cavity Insulation							
			R-13	R-15	R-17	R-17	R-19	R-20	R-22	R-24
Wall + Siding U-factor										
			13	15	17	17	19	20	22	24
Baseline (no siding)		-	0.090	0.084	0.079	0.068	0.064	0.063	0.060	0.057
Aluminum, Steel, or Vinyl siding uninsulated (hollow-back)	Varies	0.62	0.084	0.079	0.075	0.065	0.061	0.060	0.057	0.055
insulated (R-2)	Varies	2.00	0.074	0.070	0.066	0.059	0.056	0.054	0.052	0.050
insulated (R-3)	Varies	3.00	0.069	0.065	0.061	0.055	0.053	0.051	0.049	0.047
Brick veneer (3/4" air space)	3-5/8"	1.26	0.079	0.074	0.070	0.062	0.059	0.057	0.055	0.052
Hardboard siding	7/16"	0.67	0.084	0.078	0.074	0.065	0.061	0.060	0.057	0.055
Plywood siding (edges lapped)	3/8"	0.59	0.085	0.079	0.075	0.065	0.061	0.060	0.057	0.055
Wood siding										
Drop (8")	1"	0.79	0.083	0.078	0.073	0.064	0.061	0.059	0.056	0.054
Bevel (8", lapped)	1/2"	0.81	0.083	0.077	0.073	0.064	0.061	0.059	0.056	0.054
Bevel (10", lapped)	3/4"	1.05	0.081	0.076	0.072	0.063	0.060	0.058	0.055	0.053

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: Where the U-factors in the table are proposed to be decreased, this proposal may increase the cost of construction. Where cavity only insulation options have been provided, this proposal may decrease the cost of construction in certain applications.

C402.1.2T #4-EC-THOMPSON-SEHPCAC.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proponent asked for disapproval in order to prepare a public comment to address errors in the proposal.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Tim Manz, City of Blaine, MN, representing Association of Minnesota Building Officials, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Climate Zone	6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R
Walls, Above Grade						
Wood Framed and Other	R-13 + R-7.5ci or R20 + 3.8ci; or R21	R-13 + R-7.5ci; or R20 + 3.8ci; or R21	R-13 + R-7.5ci; or R20 + 3.8ci; or R21	R-13 + R-7.5ci; or R20 + 3.8ci; or R21	R-13 + R-15.6ci; or R20 + 10ci	R-13 + R-15.6ci; or R20 + 10ci

(Portions of Table not shown remain unchanged)

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

Walls, Above Grade						
CLIMATE ZONE	6		7		8	
	All other	Group R	All other	Group R	All other	Group R
Wood framed and other	U-0.054 U-.057	U-0.054 U-.057	U-0.054 U-.057	U-0.054 U-.057	U-0.036	U-0.036

(Portions of Table not shown remain unchanged)

Commenter's Reason: The State of Minnesota is amending the 2012 IECC to permit a 2" by 6" nominal wood framed wall cavity-only insulation option for both CZ 6 and 7. There is little demand for, and considerable opposition to, mandating continuous insulation or deeper insulation cavities than provided by 2" by 6" framing.

R21 was selected as the appropriate performance metric because it does not discriminate against materials.

R21 also corresponds with proposed amendments to important neighboring jurisdictions, keeping a level field for cross-border economic competition. Minnesota neighbors include:

- North Dakota, which is proposed to require R20 in CZ 6 and R21 in CZ 7.
- South Dakota; a home rule state with energy codes adopted as local options. Sioux Falls, SD's largest city, is in CZ 6 and a short distance from the MN border. It has elected to amend the 2012 IRC energy provisions to R20.
- Wisconsin, which currently administers R19 in CZ 6 and R21 in CZ 7. As of July 5, 2013 there are no administrative rules proposed to change these requirements on WI's state website nor are there indications of a 2012 IECC adoption initiation.
- Iowa administers R20 in CZ 6. As of July 5, 2013 there are no administrative rules proposed to change these requirements on IA's state website nor are there indications of a 2012 IECC adoption initiation.

We request that the assembly overturn the committee action and approve CE97 as modified by this public comment.

This proposal will decrease the cost of construction.

CE97-13

Final Action: AS AM AMPC____ D

CE98-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Mark Halverson, APA-The Engineered Wood Association (mark.halverson@apawood.org) Paul Coats, The American Wood Council

Revise as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

CLIMATE ZONE	Walls, Above Grade															
	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal buildings	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064 U-0.087	U-0.064 U-0.087	U-0.064 U-0.087	U-0.064 U-0.087	U-0.064 U-0.087	U-0.064 U-0.087	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036

(Portions of Table not shown remain unchanged)

**Table C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

CLIMATE ZONE	Walls, Above Grade															
	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal buildings	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-19.5ci	R-13 + R-13ci	R-13 + R-19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13 + R-17.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 or R-20 +R3.8ci	R-13 + R-7.5ci or R-20 or R-20 +R3.8ci	R-13 + R-7.5ci or R-20 or R-20 +R3.8ci	R-13 + R-7.5ci or R-20 or R-20 +R3.8ci	R-13 + R-7.5ci or R-20 or R-20 +R3.8ci	R-13 + R-15.6ci or R-20 or R-20 +R10ci	R-13 + R-15.6ci or R-20 or R-20 +R10ci

For SI: 1 inch = 25.4 mm. ci = Continuous insulation. NR = No requirement.

LS = Liner System—A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.2.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. Steel floor joist systems shall be insulated to R-38.

(Portions of Table not shown remain unchanged)

Reason: The above-grade wall *U*-factors and the insulation requirements in Tables C402.1.2 and C402.2 are much more stringent for wood framed walls than the other framing types in Climate Zones 1-3. This proposal brings wood frame walls to levels that are within the range of the other wall types.

The code must be product neutral and not favor one product over the others. The provision of the 2012 IECC require much lower *U*-factors and greater *R*-values in Climate Zones 1-3 for above grade wood framed walls than for the other three types of walls. Codes should not unfairly provide one framing product with an advantage over another. If the goal of the IECC is to save energy, then the code should be “blind” to material types when setting performance levels.

In addition, the amount of energy saved in requiring commercial and multi-family buildings to meet a *U*-factor of 0.064 as opposed to the proposed *U*-factor of 0.087 is minimal in these warmer climate zones. When the additional cost of construction is compared to the energy savings, the provision to build at the 0.064 *U*-level is not cost effective.

Table 1 shows a *U*-factor calculation using standard *R*-values. A 7/8-inch stucco *R*-value is used instead of single-coat stucco, as is recommended when applied to wood structural panels. The 7/16-inch sheathing is used in this system as it is a typical exterior sheathing thickness for wood frame commercial walls.

This proposal works to correct those discrepancies between framing materials while bringing the Commercial IECC in-line with the Residential IECC.

We ask the support of the committee for this proposal.

Table 1. U-Factor Calculations Climate Zones 1-3, 2x4 Wood Framed Walls

Wall Thermal Resistance by Component	2x4 Wall - R13		
	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17		
Stucco 7/8" (3-Coat)	0.18		
Continuous Insulation	0		
Wood Structural Panel Sheathing (7/16")	0.62		
Stud/Cavity Insulation	4.375	13	
Interior Gypsum	0.56		
Inside Air Film	0.68		
Studs at 16" o.c.	25%	75%	
Total Wall R-Value	6.59	15.21	11.46
Total Wall U-Factor	0.152	0.066	0.0873

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.2T #2-EC-COATS-HALVERSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: While the proposal is based on analysis conducted for the BB addendum to the ASHRAE 90.1 standard, the proposal only picked a few of the BB factors to bring forward. The result would appear to favor one industry over another.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mark Halverson, APA – The Engineered Wood Association; Paul Coats, American Wood Council (AWC), request Approval as Submitted.

Commenter’s Reason: We stand on the reason statement for the original proposal. These proposed modifications add similar numbers from the BB addendum to the ASHRAE 90.1 standard with slight modifications to keep both the “residential” cells and the “all other” cells the same value in each of the climate zones as is found in most of these tables. The cost impact of going from R-13 to R-20 walls in these warm climates is not cost effective. We urge the approval of this common sense change to Tables C402.1.2 and C402.2.

CE98-13

Final Action: AS AM AMPC____ D

CE99-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Mark Halverson, APA-The Engineered Wood Association and Paul Coats, The American Wood Council (mark.halverson@apawood.org)

Revise as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal buildings	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.054	U-0.054	U-0.054	U-0.054	U-0.036	U-0.036

(Portions of Table not shown remain unchanged)

**Table C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal buildings	R-13+ R-6.5ci	R-13+ R-6.5ci	R-13+ R-6.5ci	R-13+ R-13ci	R-13+ R-6.5ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-13ci	R-13+ R-19.5ci	R-13+ R-13ci	R-13+ R-19.5ci
Metal framed	R-13+ R-5ci	R-13+ R-5ci	R-13+ R-5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-7.5ci	R-13+ R-15.6ci	R-13+ R-7.5ci	R-13+ R-17.5ci
Wood framed and other	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-3.8ci or R-20	R-13+ R-7.5ci or R-20 +R-3.8ci	R-13+ R-6.57.5ci or R-1820 +R-33.8ci or R-24	R-13+ R-6.57.5ci or R-1820 +R-33.8ci or R-24	R-13+ R-107.5ci or R-20 +R-53.8ci or R-28	R-13+ R-107.5ci or R-20 +R-53.8ci or R-28	R-13+ R-1045.6ci or R-20 +R-540ci or R-28	R-13+ R-1045.6ci or R-20 +R-540ci or R-28

For SI: 1 inch = 25.4 mm. ci = Continuous insulation. NR = No requirement.

LS = Liner System—A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.2.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h- ft^2 °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. Steel floor joist systems shall be insulated to R-38.

(Portions of Table not shown remain unchanged)

Reason: The above-grade wall *U*-factors and the insulation requirements in Tables C402.1.2 and C402.2 are much more stringent for wood framed walls than the other framing types in Climate Zones 6-8. This proposal brings wood frame walls to levels that are within the range of the other wall types as well as levels that are similar to those found in the residential energy code.

The code must be product neutral and not favor one product over the others. The provision of the 2012 IECC require lower *U*-factors and greater *R*-values in Climate Zones 6-8 for above grade wood framed walls than for the other three types of walls. Codes should not unfairly provide one framing product with an advantage over the other. Since the goal of the IECC is to save energy, it should be “blind” to framing material types when setting performance levels. This proposal works to correct those irregularities between framing materials.

Table 1 shows the *U*-factor calculations for 2x6 and 2x4 walls using a combination of continuous insulation and cavity insulation for Climate Zone 6. The 2x6 wall system uses R18 cavity insulation with R3 continuous insulation and the 2x4 systems incorporates R13 cavity with R6.5 continuous insulation. Both systems result in a *U*-factor of 0.056.

Table 2 shows a calculation for a 2x6 wall system using R24 cavity insulation. The system also incorporates 7/8-inch stucco which is recommended for direct applications to wood structural panels. The 7/16-inch sheathing is used in this system as it is a typical exterior sheathing thickness for wood frame commercial walls. This system results in a *U*-factor of 0.056 and is equivalent to the two systems found in Table 1.

Table 3 shows the *U*-factor calculations for 2x6 and 2x4 walls using a combination of continuous insulation and cavity insulation for Climate Zones 7-8. The 2x6 wall system uses R20 cavity insulation with R5 continuous insulation and the 2x4 systems incorporates R13 cavity with R10 continuous insulation. Both systems result in a *U*-factor of 0.047.

Table 4 shows a calculation for a 2x8 wall system using R28 cavity insulation. A 7/8-inch stucco *R*-value is used as is typical when applied to wood structural panels. The 7/16-inch sheathing is used in this system as it is a typical exterior sheathing thickness for wood frame commercial walls. This system results in a *U*-factor of 0.047 and is equivalent to the two systems found in Table 3.

We ask the support of the committee for this proposal.

Table 1. U-Factor Calculations Climate Zone 6 Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R18+3			2x4 Wall - R13+6.5		
	R-Value Studs	R-Value Cavity	Assembly Value	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17			0.17		
Stucco (1-Coat)	0.08			0.08		
Continuous Insulation	3			6.5		
Wood Structural Panels Sheathing	0			0		
Stud/Cavity Insulation	6.875	18		4.375	13	
5/8" Drywall	0.56			0.56		
Inside Air Film	0.68			0.68		
Studs at 16" o.c.	25%	75%		25%	75%	
Total Wall R-Values	11.37	22.49		18.07	12.37	
Total Wall U-Factors	0.088	0.044	0.0553	0.081	0.048	0.0559

Table 2. U-Factor Calculations Climate Zone 6 Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R24		
	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17		
Stucco - 7/8" (3-Coat)	0.18		

Continuous Insulation	0		
Wood Structural Panels Sheathing (7/16")	0.62		
Stud/Cavity Insulation	6.875	24	
5/8" Drywall	0.56		
Inside Air Film	0.68		
Studs at 16" o.c.	25%	75%	
Total Wall R-Values	9.09	26.21	17.81
Total Wall U-Factors	0.110	0.038	0.0561

Table 3. U-Factor Calculations Climate Zones 7-8 Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R20+5			2x4 Wall - R13+10		
	R-Value Studs	R-Value Cavity	Assembly Value	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17			0.17		
Stucco (1-Coat)	0.08			0.08		
Continuous Insulation	5			10		
Wood Structural Panels Sheathing	0			0		
Stud/Cavity Insulation	6.875	20		4.375	13	
5/8" Drywall	0.56			0.56		
Inside Air Film	0.68			0.68		
Studs at 16" o.c.	25%	75%		25%	75%	
Total Wall R-Values	13.37	26.49	21.27	15.87	24.49	21.56
Total Wall U-Factors	0.075	0.038	0.0470	0.063	0.041	0.0464

Table 4. U-Factor Calculations - Climate Zones 7-8 Wood Framed Walls

Wall Thermal Resistance by Component	2x8 Wall - R28		
	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17		
Stucco - 7/8" (3-Coat)	0.18		
Continuous Insulation	0		
Wood Structural Panels Sheathing (7/16")	0.62		
Stud/Cavity Insulation	9.063	28	
5/8" Drywall	0.56		
Inside Air Film	0.68		
Studs at 16" o.c.	25%	75%	
Total Wall R-Values	11.27	30.21	21.28
Total Wall U-Factors	0.089	0.033	0.0470

Cost Impact: The code change proposal will not increase the cost of construction.

C402.1.2T #1-EC-COATS-HALVERSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal provides a cavity only option for the colder climate zones. It does not appear to favor one product type over another. There would appear to be a minor reduction in stringency in the colder climates.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Mark Halverson, APA-The Engineered Wood Association; Paul Coats, The American Wood Council, request Approval as Submitted.

Commenter's Reason: We stand on the reason statement for the original proposal but want to provide calculations in addition to those that were incorporated in our original reason statement. In the original calculations, we did not provide calculations that included exterior gypsum sheathing for the continuous insulation assemblies. These alternative calculations include 5/8" gypsum sheathing and are provided as a point of reference for public comment hearing voters. Also shown are the original R24 and R28 cavity insulation only calculations, which are the minimum-performance assemblies on which the U-factors are based.

We support the Committee recommendation for approval of CE99 as submitted.

Table 1A. U-Factor Calculations Climate Zone 6 - Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R18+3			2x4 Wall - R-13+6.5				
	R-Value Studs	R-Value Cavity	Assembly Value	R-Value Studs	R-Value Cavity	Assembly Value		
Wall - Outside Winter Air Film	0.17			0.17				
Siding - Stucco (1-Coat)	0.08			0.08				
Continuous Insulation	2.5			6.5				
Exterior 5/8" gypsum sheathing	0.56			0.56				
Stud/Cavity Insulation	6.875	18	18.14	4.375	13	18.47		
5/8" Drywall	0.56			0.56				
Inside Air Film	0.68			0.68				
Studs at 16" o.c.	25%	75%		25%	75%			
Total Wall R-Values	11.43	22.55		18.14	12.93		21.55	18.47
Total Wall U-Factors	0.088	0.044		0.0551	0.077		0.046	0.0541

Table 1B. U-Factor Calculations Climate Zone 6 - Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R24		
	R-Value Studs	R-Value Cavity	Assembly Value
Wall - Outside Winter Air Film	0.17		
Stucco - 7/8" (3-Coat)	0.18		
Continuous Insulation	0		
Wood Structural Panels Sheathing	7/16"		
Stud/Cavity Insulation	6.875	24	
5/8" Drywall	0.56		
Inside Air Film	0.68		
Studs at 16" o.c.	25%	75%	

Total Wall R-Values	9.09	26.21	17.81
Total Wall U-Factors	0.110	0.038	0.0561

Table 2A. U-Factor Calculations Climate Zones 7-8 Wood Framed Walls

Wall Thermal Resistance by Component	2x6 Wall - R20+5			2x4 Wall - R-13+10		
	R-Value Studs	R-Value Cavity	Assembly Value	R-Value Studs	R-Value Cavity	Assembly Value
Outside Air Film	0.17			0.17		
Siding - Stucco (1-Coat)	0.08			0.08		
Continuous Insulation	5			10		
Exterior 5/8" gypsum sheathing	0.56			0.56		
Stud/Cavity Insulation	6.875	20		4.375	13	
5/8" Drywall	0.56			0.56		
Inside Air Film	0.68			0.68		
Studs at 16" o.c.	25%	75%		25%	75%	
Total Wall R-Values	13.93	27.05	21.89	16.43	25.05	22.14
Total Wall U-Factors	0.072	0.037	0.0457	0.061	0.040	0.0452

Table 2B. U-Factor Calculations Climate Zones 7-8 Wood Framed Walls

Wall Thermal Resistance by Component	2x8 Wall - R28		
	R-Value Studs	R-Value Cavity	Assembly Value
Wall - Outside Winter Air Film	0.17		
Stucco - 7/8" (3-Coat)	0.18		
Continuous Insulation	0		
Wood Structural Panels Sheathing	0.62		7/16"
Stud/Cavity Insulation	9.06	28	
5/8" Drywall	0.56		
Inside Air Film	0.68		
Studs at 16" o.c.	25%	75%	
Total Wall R-Values	11.27	30.21	21.28
Total Wall U-Factors	0.089	0.033	0.0470

Public Comment 2:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS

Walls, Above Grade																
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036

(Portions of Table not shown remain unchanged)

TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS

Walls, Above Grade																		
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8			
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R		
Wood framed and other (cavity insulation only)	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-3.8ci or R-20	R13+R-7.5ci or R-20	R13+R-7.5ci or R-20	R13+R-7.5ci or R-20	R13+R-7.5ci or R-20	R13+R-7.5ci or R-20	R13+R-7.5ci or R-20	R13+R-15.6ci or R-20	R13+R-15.6ci or R-20
Wood framed and other (with continuous insulation) ^E	R-12ci	R-12ci	R-12ci	R-12ci	R-12ci	R-12ci	R-12ci	R-12ci	R-16ci	R-16ci	R-16ci	R-16ci	R-18ci	R-18ci	R-24ci	R-24ci		
	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-3.8ci	R-13+R-7.5ci	R-13+R-7.5ci	R-13+R-7.5ci	R-13+R-7.5ci	R-13+R-9ci	R-13+R-9ci	R-13+R-16ci	R-13+R-16ci		
	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-3ci	R-15+R-6.5ci	R-15+R-6.5ci	R-15+R-6.5ci	R-15+R-6.5ci	R-15+R-8ci	R-15+R-8ci	R-15+R-14ci	R-15+R-14ci		
	=	=	=	=	=	=	=	=	R-18+R-4ci	R-18+R-4ci	R-18+R-4ci	R-18+R-4ci	R-18+R-5.5ci	R-18+R-5.5ci	R-18+R-14ci	R-18+R-14ci		

DR = Design required

(Portions of Table not shown remain unchanged)

Committer's Reason: While this public comment could have taken an approach to request disapproval of CE99-13 for its many technical flaws (see "Problems with CE99-13" below), it instead seeks to: 1) restore a consistent analysis basis for all R-value solutions in Table C402.2 for wood framed walls, 2) improve table formatting to separately list cavity-only and exterior insulation-only options, 3) support improved energy efficiency, and 4) avoid roll-backs of the 2012 IECC values for unjustified reasons. This public comment achieves these objectives and benefits through multiple features:

1. First, this public comment makes NO CHANGE to U-factors for Climate Zones 1 through 4 except Marine or the R20 cavity only R-value solution or the R-13 + R-3.8ci solution. For these climate zones, the only change is in formatting Table C402.2 to provide for additional R+Rci options that are necessitated in colder climate zones for reasons that follow.
2. Corrects the U-factor in Climate Zone 5 and Marine 4 to agree with the R-value solutions used for Group R buildings in the same climate zone as found in the current 2012 IECC provisions. This U-factor (0.051) for Climate Zone 5 is also consistent with the ASHRAE 90.1 provisions.
3. Restores the U-factor for Climate Zone 6 back to the U-factor (0.051) in the 2012 IECC and also ASHRAE 90.1.
4. Retains the U-factor proposed in CE99-13 for Climate Zone 7 as this U-factor (0.047) creates an appropriate transition between Climate Zones 6 and 8 and modestly improves energy efficiency in Climate Zone 7.
5. Restores the 2012 IECC U-factor (0.036) for Climate Zone 8, the most extreme and broad ranging climate zone in the code.
6. Adds multiple R-value that provide moisture control and flexibility in selecting walls that are compliant with the required U-factors.
7. Uses a proven method to control moisture in walls with cavity insulation and continuous insulation based on the experience in Canada dating back to the 1995 National Building Code of Canada and supported in the technical literature. The approach is based on minimum exterior continuous insulation to interior cavity insulation ratios (Re/Ri) by climate zone. This same methodology received a positive review by the residential building committee for the vapor retarder provisions of the IRC (refer to public comment on RB358 for additional information).
8. Reformats Table C402.2 by separating wood frame walls into two categories (cavity insulation only and with continuous insulation) for ease of use and to better distinguish these methods and provide flexibility in meeting the required U-factors.
9. Places a design required (DR) for cavity only insulation solutions in Climate Zone 5-8 (which is an expansion of the recognition of cavity only solutions relative to the 2012 IECC). This approach is taken due to the high R-values required and complications with determining effective, compressed R-values based on stud cavity size and insulation product ratings, etc. Clearly, additional design information and data is needed and is currently lacking in the code and in the description of what the R-values actually mean in the CE99 proposal. Thus, a "DR" approach provides the flexibility to develop prescriptive solutions with consideration of appropriate design data to ensure the solution actually meets the required U-factor. (Note that the current code provides no such recognition of cavity insulation in the colder climate zones).
10. Finally, given the broad range of "coldness" in Climate Zone 8, the R18+R14ci solution as shown is conservative (U-factor is less than 0.036). This was done by use of the Re/Ri ratio limits as described above to provide for moisture condensation control based on Canadian building code practices and experience (see note 7 above).

For all of the above reasons and multiple benefits that improve, clarify, restore, and strengthen these provisions in important ways, your support for this public comment is kindly requested at the final action hearing.

Problems with CE99-13:

A number of problems have been identified with the original CE99-13 proposal (and a related CE110-13 proposal) that this public comment intends to resolve in a coordinated and technically robust manner. The problems with CE99-13 include:

- 1) The assumptions behind the analysis used to derive the specific R-value changes made in CE99-13 are inconsistent with the original assumptions used for the remainder of Table C402.2. The net result is a technically conflicted table with significant practical consequences as described in points 2 and 3 below. The analysis assumptions used uniformly to develop the entire table for the 2012 IECC are documented in a white paper by Britt/Makela available at <http://fsc.americanchemistry.com>. This document was shared with the ICC SEHPAC committee by ICC-ES and this public comment uses that same analysis approach uniformly for the entire table to ensure consistency in the technical basis for the table in all climate zones, just as was done for the 2012 IECC. A detailed disclosure of the analysis will be made available at <http://fsc.americanchemistry.com> prior to the public hearing.
RECOMMENDATION #1: Support this public comment to restore Table C402.2 to a consistent and accepted basis of analysis as currently provided in the 2012 IECC commercial building provisions. (Note that RE-50 was approved as submitted for the same reason).
- 2) Some significant technical problems and impacts associated with CE99-13 were not fully understood until after the first hearing. These include:
 - a. Omits an R-value for non-insulation materials resulting in an unconservative estimate of the cavity-only R-value. R-24 on a 2x6 wall has a 0.058 U-factor, not 0.056 as CE-99 suggests.
 - b. Does not account for the difference between header and stud R-factors as is done for the remainder of the table. Again, this is unconservative.
 - c. Unconservative assumptions for wall thickness on cavity-only assemblies. The cavity insulation R-value is specific to the cavity depth. Use of higher R-values in 2x6 assemblies limits the use of certain insulation materials. For some materials, users must adjust for insulation compression into a smaller cavity to achieve the effective R-values and U-factors as analyzed. Yet, guidance and data is omitted to ensure the

- d. table is used in this manner. For example, it would take approximately an R-38 fiberglass batt 12" thick compressed to a thickness of 5.5" deep to create an effective R-24 performance. It would be more appropriate to assume a 2x8 cavity, instead of 2x6. The original CE99 is incomplete without this additional information and can lead to misuse and improper enforcement.

RECOMMENDATION #2: Support this public comment to remove these inconsistencies in the basis for R-value solutions in different parts of Table C402.2 as caused by CE99-13. Such technical inconsistencies alone should warrant disapproval of CE99-13 unless modified per this public comment.

NOTE: This public comment supports the inclusion of prescriptive deep cavity insulation only solutions in Climate Zones 5-8, but until additional information regarding cavity size and compressed insulation effective R-values are provided to enable such solutions, a "DR" (design required) is indicated. This approach acknowledges that an R-value solution is permissible and possible but that additional design data (per Note 2(c) above) must be considered that is not presently included in the code or in Table C402.2.

- 3) The proponent's rationale for changing some U-factors in Table C402.1.2 is flawed or incomplete. The committee's approval was based, at least in part, on the proponent's argument to improve the consistency of U-factors for wood framing in comparison to other materials, particularly metal framing. But, it failed to disclose that the requirements in the 2012 IECC were already consistent and that the basis of "consistency" in these energy code requirements is not just a matter of U-factor equivalency for a couple of important reasons:
- The first reason is the cost-benefit basis of requirements between material types. Thus, the selective lowering the U-factor for wood framing effectively imbalances the cost-effectiveness basis of U-factors for each material type to favor wood framing over steel framing.
 - The second reason is that the proposal does not consider differences in moisture condensation control within walls and that this is closely associated with the U-factor used for steel framing vs. wood framing. For example, the metal framed U-factors result in R-value solutions that better control moisture due to the higher ratio of continuous insulation to cavity insulation (which prevents the wall interior temperatures from dropping below the dew-point temperature). Because this was not considered in CE99, it actually expands inconsistencies between wood and steel framing where continuous insulation is used and potentially also where large amounts of cavity insulation only is used in colder climates.

RECOMMENDATION #3: U-factors and the associated R-value solutions and their equivalency between material types must be viewed from both energy cost-effectiveness perspective AND moisture/durability perspective. Neither of these matters of performance was considered in the proposed changes in CE99-13 and, thus, the proposal does not make things more consistent; it actually increases inconsistencies in some cases. Support this public comment to better address these issues caused by CE99-13 and ensure robust requirements and prescriptive solutions that are product neutral and moisture resilient.

Public Comment 3:

Eric Makela, Brit/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS¹ CLIMATE ZONE**

CLIMATE ZONE	Walls, Above Grade															
	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.056	U-0.056	U-0.047	U-0.047	U-0.047	U-0.047

(Portions of Table not shown remain unchanged)

Commenter's Reason: The proponent of EC99 provides no reason for why the changes were made to the R-value table – only that the requirements were too stringent and only apply to wood frame walls which isn't a justification for making the change.

During the development of the envelope provisions for the 2012 IECC commercial code, the wood framed wall R-values for Climate Zone 5 and Marine 4 for Group R were modified without modifying the corresponding U-factor in Table C402.1.2. This oversight by the proponents of the code change proposal created an inconsistency between the R-value requirements in Table C402.2 and the U-factor requirements in Table C402.1.2. Several of the U-factors that were used to populate Table C402.1.2 came directly from ASHRAE 90.1-2010 in addition to the corresponding R-values. In this case the R-value requirement of R-13 + R-7.5ci was brought over but not the corresponding U-factor. This Public Comment corrects the oversight by correcting the U-factor to be consistent with the action taken in Climate Zone 6 of CE99 while leaving the corresponding R-value to be consistent with the 2012 IECC.

In cold climates (e.g. Climate Zone 5 and Marine 4) midrise residential multi-family buildings are using wood framing. Four-story and above multi-family buildings have heating and cooling load patterns consistent with low-rise residential construction and require higher insulation levels to reduce heat loss in the evenings and early morning hours when the buildings are typically occupied. Higher levels of insulation are also warranted because Group R buildings have lower internal gains and are envelope dominated versus other commercial buildings that have greater internal gains and require less insulation in the building envelope.

Public Comment 4:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Disapproval.

Commenter's Reason: We recommend disapproval of CE99. This proposal increases the U-factor and reduces efficiency in climate zones 6 and 8. We do not support backsliding on the energy efficiency requirements of the code, particularly without a compelling justification.

The committee admitted that adoption of this proposal would reduce stringency, but it excused this backslide on the basis that the changes “would appear to be a minor reduction in stringency in the colder climates.” While we oppose any reduction, even a small one, we disagree with the conclusion that the reduction would be “minor” – we estimate that the new values would constitute an increase in the opaque wall U-factor (and commensurate decrease in opaque envelope efficiency) by roughly 10% in climate zone 6 and 30% in climate zone 8.

The calculated U-factors are inconsistent. While the existing values match the R-Value and U-factor based on standard framing envelope calculations (i.e. R-13 + R7.5Ci = 0.051 U-factor), the new values do not use the same calculation methodology and therefore are not consistent with the rest of the table (i.e. R-13 + R6.5Ci = 0.054 U factor, not 0.056 U-factor). This calculation discrepancy further weakens the performance path requirements without justification.

Additionally, the inclusion of a single R-Value of R-28 in climate zones 7 and 8 is a loophole that is the least energy efficient option in both climate zones, further weakening buildings that use the prescriptive path. In other words, in climate zone 8 the 2012 IECC is a 0.036 U-factor while this R-28 loophole is a 0.050 U-factor without specifying the required wall thickness or framing type, which is approximately 38% less efficient opaque envelope than the 2012 IECC.

Moreover, while proponent attempts to justify the change by comparing the values for wood-framing with the values applicable to other types of construction, the numbers do not support the proponents' claim. The opaque U-factors in the commercial code currently vary for each construction type (consistent with ASHRAE practice), not just for wood-framing, yet the proponent only addresses one set of values. Moreover, the values as proposed are less stringent than for some other types of construction, which seems inconsistent with the justification for the change.

CE99-13

Final Action: AS AM AMPC_____ D

CE100-13
Table C402.1.2

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Slab-on-Grade Floors																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs	F-0.70 F-1.020	F-0.70 F-1.020	F-0.70 F-1.020	F-0.70 F-1.020	F-0.70 F-0.900	F-0.70 F-0.900	F-0.65 F-0.860	F-0.65 F-0.860	F-0.65 F-0.079	F-0.65 F-0.079	F-0.58 F-0.079	F-0.58 F-0.688	F-0.55 F-0.688	F-0.55 F-0.688	F-0.55 F-0.688	F-0.55 F-0.688

- a. Use of opaque assembly *U*-factors, *C*-factors, and *F*-factors from ASHRAE 90.1 Appendix A shall be permitted provided the construction complies with the applicable construction details from ASHRAE 90.1 Appendix A.
- b. Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.

(Portions of Table not shown remain unchanged)

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The IECC *F*-factors are outdated and need to be improved. The *F*-factors for heated slabs in Table C402.1.2 are proposed to be revised to align with those in Tables 5.5-1 through 5.5-8 of ASHRAE 90.1-2010.

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: This code change proposal will not increase the cost of construction. As the maximum *F*-values are revised higher, which means that less insulation is required, this proposal will decrease the cost of construction.

C402.1.2T #3-EC-THOMPSON-SEHPCAC.doc

Committee Action Hearing Results

Committee Action:

Approved as Modified

Modify as follows:

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Heated slabs	F-0.860	F-0.860	F-0.079 F-0.790	F-0.079 F-0.790	F-0.079 F-0.688	F-0.688	F-0.688	F-0.688	F-0.688	F-0.688

(Portions of proposal not shown remain unchanged)

Committee Reason: The proposal was modified to correct the value in 3 cells which were errors identified in the original submittal by the proponent. The values are coordinated with ASHRAE 90.1. Existing values don't reflect the current values in the R-value table, which aren't being changed. The proposal corrects the F-factors to align with current R-values.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council, requests Disapproval.

Commenter's Reason: The original CE100 proposal changes F-factors for heated slabs (i.e., slabs with heating systems in the slab) such that sub-slab insulation would no longer be required in the IECC. This is not an acceptable minimum practice with heated slabs for a number of reasons and, therefore, the proposal should be disapproved rather than adopt potential heated slab performance problems based on actions taken in ASHRAE 90.1. Ideally, a combination of perimeter insulation and full sub-slab insulation is necessary for proper application and use of in-slab heating systems. The reasons this proposal is not acceptable include:

1. There is a huge thermal mass within the ground below slabs. In the first year or so of building operation, tremendous energy waste will occur in changing the thermal equilibrium of the underlying earth. This wasted energy will occur seasonally if the ground temperature is not maintained or periodically if the building heating is turned-off or set back.
2. The slab itself provides sufficient thermal mass (and sometimes too much for responsive space heating control). Adding the additional thermal mass of the underlying earth (by not requiring sub slab insulation as a result of the proposed F-factor changes to ASHRAE 90.1 levels) will create problems in indoor temperature control.
3. The proposal is setting up builders, designers, manufacturers, and installers of in-slab heating systems for call-backs and owner complaints.
4. Heated slabs are an "upgrade" heating option over unheated slabs and should have insulation packages that are commensurate with this intent and market expectation.

CE100-13

Final Action: AS AM AMPC____ D

CE102-13

Table C402.1.2, Table C402.2

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a**

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings ^d	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other ^e	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal building ^d	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed ^d	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other ^e	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036
Walls, Below Grade																
Below-grade wall ^b	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092	C-0.092	C-0.092
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.057	U-0.055	U-0.051	U-0.055	U-0.051
Joist/Framing	U-0.066	U-0.066	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033 ^g	U-0.033	U-0.033 ^g	U-0.033 ^g	U-0.033 ^g
Slab-on-Grade Floor																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.65	F-0.65	F-0.58	F-0.58	F-0.58	F-0.58	F-0.55	F-0.55	F-0.55	F-0.55

- a. Use of Prescriptive opaque assembly *U*-factors, *C*-factors, and *F*-factors from ASHRAE 90.1 Appendix A shall be permitted to be used to show evidence of compliance with this table, provided the construction complies with the applicable construction details, including insulation component thermal requirements, from ASHRAE 90.1 Appendix A.
- b. Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.
- c. Attic insulation and all other types of roof insulation other than above deck or metal building insulation.
- d. Metal skin and steel-framed structural system wherein the insulation, other than continuous insulation, is often compressed at the areas between the structural members and the metal skin.
- e. Wood light framed walls and all other wall systems except mass walls, metal building walls and metal framed walls.
- f. Light framed walls where the insulation, other than continuous insulation, is installed in the cavity between metal framing members.

**TABLE C402.2 C402.1.1
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM R-VALUE REQUIREMENTS^a**

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
Roofs																	
Insulation Entirely Above Roof Deck	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci	
Metal Buildings (with R-5 thermal blocks) ^{b,d}	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-25 + R11 LS	R-25 + R11 LS	R-30 + R11 LS	R-30 + R11 LS	R-30 + R11 LS	R-30 + R11 LS	
Attic and other ^a	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49	
Walls, Above Grade																	
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci	
Metal building ^b	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R6.5ci	R-13 + R13ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 +R13ci	R-13+ R19.5ci	R-13 + R13ci	R-13+ R-19.5ci	
Metal Framed ^d	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13+ R17.5ci	
Wood Framed and Other ^a	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-15.6ci or R20 + 10ci	R-13 + R-15.6ci or R20 + 10ci	
Walls, Below Grade																	
Below Grade Wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci
Floors																	
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-16.7ci	
Joist / Framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^e	R-30	R-30 ^e	R-30 ^e	R-30 ^e	
Slab on Grade Floor																	
Unheated Slabs	NR	NR	NR	NR	NR	NR	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-20 for 24 in. below	
Heated Slabs	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 36 in. below	R-15 for 36 in. below	R-20 for 48 in. below	R-20 for 24 in. below	R-20 for 48 in. below	R-20 for 48 in. below	R-20 for 48 in. below	
Opaque Doors																	
Swinging	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	
Roll-up or Sliding	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	

For SI: 1 inch = 25.4 mm ci = Continuous insulation. NR = No requirement.

LS = Liner System- A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ASHRAE 90.1 Appendix A. "Attic and other" is attic insulation and all other types of roof insulation other than above deck or metal building insulation.
- b. Buildings that incorporate a metal skin and steel-framed structural system wherein the insulation is often compressed between the skin and framing members. Where using the R-value compliance method, a thermal spacer block is required between the skin and framing members, otherwise use the assembly U-factor compliance method in Section C402.1.2 and Table C402.1.2.
- c. R-5.7 ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in./h-² F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the F-factor requirements for heated slabs.
- e. Wood light framed walls and all other wall systems except mass walls, metal building walls and metal framed walls.
- f. Light framed walls where the insulation, other than continuous insulation, is installed in the cavity between metal framing members.

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal clarifies the code and increases its usability with regard to Tables C402.1.2 and C402.2 and the code's prescriptive building thermal envelope provisions. It does not contain technical changes. Most of these changes clarify the relationship between the tables and ASHRAE 90.1 Appendix A, eliminate the need to go to ASHRAE Appendix A, or add missing information regarding how ASHRAE 90.1 Appendix A is to be used when it is necessary to use it. An effort was also made to coordinate the footnotes between Tables C402.1.2 and C402.2.

Detailed reasons for this proposal are as follows:

- 1) Table C402.1.2:
 - a. Revised Footnote a: The existing language indicates that ASHRAE 90.1 Appendix A is permitted to be used, but it does not state what it is to be used for. This proposal clarifies that the purpose is to "show evidence of compliance with this table" and that the design must then also comply with Appendix A "insulation component thermal requirements."
 - b. Footnote b: unchanged
 - c. Proposed new Footnote c: This new footnote indicates what "Attic and other" is intended to apply to as used in the table, which is "insulation other than above deck or metal building insulation ." Members of SEHPCAC subgroup working on this proposal verified this information with Steve Ferguson of ASHRAE. This information is necessary as building officials have reported that many users call and ask what "Attic and other" is.
 - d. Proposed new Footnote d: This footnote describes what the term "Metal buildings" is intended to mean as used in the table. Previously it was necessary to go to ASHRAE 90.1 for this information, making the use of the table cumbersome and incomplete. This description is based upon the ASHRAE 90.1 description.
 - e. New Footnote e: This new footnote clarifies that the term "Wood framed and other," as used in the table, "are wood framed walls and all other wall systems except mass walls, metal building walls and metal framed walls." There is much confusion in the field as to how this term is to be interpreted.
 - f. Proposed new Footnote f: This new footnote describes what the term "Metal framed walls" is intended to mean as used in the table. Previously it was necessary to go to ASHRAE 90.1 for this information, making the use of the table cumbersome and incomplete. This description is based upon the ASHRAE 90.1 description.
- 2) Table C402.2:
 - a. Revised Footnote a: Rather than forcing the user to go to ASHRAE 90.1 for a description of assemblies, the footnotes have been revised to include the necessary descriptions. Footnote a in particular now describes the term ""Attic and other" as used in the table, which is "insulation other than above deck or metal building insulation." Members of SEHPCAC subgroup working on this proposal verified this information with Steve Ferguson of ASHRAE. This information is needed as building officials have reported that many users call and ask what "Attic and other" is.
 - b. Revised Footnote b: In addition to retaining the information related to "spacer blocks," this footnote now also describes what the term "Metal buildings" is intended to mean as used in the table. Previously it was necessary to go to ASHRAE 90.1 for this information, making the use of the table cumbersome and incomplete. This description is based upon the ASHRAE 90.1 description.
 - c. Footnote c: unchanged
 - d. Footnote d: unchanged
 - e. New Footnote e: Identical to proposed Footnote e to Table C402.1.2, this new footnote clarifies that the term "Wood framed and other," as used in the table, "are wood framed walls and all other wall systems except mass walls, metal building walls and metal framed walls." There is much confusion in the field as to how this term is to be interpreted.
 - f. Proposed new Footnote f: Identical to proposed Footnote f to Table C402.1.2, this new footnote describes what the term "Metal framed walls" is intended to mean as used in the table. Previously it was necessary to go to ASHRAE 90.1 for this information, making the use of the table cumbersome and incomplete. This description is based upon the ASHRAE 90.1 description.

- g. Note that, although some of the new footnotes proposed are definitions, and definitions typically belong in Chapter 2, since these definitions pertain only to the these terms as used in this table (they are not used elsewhere in the code), their proper place is as footnotes to the table.

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: This code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.1.2T #5-EC-THOMPSON-SEHPCAC.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The text of the footnotes could change how the tables are used.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Approval as Submitted.

Commenter's Reason: In light of the Commercial IECC Development Committee reason for disapproval of this proposal, the SEHPCAC reviewed the footnotes proposed in this change. We feel that footnotes only add clarity to the application of the table and they don't change the intent or application of the table. .

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE102-13

Final Action:

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CE106-13
Table C402.2, C402.2.3

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
Walls, Above Grade																	
Mass ^{b,g}	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci	
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R6.5ci	R-13 + R13ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + +R13ci	R-13+ R19.5ci	R-13 + R13ci	R-13+ R-19.5ci
Metal Framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13+ R17.5ci
Wood Framed and Other ^f	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 +3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 10ci	R-13 + R-15.6ci or R20 + 10ci	R-13 + R-15.6ci or R20 + 10ci
Walls, Below Grade																	
Below Grade Wall ^{d,4}	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci

(Portions of table not shown remain unchanged)

For SI: 1 inch = 25.4 mm ci = Continuous insulation. NR = No requirement.

LS = Liner System- A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, un-faced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ASHRAE 90.1 Appendix A.
- b. Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.2.
- c. R-5.7 ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-² °F.
- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. Steel floor joist systems shall be insulated to R-38.
- f. The R-value of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.2.
- g. "Mass walls" shall include walls weighing not less than:
 - 1. 35 psf (170 kg/m²) of wall surface area; or
 - 2. 25 psf (120 kg/m²) of wall surface area where the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).

~~**C402.2.3 Thermal resistance of above-grade walls.** The minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.~~

~~“Mass walls” shall include walls weighing not less than:~~

- ~~1. 35 psf (170 kg/m²) of wall surface area; or~~
- ~~2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).~~

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal is intended to clarify the use and application of the codes prescriptive building thermal envelope provisions and does not contain changes to the technical requirements of the code. Detailed reasons are as follows:

- a) The first sentence in Section C402.2.3 is unnecessary as it is redundant with the requirements of Section C402.1.1 and Table C402.2. It appears to be there only to tie these provisions to Section C402.1.1. Thus, it is better to simply relocate these provisions in Section C402.1.1. The current scenario also creates a condition wherein these redundant requirements could unintentionally diverge in the future.
- b) The second sentence and the “Mass wall” criteria in Section C402.2.3 are directly related to Table C402.1.1 and, therefore, are more appropriately located as footnotes to the table. While using the table in its current form (without these proposed footnotes), it is difficult to tell that these provisions are relevant to it.
- c) As currently organized, it is not apparent to users as they apply Tables C402.1.1 and C402.2 that Section C402.2.3 is applicable to the tables. This change makes the application more obvious and, therefore, will increase compliance.
- d) Note that the requirements of Section C402.2.3 are being moved, not deleted.
- e) Note that the provisions of C402.2.3 that are being moved are not requirements, they simply indicate how the term “mass walls” is intended to be applied in the tables.

The SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code’s prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: The code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.2T-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Provides clarification of the code by moving key text into a footnote format of the table. The change does not change any technical standards. The action is a companion piece to CE96-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment 1:

Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC; requests Disapproval.

Commenter's Reason: It has long been understood that each component in both the residential and commercial tables have their own text section to go with them. The code tells us in Section 401.2 Application, that you have to comply with the listed code sections, not just the tables. In fact, it doesn't even reference the tables directly; the individual code sections reference the tables, not vice versa. We aren't supposed to find code requirements in the footnotes; they are in those specific sections. The footnotes are supposed to be used to just call out or clarify small items within the table.

Every code cycle we try to take code language out of the footnotes and keep them in the text sections so that the footnotes remain understandable. This proposal removes the verbiage in the actual code text dealing with Mass Walls and puts it in the footnote, making a long footnote without much justification for doing it. Does it really make it more understandable by it being in a long footnote than being in the body of the code? A better use of this footnote might be to reference back to Section C402.2.3, where the reader could find all of the requirements for mass walls if they felt there was confusion dealing with those requirements. However, then we would set a precedence for referring the reader to the associated text when we don't do that for any of the other components in any of the tables.

We would ask for disapproval of this proposal because we do not feel as though it has made the code any better as it pertains to understanding the requirements for Mass Walls.

Public Comment 2:

Martha VanGeem, representing self, requests Disapproval.

Commenter's Reason: Adding the text from Section 402.2.3 to a footnote in the table will create too many unnecessary footnotes to the table, especially when combined with other proposals such as CE96 that take text and add it as footnotes to the table.

Also, the footnote is only added to Table C402.2 and not Table C402.1.2. This could create confusion because mass wall criteria are also specified in C402.1.2. The defining terminology for mass walls should remain in Section 402.2.3 because it is used in more than one place; it is used in the two tables.

CE106-13

Final Action: AS AM AMPC____ D

CE107-13
Table C402.2

Proposed Change as Submitted

Proponent: Mark Nowak, M. Nowak Consulting, LLC, representing Steel Framing Alliance

Revise as follows:

TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

Climate Zone	1		2	
	All other	Group R	All other	Group R
Walls, Above Grade				
Metal Framed	R-13+ 5ci	R-13+ 5ci	R-13+ 5ci	R-13+ 7.5 ci
Wood framed and other	R-13+ 3.8 or R-20	R-13+ 3.8 or R-20	R-13+ 3.8 or R-20	R-13+ 3.8 or R-20

(Portions of Table not shown remain unchanged)

Reason: The addition of continuous insulation for Climate Zones 1 and 2 in the 2009 and 2012 code resulted in significant construction costs but little energy savings. Further, in these warmer climates, the embodied energy to manufacture and ship the continuous insulation requires years of the annual projected savings before any real energy savings occurs. Energy conservation could be better accomplished in other areas of the building where more energy could be conserved for each dollar invested.

Following is an analysis of Group R construction that was conducted in various cities from Climate Zones 1 and 2. The data shows the costs and benefits associated with specifying a metal framed wall with and without continuous insulation. The selected cities are the representative cities developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) for these respective climate zones. Based on this analysis, which shows simple paybacks from 30 to 102 years, there is not sufficient justification to retain the insulation requirements at the current levels.

Climate zone	City	Building energy use with R-13 exterior walls (kWh)	Building energy use with R13+5 exterior walls (kWh)	Building Energy with R13+7.5 (kWh)	Annual energy savings with addition of continuous insulation (kWh)/\$	Cost of continuous insulation per building (\$)	Payback in years
1	Miami	373033	371739	-	1294/\$138	14032	102
2	Houston	389323	-	384992	4331/\$537	16533	31
2	Phoenix	384175	-	380105	4070/\$472	16533	35

Table Notes: Energy use was determined through simulations with Energy Gauge Summit V4.10 for a four story 32 unit multi-family apartment based on minimum prescriptive and equipment requirements in the 2012 IECC. Energy costs are as reported year end 2011 by USEIA for the largest utility providers in each city. Insulation costs are national averages from Craftsman Estimator 2007 adjusted for inflation and contractor overhead and profit.

In addition to the lengthy payback periods in these climate zones, the consideration of embodied energy needs to be addressed. The table below shows the embodied energy impact on the overall payback period. In Phoenix and Houston, it will take approximately 7 years before any overall energy will be saved compared to a wall without continuous insulation. The payback for embodied energy increases to 15 years in Miami. When added to the payback for first costs, this will put the overall payback period between 42 and 117 years for the cities in these climate zones, well outside accepted norms.

Climate zone	City	Embodied energy for R-5 continuous insulation (kWh)	Embodied energy for R-7.5 continuous insulation (kWh)	Annual energy savings with addition of continuous insulation (kWh)	Years to payback embodied energy
1	Miami	19388	-	1294	15
2	Houston	-	29030	4331	6.7
2	Phoenix	-	29030	4070	7.1

Table notes: Embodied energy information based on 1.87 kWh per SF or R-5 insulation. Source of embodied energy data extracted from Environmental Building News (Wilson 2010 downloaded from <http://www2.buildinggreen.com/blogs/avoiding-global-warming-impact-insulation> on December 4, 2012)

Cost Impact: The code change proposal will not increase the cost of construction.

C402.2T-EC-NOWAK.doc

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee felt that there are multiple methods to meet the performance levels and simply eliminating the continuous insulation sets up a discrepancy between the R-values and the U-factors.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mark Nowak, M. Nowak Consulting LLC, representing Steel Framing Alliance, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**Table C402.1.2
Opaque Thermal Envelope Assembly Requirements**

Climate Zone	1		2	
	All other	Group R	All other	Group R
Walls, Above Grade				
Metal Framed	U=0.077 <u>0.124</u>	U=0.077 <u>0.124</u>	U=0.077 <u>0.124</u>	U=0.064 <u>0.124</u>
Wood framed and other	U=0.064 <u>0.089</u>	U=0.064 <u>0.089</u>	U=0.064 <u>0.089</u>	U=0.064 <u>0.089</u>

*(Portions of Table not shown remain unchanged)
(Portions of original proposal not shown remain unchanged)*

Commenter's Reason: During the initial public hearings, objections were raised that the proposed changes to the R-values in Table C402.2 would create a conflict because the proposal did not address the corresponding U-factors. This modification brings the U-factors into alignment with the proposed R-values in Table C402.2. The U-factors are those from the same table as published in the 2009 IECC for R-13+0 insulation in wood and steel framed walls. They also match the U-factors in Table A.3.3 of Appendix A in ASHRAE 90.1-2010 for wall cavities with R-13+0 insulation.

The addition of continuous insulation for Climate Zones 1 and 2 in the 2009 and 2012 code resulted in significant construction costs but little energy savings. Further, in these warmer climates, the embodied energy to manufacture and ship the continuous insulation requires years of the annual projected savings before any real energy savings occurs. Energy conservation could be better accomplished in other areas of the building where more energy could be conserved for each dollar invested.

Following is an analysis of Group R construction that was conducted in various cities from Climate Zones 1 and 2. The data shows the costs and benefits associated with specifying a metal framed wall with and without continuous insulation. The selected cities are the representative cities developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) for these respective climate zones. Based on this analysis, which shows simple paybacks from 30 to 102 years, there is not sufficient justification to retain the insulation requirements at the current levels.

Climate zone	City	Building energy use with R-13 exterior walls (kWh)	Building energy use with R13+5 exterior walls (kWh)	Building Energy with R13+7.5 (kWh)	Annual energy savings with addition of continuous insulation (kWh)/\$	Cost of continuous insulation per building (\$)	Payback in years
1	Miami	373033	371739	-	1294/\$138	14032	102
2	Houston	389323	-	384992	4331/\$537	16533	31
2	Phoenix	384175	-	380105	4070/\$472	16533	35

Table Notes: Energy use was determined through simulations with Energy Gauge Summit V4.10 for a four story 32 unit multi-family apartment based on minimum prescriptive and equipment requirements in the 2012 IECC. Energy costs are as reported year end 2011 by USEIA for the largest utility providers in each city. Insulation costs are national averages from Craftsman Estimator 2007 adjusted for inflation and contractor overhead and profit.

In addition to the lengthy payback periods in these climate zones, the consideration of embodied energy needs to be addressed. The table below shows the embodied energy impact on the overall payback period. In Phoenix and Houston, it will take approximately 7 years before any overall energy will be saved compared to a wall without continuous insulation. The payback for embodied energy increases to 15 years in Miami. When added to the payback for first costs, this will put the overall payback period between 42 and 117 years for the cities in these climate zones, well outside accepted norms.

Climate zone	City	Embodied energy for R-5 continuous insulation (kWh)	Embodied energy for R-7.5 continuous insulation (kWh)	Annual energy savings with addition of continuous insulation (kWh)	Years to payback embodied energy
1	Miami	19388	-	1294	15
2	Houston	-	29030	4331	6.7
2	Phoenix	-	29030	4070	7.1

Table notes: Embodied energy information based on 1.87 kWh per SF or R-5 insulation. Source of embodied energy data extracted from Environmental Building News (Wilson 2010 downloaded from <http://www2.buildinggreen.com/blogs/avoiding-global-warming-impact-insulation> on December 4, 2012)

CE107-13

Final Action: AS AM AMPC_____ D

CE108-13
Table C402.2

Proposed Change as Submitted

Proponent: Larry Williams, Steel Framing Industry Association

Revise as follows:

Table C402.2
Opaque thermal Envelope requirements

Climate Zone	3	
	All other	Group R
	Walls, above grade	
Metal Framed	R-13+7.5 _{ci}	R-13+7.5 _{ci}
Wood framed and other	R-13+3.8 or R-20	R-13+3.8 or R-20

(Portions of Table not shown remain unchanged)

Reason: The addition of continuous insulation for Climate Zone 3 in 2009 and its further increase in the 2012 code resulted in significant construction costs but little energy savings. Further, the embodied energy to manufacture and ship the continuous insulation requires years of the annual projected savings before any real energy savings occurs. Energy conservation could be better accomplished in other areas of the building where more energy could be conserved for each dollar invested.

Following is an analysis of Group R construction that was conducted in various cities from Climate Zone 3. The data shows the costs and benefits associated with specifying a metal framed wall with and without continuous insulation. The selected cities are the representative cities developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) for this climate zone. Based on this analysis, which shows simple paybacks from 23 to 25-1/2 years, there is not sufficient justification to retain the insulation requirements at the current levels.

Climate zone	City	Building energy use with R-13 exterior walls (kWh)	Building Energy with R13+7.5 (kWh)	Annual energy savings with addition of continuous insulation (kWh)/\$	Cost of continuous insulation per building (\$)	Payback in years
3	El Paso	399359	393888	5471/\$649	16533	25.5
3	San Francisco	355492	351170	4322/\$662	16533	25
3	Memphis	439907	432413	7494/\$718	16533	23

Table Notes: Energy use was determined through simulations with Energy Gauge Summit V4.10 for a four story 32 unit multi-family apartment based on minimum prescriptive and equipment requirements in the 2012 IECC. Energy costs are as reported year end 2011 by US EIA for the largest utility providers in each city. Insulation costs are national averages from Craftsman Estimator 2007 adjusted for inflation and contractor overhead and profit.

In addition to the lengthy payback period in these climate zones for first costs, the consideration of embodied energy needs to be addressed. The table below shows the embodied energy payback periods. The embodied energy increases payback by approximately 4 to just under 7 additional years. When added to the payback for first costs, this will put the overall payback period between approximately 27 and 32 years, well outside accepted norms.

Climate zone	City	Embodied energy for R-7.5 continuous insulation (kWh)	Annual energy savings with addition of continuous insulation (kWh)	Years to payback embodied energy
1	El Paso	29030	5471	5.3
2	San Francisco	29030	4322	6.7
2	Memphis	29030	7494	3.9

Table notes: Embodied energy information based on 1.87 kWh per SF or R-5 insulation. Source of embodied energy data extracted from Environmental Building News (Wilson 2010, downloaded from <http://www2.buildinggreen.com/blogs/avoiding-global-warming-impact-insulation> on December 4, 2012)

Cost Impact: The code change proposal will not increase the cost of construction.

C402.2T-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Consistent with the disapproval of CE107-13, the committee found that this proposal would also reduce R-values in even colder climate zones than addressed in CE107.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mark Nowak, M. Nowak Consulting LLC, representing Steel Framing Alliance, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**Table C402.1.2
Opaque Thermal Envelope Assembly Requirements**

Climate Zone	3	
	All other	Group R
	Walls, above grade	
Metal Framed	U=0.064 <u>-0.124</u>	U=0.064 <u>0.124</u>
Wood framed and other	U=0.064 <u>0.089</u>	U=0.064 <u>0.089</u>

(Portions of code change proposal and Table not shown remain unchanged)

Commenter's Reason: This modification brings the U-factors into alignment with the proposed R-values in Table C402.2. The proposed U-factors are taken from Table A.3.3 of Appendix A in ASHRAE 90.1-2010 for wall cavities with R-13+0 insulation.

The addition of continuous insulation for Climate Zone 3 in 2009 and its further increase in the 2012 code resulted in significant construction costs but little energy savings. Further, the embodied energy to manufacture and ship the continuous insulation requires years of the annual projected savings before any real energy savings occurs. Energy conservation could be better accomplished in other areas of the building where more energy could be conserved for each dollar invested.

Following is an analysis of Group R construction that was conducted in various cities from Climate Zone 3. The data shows the costs and benefits associated with specifying a metal framed wall with and without continuous insulation. The selected cities are the representative cities developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) for this climate

zone. Based on this analysis, which shows simple paybacks from 23 to 25-1/2 years, there is not sufficient justification to retain the insulation requirements at the current levels.

<i>Climate zone</i>	<i>City</i>	<i>Building energy use with R-13 exterior walls (kWh)</i>	<i>Building Energy with R13+7.5 (kWh)</i>	<i>Annual energy savings with addition of continuous insulation (kWh)/\$</i>	<i>Cost of continuous insulation per building (\$)</i>	<i>Payback in years</i>
3	<i>El Paso</i>	399359	393888	5471/\$649	16533	25.5
3	<i>San Francisco</i>	355492	351170	4322/\$662	16533	25
3	<i>Memphis</i>	439907	432413	7494/\$718	16533	23

Table Notes: Energy use was determined through simulations with Energy Gauge Summit V4.10 for a four story 32 unit multi-family apartment based on minimum prescriptive and equipment requirements in the 2012 IECC. Energy costs are as reported year end 2011 by US EIA for the largest utility providers in each city. Insulation costs are national averages from Craftsman Estimator 2007 adjusted for inflation and contractor overhead and profit.

In addition to the lengthy payback period in these climate zones for first costs, the consideration of embodied energy needs to be addressed. The table below shows the embodied energy payback periods. The embodied energy increases payback by approximately 4 to just under 7 additional years. When added to the payback for first costs, this will put the overall payback period between approximately 27 and 32 years, well outside accepted norms.

<i>Climate zone</i>	<i>City</i>	<i>Embodied energy for R-7.5 continuous insulation (kWh)</i>	<i>Annual energy savings with addition of continuous insulation (kWh)</i>	<i>Years to payback embodied energy</i>
1	<i>El Paso</i>	29030	5471	5.3
2	<i>San Francisco</i>	29030	4322	6.7
2	<i>Memphis</i>	29030	7494	3.9

Table notes: Embodied energy information based on 1.87 kWh per SF or R-5 insulation. Source of embodied energy data extracted from Environmental Building News (Wilson 2010, downloaded from <http://www2.buildinggreen.com/blogs/avoiding-global-warming-impact-insulation> on December 4, 2012)

CE108-13

Final Action: AS AM AMPC_____ D

CE110-13
Table C402.2

Proposed Change as Submitted

Proponent: Mark Halverson, APA-The Engineered Wood Association (mark.halverson@apawood.org), Paul Coats, The American Wood Council

Revise as follows:

Table C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

Walls, Above Grade																
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal buildings	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R13 + 13ci	R-13 + 13ci	R13 + 13ci	R13 + 13ci	R13 + 13ci	R13 + 13ci	R13 + 13ci	R13 + 19.5ci	R13 + 13ci	R13 + 19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13 + R-17.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20

For SI: 1 inch = 25.4 mm. ci = Continuous insulation. NR = No requirement.

LS = Liner System—A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

- Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- Where using *R*-value compliance method, a thermal spacer block shall be provided, otherwise use the *U*-factor compliance method in Table C402.1.2.
- R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-² °F.
- Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- Steel floor joist systems shall be insulated to R-38.

(Portions of Table not shown remain unchanged)

Reason: The above-grade wall *U*-factors and the insulation requirements for Climate Zone 5 and Marine 4 in Tables C402.1.2 and C402.2 are in alignment, except for the *R*-value requirements for Group R buildings. This proposal simply brings those insulation values into alignment with the other *R*-values and *U*-factors for the climate zone. Since each of the other climate zones have consistent wood frame wall *R*-values and *U*-factors for “Group R” buildings and “All Other” buildings, it only makes sense to correct the inconsistency found in this cell in Table C402.2.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.2T-EC-COATS-HALVERSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal aligns the *R*-value and *U*-factor for this cell of the tables.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Eric Makela, Britt/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**Table C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Walls, Above Grade																	
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci		
Metal buildings	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 13ci	R-13 + 19.5ci	R-13 + 13ci	R-13 + 19.5ci	R-13 + 19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + 7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R15.6ci	R-13 + R-7.5ci	R-13 + R17.5ci	R-13 + R17.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R3.87.5ci or R20 +R3.8ci	R13 + R7.5ci or R20 +R3.8ci	R13 + R7.5ci or R20 +R3.8ci	R13 + R7.5ci or R20 +R3.8ci	R13 + R7.5ci or R20 +R3.8ci	R13 + R15.6ci or R20 +R10ci	R13 + R15.6ci or R20 +R10ci

**TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS CLIMATE ZONE**

Walls, Above Grade																
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal buildings	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.052	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036

Commenter's Reason: During the development of the envelope provisions for the 2012 IECC commercial code, the wood framed wall R-values for Climate Zone 5 and Marine 4 for Group R were modified without modifying the corresponding U-factor in Table C402.1.2. This oversight by the proponents of the code change proposal created an inconsistency between the R-value requirements in Table C402.2 and the U-factor requirements in Table C402.1.2. Several of the U-factors that were used to populate Table C402.1.2 came directly from ASHRAE 90.1-2010 in addition to the corresponding R-values. In this case the R-value requirement of R-13 + R-7.5ci was brought over but not the corresponding U-factor. This Public Comment corrects the oversight by correcting the U-factor while leaving the corresponding R-value to be consistent with the 2012 IECC. In cold climates (e.g. Climate Zone 5 and Marine 4) midrise residential multi-family buildings are using wood framing. Four-story and above multi-family buildings have heating and cooling load patterns consistent with lowrise residential construction and require higher insulation levels to reduce heat loss in the evenings and early morning hours when the buildings are typically occupied. Higher levels of insulation are also warranted because Group R buildings have lower internal gains and are envelope dominated versus other commercial buildings that have greater internal gains and require less insulation in the building envelope.

Public Comment 2:

Jay H. Crandell, ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council requests Disapproval.

Commenter's Reason: This PC requests disapproval on the basis that a public comment submitted for CE99-13 (by this PC proponent) does a better job of addressing this concern. See the public comment on CE99-13 and its reason statement for the rationale.

Public Comment 3:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Disapproval.

Commenter's Reason: We recommend disapproval of CE110. This proposal decreases the R-Value and reduces efficiency in climate zone 5. We do not support backsliding on the energy efficiency requirements of the code, particularly without a compelling justification.

In addition to reducing the energy efficiency of buildings in climate zone 5 compared to the 2012 IECC, this proposal also goes counter to ASHRAE 90.1 addendum bb which recommends the original R-Values (R-13+7.5) and the corresponding correct U-factor (0.051) for Climate Zone 5. The proper "correction" for the climate zone 5 wood framed wall can be found in both CE-89 and CE-90.

CE110-13

Final Action: AS AM AMPC_____ D

CE116-13
C402.2.1.1

Proposed Change as Submitted

Proponent: Amy Dickie, Global Cool Cities Alliance (amy@globalcoolcities.org)

Revise as follows:

C402.2.1.1 Roof solar reflectance and thermal emittance. Low-sloped roofs, with a slope less than 2 units vertical in 12 horizontal, directly above cooled *conditioned spaces* in Climate Zones 1, 2, and 3, 4a and 4b, shall comply with one or more of the options in Table C402.2.1.1.

(Portions of text not shown remains unchanged)

Reason: Cool roofs are cost effective in climate zones 4a and 4b. Currently, the cool roof provision applies only to climate zones 1 through 3. This proposal expands the cool roof provision to climate zones 4a and 4b, where there is overwhelming evidence that cool roofs provide consistent and significant energy savings and energy cost savings.

Roofs that have a high solar reflectance and high thermal emittance (cool roofs) stay cooler in the sun. Cool roofs will have multiple benefits in climate zones 4a and 4b.

- Switching to cool roofs across climate zones 4a and 4b generates energy savings and energy cost savings.
- Cool roofs help reduce peak load in IECC climate zones 4a and 4b.
- The benefits of cool roofs have been proven beneficial in major metropolitan areas within climate zones 4a and 4b. Several major cities in climate zone 4 have adopted the use of cool roofs on commercial, low-sloped roofs into law.
- Cool roofs provide a cooler environment for roof equipment, thus enabling better performance for rooftop equipment.
- In many cases roof construction can have a cool roof option with zero price premium. Some cool roofs have small price premiums.
- Cool roofs have many important co-benefits. For example, a large number of cool roofs will reduce the summer air temperature in cities and therefore improve resiliency of urban populations to heat events.

The following technical analyses and substantiating information supports this proposal.

1) Switching to cool roofs across IECC Climate Zones 4a and 4b generates energy savings and energy cost savings.

- a. Cool roofs have a positive net energy savings in most parts of the country (Figure 1) and net energy cost savings in most parts of the country (Figure 2).¹

Figure 1: Cooling energy savings and heating energy penalty for commercial buildings with low-sloped roofs that have installed cool roofs. Calculations are based on increasing the aged solar reflectance of the roof to 0.55 from 0.20. Data from Levinson and Akbari (2010). Btu conversions added by GCCA. Annual net energy savings = annual cooling energy savings – heating energy penalty. *Values for other climate zones are available in the Levinson and Akbari (2010) paper.*

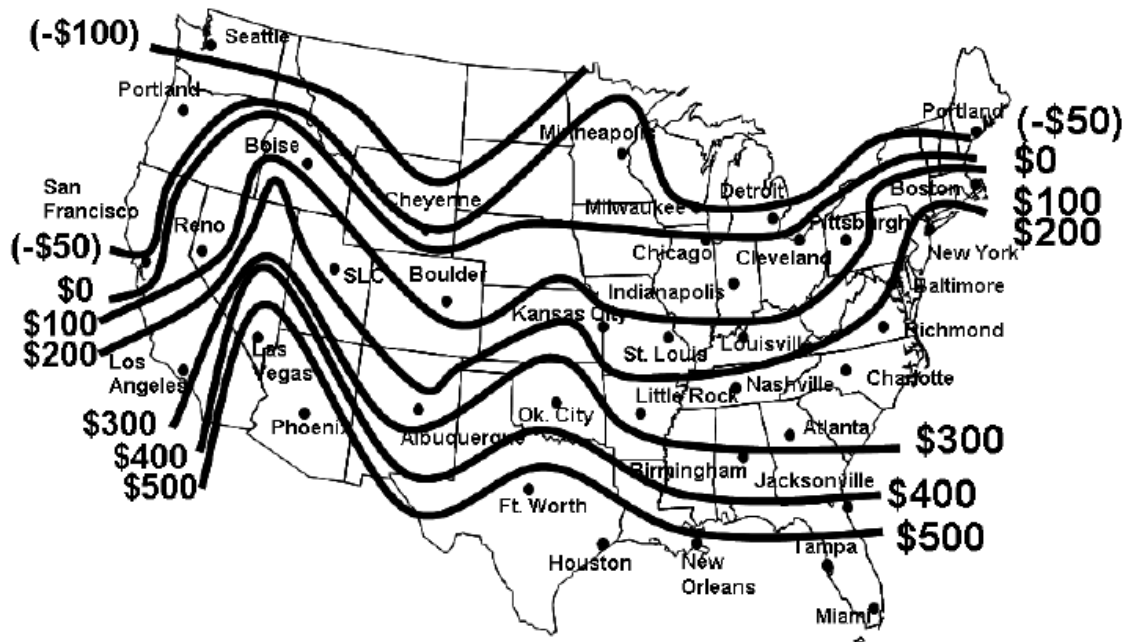
DOE benchmark city	State	Climate Zone	new office annual cooling-energy savings (Btu/m ²)	new office annual heating-energy penalty (Btu/m ²)	new office annual net energy savings (Btu/m ²)
Baltimore	MD	4A	7,034	4,766	2,268
Albuquerque	NM	4B	10,084	4,714	5,370

Figure 2: Net energy cost savings for commercial buildings with low-sloped roofs that have installed cool roofs. Calculations are based on increasing the aged solar reflectance of the roof to 0.55 from 0.20. Data from Levinson and Akbari (2010) with updated energy prices from EIA 2010. *Values for other climate zones are available upon request by e-mail.*

DOE benchmark cities	State	Climate Zone	new office annual energy-cost saving (\$/ft ²)	new retail annual energy-cost saving (\$/ft ²)
Baltimore	MD	4A	\$ 0.01	\$ 0.02
Albuquerque	NM	4B	\$ 0.02	\$ 0.03

- b. The breakeven line for cool roofs is well north of climate zones 4a and 4b.

Figure 3: Net Annual Energy Cost Savings for a reflective roof versus a non-reflective roof (dollars per 20,000 square foot roof area) for low-sloped commercial buildings. Calculations were made using the DOE Cool Roof Calculator.²



- 2) **Cool roofs help reduce peak load in IECC Climate Zones 4a and 4b.**
 - a. According to a recent study, peak energy savings from cool roofs are significant in all climate zones.³
 - b. According to an analysis conducted for the Environmental Protection Agency⁴, adopting cool roofs across 11 metropolitan areas generates peak energy savings for all of them. The three cities included in the study from climate zone 4a had peak annual energy savings from commercial buildings as follows:
 - New York – 95 MW
 - Philadelphia – 49 MW
 - DC/Baltimore – 31 MW
- 3) **The benefits of cool roofs have been proven beneficial in major metropolitan areas within climate zones 4a and 4b. Several major cities in climate zone 4 have adopted the use of cool roofs on commercial, low-sloped roofs into law.**
 - a. A study that analyzed temperature data collected from three different roof surface treatments in Long Island City, Queens, New York found that the white roof surfaces did not show any “winter heating penalty” relative to the black roofs, and found that white roofs generate an energy cost savings of approximately \$200 per year.⁵
 - b. A study which analyzed the building energy impacts of the use of light colored roofs across the US found net energy cost savings for commercial buildings in all eleven of the metropolitan areas it analyzed.⁶ GCCA updated this analysis using EIA electricity and natural gas data from 2010. See Figure 4, below.

Figure 4: Annual energy savings and energy cost savings per 1,000 square feet of roof area of air conditioned commercial buildings resulting from the application of light colored roofs. Building energy data from Konopacki et al. Energy cost data from EIA 2010.

Metropolitan Area	Annual Savings on Commercial Buildings					
	Climate Zone	electricity (kWh)	gas (therms)	electricity savings (\$)	heating energy penalty (\$)	net energy savings (\$)
Atlanta	3A	239	-6	21.65	-6.57	15.08
Chicago	5A	228	-15	20.25	-13.14	7.11
Los Angeles	3B	350	-3	45.85	-2.49	43.36
Dallas / Forth Worth	3A	224	-4	20.59	-3.16	17.43
Houston	2A	261	-2	23.99	-1.58	22.41
Miami/ Ft. Lauderdale	1A	340	0	33.18	0	33.18
New Orleans	2A	287	-2	24.4	-1.97	22.43
New York	4A	211	-9	34.41	-9.79	24.62
Philadelphia	4A	232	-14	23.43	-14.66	8.77
Phoenix	2B	409	-2	38.73	-2.14	36.59
DC/Baltimore	4A	221	-9	29.66	-11.03	18.63

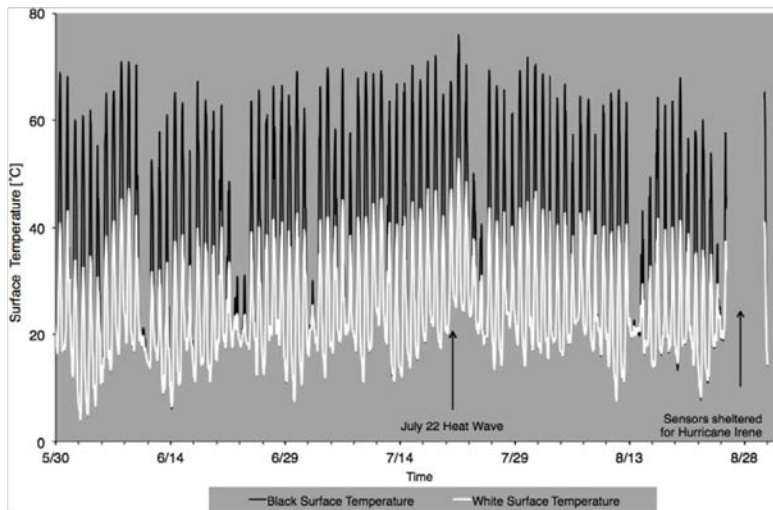
c. New York, Philadelphia, and Washington DC all require cool roofs. All of these cities are in climate zone 4. In all cases, these ordinances were adopted in an effort to generate building energy savings and mitigate the urban heat island.

- As of January 2012, New York City requires cool roofs on new and replacement low-sloped roofs (Local Laws of the City of New York for the Year 2011, #21). Roofs must have a minimum initial reflectance of 0.7 and initial thermal emittance of 0.75 or an SRI of 78.
- Washington DC's Construction Code of 2008 for commercial buildings includes a provision on cool roofs in Chapter 15A. Low-sloped roofs are required to have a minimum initial SRI of 78 or comply with Energy Star. In December 2012, the Washington DC Department of Consumer and Regulatory Affairs and the Construction Codes Coordinating Board published a proposed rulemaking to adopt IECC 2012 section C402.2.1.1 with an amendment to include climate zone 4.
- In April, 2010, the City of Philadelphia issued an ordinance (#090923) that all low-sloped roofs on new buildings and additions to existing buildings be Energy Star rated as highly reflective.

4) Cool roofs provide a cooler environment for roof equipment

a. Cool roofs lead to less thermal expansion due to their cooler temperatures.⁷

Figure 5: White and black roof temperatures on a building in New York City through the summer of 2011.⁷



5) In many cases roof construction can have a cool roof option with zero price premium. Some cool roofs have small price premiums.

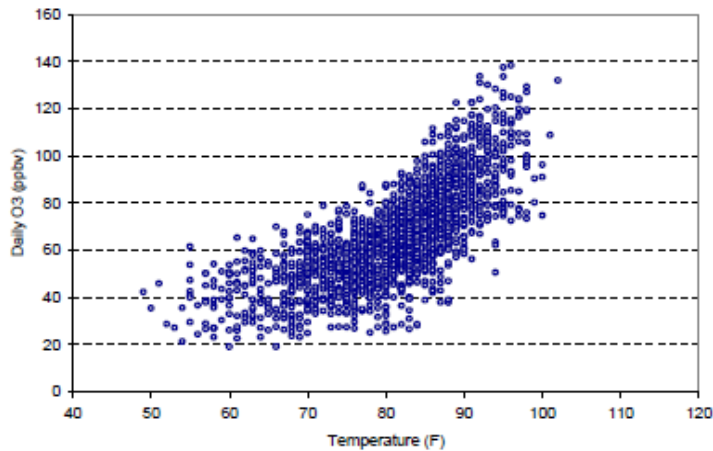
a. As with most construction materials, pricing can vary by market. According to EPA's Cool Roof website states, the cost premium for cool roofs versus conventional roofing materials ranges from zero to 5 or 10 cents per square foot for most products.⁸

6) Cool roofs provide co-benefits beyond building energy efficiency

a. Cool roofs help reduce ambient air temperatures, which in turn lower the incidences of smog formation.⁹

Figure 6 shows that as the surface temperature at Baltimore Washington International Airport (x-axis) rises, peak 8-hour ozone concentrations (y-axis) rise at an accelerated pace. Plots above horizontal red line indicate readings that exceeded the EPA compliance standard.

Figure 6: Maximum surface temperature at BWI versus peak 8-hour ozone concentrations



- b. Cool roofs improve resiliency of urban populations to heat events. A report for the Environmental Protection Agency studied the estimated mortality attributed to actual extreme heat events in Detroit, Philadelphia, Los Angeles, and New Orleans. Scenarios where the cities had higher albedos (10% improvements and 20% improvements) and greater vegetative cover suggest reductions in mortality during extreme heat events when cool surfaces are used to reduce urban temperatures. The paper models three multi-day heat events in Philadelphia (Climate Zone 4a) and estimated a reduction in mortality of approximately 5.5% as a result of a 10% improvement in urban reflectivity.¹⁰

References:

- 1) Ronnen Levinson and Hashem Akbari, "Potential benefits of cool roofs on commercial buildings," *Energy Efficiency* (2010) 3:53-109.
- 2) Hoff, J. L. (2005). The Economics of Cool Roofing: A local and regional approach. *Proceedings of Cool Roofing: Cutting through the Glare*, Atlanta, Georgia, May 2005.
- 3) Hoff, J. L. (2012) An outcome-based, multi-variate approach to roof surface thermal contribution. *Proceedings of the International Roof Coatings Conference*, Baltimore, MD, July 2012.
- 4) Konopacki et al., "Cooling Energy Savings Potential of Light-Colored Roofs for Residential and Commercial Buildings in 11 U.S. Metropolitan Areas", a report prepared for the Environmental Protection Agency, 1997.
- 5) Gaffin, S.R., Rosenzweig, C., Eichenbaum-Pikser, J., Khanbilvardi, R. and Susca, T., 2010. "A Temperature and Seasonal Energy Analysis of Green, White, and Black Roofs" Columbia University, Center for Climatic Systems Research. New York.
- 6) Konopacki et al., "Cooling Energy Savings Potential of Light-Colored Roofs for Residential and Commercial Buildings in 11 U.S. Metropolitan Areas", a report prepared for the Environmental Protection Agency, 1997.
- 7) Gaffin et al., "Bright is the New Black" *Environmental Research Letters* 7 (2012).
- 8) <http://www.epa.gov/hiri/mitigation/coolroofs.htm>
- 9) Russell Dickerson et al., "Climate Change and Air Quality for Baltimore and Washington," a contribution to ACCENT CCAQ: Group 1 (2007).
- 10) Kalkstein and Sheridan, "The Heat Impact of Heat Island Reduction Strategies on Health-Debilitating Oppressive Air Masses in Urban Areas" a report for the EPA, 2003.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was opposed to this increase in stringency represented by adding Climate Zone 4 to this requirement.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Amy Dickie, Global Cool Cities Alliance, requests Approval as Submitted

Commenter's Reason: The Committee opposed the addition of Climate Zones 4a and 4b to the current 'cool roof' requirement in section C402.2.1.1. We maintain that expanding the existing cool roof requirements into Climate Zones 4a and 4b is a beneficial change for the IECC for the following reasons:

- 1) Cool roofs are already in wide use in the commercial market in Climate Zones 4a and 4b, and even farther north. They are eminently feasible, and several large jurisdictions in these regions already require the use of cool roofs. New York, Philadelphia, and Washington DC all require cool roofs on low-sloped commercial buildings. In June, Pittsburgh (Climate Zone 5a) established a program that will install cool roofs on several city buildings.
- 2) Cool roofs provide short or even immediate payback periods in Climate Zones 4a and 4b.
- 3) This proposal maintains sufficient design flexibility in the code.

As this Hearing is being held in Climate Zone 4a, we believe the Assembly should have the opportunity to debate CE116.

CE116-13

Final Action:

AS

AM

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D

CE118-13
C202 (NEW), C402.2.1.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.2.1.1 Roof solar reflectance and thermal emittance. ~~Low sloped roofs, with a slope less than 2 units vertical in 12 units horizontal,~~ directly above cooled conditioned spaces in Climate Zones 1, 2, and 3 shall comply with one or more of the options in Table C402.2.1.1.

Exceptions: The following roofs and portions of roofs are exempt from the requirements in Table C402.2.1.1:

1. Portions of roofs that include or are covered by:
 - 1.1. Photovoltaic systems or components.
 - 1.2. Solar air or water heating systems or components.
 - 1.3. Roof gardens or landscaped roofs.
 - 1.4. Above-roof decks or walkways.
 - 1.5. Skylights.
 - 1.6. HVAC systems, components, and other opaque objects mounted above the roof.
2. Portions of roofs shaded during the peak sun angle on the summer solstice by permanent features of the building, or by permanent features of adjacent buildings.
3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (psf) (74 kg/m²) or 23 psf (117 kg/m²) pavers.
4. Roofs where a minimum of 75 percent of the roof area meets a minimum of one of the exceptions above.

Add new definition as follows:

LOW SLOPED ROOF. A roof having a slope less than 2 units vertical in 12 units horizontal.

Reason: This proposal simplifies criteria for low sloped roofs by adding a definition for the term "low slope roof." The current code text includes within it a definition that might be better placed in the definitions section of the code. Alternatively, if this is the only place the term is used, the need for a definition is moot if the text is then revised as "Roofs with a slope less than 2 units vertical in 12 units horizontal directly above...."

Cost Impact: The code change proposal will not increase the cost of construction.

C402.2.1.1-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal adds a welcome definition and should eliminate confusion between the IECC and the *International Residential Code* regarding low sloped roofs.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Amy Dickie, Global Cool Cities Alliance, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

LOW SLOPED ROOF. A roof having a slope less than or equal to 2 units vertical in 12 units horizontal.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This modification to the definition of low sloped roof makes it consistent with the definition in CE 122 which was approved as submitted by the Committee. We are in favor of moving the definition into the definitions section of the code.

CE118-13

Final Action: AS AM AMPC____ D

CE121-13

Table C402.2.1.1, C402.1.1.1 (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Robert A. Zabcik, P.E., NCI Building Systems, Inc., representing Cool Metal Roofing Coalition

Revise as follows:

**TABLE C402.2.1.1
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS^a**

Three-year aged solar reflectance ^b of 0.55 and three-year aged thermal emittance ^c of 0.75
Initial solar reflectance ^b of 0.70 and initial thermal emittance ^c of 0.75
Three-year aged solar reflectance index ^d of 64
Initial solar reflectance index ^d of 82

- The use of area-weighted averages to meet these requirements shall be permitted. ~~Materials lacking initial tested values for either solar reflectance or thermal emittance, shall be assigned both an initial solar reflectance of 0.10 and an initial thermal emittance of 0.90. Materials lacking three-year aged tested values for either solar reflectance or thermal emittance shall be assigned both a three-year aged solar reflectance in accordance with Section C402.2.1.1.1 of 0.10 and a three-year aged thermal emittance of 0.90.~~
- ~~Aged s~~Solar reflectance tested in accordance with ~~CRRC-1~~ASTM C 1549, ASTM E 903 ~~or~~ ASTM E 1918.
- ~~Aged t~~Thermal emittance tested in accordance with ~~CRRC-1~~ASTM C 1371 ~~or~~ ASTM E 408.
- Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 Btu/h x ft² x °F (12W/m² x K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance. ~~Calculation of initial SRI shall be based on initial tested values of solar reflectance and thermal emittance.~~

C402.2.1.1.1 Aged roof solar reflectance. Where an aged solar reflectance required by Section C402.2.1.1 is not available, it shall be determined in accordance with Equation 4-X.

$$R_{\text{aged}} = [0.2 + 0.7(R_{\text{initial}} - 0.2)] \quad \text{(Equation 4-X)}$$

where:

R_{aged} = The aged solar reflectance

R_{initial} = The initial solar reflectance determined in accordance with CRRC-1

Add new standard to Chapter 5 as follows:

CRRC Cool Roof Rating Council

1610 Harrison St
Oakland, CA 94612

CRRC-1 2012 Cool Roof Rating Council, CRRC-1 Standard

Reason: The use of initial values for compliance with solar reflectance (SR) and thermal emittance (TE) requirements as opposed to three-year aged values is not representative of real-world conditions. Weathering of most roofing materials greatly changes the SR and to a lesser degree, the TE, as documented by Lawrence Berkeley and Oak Ridge National Laboratories. The California Energy Commission (CEC) Title 24 Building Energy Efficiency Standards has addressed this issue very effectively since 2005. By requiring 3-year aged SR and TE values, a more realistic SRI is obtained; one that represents the performance of the roofing material during the life of the material rather than at the time of installation. The Cool Roof Rating Council (CRRC) has simultaneously developed the CRRC-1 standard to rigorously qualify the test procedures used to measure SR and TE, as well as the aging process. Thus, referencing the CRRC-1 standard is much more thorough than simply referencing the ASTM test methods used to measure SR and TE directly. The CRRC has recently been ANSI accredited to develop standards, further adding credibility.

The CRRC-1 standard uses the same test methods as the 2012 IECC, with the exception of ASTM E 408, which measures direct normal TE using a handheld device. (ASTM C 1371 measures the TE averaged over a hemisphere and the two methods can yield greatly different results.) Energy Star has recently dropped ASTM E 408 as well. Furthermore, the test procedures are further qualified to ensure consistency across all tested roofing products, including variegated products such as granule coated shingles.

The aging process has absolutely no qualification as currently specified in the IECC. The CRRC-1 Standard very effectively addresses this gap as well by specifying multiple test farms sites and accrediting labs to age and test specimens for SR and TE. It also outlines a color family program that allows manufacturers of colored products to group and test their products in representative lots. The downside is that the aging process takes three years. However, the CEC has included the aging formula presented in proposed new Section C402.2.1.1.1 since 2005 to predict aged values, which is also introduced in this proposal to provide values to use before testing is completed. This formula is based on a curve fit of the CRRC dataset and provides aged values of SR with conservatism and accuracy.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, CRRC-1-2012 – CRRC-1 Standard, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C402.2.1.1T-EC-ZABEIK.doc

Committee Action Hearing Results

For staff analysis of the content of ANSI/CRRC-1-2012 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Modified

Modify the proposal as follows:

- b. Aged solar reflectance tested in accordance with ASTM C 1549, ASTM E 903, ASTM E 1918 or CRRC-1.
- c. Aged thermal emittance tested in accordance with ASTM C 1371, ASTM E 408 or CRRC-1.

(Portions of proposal not shown remain unchanged)

Committee Reason: The modification retains the existing testing standards so that products which had been tested under them don't need to be retested under CRRC-1. The proposal was accepted by the committee as providing a method by which aged solar reflectance can be determined where testing hasn't been completed. The proposal is a compatible addition to the revision to the section approved in CE122-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Robert A. Zabcik, P.E., NCI Building Systems, Inc., representing Cool Metal Roofing Coalition, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

**TABLE C402.2.1.1
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS^a**

Three-year aged solar reflectance ^b of 0.55 and three-year aged thermal emittance ^e of 0.75
Three-year-aged solar reflectance index ^{ab} of 64

- a. The use of area-weighted averages to meet these requirements shall be permitted. Materials lacking three-year aged tested values for either solar reflectance or thermal emittance shall be assigned a three-year aged solar reflectance in accordance with Section C402.2.1.1.1 and a three-year aged thermal emittance ~~of 0.90~~ in accordance with C402.2.1.1.2.
- b. ~~Aged solar reflectance tested in accordance with CRRC-1, ASTM C 1549, ASTM E 903 or ASTM E 1918.~~
- c. ~~Aged thermal emittance tested in accordance with CRRC-1, ASTM C 1371 or ASTM E 408.~~
- d. ~~Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 Btu/h x ft² x °F (12 W/m² x K).~~

C402.2.1.1.1 Aged roof solar reflectance. Aged solar reflectance shall be determined in accordance with CRRC-1 Standard. Alternatively, solar reflectance shall be permitted to be determined by ASTM C 1549, ASTM E 903 or ASTM E 1918 when conducted on samples aged for at least three years in accordance with an accepted national standard on test farms accredited by a

nationally recognized program in at least three different climates: Hot/Humid, Cold/Temperate and Hot/Dry, as described in the CRRC-1 Standard. Where an aged solar reflectance required by Section C402.2.1.1 is not available, it shall be determined in accordance with Equation 4-X.

$$R_{\text{aged}} = [0.2+0.7(R_{\text{initial}}-0.2)] \quad (\text{Equation 4-X})$$

where:

R_{aged} = The aged solar reflectance

R_{initial} = The initial solar reflectance determined in accordance with CRRC-1, ASTM C 1549, ASTM E 903 or ASTM E 1918.

C402.2.1.1.2 Aged thermal emittance. Aged thermal emittance shall be determined in accordance with CRRC-1 Standard. Alternatively, thermal emittance shall be permitted to be determined in accordance with ASTM C 1371 or ASTM E 408 when conducted on samples aged for at least three years in accordance with an accepted national standard on test farms accredited by a nationally recognized program in at least three different climates: Hot/Humid, Cold/Temperate and Hot/Dry as described in the CRRC-1 Standard. Where an aged thermal emittance required by Section C402.2.1.1 is not available, it shall be assigned a value of 0.90.

Commenter's Reason: The re-inclusion of the ASTM standards for determination of solar reflectance and thermal emittance from the original CE 121, which contained a reference to CRRC-1 only, has introduced discrepancies that this comment intends to correct. While ASTM C 1549, ASTM E 903 and ASTM E 1918 are the same test methods that the CRRC-1 Standard utilizes for solar reflectance, CRRC-1 also includes extensive detail on the aging process itself, which if a user elects to test to the ASTM standards directly, will not be passed through. The same situation exists with thermal emittance as well.

Without the changes identified in this comment, the only requirements for aging are the words "three-year aged", which alone do not provide a sufficient level of detail to ensure the solar reflectance and thermal emittance values to be consistent throughout all products regardless of compliance path. As is, the alternate compliance path the code is providing lacks any information on the following:

- Mounting configuration
- Exposure conditions
- Identification of climates for purposes of consistent aging
- Required number of test farms to be used
- Required number of samples to be aged and tested

The proposed changes address all of these points and provide the minimal level of detail that will make the alternate compliance path consistent with the CRRC-1 Standard. This will provide a consistent set of requirements while still allowing more than a single compliance path.

CE121-13

Final Action: AS AM AMPC____ D

CE122-13

C402.2.1.1, C402.2.1.1.1 (NEW), C402.2.1.2 (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Amy Dickie, Global Cool Cities Alliance (amy@globalcoolcities.org), Craig Conner, Building Quality, representing self (craig.conner@mac.com)

Delete and substitute as follows:

~~C402.2.1.1 Roof solar reflectance and thermal emittance.~~ ~~Low-sloped roofs, with a slope less than 2 units vertical in 12 horizontal, directly above cooled *conditioned spaces* in Climate Zones 1, 2, and 3 shall comply with one or more of the options in Table C402.2.1.1.~~

~~Exceptions:~~ ~~The following roofs and portions of roofs are exempt from the requirements in Table C402.2.1.1:~~

- ~~1. Portions of roofs that include or are covered by:
 - ~~1.1. Photovoltaic systems or components.~~
 - ~~1.2. Solar air or water heating systems or components.~~
 - ~~1.3. Roof gardens or landscaped roofs.~~
 - ~~1.4. Above-roof decks or walkways.~~
 - ~~1.5. Skylights.~~
 - ~~1.6. HVAC systems, components, and other opaque objects mounted above the roof.~~~~
- ~~2. Portions of roofs shaded during the peak sun angle on the summer solstice by permanent features of the building, or by permanent features of adjacent buildings.~~
- ~~3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (psf) (74 kg/m²) or 23 psf (117 kg/m²) pavers.~~
- ~~4. Roofs where a minimum of 75 percent of the roof area meets a minimum of one of the exceptions above.~~

C402.2.1.1 Roof solar reflectance and thermal emittance. In climate zones 1, 2 and 3, roofs with a slope less than or equal to 2 units vertical in 12 units horizontal that are located directly above cooled conditions spaces shall have an average aged solar reflectance of not less than 0.55 and an average aged thermal emittance of not less than 0.75.

Exceptions: The following roofs and portions of roofs are exempt from the requirements in this Section:

1. Portions of the roof that include or are covered by the following:
 - 1.1. Photovoltaic systems or components
 - 1.2. Solar air or water heating systems or components
 - 1.3. Roof gardens or landscaped roofs
 - 1.4. Above-roof decks or walkways
 - 1.5. Skylights
 - 1.6. HVAC systems, components, and other opaque objects mounted above the roof.
2. Portions of the roof shaded during the peak sun angle on the summer solstice by permanent features of the building, or by permanent features of adjacent buildings.
3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (lb/ft²) [74 kg/m²] or 23 psf (lb/ft²) [117 kg/m²] pavers.
4. Roofs where a minimum of 75 percent of the roof area meets one or more of the exceptions above.

C402.2.1.1.1 Alternative Compliance Pathways. Roofs or portions of roofs that comply with one or more of the following also shall be in compliance with C402.2.1.1.

1. An aged solar reflectance index of not less than 64.
2. An initial solar reflectance of not less than 0.70 and an initial thermal emittance of not less than 0.75.
3. An initial solar reflectance index of not less than 82.

C402.2.1.2 Roof testing. Roof product solar reflectance and thermal emittance shall be determined as follows:

1. The initial and aged solar reflectances and initial and aged thermal emittances of the roofing product shall be measured in accordance with the ANSI/CRRC-1 Standard.
2. Initial and aged values of solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a medium wind speed convective coefficient of 2.1 BTU/(h · ft² · °F) [12 W/(m² · K)]. Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance. Calculation of initial SRI shall be based on initial tested values of solar reflectance and thermal emittance.
3. Materials lacking initial tested values for either solar reflectance or thermal emittance shall be assigned both an initial solar reflectance of 0.10 and an initial thermal emittance of 0.90. Materials lacking aged tested values for either solar reflectance or thermal emittance shall be assigned both an aged solar reflectance of 0.10 and an aged thermal emittance of 0.90.

Add new standard to Chapter 5 as follows:

CRRC Cool Roof Rating Council
1610 Harrison Street
Oakland, CA 94612

CRRC-1-12 – CRRC-1 Standard

Reason: The 2012 IECC is the first I-code to contain substantive language for ‘cool roofs’. This proposal makes technical corrections, reformats, and adds clarity to the language in Section C402.2.1.1, and adds a reference to the CRRC standard. Descriptions of specific changes and the reasons for each are described below.

- 1) Problem: The definition for low-sloped roofs is inconsistent with other major codes and standards, including ASHRAE and California’s Title 24.
 Solution: Change the definition of low-sloped roofs from a rise to run ratio of less than 2:12 to a rise to run ratio of less than or equal to 2:12. This change makes the definition of low-sloped roofs consistent with other codes (e.g. ASHRAE 90.1 and California’s Title 24).
- 2) Problem: The code does not make clear which performance metric is preferred.
 Solution: Reformat the code to state primary rating option (aged solar reflectance and aged thermal emittance) in the body of the code and the other rating options as exceptions. Note that although this change alters the format of the code, it has no influence on the stringency of the code.
- 3) Problem: The “three-year” specification is redundant to “aged”. Further, future versions of the CRRC-1 Standard may allow a different time period for aged testing.
 Solution: Remove the specification of “three-year” from the notation of aged reflectivity and aged emissivity values because the duration of the aging is explicit in the CRRC Standard, and should be changed as the standard evolves.
- 4) Problem: Important definitions and requirements for roof testing are included in footnotes and are therefore confusing and difficult to follow.
 Solution: Move the footnotes that pertain to the testing requirements into a new section (Section C402.2.1.3), titled “Roof Testing”. This change moves important definitions and requirements out of the footnotes, thus providing a cleaner format for the code.
- 5) Problem: The ANSI approval for the CRRC-1 Standard as a consensus standard had not been received at the time of the final action hearing of the last code cycle. Therefore, the code does not reference the most appropriate industry standard for roof testing and aging.
 Solution: The CRRC-1 Standard is now an ANSI approved consensus standard. This code change references what most stakeholders consider to be the most appropriate standard, which now complies with ICC CP-28.

Cost Impact: The codec change proposal will not increase the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, CRRC-1-2012 – CRRC-1 Standard, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C402.2.1.1(NEW)-EC-CONNER-DICKIE.doc

Committee Action Hearing Results

For staff analysis of the content of ANSI/CRRC-1-2012 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: The committee was concerned, based on testimony that key technical issues were not addressed in the proposal and that some existing products could be put at a disadvantage. The proposal was approved based on it being a good reorganization of the requirements in a concise, readable format as well and because it added the CRRC1 standard.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Amy Dickie, Global Cool Cities Alliance, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**Table C402.2.1.1
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS^a**

Three-year aged solar reflectance^a of 0.55 and three-year aged thermal emittance of 0.75.
Initial solar reflectance of 0.70 and initial thermal emittance^a of 0.75.
Three-year aged solar reflectance index^a of 64.
Initial solar reflectance index of 82.

- a. ~~The use of area-weighted averages to meet these requirements shall be permitted. Materials lacking initial tested values for either solar reflectance or thermal emittance, shall be assigned both an initial solar reflectance of 0.10 and an initial thermal emittance of 0.90. Materials lacking three-year aged tested values for either solar reflectance or thermal emittance shall be assigned both a three-year aged solar reflectance of 0.10 and a three-year aged thermal emittance of 0.90.~~
- b. ~~Solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918.~~
- c. ~~Thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408.~~
- d. ~~Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 Btu/h x ft² x F (12W/m² x K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance. Calculation of initial SRI shall be based on initial tested values of solar reflectance and thermal emittance.~~

(The portions of the proposal not shown remain unchanged)

Commenter's Reason: This comment strikes out Table C402.2.1.1 which was left orphaned after CE122 was approved at the Committee Hearings in Dallas. We intended to remove the table with our proposal, but failed to include the strike out in our initial proposal. This comment rectifies this problem. It makes no other changes to CE122.

Public Comment 2:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair, requests Disapproval.

Commenter's Reason: The approval of CE122 introduces a problem into the code. The text of CE122 eliminates all reference to Table C402.2.1.1. This would create an orphan table, the use of which would be unclear for the code user. We understand it is the intent of the proponents of CE121 and CE122 to submit public comments to address the merger of their two code change proposals, but to also address the status of the table. If their public comments to amend the proposals are successful, the SEHPCAC will not pursue disapproval. But without some action to address the orphan table, the SEHPCAC will seek disapproval in order to restore the existing text and its reference to Table C402.2.1.1.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings

and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE122-13

Final Action: AS AM AMPC_____ D

CE124-13

C202 (New), C402.2.2, C402.2.2.1, C402.2.2.2

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Delete without substitution as follows:

~~**C402.2.2 Classification of walls.** Walls associated with the building envelope shall be classified in accordance with Section C402.2.2.1 or C402.2.2.2.~~

~~**C402.2.2.1 Above-grade walls.** Above-grade walls are those walls covered by Section C402.2.3 on the exterior of the building and completely above grade or walls that are more than 15 percent above grade.~~

~~**C402.2.2.2 Below-grade walls.** Below-grade walls covered by Section C402.2.4 are basement or first-story walls associated with the exterior of the building that are at least 85 percent below grade.~~

Add new definitions as follows:

SECTION C202 GENERAL DEFINITIONS

WALL, ABOVE-GRADE. A wall associated with the *building thermal envelope* that is more than 15 percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building.

WALL, BELOW-GRADE. A wall associated with the basement or first story of the building that is part of the *building thermal envelope*, is at least 85 percent below grade and is on the exterior of the building.

Reason: In order to clarify and simplify the code, this proposal replaces the current text indicating how to determine a wall classification with a formal definition of each wall type

Section C402.2.2 contains only definitions that are more appropriately located in Section C202. Application of the current Sections C402.2.3 (above grade walls) and C402.2.4 (below grade walls) are clear as to requirements and can be readily and more easily applied by locating the definitions of those terms in the definitions section as opposed to another section of the code.

The current code provisions are technically incorrect. They refer to the building envelope (not the defined term building thermal envelope) and the exterior of the building. This omits any wall that is an interior wall that is part of the building thermal envelope, which is where the heat transfer occurs that the code is intending to address. Examples of this are a stairway wall separating an unconditioned basement from a conditioned first floor or a wall separating a conditioned basement from a vented crawl space. A strict application of the current code would eliminate such walls from having to be insulated because they are neither on the building exterior nor associated with the building envelope. The proposed definitions, therefore, cover all possible walls that could be part of the building thermal envelope (those bounded completely or partially by earth, those exposed to the outdoor elements and not bounded by earth, and those separating conditioned from unconditioned or exempt spaces regardless of location in relation to grade) in a clearer manner.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.2.2-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: As with CE123-13, the committee is concerned that the existing definitions of above grade wall and basement wall and introduction of these two new definitions will result in confusion in application of the code. While the committee did approve a modification to remove the definition of Above Grade Wall, in the end there remained unresolved issues.

Assembly Action:

Approved as Modified

Modify the proposal as follows:

~~**ABOVE-GRADE WALL.** A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.~~

(Portions of proposal not shown remain unchanged)

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Modified and because public comments were received.

Public Comment 1:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

SECTION C202 GENERAL DEFINITIONS

~~**ABOVE-GRADE WALL.** A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.~~

~~**BASEMENT WALL.** A wall 50 percent or more below grade and enclosing conditioned space.~~

~~**WALL, ABOVE-GRADE.** A wall associated with the *building thermal envelope* that is more than 15% above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building.~~

~~**WALL, BELOW-GRADE.** A wall associated with the basement or first story of the building that is part of the *building thermal envelope*, is at least 85% below grade and is on the exterior of the building.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: At the code development hearing, it was noted that the current code has a conflict wherein the definitions of above grade wall and basement wall, and the provisions in Sections C402.2.2.1 and C402.2.2.2 treat walls differently. The former being a 50/50 threshold, and the latter two being a 15/85 threshold. In addition, and more importantly, the former do not clearly indicate how a wall below grade and not on the building exterior but which is part of the building thermal envelope (e.g. interior wall in a basement separating a conditioned basement from a vented crawl space) is to be classified. It was noted that the intent was to also delete the current definitions of above-grade wall and basement wall, and a floor modification to do that was approved for consideration and voted for by the committee 6-3.

During testimony on the change, there were questions about the 15/85 threshold and disagreement that a wall that might be over 15% above grade but less than 50% above grade would or should be considered an above grade wall. While this might be, it remains that the code currently delineates above and below grade walls based on more than 15% above grade in Sections C402.2.2.1 and C402.2.2.2. So whether the issue of above and below grade walls is covered in the code text or a definition as proposed in CE124-13, any concern associated with a 50/50 versus 15/85 threshold is not related to this code change proposal but would require a change in the current code. This change simply proposes to put what are definitions in the definitions section, as opposed to having them located within the technical requirements of the code. It is important to note that the term 'basement wall' appears outside Chapter 2 of the IECC Commercial provisions (definitions) only once – in Section C303.2.1 where referring to protecting insulation on the exterior of basement walls – a likely unintended carryover from the separation of residential and commercial building provisions in the 2012 edition, where basement walls is used and applied to residential buildings. The thermal criteria in Chapter 4 of the IECC Commercial Provisions consistently refer to walls above-grade and walls-below grade and never use the term basement wall.

This change is simply about correcting a significant conflict within the code that is causing confusion. The existence of two conflicting ways to designate above and below grade walls and basement walls can be traced back to the prior editions of the IECC, where the commercial section (Chapter 5) had the 15/85 threshold covered in the text of the code, and the definitions of above-grade wall and basement wall were in the definitions section; intending to apply to the residential provisions of the IECC in Chapter 4. When the residential and commercial provisions were fully separated in the 2012 IECC the definitions of above-grade wall and basement wall and the 50/50 threshold associated with them was carried forward in error. In short – whether this code change proposal is approved as modified or not, the code will still have a 15/85 and 50/50 issue. The code change proposal, as modified and approved with a floor vote of 30-16 at least makes the following improvements, which are not covered in the current code:

- clarifies this conflicting percentage of wall issue for commercial buildings,

- confirms that the threshold is 15/85,
- confirms that the proper place to address that is as a definition, and
- provides specific direction for interior walls that separate conditioned and unconditioned space and are below grade but not on the building exterior,

In disapproving the change, the committee expressed concern about resulting confusion in the application of the code. The code change **as modified** removes any confusion, because it (1) removes terms that are not needed and not used in a relevant manner in the IECC Commercial Provisions, and (2) defines terms that are used identical to how they are “defined” in the body of the code. If anything, the current code is confusing as noted above by having the definition of above grade wall and basement, and then not using those terms in a relevant manner. It is further confusing by including conflicting criteria defining above and below grade walls in the body of the code. In recommending disapproval, the committee noted there were unresolved issues in the proposal. The only remaining unresolved issue is the removal of the term basement wall in the definitions section, which is addressed by this public comment.

Also of relevance, there were three other code change proposals submitted that relate to these definitions; all of which were recommended for disapproval. CE45-13 would retain the current definitions of above-grade wall and basement wall but change the 50/50 threshold to 15/85. This would ensure the consistency of the definitions to the criteria in C402.2.2.1 and C402.2.2.2 but could still result in confusion given the terms are then essentially defined in both Section C202 and those sections. CE123-13, if approved, as submitted would have the same result as the approval of CE124-13 as modified by this public comment. CE125-13 would not address this issue, as the definitions in Section C202 for above-grade wall and basement wall would be retained and the conflict would remain.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

Public Comment 2:

Don Surrena, CBO, National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

WALL, ABOVE-GRADE. A wall with the *building thermal envelope* that is more than ~~45-50~~ percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building.

WALL, BELOW-GRADE. A wall with the *basement or first story of the building that is part of the building thermal envelope*, is at least ~~85-50~~ percent below grade and is on the exterior of the building.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: These modifications create a consistency between the commercial and residential definitions of above grade and below grade / basement walls. The commercial and residential definition of a basement wall is a wall that is more than half below grade. It is much more reasonable to consider a wall that is more than half below grade to be a “below-grade” wall and less than half above grade to be an “above-grade” wall. As it currently stands, the commercial definition of a below grade wall is a wall that is 85% or more below grade. So an eight foot wall that is 81” below grade (15” exposed) is considered an above-grade wall. This change would classify an 8 ft wall 47” below grade as an above grade wall and a wall 49” below grade would be a below grade wall.

CE124-13

Final Action: AS AM AMPC____ D

CE125-13

Table C402.2, C402.2.2, C402.2.2.1, C402.2.2.2, C402.2.3, C402.2.4

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

~~**C402.2.2 Classification of walls.** Walls associated with the building envelope shall be classified in accordance with Section C402.2.2.1 or C402.2.2.2.~~

~~**C402.2.2.1 Above-grade walls.** Above-grade walls are those walls covered by Section C402.2.3 on the exterior of the building and completely above grade or walls that are more than 15 percent above grade.~~

~~**C402.2.2.2 Below-grade walls.** Below-grade walls covered by Section C402.2.4 are basement or first-story walls associated with the exterior of the building that are at least 85 percent below grade.~~

~~**C402.2.3 Thermal resistance of above-grade walls more than 15 percent above grade.** For exterior walls that are completely above grade or are more than 15 percent above grade, the minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.~~

"Mass walls" shall include walls weighing not less than:

1. 35 psf (170 kg/m²) of wall surface area; or
2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).

~~**C402.2.4 Thermal resistance of below-grade walls at least 85 percent below grade.** For exterior walls that are at least 85 percent below grade, the minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table C402.2, and shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the floor, whichever is less.~~

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation Entirely Above <u>Roof Deck</u>	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal Buildings (with R-5 thermal blocks) ^{a,b}	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-19 + R11 LS	R-25 + R11 LS	R-25 + R11 LS	R-30 + R11 LS	R-30 + R11 LS	R-30 + R11 LS	R-30 + R11 LS
Attic and other ^a	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49
Exterior Walls, completely or more than 15 Percent Above Grade																
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 +R13ci	R-13+ R19.5ci	R-13 + R13ci	R-13+ R-19.5ci
Metal Framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13+ R17.5ci
Wood Framed and Other ^d	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 +3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-15.6ci or R20 + 10ci	R-13 + R-15.6ci or R20 + 10ci
Exterior Walls, At Least 85 Percent Below Grade																
Wall Walls at least 85 percent Below Grade ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci
Floors																
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R- 12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-16.7ci
Joist / Framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^e	R-30	R-30 ^e	R-30 ^e	R-30 ^e
Slab on Grade Floors																
Unheated Slabs	NR	NR	NR	NR	NR	NR	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-20 for 24 in. below
Heated Slabs ^d	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-10 for 24 in. below	R-10 for 24 in. below	R-15 for 24 in. below	R-15 for 24 in. below	R-15 for 36 in. below	R-15 for 36 in. below	R-15 for 36 in. below	R-20 for 48 in. below	R-20 for 24 in. below	R-20 for 48 in. below	R-20 for 48 in. below	R-20 for 48 in. below
Opaque Doors																
Swinging	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Roll-up or Sliding	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm ci = Continuous insulation. NR = No requirement.

LS = Liner System- A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, un-faced insulation rests on top of the membrane between the purlins.

- a. Assembly descriptions can be found in ASHRAE 90.1 Appendix A.
- b. Where using R-value compliance method, a thermal spacer block is required, otherwise use the U-factor compliance method in Table C402.1.2.
- c. R-5.7 ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h-² °F.

- d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.
- e. Steel floor joist systems shall be insulated to R-38.

Reason: This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Reasons for this proposal are as follows:

This proposal moves and clarifies, but does not delete the requirements of existing Sections C402.2.2, C402.2.2.1 and C402.2.2.2 of the 2012 IECC.

The code currently has definitions in Chapter 2 for "above-grade" and "basement walls" which conflict with Sections C402.2.1 and C402.2.1, which are also essentially definitions. Furthermore, as Sections 402.2.1 and C402.2.2.2 are not referenced in C402.2.3 and C402.2.4, it is not immediately clear which definitions apply to Sections C402.2.3 and C402.2.4. To eliminate this confusion and add clarity, we propose that the technically important content from Sections C402.2.2.1 and C402.2.2.2 (i.e., percentages above or below grade) be moved into Sections C402.2.3 and C402.2.4, respectively, and that the terms "above grade" and "basement" or "below grade" walls be eliminated. In this manner, confusion is eliminated with other code sections that rely on the Chapter 2 definitions.

Note that the SEHPCAC also submitted a separate proposal to delete Section C402.2.4. This proposal works whether or not that proposal is successful. The committee's preference is that both proposals be approved, resulting in the deletion of Section C402.2.4 and the approval of all other provisions in this proposal.

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: The code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.2.2-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that this did not provide a solution to the issues identified in this proposal as well as CE123-13 and CE124-13. There was concern that moving the text into the table headers was confusing the issue. The committee encouraged the parties to work with SEHPCAC to develop a comprehensive public comment.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.2.3 Thermal resistance of above-grade walls more than 15 percent above grade. For exterior walls that are completely above grade or are more than 15 percent above grade, the minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.

"Mass walls" shall include walls weighing not less than:

1. 35 psf (170 kg/m²) of wall surface area; or

2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).

**TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a**

Climate Zone	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8		
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	
Exterior Walls completely or more than 15 Percent Above Grade																	
Mass	R-5.7ci ^c	R-5.7ci ^c	R-5.7ci ^c	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci		
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R6.5ci	R-13 + R13ci	R-13 + R6.5ci	R-13 + R13ci	R-13 + R13ci	R-13 + R13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 +R13ci	R-13+ R19.5ci	R-13 + R13ci	R-13+ R- 19.5ci
Metal Framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R- 15.6ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13+ R17.5ci
Wood Framed and Other ^f	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 +3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + 3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R-7.5ci or R20 + 3.8ci	R-13 + R- 15.6ci or R20 + 10ci	R-13 + R- 15.6ci or R20 + 10ci	R-13 + R- 15.6ci or R20 + 10ci
Exterior Walls-At Least 85 Percent Below Grade																	
Walls at least 85 percent Below Grade ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-10ci	R-12.5ci
Floors																	
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-15ci	R-16.7ci
Joist / Framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^e	R-30	R-30 ^e	R-30 ^e	R-30 ^e

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The SEHPCAC believe that the intent of the original proposal remains valid. The current Section C402.2.2 states that walls associated with the Building Envelop are classified by Sections C402.2.2.1 and C402.2.2.2. These sections establish the 85/15% split in determining when a wall is above or below grade for envelop purposes. Since Table C402.2 establishes the criteria for insulation for walls, the proper application of table C402.2 is based on the 85/15% split. This is a direct application of the code for this requirement and supersedes the 50% established by the definition of above grade walls. The proposed modification removes unnecessary verbiage. A wall this is completely above grade also is one that is at least 15% above grade. 'Completely above' is a redundant criteria.. This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

Public Comment 2:

Don Surrena, CBO, National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.2.3 Thermal resistance of walls more than 45 50 percent above grade. For exterior walls that are completely above grade or are more than 45 50 percent above grade, the minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.

“Mass walls” shall include walls weighing not less than:

1. 35 psf (170 kg/m²) of wall surface area; or
2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).

C402.2.4 Thermal resistance of walls at least 85 50 percent below grade. For exterior walls that are at least 85 50 percent below grade, the minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the walls shall be as specified in Table C402.2, and shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the floor, whichever is less.

Commenter’s Reason: These modifications create a consistency between the commercial and residential definitions of above grade and below grade basement walls. The commercial and residential definition of a basement wall is a wall that is more than half below grade. It is much more reasonable to consider a wall that is more than half below grade to be a “below-grade” wall and less than half above grade to be an “above-grade” wall. As it currently stands, the commercial definition of a below grade wall is a wall that is 85% or more below grade. So an eight foot wall that is 81” below grade (15” exposed) is considered an above-grade wall. This change would classify an 8 ft wall averaging 47” below grade as an above grade wall and a wall 49” below grade would be a below grade wall.

CE125-13

Final Action:

AS

AM

AMPC ____

D

CE127-13, Part I
C402.2.3, R402.2.5 (IRC N1102.2.5)

Proposed Change as Submitted

Proponent: James D. Katsaros, PhD, DuPont Building Innovations (james.d.katsaros@dupont.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C402.2.3 Thermal resistance of above-grade walls. The minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.

“Mass Walls” shall include walls weighing not less than:

1. 35 psf (170 kg/m²) of wall surface areas; ~~or~~
2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pound per cubic foot (pcf) (1900 kg/m³), or
3. Having a heat capacity greater than or equal to 6 BTU/ft²·x°F [123 kJ/m²·x K].

Reason: This proposal adds a heat capacity provision to mass wall definition to be consistent with IRC definition

Cost Impact: This code change proposal will not increase the cost of construction.

C402.2.3-EC-KATSARAS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Disapproved

Committee Reason: The lead in language is that mass walls are those that weigh a certain amount, but the proposed text is not a measurement of weight. There was concern that the proposal contained the correct factor for the heat capacity. The proposal needs to be reformatted.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Martha VanGeem, representing Masonry Alliance of Codes and Standards; Theresa A. Weston, PhD., DuPont Building Innovations, request Approval as Modified by this Public Comment

Modify the proposal as follows:

C402.2.3 Thermal resistance of above-grade walls. The minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.

"Mass Walls" shall include walls weighing not less than:

1. weighing not less than 35 psf (170 kg/m²) of wall surface areas; or
2. weighing not less than 25 psf (120 kg/m³) of wall surface area if the material weight is not more than 120 pound per cubic foot (pcf) (1900 kg/m³), or
3. having a heat capacity exceeding 7 Btu/ft²·°F greater than or equal to 6 BTU/ft²·°F [144 123 kJ/m² x K], or
4. having a heat capacity exceeding 5 Btu/ft²·°F [103 kJ/m² x K], where the material weight is not more than 120 pound per cubic foot (pcf) (1900 kg/m³).

Commenter's Reason:

Van Geem: The energy-saving benefits of thermal mass are not based on the weight of the wall or the heat capacity, but on the thermal diffusivity. It is thermal diffusivity or its combined components of thermal conductivity, specific heat, and density that are entered into simulation software to model thermal mass. A simplification of this to ease code compliance is allowing mass walls to be defined differently for different wall weights (as already in the IECC in items (1) and (2) above) or different heat capacities (as in the code change proposal and this comment). Items (1) and (3) are technically equivalent for mass walls, as are items (2) and (4). This proposal is consistent with the definitions for mass walls used in ASHRAE 90.1.

A paper providing more information has been published on this subject and is available upon request:
VanGeem, M.G., "Optimal Thermal Mass and R-Value in Concrete," First International Conference on Concrete Sustainability, Tokyo, May 2013.

Weston: The original proposal sought to add to the code a better understanding of thermal "mass walls". During the earlier hearings, as was noted in the committee's reason statement, there was a discussion on the correct usage of heat capacity in the determination of a mass wall. The modification corrects the usage of heat capacity and was arrived at after discussion with industry experts. The modification also corrects the formatting issue stated in the committee's comments.

CE127-13, Part I

Final Action: AS AM AMPC_____ D

CE127-13, Part II

C402.2.3, R402.2.5 (IRC N1102.2.5)

Proposed Change as Submitted

Proponent: James D. Katsaros, PhD, DuPont Building Innovations (james.d.katsaros@dupont.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R402.2.5 (N1102.2.5) Mass Walls. Mass walls for the purpose of this chapter shall be considered above-grade walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs, or any other walls having a heat capacity greater than or equal to 6 BTU/ft²·°F) [123 kJ/m²·K].

Reason: This proposal adds a heat capacity provision to mass wall definition to be consistent with IRC definition

Cost Impact: This code change proposal will not increase the cost of construction.

C402.2.3-EC-KATSARAS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART II – IECC – Residential

Committee Action:

Approved as Submitted

Committee Reason: This proposed text defining mass walls is consistent with the IRC.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Martha VanGeem, representing Masonry Alliance for Codes and Standards; Theresa A. Weston, PhD. Dupont Building Innovations, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R402.2.5 (N1102.2.5) Mass Walls. Mass walls for the purpose of this chapter shall be considered above-grade walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth), and solid timber/logs; or any other walls having a heat capacity greater than or equal to 6 BTU/ft²·°F) [123 kJ/m²·K].

1. 7 Btu/ft²·°F) [144 kJ/m²·K]; or

2. 5 Btu/ft²·°F [103 kJ/m²·K], where the material weight is not more than 120 pound per cubic foot (pcf) (1900 kg/m³).

Commenter's Reason:

Van Geem: The energy-saving benefits of thermal mass are not based on the weight of the wall or the heat capacity, but on the thermal diffusivity of the materials. It is thermal diffusivity or its components of thermal conductivity, specific heat, and density that are entered into simulation software to model thermal mass. A simplification of this to ease code compliance is to list the wall types as currently in the IRC. Another simplification is allowing mass walls to be defined differently for different wall heat capacities (as in this code change proposal and this public comment). This proposal is consistent with the definition of mass walls in ASHRAE 90.1.

A paper providing more information has been published on this subject and is available upon request:
VanGeem, M.G., "Optimal Thermal Mass and R-Value in Concrete," First International Conference on Concrete Sustainability, Tokyo, May 2013.

Weston: The original proposal sought to add to the code a better understanding of thermal "mass walls". During the committee hearings, there was a discussion on the correct usage of heat capacity in the determination of a mass wall. The modification corrects the usage of heat capacity and was arrived at after discussion with industry experts.

CE127-13, Part II

Final Action: AS AM AMPC_____ D

CE131-13
C402.2.6

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

C402.2.6 Slabs-on-grade perimeter insulation. Where the slab-on-grade is in contact with the ground, the minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors designed in accordance with the *R*-value method of Section C402.1.2 shall be as specified in Table C402.2. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

Reason: This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 2 open meetings and over 15 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The title of this section is proposed to be revised to clarify that:

- a) Section C402.2.6 applies only to the perimeter insulation associated with slab-on-grade construction. This section does not apply to the insulation installed within or immediately above or below and in contact with the slab-on-grade construction.
- b) Section C402.2.6 applies only to the *R*-value method in Section C402.1.1. It does not apply to the *U*-, *C*- and *F*-factor method in Section C402.1.2. (Note the ASHRAE 90.1 prescriptive tables referenced by Table C402.1.2 contain their own perimeter insulation requirements and are not reliant on Table C402.2.)

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals

Cost Impact: The code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C402.2.6-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal was found to be confusing, especially the proposed section title. *F*-factor is not addressed.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Approval as Submitted.

Commenter's Reason: The Commercial IECC Development Committee was in error in disapproving this proposal. The Committee's reason statement questions why the F-factor was not addressed. The F-Factor is not addressed because this is a section specific to the R-value methodology and the F-factor is irrelevant. The committee also felt the title was confusing. The title is an editorial matter. The SEHPCAC felt that 'Slab-on-grade perimeter insulation' is an apt description of the requirements found in this section. The SEHPCAC stands by its original reason statement submitted with this proposal.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

Please note that the original proposal contained a typographical error, the Section reference added should have been shown as C402.1.1 – not C402.1.2.

CE131-13

Final Action: AS AM AMPC_____ D

CE136-13

C402.3, C402.3.4 (NEW), Table C402.3.4 (NEW), Table C407.5.1(1)

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

C402.3 Fenestration (Prescriptive). Fenestration shall comply with this section, including the prescriptive values in Table C402.3 and Table C402.3.4. Automatic daylighting controls specified by this section shall comply with Section C405.2.2.3.2.

C402.3.4 Minimum VT. The minimum visible transmittance (VT) for vertical fenestration and skylights in all climate zones shall be as specified in Table C402.3.4.

Exception: Buildings where the vertical fenestration products collectively have an area-weighted average VT equal to or greater than the alternative minimum VT (VT_{alt}) calculated in accordance with Equation C4-3.

$$VT_{alt} = 0.11/FWR \quad \text{(Equation C4-3)}$$

where:

FWR = Fenestration to Wall Ratio which shall be equal to the actual fenestration area of the proposed building divided by the gross above-grade wall area (expressed as a decimal), but shall not exceed the maximum fenestration area as a percent of gross above-grade wall area allowed in Section C402.3.1.

**TABLE C402.3.4
FENESTRATION MINIMUM VT**

<u>FENESTRATION TYPE</u>	<u>MINIMUM VT</u>
All Climate Zones	
<u>Vertical Fenestration:</u>	
<u>Fixed</u>	<u>0.42</u>
<u>Operable</u>	<u>0.32</u>
<u>Curtain wall/storefront</u>	<u>0.46</u>
<u>Glazed entrance doors</u>	<u>0.17</u>
<u>Skylights</u>	<u>0.49</u>

C402.3.4 C402.3.5 Area-weighted average U-factor and VT. An area-weighted average shall be permitted to satisfy the U-factor requirements for each fenestration product category listed in Table C402.3 and the VT requirements for each fenestration product category listed in Table C402.3.4. Individual fenestration products from different fenestration product categories listed in Table C402.3 or Table C402.3.4 shall not be combined in calculating area-weighted average U-factor or VT, respectively.

**TABLE C407.5.1(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT CHARACTERISTICS	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
<p align="center">Glazing</p>	<p>Area</p> <ol style="list-style-type: none"> 1. The proposed glazing area; where the proposed glazing area is less than 40 percent of above-grade wall area. 2. 40 percent of above-grade wall area; where the proposed glazing area is 40 percent or more of the above-grade wall area. <p><i>U</i>-factor: from Table C402.3</p> <p>SHGC: from Table C402.3 except that for climates with no requirement (NR) SHGC = 0.40 shall be used</p> <p><u>VT: from Table C402.3.4</u></p> <p>External shading and PF: None</p>	<p align="center">As proposed</p> <p align="center">As proposed</p> <p align="center">As proposed</p> <p align="center"><u>As proposed</u></p> <p align="center">As proposed</p>
<p align="center">Skylights</p>	<p>Area</p> <ol style="list-style-type: none"> 1. The proposed skylight area; where the proposed skylight area is less than 3 percent of gross area of roof assembly. 2. 3 percent of gross area of roof assembly; where the proposed skylight area is 3 percent or more of gross area of roof assembly. <p><i>U</i>-factor: from Table C402.3</p> <p>SHGC: from Table C402.3 except that for climates with no requirement (NR) SHGC = 0.40 shall be used</p> <p><u>VT: from Table C402.3.4</u></p>	<p align="center">As proposed</p> <p align="center">As proposed</p> <p align="center">As proposed</p> <p align="center"><u>As proposed</u></p>

Reason: The purpose of this proposal is to establish minimum visible transmittance (VT) requirements for commercial fenestration in the *IECC*. This proposal will establish in the *IECC* the same level of minimum VT performance criteria that have been approved and will take effect under California’s most recently-revised building energy code, Title 24 *Building Energy Efficiency Standards*, starting in January 2014. The proposal also contains certain provisions, such as weighted averaging and an alternative compliance option based on an equation reflecting fenestration to wall ratio, that were adopted by California to provide flexibility in compliance approaches.

It is well understood that windows are the source of significant solar heat gain, particularly in commercial structures, which have significant internal and external heat gains. Even in colder climates, cooling energy use is typically the most significant load for commercial structures. Due to this fact, most commercial energy codes, including the *IECC*, have appropriately focused on establishing low SHGCs to reduce air conditioning loads, resulting in lower peak energy use and lower electrical peak demand (note that we have another proposal to lower SHGCs in climate zones 4 – 6). Traditional solutions to blocking solar gain sacrificed visible light by allowing the use of dark glazing because of limited glazing options that were available at the time; however, because of

technological improvements over the last decade, windows with low SHGC and high VT are now widely available. Thus, this proposal is intended to ensure that reasonable levels of natural light are also available inside the building (or at least that the building capture energy savings associated with such levels) by establishing a minimum VT performance requirement.

Historically, model building codes have required minimum glazing area for these and other reasons. The International Building Code, for example, in Section 1205.2, requires a minimum net glazed area of at least 8% of the floor area of the room served. This is to ensure, among other things, that natural light is provided to spaces intended for human occupancy. However, these values were set based primarily on clear glass, with much higher VTs. In fact, given much lower VTs for fenestration in many commercial buildings, there was a significant debate in the 2012 IECC code cycle over perceived problems to reducing maximum glazing area to 30% in the prescriptive path based on the perceived need for more glazing for daylighting. As our nation's energy codes continue to move to implement criteria for reducing unwanted solar heat gain, setting reasonable VT minimums is a simple measure that will ensure that windows perform as intended to provide natural light, while at the same time reduce solar gain. Ideally, energy codes should establish balanced criteria to address SHGC and VT that are designed to ensure that only the part of the sun's energy useful for daylighting enters the building. This proposal is an effort in that direction.

Achieving this balanced glazing performance (between low SHGC and high VT) was a driving force behind California's implementation of minimum VT requirements (at the same time, California set low SHGC requirements statewide). In 2009, California commissioned a series of Codes and Standards Enhancement Initiative ("CASE") studies to identify opportunities for improvements and efficiency in its Title 24 Building Energy Efficiency Standards. One such CASE Study, entitled "Nonresidential and High-Rise Residential Fenestration Requirements," evaluated and substantiated the establishment of a minimum VT requirement, along with a related CASE Study on daylighting. The California CASE Studies concluded that setting a prescriptive minimum VT ensures maximum natural lighting and minimum artificial lighting for the energy baseline, and it is the simplest and most effective metric in the context of a prescriptive compliance approach.

The CASE Studies found that the more visible light that is provided through fenestration, the more likely internal electric lighting and resulting electric loads are reduced at peak times during the day, which provides a series of benefits beyond the obvious lighting electricity reductions, such as reduced cooling loads due to lower internal heat generated from lighting and, therefore, reduced cooling energy use to offset the lighting heat load and associated lower peak demand. The CASE study authors also found that "the VT requirement is predicted to give occupants a better connection to the outdoors, which has been shown to improve occupant comfort and productivity" (CASE Study, Nonresidential and High-Rise Residential Fenestration Requirements, page 10, note e). The California Energy Commission used the results of these CASE Studies and several months of stakeholder review and comments and staff workshops that followed to further develop, refine and adopt new Title 24 Building Energy Efficiency Standards with minimum prescriptive VT requirements. Starting January 2014, all new nonresidential and high-rise residential buildings and hotels/motels in California must meet or exceed the minimum VT requirements in this proposal.

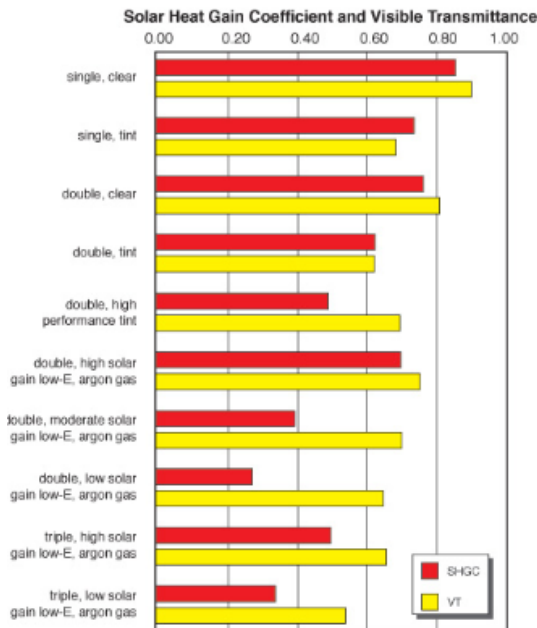
The ideal type of glazing technology capable of meeting the VT requirements in this proposal is referred to by some in the industry as "triple-silver" low SHGC low-e glazing. Triple-silver coatings in a double-pane insulating glass unit provide excellent solar heat gain reduction without losing nearly as much visible light as other glazing types or shading approaches. A triple-silver coating is produced by multiple glazing manufacturers for both residential and nonresidential applications, and is widely available from commercial and residential fenestration manufacturers and contractors across the country. The benefit of a product like triple-silver low-e glazing is that it represents the best available combination of low SHGC, low U-factor and high VT at roughly the same cost to the user as glazing with a low SHGC and low VT. In other words, the visible light benefits can be obtained at little or no additional cost. The minimum VT requirements in this proposal will ensure that the IECC calls for the right glazing choice at the time the windows are installed. Even if controls and other techniques are not implemented at initial construction to maximize daylighting benefit, the minimum VT will still provide benefits. A minimum reasonable VT presents a greater opportunity for effective future retrofits of controls and other techniques, as well as increasing the likelihood of voluntary non-automatic lighting reduction by occupants.

The life-cycle costing analysis used by California in its CASE Studies substantiated that "double-pane triple-silver low-e coated glazing was the most cost-effective choice for a statewide fenestration standard" (CASE Study, Nonresidential and High-Rise Residential Fenestration Requirements, page 33).

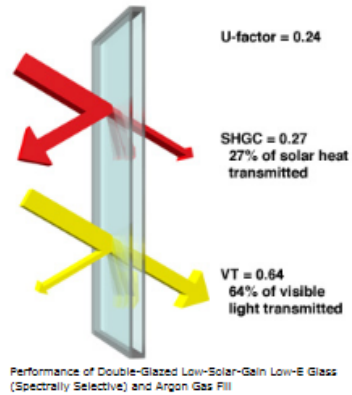
The following graphic from the Efficient Window Collaborative's website compares and contrasts the solar heat gain reduction and visible light transmitting characteristics of various glazing types. As you can see from this graphic, double-pane, low solar gain (triple-silver) low-e glazing (the eighth option on the list) provides the best combination of low SHGC and high VT of standard glazing types. Note that the values in the graphic are for glass only without the frame – actual SHGCs and VTs for code compliance include the effects of frames, which will typically reduce both the SHGC and VT by at least 10%.

Benefits: Increased Light & View

Daylight and view are two of the fundamental attributes of a window. Unfortunately, windows can also be the source of significant solar heat gain during times when it is unwanted. Traditional solutions to reducing solar heat gain such as tinted glazing or shades mean that the amount of light is reduced as well. New glazings with low-solar-gain Low-E (spectrally selective) coatings can provide better solar heat gain reduction than tinted glass, with a minimal loss of visible light. This also means that views can be clearer and unobstructed.



Note: All values are for glass only without frame. Source: Residential Windows by Carmody, Selkowitz, Arasteh and Heschong.



Verifying fenestration VT for code compliance will not add to cost or complexity. VT is simply another number to check that is already listed on the NFRC label, along with U-factor and SHGC. Also, *IECC* Table C303.1.3(3) already includes default VT values for products without NFRC ratings.

During California's most recent code adoption process, some commenters were concerned about glare being a problem associated with a minimum VT requirement. There was much evidence presented (by the California CASE Study authors and others) that refuted any suggestion that higher VTs lead to increased glare. Instead, it was shown that glare could be present regardless of a fenestration product's VT rating, and it is something best addressed through design, not VT.

Other options California considered for establishing minimum visible light criteria included effective aperture (EA) and light-to-solar gain ratio (referred to as LSG or VT/SHGC). California dismissed those as less effective alternatives, and we agree. Focusing first on EA, most daylighting experts agree that EA is overly complicated and unnecessary. The EA approach analyzed in California uncovered a technical loophole and energy penalty that made EA inferior to VT or VT/SHGC. The CASE Study noted "the reason that the EA approach is an energy penalty is that it results in low VTs at crucial WWRs" (CASE Study, Nonresidential and High-Rise Residential Fenestration Requirements, page 37). (Crucial WWRs, or window-to-wall ratios, are ones at or near 30%.) The CASE Study found that the EA penalty could be minimized by adding the complexity of more rules to the code, but such complexity would have been contrary to California's stated goal of simplification. An EA approach also would be contrary to the simplification improvements that the *IECC* has achieved over past cycles.

The second analyzed option of an LSG or VT/SHGC ratio would satisfy a simplification goal, because it relies on two readily available window performance metrics (VT and SHGC), but the same benefits with less complexity can be accomplished by simply setting a minimum VT. Those who supported the VT/SHGC approach in California seemed more interested in adopting the extremely weak 1.1 ratio that is presently required in limited applications in the *IECC* (Section C402.3.1.1(3)), as opposed to any particular reason why the LSG ratio approach would be better than simply setting a minimum VT. The problem with 1.1 VT/SHGC ratio is that it is not a particularly robust or effective target. If a VT/SHGC or LSG ratio approach were implemented in the *IECC*, the ratio would need to be much higher than 1.1 to achieve the same level of performance that California adopted. As an example, using a triple-silver low SHGC low-e glass that is available in today's market as a reference point, the VT/SHGC ratio would exceed 2.0.

To allow flexibility and a greater array of products to qualify, while preserving the core of the VT requirement and associated daylighting savings, several allowances are included in this proposal to match what was adopted in California. First and foremost, in California and in this proposal, the minimum VT is established as the prescriptive path energy baseline for the performance path. The prescriptive VT can be traded away in the performance path, so long as comparable energy savings are provided. Any glazing or combination of measures that deliver equivalent savings would be allowed, which provides the greatest flexibility. Also, as in California, this proposal allows the minimum VT requirements to be met on an area-weighted average basis, which permits some glass not to meet the minimum, so long as the glass meets the minimum on average. Lastly, this proposal includes as an exception, California's equation approach, as an alternative to the prescriptive VT values as a way to provide additional flexibility for buildings

with higher glazing areas (Alternative Minimum VT = 0.11/FWR). California viewed this equation as a temporary option that likely will be removed in the next Title 24 rulemaking cycle.

It is also worth noting that the minimum prescriptive VT values that California's CASE Study initially substantiated and recommended were considerably more stringent than the values that were ultimately adopted and are being proposed here. The California Energy Commission Staff took into consideration several factors and comments throughout its rulemaking process, and the minimum prescriptive values and approaches ultimately settled upon in California were found to be sufficient for a reasonable group of products to qualify while still providing the daylighting benefits and savings that California set out to achieve.

While we too would have constructed a more stringent set of requirements if we were starting from scratch, we believe that adopting this fully-developed and soon-to-be-implemented approach from California, with its already built-in compromises, would be the best course to make real progress at this point on a national basis and hopefully garner additional support and avoid controversy. On balance, we think that additional refinements would best be considered in future code cycles.

In summary, adoption of the minimum VT requirements in this proposal will ensure that fenestration capable of meeting the IECC's insulating and solar gain performance requirements will not needlessly sacrifice visible light. The level of performance in this proposal can be met cost-effectively by existing readily available glazing technology. These proposed performance values will establish in the IECC the appropriate technology targets for high performance glazing that will generate significant cooling, heating and lighting energy savings.

Bibliography: Codes and Standards Enhancement Initiative (CASE), Nonresidential & High-Rise Residential Fenestration Requirements, 2013 California Building Energy Efficiency Standards, California Utilities Statewide Codes and Standards Team, September 2011.

http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Nonresidential/Envelope/2013_CASE_NR_Fenestration_Reqs_Sept_2011.pdf

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

C402.3-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee recognizes the complexity of addressing daylighting in the code and found this proposal to be too simplistic to address it. Orientation is not adequately addressed. There was concern that the numbers in the proposed table were not correct. There was concern that this approach wasn't appropriate for the prescriptive path of the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing Energy Efficiency Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Submitted.

Commenter's Reason: We recommend approval of CE136, as submitted. We believe that this proposal is one of the biggest potential areas to save energy in the commercial code, specifically in the daylighting arena, which is still largely untapped for most commercial buildings under the IECC.

The VT requirements proposed in CE136 take an important step toward requiring adequate visible light transmittance for fenestration used in commercial construction. The original reason statement outlines the many reasons why this improvement is the logical next step for the IECC, so there is no need to repeat these arguments here. However, in response to issues raised by the commercial energy committee in its reason, a few clarifications are in order:

1. The values in CE136 come directly from the new California energy code, scheduled to take effect in 2014. These values are included in the prescriptive path and as the baseline for performance and other trade-offs in the California code. The California Energy Commission conducted extensive analysis of the values, cost effectiveness and approach across 16 California climate zones.
2. The committee was concerned that CE136 is "too simplistic" to address daylighting. While a set of requirements that included orientation may provide additional benefits, we think the proposed requirements capture the vast majority of the benefits from fenestration visible transmittance. If this approach works for the generally far more complex California

energy code, we think it will also work for the simpler IECC. Simplicity is a virtue, not a detriment, in the prescriptive path. More complex issues can be addressed through performance compliance.

3. Just as a moderate initial VT requirement was incorporated into the 2012 IECC, this proposal moves a great deal further toward reaping the full benefits of efficiency and visible transmittance in commercial buildings. While there may be additional improvements in the future, this is a sensible improvement for 2015.

CE136 helps ensure that the glazing used in commercial construction is not just energy efficient from a heating and cooling standpoint, but also provides the potential for energy savings from reducing lighting loads and all other benefits of fenestration with reasonable VTs.

CE136-13

Final Action: AS AM AMPC____ D

CE137-13

C202 (NEW), C402.3, C402.3.1.1, C402.3.1.2, C402.3.2.1, C402.3.3.3, C402.3.3.4, Table C406.3, C408.3.1

Proposed Change as Submitted

Proponent: Jack Bailey, One Lux Studio, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

Revise as follows:

C402.3 Fenestration (Prescriptive). Fenestration shall comply with Table C402.3. ~~Automatic daylighting controls specified by this section shall comply with Section C405.2.2.3.2.~~ Daylight responsive controls shall comply this section and Section C405.2.2.3.2.

C402.3.1.1 Increased vertical fenestration area with ~~daylighting controls~~ daylight responsive controls. In Climate Zones I through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

1. No less than 50 percent of the conditioned floor area is within a daylight zone;
2. ~~Automatic daylighting controls~~ Daylight responsive controls are installed in daylight zones; and
3. Visible transmittance (VT) of vertical fenestration is greater than or equal to 1.1 times solar heat gain coefficient (SHGC).

Exception: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 3.

C402.3.1.2 Increased skylight area with ~~daylighting controls~~ daylight responsive controls. The skylight area shall be permitted to be a maximum of 5 percent of the roof area provided ~~automatic daylighting controls~~ daylight responsive controls are installed in daylight zones under skylights.

C402.3.2.1 Lighting controls in daylight zones under skylights. ~~All lighting in the daylight zone shall be controlled by multilevel lighting controls that comply with Section C405.2.2.3.3.~~ Daylight responsive controls shall be provided to control the electric lights within daylight zones under skylights.

Exception: ~~Skylights above daylight zones of enclosed spaces are not required in:~~

1. ~~Buildings in Climate Zones 6 through 8.~~
2. ~~Spaces where the designed *general lighting* power densities are less than 0.5 W/ft² (5.4 W/m²).~~
3. ~~Areas where it is documented that existing structures or natural objects block direct beam sunlight on at least half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 am and 4 pm.~~
4. ~~Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.~~

C402.3.3.3 Increased skylight SHGC. In Climate Zones 1 through 6, skylights shall be permitted a maximum SHGC of 0.60 where located above daylight zones provided with ~~automated daylighting controls~~ daylight responsive controls.

C402.3.3.4 Increased skylight U-factor. Where skylights are installed above daylight zones provided with ~~automated daylighting controls~~ daylight responsive controls, a maximum U-factor of 0.9 shall be permitted in Climate Zones 1 through 3; and a maximum U-factor of 0.75 shall be permitted in Climate Zones 4 through 8.

**TABLE C406.3
REDUCED INTERIOR LIGHTING POWER**

(Portions of Table not shown remain unchanged)

- a. In cases where both a general building area type and a more specific building area type are listed, the more specific building area type shall apply.
- b. First LPD value applies if no less than 30 percent of conditioned floor area is in daylight zones. ~~Automatic daylighting controls~~ Daylight responsive controls shall be installed in daylight zones and shall meet the requirements of Section C405.2.2.3. In all other cases, second LPD value applies.
- c. No less than 70 percent of the floor area shall be in the daylight zone. Automatic daylighting controls shall be installed in daylight zones and shall meet the requirements of Section 405.2.2.3.

C408.3.1 Functional testing. Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer’s installation instructions. The construction documents shall state the party who will conduct the required functional testing. Where required by the code official, an approved party independent from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the code official certifying that the installed lighting controls meet the provisions of Section C405.

Where occupant sensors, time switches, programmable schedule controls, photosensors or ~~daylighting controls~~ daylight responsive controls are installed, the following procedures shall be performed:

- 1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
- 2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
- 3. Confirm that the placement and sensitivity adjustments of ~~photosensor~~ daylight responsive controls reduce electric light based on the amount of usable daylight in the space as specified.

Add new definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

DAYLIGHT RESPONSIVE CONTROL. A device or system that provides automatic control of electric light levels based on the amount of daylight in a space.

Reason: The terms “daylighting controls”, “automatic daylighting controls”, “automated daylighting controls” and “photosensor controls” are used interchangeably throughout the code but not defined. These terms are misleading because the controls they are describing do not control daylight, but rather they control electric lights in response to daylight. “Daylight responsive controls” is proposed to replace all of these terms.

The exceptions to C402.3.2.1 do not make any sense, as they are exceptions to the skylight requirement in the code, but Section C402.3.2.1 refers to daylighting controls, not skylights. The exact same list of exceptions appears under C402.3.2. We believe that including these exceptions under C402.3.2.1 was an unintentional oversight.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.3-EC-BAILEY

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The terminology in the proposal is not the same as used by NEMA.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jack Bailey, One Lux Studio, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.3 Fenestration (Prescriptive). Fenestration shall comply with Table C402.3. ~~Daylight responsive controls shall comply with this section and Section C405.2.2.3.2.~~

C402.3.1.1 Increased vertical fenestration area with daylight responsive controls. In Climate Zones I through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

2. Daylight responsive controls complying with the requirements of Section C405.2.2.3.1 are installed in daylight zones; and

C402.3.1.2 Increased skylight area with daylight responsive controls. The skylight area shall be permitted to be a maximum of 5 percent of the roof area provided daylight responsive controls complying with the requirements of Section C405.2.2.3.1 are installed in daylight zones under skylights.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: Editorial. CE139 changes the way that the envelope section of the code refers to Section C405 and CE294 changes those portions of C405 which are being referred to. This public comment puts all of the pieces together. Section number C405.2.2.3.1 is the new section "Daylight responsive control function" in CE294.

CE137-13

Final Action: AS AM AMPC ____ D

CE138-13
C402.3.1.1, C402.3.2

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

C402.3.1.1 Increased vertical fenestration area with daylighting controls. In Climate Zones 1 through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

1. No less than 50 percent of the conditioned floor area is within a daylight zone; and
2. Automatic daylighting controls are installed in daylight zones; ~~and~~
3. ~~Visible transmittance (VT) of vertical fenestration is greater than or equal to 1.1 times solar heat gain coefficient (SHGC).~~

Exception: ~~Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 3.~~

C402.3.2 Minimum skylight fenestration area. In an enclosed space greater than 10,000 square feet (929 m²), directly under a roof with ceiling heights greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, non-refrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop, the total daylight zone under skylights shall be not less than half the floor area and shall provide a minimum skylight area to daylight zone under skylights of either:

1. Not less than 3 percent ~~with a skylight VT of at least 0.40~~; or
2. Provide a minimum skylight effective aperture of at least 1 percent determined in accordance with Equation C4-1.

Reason: The purpose of the proposed code change is to eliminate potentially unnecessary and inconsistent code provisions. The proposal is intended as a clean-up companion proposal to a separate proposal that would establish minimum VT performance requirements for fenestration under the *IECC* commercial energy efficiency chapter. If the companion proposal is adopted, this proposal would be useful to delete the VT references in these code sections because they would no longer be necessary and could be confusing. For example, the minimum VT for skylights in the companion minimum VT proposal is higher than the VT specified in section C402.3.2. Similarly, the VT/SHGC ratio referenced in section C402.3.1.1 will be unnecessary if the minimum VTs are adopted as proposed in the companion proposal, since the resulting VT/SHGC ratios from the VT minimums can be expected to be substantially higher.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.3.1.1-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Consistent with the action on CE136-13, the committee disapproved this proposal.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Submitted.

Commenter's Reason: We recommend approval of CE138, as submitted. As explained in the original reason statement, CE138 eliminates language that would be unnecessary if CE136 is approved.

CE138-13

Final Action: AS AM AMPC_____ D

CE142-13

Table C402.3, C402.3.3, C402.3.3.1, Table C402.3.3.1

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov); Dr. Thomas D. Culp, Birch Point Consulting LLC, representing the Glazing Industry Code Committee and Aluminum Extruders Council (culp@birchpointconsulting.com)

Revise as follows:

**TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Vertical fenestration								
U-factor								
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
SHGC								
Orientation ^a	<u>SEW</u>	<u>N</u>	<u>SEW</u>	<u>N</u>	<u>SEW</u>	<u>N</u>	<u>SEW</u>	<u>N</u>
SHGC PF < 0.2	0.25	<u>0.33</u>	0.25	<u>0.33</u>	0.25	<u>0.33</u>	0.40	<u>0.53</u>
0.2 ≤ PF < 0.5	<u>0.30</u>	<u>0.37</u>	<u>0.30</u>	<u>0.37</u>	<u>0.30</u>	<u>0.37</u>	<u>0.48</u>	<u>0.58</u>
PF ≥ 0.5	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.64</u>	<u>0.64</u>
Skylights								
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR

NR = No requirement.

a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

C402.3.3 Maximum U-factor and SHGC. For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3, based on the window projection factor and orientation. For skylights, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3.

The window projection factor shall be determined in accordance with Equation 4-2.

$$PF = A/B \quad \text{(Equation 4-2)}$$

where:

- PF* = Projection factor (decimal).
- A* = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.
- B* = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different *PF* values, they shall each be evaluated separately.

C402.3.3.1 SHGC adjustment. Where the fenestration projection factor for a specific vertical fenestration product is greater than or equal to 0.2, the required maximum SHGC from Table C402.3 shall be adjusted by multiplying the required maximum SHGC by the multiplier specified in Table C402.3.3.1 corresponding with the orientation of the fenestration product and the projection factor.

**TABLE C402.3.3.1
SHGC ADJUSTMENT MULTIPLIERS**

PROJECTION FACTOR	ORIENTED WITHIN 45 DEGREES OF TRUE NORTH	ALL OTHER ORIENTATION
$0.2 \leq PF < 0.5$	1.1	1.2
$PF \leq 0.5$	1.2	1.6

Reason:

(Thompson): This proposal is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

This proposal moves and clarifies, but does not delete requirements that are currently contained in Section C402.3.3.1 and Table C402.3.3.1 of the 2012 IECC.

The purpose of this proposal is twofold: correct a technical error in the SHGC shading adjustment, and increase the enforceability and usability of the vertical fenestration requirements.

Technical Correction

During review of the 2012 IECC, a technical error was identified in the way the multipliers of the new Table C402.3.3.1 are applied to adjust the SHGC based on shading projections and orientation. When used, Table C402.3.3.1 illogically allows a higher SHGC on the west side of a building than on the north side. For example, with a 3 ft overhang above 6 ft tall glazing on a building in zone 3, this would require a max SHGC of 0.30 on the north where solar loads are low, yet would allow 0.40 SHGC on the west where solar impact on energy efficiency is more critical. The source of the problem is as follows. The multipliers are indirectly based on a similar SHGC adjustment in ASHRAE 90.1, which in turn was based on a technical paper using DOE2 simulations in 12 cities across various climate zones and latitudes (E.P. Kolderup and C.N. Eley Jr, "Evaluating the Impact of Overhangs and Sidescreens", ACEEE Summer Study on Energy Efficiency in Buildings, 1992). ASHRAE 90.1 determined that the multipliers could be grouped into two sets of multipliers: one for the south, east, and west (SEW) orientations, and one for the north (N) orientation. At the same time, this was meant to be used together with two sets of SHGC base criteria: one number for the overall building, and a

separate number for the north side. This recognized the difference in the solar performance of the north side, and also avoided the technical problem now identified in the 2012 IECC with how the shading adjustments are used.

This was the case in ASHRAE 90.1-2004, but unfortunately, this technical rationale may have been forgotten and both ASHRAE 90.1 and IECC have deviated from this since then. The 2009 IECC avoided the multiplication problem by simply listing the required SHGC for different shading levels (projection factor PF), but did not address the difference between north and the other sides. On the other hand, ASHRAE 90.1-2007 and 2010 kept the different shading factors for SEW and N, but dropped the different baseline SHGC for the north in an effort to simplify – and as a result, they now contain the same technical error as 2012 IECC. This proposal aims to correct the error for the IECC, and the issue will also be raised at ASHRAE 90.1.

This proposal restores the basic format of the 2009 IECC where the required SHGC is directly listed for the appropriate climate zone and projection factor, but also reinstates the different SHGC criteria for the north side. While adding some rows, this table format improves usability and enforcement by allowing the required SHGC to be simply read from the main fenestration table instead of involving a separate table and calculation. There is no change in the 2012 baseline SHGC criteria, but the SEW multipliers are applied to directly show the adjusted SHGC for different shading levels ($0.2 \leq PF < 0.5$ and $PF \geq 0.5$) for the SEW orientations. Then, matching the adjusted SHGC requirement for N and SEW orientations for this high PF well shaded window, the SHGC requirements for the north side are then calculated at $0.2 \leq PF < 0.5$ and $PF < 0.2$ using the same multipliers. This ensures consistency, corrects the technical error of requiring higher SHGC on the west than on the north, and also accounts for the different solar performance of northern orientations.

Additionally, the footnote is added to clarify what to do if located in the southern hemisphere or near the equator. The northern multipliers do not apply well between the Tropics of Cancer and Capricorn (23.5 degrees latitude), and the SEW multipliers are more appropriate for all orientations. (Think of it this way: there is no difference between north and south in terms of the sun when standing at the equator.)

Improved Usability and Enforcement

In addition to correcting the technical error, a very important aspect of this proposal is to improve usability and enforcement of the code. Concerns have been expressed about the increased complexity for enforcement with the format of the 2012 IECC, as compared to the 2009 and 2006 IECC. Rather than simply looking up the maximum SHGC for a given projection factor on the main prescriptive table, the 2012IECC forces extra unnecessary steps on the user, referring to a separate table and requiring additional calculations. This increases both the workload and potential for error in code compliance checks. This proposal simplifies the process by allowing the code official to simply look up the required SHGC on the main fenestration table, similar to the 2006 and 2009 IECC. This simplifies enforcement and compliance, makes it easy to determine the baseline value in performance path calculations, and improves overall usability of the code. Also, while SHGC requirements for the northern orientation have been added to make this section technically correct, this does not necessarily add complexity – users can still simply comply with one glass type and SHGC by meeting the main SHGC requirement for the SEW orientation (which is lower or equal to the N requirement in all cases).

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

(Culp): The purpose of this proposal is twofold: correct a technical error in the SHGC shading adjustment, and increase the enforceability and usability of the vertical fenestration requirements.

Technical Correction

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Cost Impact: The code change proposal will not increase the cost of construction. This proposal is cost neutral as it is an optional trade-off only.

C402.3T-EC-THOMPSON-SEHPCAC-CULP

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal reorganizes the code requirements into a format which should be easier to use. It improves how the code addresses north facing fenestration.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Disapproval.

Commenter's Reason: We recommend disapproval of CE142. Given the large amount of fenestration area in typical commercial buildings and their substantial internal heat loads, controlling SHGC is very important. Unfortunately, CE142 weakens and complicates the IECC SHGC requirements, which results in unnecessary backsliding and a less efficient and more difficult to enforce IECC. If changes to the provisions governing the projection factor exception are necessary, IECC's CE156 is a much better solution. Our specific concerns with CE142 include:

- **CE142 substantially weakens the efficiency requirements (SHGC) of the IECC.** In CE142, the SHGC requirements for north-oriented windows with projection factors of 0 to 0.2 are weaker in every climate zone than the current IECC. The proponent does not justify why north-facing windows in all climate zones should be permitted to have 32% higher solar heat gain and SHGC requirements than currently, or in the case of climate zones 7-8, why it is reasonable to eliminate the SHGC requirement entirely. This is not a "technical correction" as described by the proponents, but a substantial decrease in the efficiency of the IECC. While some may argue that northern SHGC is less important than other orientations, this is not a justification for reducing the current stringency of northern SHGC requirements, particularly without any showing of the need for or benefits of a reduction to requirements that have been in place many years. It should be kept in mind that "northern" orientations include northwest and northeast orientations and can get substantial sun, particularly during the summer and in the southern regions of the country. Moreover, there is a substantial potential for reflected light from other surfaces, including other buildings, making SHGC important for all commercial orientations.
- **CE142 unnecessarily complicates fenestration code compliance.** The current IECC fenestration table simply lists the SHGC requirement for each climate zone, providing clear requirements that will apply to the vast majority of buildings designed and constructed across the country. Where a design professional intends to take advantage of the exception to the SHGC requirements in Section C402.3.3.1, the section provides a simple multiplier that applies to two possible ranges of projection factor. In short, this approach significantly reduces work by the designer, builder and code official and limits the cases where projection factor must be calculated to those where the baseline SHGC is not met and there is a substantial projection.

CE142 complicates and confuses this simple requirement by including the projection factor ranges in the fenestration table, implying that a projection factor has to be calculated and that the exception applies to every fenestration product. This will cause significant confusion among design professionals and code officials in the majority of buildings where such calculations are unnecessary and the multipliers would not apply. If a design professional does not intend to use the projection factor exception to the SHGC requirement, there is no need to determine the orientation of each window (footnote a) or apply the multiple different SHGC requirements detailed in the fenestration table. It should be noted that measuring and calculating a projection factor for every window in every building and then checking such measurements and calculations to determine compliance will be daunting and time-consuming tasks, both for the code official and the builder, which will cause unnecessary enforcement headaches.

- **The approach to CE142 combines the basic SHGC requirements with the exception and reduces flexibility in the event SHGC requirements are modified in future codes.** In the current IECC, the tables are organized in a simple manner that will apply to the vast majority of buildings designed to the code. SHGC is no exception. Exceptions to the requirements (like the projection factor exception) and other trade-off methods are best detailed more fully in the sections that follow the prescriptive tables, in order to maintain clarity and usability of the code. Moreover, the current IECC projection factor multipliers will continue to work if baseline SHGC requirements are changed in the prescriptive table – under CE142 it is not clear what the new SHGC values would be if the baseline SHGC requirements change.

CE142 weakens the efficiency requirements of the 2012 IECC and adds significant unnecessary complexity to the simple fenestration table. It should be rejected.

CE142-13

Final Action: AS AM AMPC_____ D

CE143-13
C202 (NEW), Table C402.3

Proposed Change as Submitted

Proponent: Shaunna Mozingo, City of Cherry Hills Village, Colorado Code Consulting, representing self. (smozingo@coloradocode.net)

Revise as follows:

TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

Climate Zone	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Vertical Fenestration								
U-factor								
<u>Nonmetal framing (all)</u>	<u>0.50</u>	<u>0.40</u>	<u>0.35</u>	<u>0.35</u>	<u>0.32</u>	<u>0.32</u>	<u>0.29</u>	<u>0.29</u>
<u>Fixed fenestration Metal framing, fixed</u>	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29
<u>Operable fenestration Metal framing, operable</u>	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
<u>Metal framing, entrance doors</u>	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
SHGC (all frame types)								

(Portions of Table not shown remain unchanged)

Add new definitions as follows:

SECTION C202
GENERAL DEFINITIONS

FENESTRATION, METAL FRAMING. Fenestration products using metal framing with or without thermal breaks.

FENESTRATION, NONMETAL FRAMING. Fenestration products using framing materials other than metal, with or without metal reinforcement or cladding.

FENESTRATION, FIXED. Vertical fenestration other than *operable fenestration* and *entrance doors* including, but not limited to, curtain wall, storefront, window walls, fixed windows, and picture windows.

FENESTRATION, OPERABLE. Vertical fenestration that opens, except *entrance doors*.

Reason: While I understand the reason the proponent of the table change submitted it for the 2012 IECC to go from windows classified by framing type to windows classified by whether they are fixed or operable, I definitely disagreed with it then and do so even more now that I have had to work with it as a code requirement. Code users are not looking for something as simple as fixed/operable as much as they are the types of framing because that is what we use everywhere else in this code. We have been taught that there is a real difference in metal framing verses all other types of window frames, and that we need to pay attention to the U-factors we are seeing. Now when we take away that framing issue and just say fixed/operable, it looks like framing type no longer matters, so we will go back to not verifying, going backwards in compliance as well as efficiency.

In reality, what is on paper and what happens in the field are two very different things. I am very much for energy efficiency. I have been saying for years that commercial windows are the least complied with requirement of the energy code because they don't usually have the handy labels on the windows and so few take the time to verify NFRC compliant certification. Very few will hold up

a Certificate of Occupancy based on a U-Factor not being verified. I know what is being enforced in a lot of jurisdictions, and I know that if we make it sound like all windows are created equal then the code officials will go back to their way of not worrying about it, and all of our hard work on educating them will have gone out the "metal framed window". A very large number of jurisdictions across the U.S. do absolutely nothing for verifying commercial windows other than seeing that something is listed on ComCheck, and then only half of those make sure that the U-Factor on ComCheck is within in the correct range for the type of framing. Many designers put the U-Factor in as the last item on a ComCheck and put whatever value will get it to pass, knowing full well that the jurisdiction will not verify it at plan review, and if they do, it won't get verified in the field. Ask NFRC how many certificates actually get requested.

The definition of U-Factor doesn't do enough to let the user know that we are not dealing with just center of glass here. It's the entire assembly that gets calculated together to create the U-Factor for this code. The code language in Chapter 3 states that U-Factor is calculated in accordance with NFRC 100. But there are hundreds of referenced standards and testing items in the codes, and I can absolutely tell you that the code official doesn't own them all or read them all, and many will not know or understand that NFRC 100 is for the whole assembly, glass and framing. They need something simple that lets them know that the framing materials matter when it comes to U-Factor, and by taking the table and converting it from framing materials to just fixed/operable, that one piece of information went away.

The default tables in Chapter 3 are based on framing materials and we are taught to figure out what the framing material is so that we can determine a conservative U-Factor and SHGC in the absence of a label or certification. We would need to change the default tables to match the table in Chapters C and R 4 if we are going to keep this new way of determining these values. But you can see by looking in these default tables that framing does matter, and not all windows should be treated as equal.

You can absolutely get a metal framed window to meet the same U-Factor of a window of different framing; it will just cost a lot more. There are structural reasons where metal framed windows are required and in these instances we will be forcing higher costs on the owner because these metal windows will cost a lot more in order to get these lower U-Factors out of them.

What has been proposed here is not exactly the same format as 2009 IECC but is consistent with the format of ASHRAE 90.1-2013. It makes the table a little cleaner than 2009 IECC, putting some of the language in the definitions. But it also uses metal fixed and metal operable, as opposed to metal curtain wall / storefront and metal all other. The main reason ASHRAE did this was because fixed punched opening windows (e.g. strip windows and picture windows) now fall under the more stringent fixed category, as opposed to the less stringent "all other" category, which was really intended to cover operable windows.

For nonmetal U-factors, I used the 2012 residential U-factors, except there is a question about zone 7-8. The residential chapter has 0.32, but the commercial chapter has 0.29 for metal framed fixed products. I chose not to take the nonmetal values from the residential values because it would have made the nonmetal values less stringent than the metal values, which currently requires triple glazing. So I adjusted them to 0.29 on the rationale of staying at least as stringent.

Cost Impact: These glazing values are already realized in the residential portion of the code but if just dealing with commercial buildings, there will be an increase in cost for the more efficient non-metal framed windows because the values were brought up to match those in the residential section.

C402.3T-EC-MOZINGO.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was not convinced that the different framing types warranted differences in the U-factors.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shaunna Mozingo, City of Cherry Hills Village, CO, representing self; Dr. Thomas D. Culp, Birch Point Consulting, LLC, representing Aluminum Extruders Council, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

Climate Zone	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Vertical Fenestration								
U-factor								
Nonmetal framing (all)	0.50	0.40	0.35	0.35	0.32	0.32	0.29 <u>0.32</u>	0.29 <u>0.32</u>
Metal framing, fixed	0.50	0.50	0.46	0.38	0.38	0.36	0.29 <u>0.32</u>	0.29 <u>0.32</u>
Metal framing, operable	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
Metal framing, entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
SHGC (all frame types)								

(Portions of table not shown remain unchanged)

Commenter's Reason: We are asking that CE143 be approved as modified by this public comment to correct the fenestration categories in Table C402.3 and increase enforceability of the fenestration provisions. The original reason statement laid out clearly how this change is important to real-life training, enforcement, and verification of fenestration requirements in the field, helping to ensure that both code officials and designers/suppliers are using whole product performance and not making the same mistake of just using center-of-glass values, or worse, ignoring the fenestration energy requirements altogether. In addition, this proposal will make the format of the fenestration requirements consistent with the format of ASHRAE 90.1-2013, making use and enforcement of this section easier and more consistent.

Equally important, this proposal will (1) correct a decrease in energy efficiency that inadvertently occurred when the table format was changed in the last cycle, and (2) restore the distinction for different product types used in the diverse range of commercial buildings. First, when the table format was changed at the final action hearings last cycle, it was to establish much more stringent U-factors that could still be achieved by structural metal framed windows, albeit at higher cost, while simplifying the window types down to just fixed vs. operable windows. However, while this was focused on metal framed products that make up 91% of commercial fenestration because of structural and durability performance, this neglected to account for nonmetal residential-style windows that are used in multifamily and light commercial buildings that also fall under the commercial code. For those buildings that would have used these products anyway, the U-factor actually *increased* by 9 - 41% compared to the 2012 residential values (e.g. in zone 5, the U-factor was increased from 0.32 up to 0.38 for fixed windows and 0.45 for operable windows). This resulted in free trade-off credit for something that was going to be done anyway, increasing the overall energy use in these types of buildings.

Second, since first introduced by the New Buildings Institute in 2004, the commercial fenestration requirements have made a distinction between residential-style windows going into multifamily and light commercial buildings, and heavier commercial windows used for structural and durability purposes. This established a fair playing field in that the architect will select the window and framing type based on many building performance considerations, and then each category set an overall U-factor (whole assembly, with both glazing and framing) appropriate for that product type that ensures each product uses a comparable energy efficient glazing package. In other words, make each product type have to use similar energy efficiency measures (low-e, argon, better spacers, etc) to meet the requirement. However, as it stands without that distinction, the current table not only favors less structural products, but also, lighter residential-style windows can get away with a less efficient glazing package.

The 2006 and 2009 IECC used the simplest distinction – metal and nonmetal framed products. This was simple to understand and simple for code enforcement. This distinction between metal and nonmetal framing is also used in ASHRAE 90.1-2007, ASHRAE 90.1-2010, ASHRAE 90.1-2013, ASHRAE 189.1-2009, and ASHRAE 189.1-2011. This proposal will restore the

distinction and level playing field for different products while also correcting the decrease in the stringency that occurred last cycle for residential-style products.

The proposed modification is to satisfy concerns raised during the preliminary hearings that the 0.29 U-factor in zones 7-8 would be inconsistent with the residential fenestration requirements. While we believe the original proposal is still valid, this comment would address those concerns and modify the U-factor to 0.32 in zones 7-8. Not only is this now consistent with the IECC residential requirements, it is also consistent with the ASHRAE 90.1-2013 requirements for nonmetal windows (and still 8-16% more stringent than the ASHRAE 90.1-2013 requirements for metal windows).

We ask that you vote "NO" to the initial motion for disapproval, and then vote "YES" to approve CE143 as modified by this comment.

CE143-13

Final Action:

AS

AM

AMPC____

D

CE145-13
Table C402.3

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Vertical fenestration								
SHGC								
SHGC	0.25	0.25	0.25	0.40 <u>0.25</u>	0.40 <u>0.25</u>	0.40 <u>0.25</u>	0.45	0.45

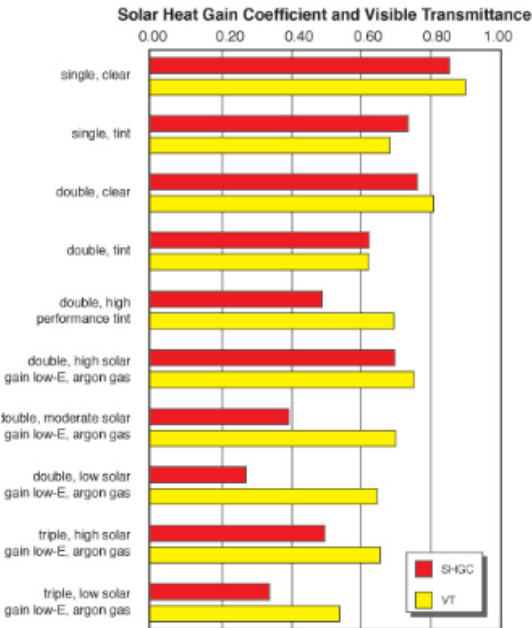
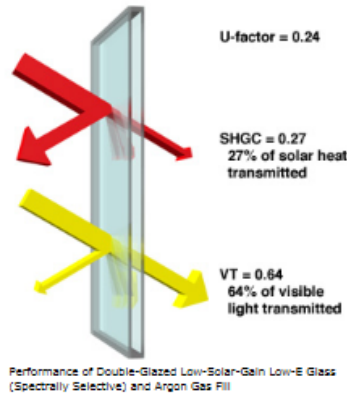
(Portions of Table not shown remain unchanged)

Reason: The purpose of the proposed code change is to strengthen the SHGC requirement for vertical fenestration in climate zones 4 - 6 from 0.40 to 0.25, thereby increasing the energy efficiency of vertical fenestration in these climates.

Low solar heat gain fenestration is even more critical for commercial buildings than residential buildings in all climate zones because commercial buildings tend to be internal heat load dominated, and require cooling during far more hours. Recognizing this fact, the code currently requires some degree of solar control in commercial buildings in all climate zones, by requiring an SHGC of 0.45 or less even in climate zones 7 - 8, 0.40 or less in climate zones 4 – 6; and 0.25 or less in climate zones 1 - 3. When the 0.40 maximum was established for climate zones 4 - 6, a consideration that may have justified the higher SHGC was the reduction in visible light that came with lower SHGC glazing at that time. However, this issue has since been addressed with the introduction of low SHGC glass with much higher visible light transmission resulting from optimizing control of solar gain outside of the visible light spectrum. As a result, lower SHGCs have already been established for homes in climate zones 1 -3 (dropping from 0.40 SHGC in the 2006 *IECC* to 0.25 in the 2012 *IECC*). A similar benefit can be captured for commercial buildings in climate zones 4 – 6 by setting the maximum SHGC at 0.25 for these climate zones. The level of solar heat gain, whether 0.40 or 0.25, is simply a choice of low-e coatings and does not involve significant increases in cost; there is no good reason not to capture the benefit of reducing the requirement to 0.25. The Efficient Windows Collaborative (“EWC”) shows how low solar gain, low U-factor and high visible light can now be achieved with improved glazings (see the graphic from their website below; note that these are glass-only values; since NFRC ratings also factor in frames, the reported SHGC and VT can be expected to be at least 10% lower):

Benefits: Increased Light & View

Daylight and view are two of the fundamental attributes of a window. Unfortunately, windows can also be the source of significant solar heat gain during times when it is unwanted. Traditional solutions to reducing solar heat gain such as tinted glazing or shades mean that the amount of light is reduced as well. New glazings with low-solar-gain Low-E (spectrally selective) coatings can provide better solar heat gain reduction than tinted glass, with a minimal loss of visible light. This also means that views can be clearer and unobstructed.



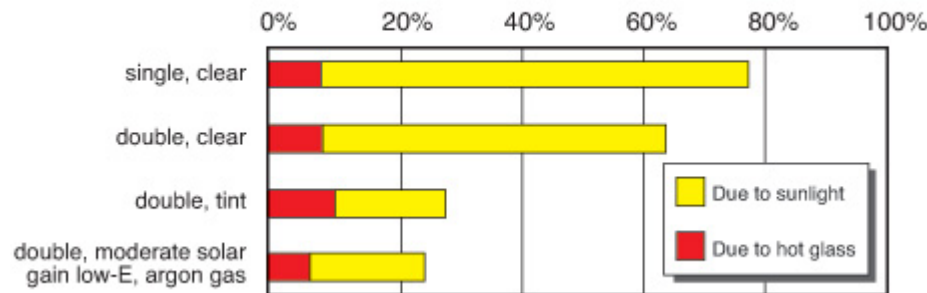
Note: All values are for glass only without frame. Source: Residential Windows by Carmody, Seikowitz, Arasteh and Heschong.

It is well documented that buildings (which account for over 70% of the electricity used in the United States) have the greatest potential for reducing both energy use and particularly peak electricity use. Peak electricity use is driven by air conditioning load, which is, in large part, driven by summer solar gain. Lower SHGC windows will translate into substantial energy cost savings for building owners and a reduced need for utilities to build additional peak generating plants. For example, based on US DOE's EnergyPlus office reference buildings and an assumption of 30% fenestration area, we estimate a net energy savings (heating, cooling and hot water) for this proposed reduction in maximum SHGC to 0.25 ranging between 2% and 5% depending on the climate zone.

In addition, lower SHGCs will result in smaller cooling equipment for such buildings, easily offsetting any cost increase, thereby reducing first cost as well. Reducing SHGC will provide savings to all consumers, and not just the owners or operators of buildings. Lower SHGCs also produce increased summer comfort, as also illustrated by the EWC on its website. According to EWC:

In summer, strong direct sunlight strikes people and interior surfaces, creating overheating and discomfort. Windows with low solar heat gain coefficients will reduce the solar radiation coming through the glass and associated discomfort. Low solar heat gain low-E glass (spectrally selective) reduces heat gain while still providing sufficient light and view.

Probability of Discomfort



Source: Lawrence Berkeley National Laboratory (Lyons and Arasteh).

For all of these reasons, reducing the SHGC prescriptive requirement to 0.25 in climate zones 4 – 6 is justified in order to reduce energy use and electrical peak demand in commercial buildings.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: : The proposal represents a huge change in stringency, The SHGC values are even lower than ASHRAE 90.1. While 0.25 may be cost effective for some buildings, the committee questioned the application to smaller commercial buildings and to residential buildings covered by this part of the code. The committee found the proposal unacceptable.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Vertical fenestration								
SHGC								
SHGC	0.25	0.25	0.25	0.25	0.25 0.30	0.25 0.30	0.45	0.45

Commenter’s Reason: We recommend approval of CE145 as modified. Better controlling SHGC in commercial buildings in climate zones 4 – 6 will result in substantial energy, peak demand and cost savings, as well as other potential societal benefits.

The committee recognized potential energy savings, but stated, “While 0.25 may be cost effective for some buildings, the committee questioned the application to smaller commercial buildings and to residential buildings covered by this part of the code.” In response to this concern, ICF International has conducted additional analyses of smaller commercial buildings and also residential buildings covered under this code. The ICF analysis does include both small commercial buildings and residential building types questioned by the committee and shows energy savings in all climate zones.

First, it should be noted that cost effectiveness is not a significant issue related to SHGC choice – any cost difference for glass with SHGC values between 0.40 and 0.25 would be very small – the only difference necessary between a 0.40, 0.35, 0.30 and 0.25 SHGC rating in commercial fenestration is the specific type of low-e coating selected. It should also be noted that glass designed to produce SHGCs as low as 0.25 today can also provide substantial light transmission as the glass has been carefully designed to prevent transmission of non-visible solar gain while maintaining reasonable visible light. Moreover, since reductions to SHGC substantially reduce cooling load, which results in smaller capacity and lower cost cooling equipment, we would expect that lower SHGC glazing is cost-beneficial based on reduced equipment cost alone.

Second, as to energy savings, we have found that when including all of the major commercial building types in the analysis, there are substantial energy savings by reducing the SHGC in all of these climate zones. The savings do drop somewhat as we move northward reflecting the balance between heating and cooling energy. In addition, in climate zones Marine 4, 5 and 6, the energy savings level off around 0.30 SHGC. As a result, we have developed the proposed modification, making the maximum SHGC 0.30 in climate zones Marine 4, 5 and 6 and 0.25 in climate zone 4. We estimate that this modified proposal will save roughly 2% energy across these climate zones based on our updated analysis. While we continue to support adopting the proposal as submitted, given the other potential benefits from a lower SHGC, we also believe that the proposed modification is a reasonable alternative.

SHGC reductions produce more than simply energy savings. Solar heat gain is a major driver of cooling load in buildings. Cooling load drives larger building cooling systems and electric utility peak demands, as most utilities even in northern US climates, are summer-peaking. By producing lower peak demands, lower SHGC fenestration creates other societal energy-related benefits

such as reduced impact on the electric grid, reduced need to build more power plants and expanded transmission grids, and reduced on-peak electric prices.

CE145-13

Final Action:

AS

AM

AMPC_____

D

CE149-13
C402.3.2

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.3.2 Minimum skylight fenestration area. In an enclosed space greater than 10,000 square feet (929 m²) in floor area directly under a roof with a not less than 75 percent of ceiling area with heights greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, non-refrigerated warehouse, retail store, distribution/sorting area, transportation depot, or workshop, the total daylight zone under skylights shall be not less than half the floor area and shall provide a minimum skylight area to daylight zone under skylights of either

1. ~~A minimum skylight area to daylight zone under skylights of not less than 3 percent with a skylight where all skylights have a~~ VT of at least 0.40 when tested in accordance with NFRC 202, or
2. ~~A provide~~ minimum skylight effective aperture of at least 1 percent as determined in accordance with Equation 4-1.

$$\text{Skylight Effective Aperature} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Daylight zone under skylight}} \quad \text{(Equation 4-1)}$$

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above daylight zones of enclosed spaces are not required in:

1. Buildings in climate zones 6 through 8.
2. Spaces where the designed *general lighting* power densities are less than 0.5 W/ft² (5.4 W/m²).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on at least half of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 am and 4 pm.
4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.

Reason: This proposal clarifies the language pertaining to requiring skylights in roofs covering areas greater than 10,000 ft². The objective of this proposal is to clarify the code to foster implementation and compliance verification.

By definition skylights are fenestration such that the use of the term fenestration with skylights is redundant. The intent is to address ceilings with variable heights and the proposed revision does that by indicating the requirement applies when more than 75% of ceiling area is above 15 feet. Some of the subject spaces referenced are not technically spaces or areas so the language has been enhanced to convey the intent. Simplification is achieved by making items 1 and 2 parallel construction with reference to the lighting section. While VT is defined, there is no referenced test method. NFRC 202 provides a uniform test method by which VT can be objectively determined and should be referenced to enhance uniformity of application and implementation of and compliance verification with the code.

Cost Impact: The code change proposal will not increase the cost of construction. There is no cost impact associated with this proposed change because the current code requires daylighting control.

C402.3.2 #2-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proponent was not sure that NFRC 202 was the appropriate standard to be referenced. The testimony indicated that this standard referenced did not address domed skylights that are commonly used in commercial applications.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.3.2 Minimum skylight area. In an enclosed space greater than 10,000 square feet (929 m²) in floor area directly under a roof with a not less than 75 percent of ~~the~~ ceiling area with ~~a ceiling height~~ heights greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage space, gymnasium/exercise center, convention center, automotive service area, space where manufacturing occurs, non-refrigerated warehouse, retail store, distribution/sorting area, transportation depot, or workshop, the total daylight zone under skylights shall be not less than half the floor area and shall provide either

1. A minimum skylight area to daylight zone under skylights of not less than 3 percent where all skylights have a VT of at least 0.40 ~~when tested in accordance with NFRC 202~~ as determined in accordance with Section C303.1.3, or
2. A minimum skylight effective aperture of at least 1 percent as determined in accordance with Equation 4-1.

Commenter's Reason: At the code development hearing, only one issue was raised in opposition to the code change proposal. Specifically the reference to NFRC 202 that is appropriate for flat panel skylights only. This could result in confusion as to what to do for plastic domed skylights when determining the VT of such products, since there is no reference standard for those skylights. There was no intent to omit any skylight type, and it is recognized that all skylights need to have a means for determining VT.

A further review of that comment and the code suggests that the issue of testing standards for fenestration products such as skylights is covered in Section C 303.1.3 (fenestration product rating). So, the basis for measuring and expressing VT is already covered in the code and need not be addressed in this section of the code. The code change proposal is further modified in this public comment by simply referring to Section C303.1.3 where the basis for VT is covered either through testing or use of a default table. There was no opposition to the other portions of the change, all of which were focused on clarification and simplification of the code provisions and are not proposed for further modification in this public comment.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE149-13

Final Action:

AS

AM

AMPC_____

D

CE152-13
C402.3.3 (NEW)

Proposed Change as Submitted

Proponent: Dr. Thomas D. Culp, Birch Point Consulting LLC, representing the Glazing Industry Code Committee (culp@birchpointconsulting.com)

Add new text as follows:

C402.3.3 Daylight zones. In buildings not greater than two stories above grade plane, not less than 10 percent of the net floor area shall be located within a daylight zone. In buildings three or more stories above grade plane, not less than 5 percent of the net floor area shall be located within a daylight zone.

Exception: Daylighting in accordance with this section is not required in the following spaces:

1. Auditoriums, places of religious worship, theaters, museums, mercantile occupancies with less than 10,000 square feet of net floor area, and refrigerated warehouses.
2. Existing buildings undergoing alteration, repair, relocation, or a change of occupancy.
3. Buildings where the total daylight potential (TDP) calculated in accordance with Section 808.3 of the International Green Construction Code is less than 0.5.

Reason: This proposal would require a minimum daylight area similar in concept to the 2012 International Green Construction Code, but at much less aggressive level (only 1/5 of the IgCC) and with a simplified approach. For comparison, the IgCC requires 50% of the net floor area to be in daylight zones for 1-2 story buildings, and 25% for 3+ story buildings. On the other hand, this proposal is meant to only be a simple base level requirement to ensure that building designers address daylighting and glazing layout, while being easy enough to provide flexibility for different space and building types, and not require any gross changes in building geometry. Exceptions are included for spaces where daylighting would interfere with the function of the space, provide little benefit, or not be feasible.

Cost Impact: This proposal will not increase the cost of construction for most buildings and will help improve layout and use of glazing that would have been installed anyway, but this will increase the cost of construction in some buildings where there would have been insufficient fenestration and daylighting.

C402.3.3 (NEW)-EC-CULP.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that the exceptions were not adequate and that there were unintended consequences from this proposal. For example one would not want to daylight a movie studio. Requiring daylighting in residential buildings would be problematic.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Dr. Thomas C. Culp, Birch Point Consulting LLC, representing Glazing Industry Code Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.3.1.1 Increased vertical fenestration area with daylighting controls. In Climate Zones 1 through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

1. ~~In buildings not greater than two stories above grade, not less than 50 percent of the conditioned net floor area is within a daylight zone; In buildings three or more stories above grade, not less than 25 percent of the net floor area is within a daylight zone;~~
2. Automatic daylighting controls are installed in daylight zones; and
3. Visible transmittance (VT) of vertical fenestration is greater than or equal to 1.1 times solar heat gain coefficient (SHGC).

Exception: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 3.

~~**C402.3.3 Daylight zones.** In buildings not greater than two stories above grade plane, not less than 10 percent of the net floor area shall be located within a daylight zone. In buildings three or more stories above grade plane, not less than 5 percent of the net floor area shall be located within a daylight zone.~~

~~**Exception:** Daylighting in accordance with this section is not required in the following spaces:~~

- ~~1. Auditoriums, places of religious worship, theaters, museums, mercantile occupancies with less than 10,000 square feet of net floor area, and refrigerated warehouses.~~
- ~~2. Existing buildings undergoing alteration, repair, relocation, or a change of occupancy.~~
- ~~3. Buildings where the total daylight potential (TDP) calculated in accordance with Section 808.3 of the *International Green Construction Code* is less than 0.5.~~

Section C202 Definitions:

FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

Commenter's Reason: The original purpose of CE152 was to require a minimum amount of daylight zones similar to the 2012 *International Green Construction Code*, but at a much lower level (only 1/5th of the IgCC requirement) in recognition of the IECC being a base energy code. Nonetheless, while many expressed support for the concept, the committee felt that *requiring* a minimum amount of daylight zones was too aggressive for the IECC at this time, and even with the exceptions, it would be difficult to apply to every building type covered by the code.

Therefore, this public comment modifies the proposal based on the committee feedback to increase the incentive for daylight zones without making it a requirement, while at the same time correcting section C402.3.1.1 to be more consistent with the IgCC. It moves the requirement that a minimum percentage of the floor area be within a daylight zone to the optional path of section C402.3.1.1, which provides an incentive allowing increased window area as long as the minimum daylight zones are provided, along with automatic daylighting controls and certain glazing properties.

When first written as a requirement, the original proposal set the minimum daylight zones at 1/5 of that required by the IgCC. Since this is now written as an optional incentive, it is appropriate to set the level higher, and we have chosen to use the same levels required by the IgCC: 50% of the net floor area for 1-2 story buildings, and 25% of the net floor area in higher buildings. Note that this also corrects the current language of section C402.3.1.1 to be consistent with the IgCC, including adding the definition of net floor area consistent with the IgCC and IBC. In the time after approval of the 2012 IECC and during development of the 2012 IgCC, it was noted that it is much more difficult to achieve the 50% daylight area in the more constrained floor plates of taller buildings, so 25% was used for buildings 3 stories and up. It doesn't make sense for this part of the IECC to be more restrictive than the IgCC, so this proposed modification serves both purposes of turning the original proposal from a requirement into an incentive for designers to increase daylight zones, while also making this subsection more consistent with the IgCC.

We ask that you vote "NO" on the initial motion for disapproval, and then vote "YES" to approve CE152 as modified by this comment.

CE152-13

Final Action: AS AM AMPC _____ D

CE153-13
C402.3.2.2

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.3.2.2 Haze factor. Skylights in office, storage, automotive, service, manufacturing, non-refrigerated warehouse, retail store and distribution/sorting area spaces shall have a glazing materials or diffuser with a ~~measured~~ haze factor greater than 90 percent when tested in accordance with Procedure A of ASTM D 1003.

Exception: Skylights ~~designed~~ installed to exclude direct sunlight entering the occupied space by use of fixed or automated baffles, or the geometry of skylight and light well ~~need not comply with Section C402.3.2.2.~~

Reason: This proposal clarifies the testing requirements for fenestration haze factor to reference Procedure A of ASTM D 1003 or other ASTM standards as applicable.

The requirement for testing in the code eliminates the need to use the term “measured,” and could provide additional confusion should a user of the code interpret that as allowing post-installation measurement of haze factor in accordance with the standard. ASTM D 1003 has multiple procedures. Procedure A (hazemeter) test values are normally slightly higher and less variable than Procedure B (spectrophotometer) test values. Where the code indicates a singular criterion (90%) a singular test procedure should be specifically referenced. If there are two test procedures that yield different results for the same metric then the code should provide a separate criterion for each procedure (e.g. 90% when tested per procedure A and a TBD equivalent percentage when tested per procedure B). Also replacing “designed” with “installed” provides clarification as a skylight can be “designed” in the factory where the installation conditions in the exception may not be known. Those conditions are related to the installation of the skylight within the building and are more appropriately referenced in the code.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.3.2.2-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was concerned that the proposal limited the testing to one procedure. Testimony had identified the potential applicability of more than one procedure.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.3.2.2 Haze factor. Skylights in office, storage, automotive service, manufacturing, non-refrigerated warehouse, retail store and distribution/sorting area spaces shall have a glazing materials or diffuser with a haze factor greater than 90 percent when tested in accordance with Procedure A of ASTM D 1003.

Exception: Skylights designed and installed in such a manner as to exclude direct sunlight entering the occupied space by use of fixed or automated baffles, or the geometry of the skylight and light well.

Commenter's Reason: At the code development hearing, there were two issues raised in opposition to the code change proposal. One proposed a floor modification to retain the word 'designed' in the exception, and that floor modification was approved for consideration. The other concern raised was with limiting the determination of haze factor to only Procedure A of ASTM D1003. Testimony mentioned the difference between Procedure A and Procedure B, and that those skylights that had been tested to Procedure B would have to be re-tested.

Procedure A and B differ with respect to how the light is transmitted through the sample. Procedure A directly transmits the light beam through the sample into a reflecting integrating sphere and measures light transmission. Procedure B is reversed, where the light is reflected into an integrating sphere and then transmitted through the sample. Procedure A provides results that are less variable than those obtained through Procedure B. The difference between procedure A and B is also due to the different equipment and manufacturers of the equipment used with each.

In the original proposal, DOE expressed the view that if there is a singular criterion that must be satisfied (in this case haze factor), the allowance for two separate procedures to determine haze factor that would not yield the exact same results. DOE felt that this created two paths to compliance, with an increased likelihood that the path of least resistance would be taken. However, DOE understands the challenges associated with re-testing of products. This public comment addresses that issue by not calling out either procedure in ASTM D 1003, but retains the remainder of the code change proposal as editorially enhanced, and includes the floor amendment that was accepted at the code development hearing.

Note that CE154-13 was recommended for approval as submitted and the modifications contained in this public comment do not conflict with CE154-13 and would be readily additive with that change.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE153-13

Final Action: AS AM AMPC____ D

CE156-13
C402.3.3, C402.3.3.1

Proposed Change as Submitted

Proponent: Brian Dean, ICF International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

C402.3.3 Maximum U-factor and SHGC. For vertical fenestration, the maximum U-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3, based on the climate zone, type of vertical fenestration and, for SHGC, adjusted where necessary for window projection factor. For skylights, the maximum U-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3 by climate zone.

~~The window projection factor shall be determined in accordance with Equation C4-2.~~

~~PF = A/B~~ **(Equation C4-2)**

~~where:~~

~~PF = Projection factor (decimal).~~

~~A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.~~

~~B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.~~

~~Where different windows or glass doors have different PF values, they shall each be evaluated separately.~~

C402.3.3.1 SHGC adjustment. Where the fenestration projection factor for a specific vertical fenestration product is greater than or equal to 0.2, the ~~required~~ maximum SHGC from Table C402.3 shall be adjusted by multiplying the required maximum SHGC by the adjustment multiplier specified in Table C402.3.3.1 corresponding with the orientation of the fenestration product and the projection factor for each fenestration product.

TABLE C402.3.3.1
SHGC ADJUSTMENT FOR PROJECTION FACTOR MULTIPLIERS

PROJECTION FACTOR	ORIENTED WITHIN 45 DEGREES OF TRUE NORTH SHGC ADJUSTMENT MULTIPLIER	ALL OTHER ORIENTATION
0.2 ≤ PF < 0.5	1.1 <u>1.2</u>	1.1 <u>1.2</u>
PF ≥ 0.5	1.1 <u>1.6</u>	1.1 <u>1.6</u>

The projection factor for each vertical fenestration product shall be determined in accordance with Equation C4-2.

PF = A/B **(Equation C4-2)**

where:

PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF values, they shall each be evaluated separately.

Reason: The purpose of this proposal is to simplify and improve the code in how it addresses the prescriptive U-factor and SHGC requirements for fenestration and the effects of projection factor by:

- cleaning up, clarifying and making the language more specific;
- moving the projection factor methodology and equation to a more appropriate place in the IECC (in the section that establishes an adjustment for projection factor);
- eliminating the need to calculate the projection factor for each window for buildings with little (<0.20) or no projection factor and which do not qualify for an SHGC adjustment; and
- applying a uniform projection factor multiplier to SHGC requirements, regardless of the orientation of the fenestration.

The current IECC applies a different SHGC multiplier to fenestration oriented within 45 degrees of true north as opposed to all other fenestration. While the multipliers yield mathematically correct results based on the current approach in *ASHRAE 90.1*, some code users have expressed concern that windows facing north should not be required to meet a lower SHGC number than windows facing other directions. This proposal eliminates this concern, while simplifying the code, by moving to a single multiplier for all orientations. At the same time, by retaining the multiplier approach, this proposal allows for an automatic adjustment in the event the underlying SHGC values are modified in the future.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.3.3-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Consistent with previous actions on proposals related to fenestration U-factors and SHGC adjustment factors.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brian Dean, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Bill Prindle, representing the Energy Efficient Codes Coalition; Garrett Stone, Brickfield, Burchette, Ritts & Stone, PC; Donald J. Vigneau, Northeast Energy Efficiency Partnerships Inc., request Approval as Submitted.

Commenter's Reason: We recommend approval of CE156, as submitted. This proposal should be approved for the reasons outlined in the original reason statement. While the current language in the code is adequate and much better than CE142, which

also addresses projection factor, CE156 is an improvement over both. CE156 is a simpler and less confusing solution to calculating projection factor adjustments, and unlike CE142, CE156 does not weaken the baseline efficiency of the 2012 IECC.

CE156-13

Final Action: AS AM AMPC____ D

CE161-13, Part I

C402.3.3.5, R402.3.2 (IRC N1102.3.2)

Proposed Change as Submitted

Proponent: Dr. Helen Sanders, SAGE Electrochromics Inc. (helen.sanders@sageglass.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C402.3.3.5 Dynamic glazing. ~~For compliance with Section C402.3.3, the SHGC for *dynamic glazing* shall be determined using the manufacturer's lowest rated SHGC, and the VT/SHGC ratio shall be determined using the maximum VT and maximum SHGC. *Dynamic glazing* shall be permitted to satisfy the SHGC and VT requirements of Table C402.3 and Section C402.3.1.1 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 3, and the *dynamic glazing* is automatically controlled to modulate the amount of solar gain into the space in multiple steps. *Dynamic glazing* shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not *dynamic glazing* shall not be permitted.~~

Reason: (Part I) Last cycle, the commercial IECC clarified how to deal with code compliance for dynamic glazing, and dynamic glazing is also now addressed in the IgCC, ASHRAE 90.1, ASHRAE 189.1, and the new 2013 California Title 24 standards. This was important in that dynamic glazing offers the unique ability to reversibly change properties such as SHGC and VT to optimize energy performance, daylighting, and glare based on changing situations during the day, and over different seasons. As such, dynamic glazing represents a key technology on the route to zero energy buildings, and has been strongly supported by the U.S. Department of Energy, Lawrence Berkeley National Laboratory, and the National Renewable Energy Laboratory.

However, to provide additional assurances that the dynamic glazing delivers the maximum energy savings, this proposal strengthens the requirement by only allowing compliance if the dynamic glazing has a certain dynamic range (ratio of the high to low SHGC greater than 3) and is automatically controlled in multiple steps. The minimum dynamic range prevents a loophole for products claiming dynamic properties that do not really have a significant energy impact. Also, with a minimum SHGC dynamic ratio of 3, the current language about using the lowest rated SHGC for compliance is no longer needed ... the highest SHGC in any double glazing is perhaps 0.60, so the lowest SHGC would have to be < 0.20, which is already lower than the lowest 0.25 SHGC requirement. Furthermore, although the dynamic range is specified as a SHGC ratio, this also ensures a good dynamic range for VT, which will be higher than the SHGC ratio. (Typical products commonly have SHGC range from <0.10 to >0.40, and VT range from <0.04 to >0.50.)

Finally, the dynamic glazing must be properly controlled in order to optimize energy performance. Dynamic glazing is almost always already sold as a system integrated with automatic controls, but this proposal clarifies that the dynamic glazing must be automatically controlled in multiple steps, and not rely on manual adjustment by occupants.

(Part II) Dynamic glazing is currently defined and addressed in the commercial IECC, as well as the IgCC, ASHRAE 90.1, ASHRAE 189.1, and the new 2013 California Title 24 standards. However, the residential IECC does not currently address how to deal with compliance of dynamic glazing. Dynamic glazing is unique in that it has the ability to reversibly change properties such as SHGC and VT. This allows the glazing to be controlled optimize energy performance, daylighting, and glare based on changing situations during the day, and over different seasons. For example, unlike traditional glazing with fixed properties, dynamic glazing can be operated in a lower SHGC state during summer to reduce cooling loads, and a higher SHGC state during winter to reduce heating loads.

As such, dynamic glazing represents a key technology on the route to zero energy buildings, and has been strongly supported by the U.S. Department of Energy, Lawrence Berkeley National Laboratory, and the National Renewable Energy Laboratory. Dynamic glazing has been available on the market for 10 years now, and manufacturing expansions have come on line in 2012 to provide larger pane sizes at higher volumes and lower prices to allow broader application. Not only should its use be encouraged, but barriers to its use must be removed. Specifically, the NFRC label for dynamic glazing which has been in place for a number of years, lists two values for SHGC, representing the range over which the SHGC varies. It is not clear how this label should be used to determine compliance with maximum or minimum SHGC requirements, and direction must be given to aid enforcement by the building code official.

Because of the ability of dynamic glazing to optimize solar gain and energy efficiency, the commercial IECC already allows compliance with SHGC requirements by simply saying to use the lower labeled SHGC value, and to treat dynamic glazing separately from other fenestration in the building (no mixing in area-weighted averages). To provide additional assurances of proper performance, this proposal provides a stronger requirement by only allowing compliance if the dynamic glazing has a certain dynamic range (ratio of the high to low SHGC greater than 3) and is automatically controlled in multiple steps. First, the minimum

dynamic range prevents a loophole for products claiming dynamic properties that do not really have a significant energy impact. The minimum SHGC dynamic ratio of 3 will also more than ensure compliance with the lowest rated SHGC ... the highest SHGC in any double glazing is perhaps 0.60, so the lowest SHGC would have to be < 0.20, which is already lower than the lowest 0.25 SHGC requirement. (In practice, typical products commonly have SHGC range from <0.10 to 0.40.) Second, the dynamic glazing must be properly controlled in order to optimize energy performance. Automatic controls are especially important in a residential home or apartment, where the occupant may not be home to manually adjust the glazing. A separate proposal is also being submitted to the commercial IECC to strengthen those requirements in a similar manner.

References:

1. "Window Systems for High-Performance Buildings" by Carmody, Selkowitz, Lee, Arasteh, Willmert, 2004, pages 94-100.
2. Lawrence Berkeley National Laboratory – Paper 50502
"High Performance Commercial Building Facades" by Lee, Selkowitz, Bazjanac, Inkarojrit, and Kohler, 2002. See especially p. 28. http://windows.lbl.gov/comm_perf/Electrochromic/refs/LBNL-50502.pdf
3. Lawrence Berkeley National Laboratory – Paper 54924
"Daylighting control performance of a thin-film ceramic electrochromic window: field study results" by Lee, DiBartolomeo, Selkowitz, 2005. http://windows.lbl.gov/comm_perf/Electrochromic/refs/LBNL-54924.pdf

Cost Impact: The code change proposal will not increase the cost of construction. The large majority of dynamic glazing is already sold with automatic control systems.

CE161-C402.3.3.5-EC-SANDERS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Submitted

Committee Reason: The proposal clarifies the intent of dynamic glazing. Approval is consistent with action by Residential Energy Code Development Committee to approve Part II of this item.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Dr. Helen Sanders, SAGE EElectrochromics Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.3.3.5 Dynamic glazing. *Dynamic glazing* shall be permitted to satisfy the SHGC and VT requirements of Section Table C402.3 and Section C402.3.1.4 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 3 2.4, and the *dynamic glazing* is automatically controlled to modulate the amount of solar gain into the space in multiple steps. *Dynamic glazing* shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not *dynamic glazing* shall not be permitted.

Exception: *Dynamic glazing* is not required to comply with this section when both the lower and higher labeled SHGC already comply with the requirements of Table C402.3.

Commenter's Reason: CE161 parts 1 and 2 were both unanimously recommended for approval by the commercial and residential energy code committees, respectively. This public comment simply builds upon that by making a few corrections / clarifications that were noticed during the public comment period:

1. Section numbers were corrected. In part 1, it is more correct to reference Section C402.3 instead of just Table C402.3, so that it also covers when VT is needed in subsections C402.3.1.1 and C402.3.2. In part 2, this is simply an editorial correction to the correct table number.

2. The ratio of higher to lower labeled SHGC was adjusted to 2.4 to account for the full range of window product categories and frame-to-glass ratios at NFRC standard sizes, and to ensure other dynamic glazing products are not inadvertently excluded.
3. The exception was added to clarify that a product whose full range already complies with Table R402.1.1 does not need to comply with the extra requirements of this section such as automatic control, since it is already in compliance just like a normal window.

Dynamic glazing is an important energy savings technology that has been available for 10 years and will be in even wider use during the time period when this code is adopted and enforced, so it is important to address it properly in the energy code. We ask you to please vote to approve CE161 parts 1 and 2 as modified by this comment.

CE161-13, Part I

Final Action: AS AM AMPC_____ D

CE161-13, Part II C402.3.3.5, R402.3.2 (IRC N1102.3.2)

Proposed Change as Submitted

Proponent: Dr. Helen Sanders, SAGE Electrochromics Inc. (helen.sanders@sageglass.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R402.3.2 (N1102.3.2) Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Dynamic glazing shall be permitted to satisfy the SHGC requirements of Table R402.3.3 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 3, and the dynamic glazing is automatically controlled to modulate the amount of solar gain into the space in multiple steps. Dynamic glazing shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall not be permitted.

Reason: (Part I) Last cycle, the commercial IECC clarified how to deal with code compliance for dynamic glazing, and dynamic glazing is also now addressed in the IgCC, ASHRAE 90.1, ASHRAE 189.1, and the new 2013 California Title 24 standards. This was important in that dynamic glazing offers the unique ability to reversibly change properties such as SHGC and VT to optimize energy performance, daylighting, and glare based on changing situations during the day, and over different seasons. As such, dynamic glazing represents a key technology on the route to zero energy buildings, and has been strongly supported by the U.S. Department of Energy, Lawrence Berkeley National Laboratory, and the National Renewable Energy Laboratory.

However, to provide additional assurances that the dynamic glazing delivers the maximum energy savings, this proposal strengthens the requirement by only allowing compliance if the dynamic glazing has a certain dynamic range (ratio of the high to low SHGC greater than 3) and is automatically controlled in multiple steps. The minimum dynamic range prevents a loophole for products claiming dynamic properties that do not really have a significant energy impact. Also, with a minimum SHGC dynamic ratio of 3, the current language about using the lowest rated SHGC for compliance is no longer needed ... the highest SHGC in any double glazing is perhaps 0.60, so the lowest SHGC would have to be < 0.20, which is already lower than the lowest 0.25 SHGC requirement. Furthermore, although the dynamic range is specified as a SHGC ratio, this also ensures a good dynamic range for VT, which will be higher than the SHGC ratio. (Typical products commonly have SHGC range from <0.10 to >0.40, and VT range from <0.04 to >0.50.)

Finally, the dynamic glazing must be properly controlled in order to optimize energy performance. Dynamic glazing is almost always already sold as a system integrated with automatic controls, but this proposal clarifies that the dynamic glazing must be automatically controlled in multiple steps, and not rely on manual adjustment by occupants.

(Part II) Dynamic glazing is currently defined and addressed in the commercial IECC, as well as the IgCC, ASHRAE 90.1, ASHRAE 189.1, and the new 2013 California Title 24 standards. However, the residential IECC does not currently address how to deal with compliance of dynamic glazing. Dynamic glazing is unique in that it has the ability to reversibly change properties such as SHGC and VT. This allows the glazing to be controlled optimize energy performance, daylighting, and glare based on changing situations during the day, and over different seasons. For example, unlike traditional glazing with fixed properties, dynamic glazing can be operated in a lower SHGC state during summer to reduce cooling loads, and a higher SHGC state during winter to reduce heating loads.

As such, dynamic glazing represents a key technology on the route to zero energy buildings, and has been strongly supported by the U.S. Department of Energy, Lawrence Berkeley National Laboratory, and the National Renewable Energy Laboratory. Dynamic glazing has been available on the market for 10 years now, and manufacturing expansions have come on line in 2012 to provide larger pane sizes at higher volumes and lower prices to allow broader application. Not only should its use be encouraged, but barriers to its use must be removed. Specifically, the NFRC label for dynamic glazing which has been in place for a number of years, lists two values for SHGC, representing the range over which the SHGC varies. It is not clear how this label should be used to determine compliance with maximum or minimum SHGC requirements, and direction must be given to aid enforcement by the building code official.

Because of the ability of dynamic glazing to optimize solar gain and energy efficiency, the commercial IECC already allows compliance with SHGC requirements by simply saying to use the lower labeled SHGC value, and to treat dynamic glazing separately from other fenestration in the building (no mixing in area-weighted averages). To provide additional assurances of proper performance, this proposal provides a stronger requirement by only allowing compliance if the dynamic glazing has a certain dynamic range (ratio of the high to low SHGC greater than 3) and is automatically controlled in multiple steps. First, the minimum

dynamic range prevents a loophole for products claiming dynamic properties that do not really have a significant energy impact. The minimum SHGC dynamic ratio of 3 will also more than ensure compliance with the lowest rated SHGC ... the highest SHGC in any double glazing is perhaps 0.60, so the lowest SHGC would have to be < 0.20, which is already lower than the lowest 0.25 SHGC requirement. (In practice, typical products commonly have SHGC range from <0.10 to 0.40.) Second, the dynamic glazing must be properly controlled in order to optimize energy performance. Automatic controls are especially important in a residential home or apartment, where the occupant may not be home to manually adjust the glazing. A separate proposal is also being submitted to the commercial IECC to strengthen those requirements in a similar manner.

References:

1. "Window Systems for High-Performance Buildings" by Carmody, Selkowitz, Lee, Arasteh, Willmert, 2004, pages 94-100.
2. Lawrence Berkeley National Laboratory – Paper 50502
"High Performance Commercial Building Facades" by Lee, Selkowitz, Bazjanac, Inkarojrit, and Kohler, 2002. See especially p. 28. http://windows.lbl.gov/comm_perf/Electrochromic/refs/LBNL-50502.pdf
3. Lawrence Berkeley National Laboratory – Paper 54924
"Daylighting control performance of a thin-film ceramic electrochromic window: field study results" by Lee, DiBartolomeo, Selkowitz, 2005. http://windows.lbl.gov/comm_perf/Electrochromic/refs/LBNL-54924.pdf

Cost Impact: The code change proposal will not increase the cost of construction. The large majority of dynamic glazing is already sold with automatic control systems.

CE161-C402.3.3.5-EC-SANDERS.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: This is a proven technology that provides flexibility for achieving energy savings in the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Dr. Helen Sanders, SAGE Electrochromics, Inc., requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R402.3.2 (N1102.3.2) Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Dynamic glazing shall be permitted to satisfy the SHGC requirements of Table R402.3.3 R402.1.1 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 3 2.4, and the *dynamic glazing* is automatically controlled to modulate the amount of solar gain into the space in multiple steps. *Dynamic glazing* shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall not be permitted.

Exception: *Dynamic glazing* is not required to comply with this section when both the lower and higher labeled SHGC already comply with the requirements of Table R402.1.1.

Commenter's Reason: CE161 parts 1 and 2 were both unanimously recommended for approval by the commercial and residential energy code committees, respectively. This public comment simply builds upon that by making a few corrections / clarifications that were noticed during the public comment period:

1. Section numbers were corrected. In part 1, it is more correct to reference Section C402.3 instead of just Table C402.3, so that it also covers when VT is needed in subsections C402.3.1.1 and C402.3.2. In part 2, this is simply an editorial correction to the correct table number.

2. The ratio of higher to lower labeled SHGC was adjusted to 2.4 to account for the full range of window product categories and frame-to-glass ratios at NFRC standard sizes, and to ensure other dynamic glazing products are not inadvertently excluded.
3. The exception was added to clarify that a product whose full range already complies with Table R402.1.1 does not need to comply with the extra requirements of this section such as automatic control, since it is already in compliance just like a normal window.

Dynamic glazing is an important energy savings technology that has been available for 10 years and will be in even wider use during the time period when this code is adopted and enforced, so it is important to address it properly in the energy code. We ask you to please vote to approve CE161 parts 1 and 2 as modified by this comment.

CE161-13, Part II

Final Action: AS AM AMPC_____ D

CE164-13

C402.4, C402.4.1.2, C402.4.1.2.3

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.4 Air leakage (Mandatory). The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8. Alternatively the building thermal envelope shall be permitted to be tested in accordance with ASTM E779 at a pressure differential of 0.3 inches water gauge, or an equivalent method approved by the code official, and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope does not exceed 0.40 cfm/ft². Where compliance is based on such testing the building shall also comply with Sections C402.4.5, 402.4.6 and 402.4.7.

C402.4.1.2 Air barrier compliance options. A continuous air barrier for the opaque portions of the building thermal envelope shall comply with Section C402.4.1.2.1, or C402.4.1.2.2. ~~or C402.4.1.2.3.~~

~~**C402.4.1.2.3 Building test.** The completed building shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s · m² at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official.~~

Reason: This proposal clarifies the language pertaining to the sealing of penetrations in the building thermal envelope associated with continuous air barriers so that all three compliance options associated with air barriers are equivalent. The current code lists three options for meeting the provisions of the opaque building envelope. The first two that deal with the opaque components are valid and allow compliance based on either the materials used or the assemblies of the envelope. The test is also a valid way of addressing air leakage on a performance basis. Unfortunately, a whole building test includes fenestration such that the test cannot address only opaque sections of the envelope as is the case with the other two options. All three options should be comparable and have the same scope. For this reason the text has been more appropriately rearranged. One approach prescriptively addresses the particular components of the building thermal envelope and their construction and installation as well as individual air leakage properties. The other provides a performance oriented approach that is based on the testing currently allowed, since all possible means of air leakage through the envelope are measured

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal relocates the alternative compliance option in the code so that it occurs before the prescriptive standards which would have to be used if the alternative isn't chosen.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4 Air leakage (Mandatory). The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8. Alternatively the building thermal envelope shall be permitted to be tested in accordance with ASTM E779 at a pressure differential of 0.3 inches water gauge, or an equivalent method approved by the code official, and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope does not exceed 0.40 cfm/ft². Where compliance is based on such testing the building shall also comply with Sections C402.4.5, 402.4.6 and 402.4.7.

C402.4.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with Section C402.4.2. 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 from wind, stack effect and mechanical ventilation.
3. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

~~**Exception:** Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and 3.~~

(Portions of code change proposal not shown remain unchanged)

Commenter's Reason: This change is needed to address some housekeeping items associated with this change and CE167-13, which was also recommended for approval. Note that there was no opposing testimony, adverse comment or committee concern raised about either CE164-13 or CE167-13 at the first public hearing. With the approval of CE164-13 Section C402.4.1.2.3 is moved to Section C402.4. This places the compliance path that is based on building testing up front so that those choosing this option are not required to specifically address criteria no longer relevant (e.g., if you are testing the building then it is not necessary to specifically follow criteria covering air barrier penetrations and then inspect them.) With this change, you either meet the performance test criterion or not, and if not, then the building must be sealed better. This approach is very similar to what is currently done for testing duct systems for leakage. The exception to Section C402.4.1.1 refers to Section C402.4.1.2.3, which per CE164-13 does not exist. This is a simple housekeeping change to remove the exception, because there is no more Section C402.4.1.2.3 and as noted above is covered in Section C402.4 as stated above because any building so tested does not need to specifically comply with Section C402.4.1.1.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

Public Comment 2:

Jim Edelson, New Buildings Institute, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4 Air leakage (Mandatory). The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8. Alternatively the building thermal envelope shall be permitted to be tested in accordance with ASTM E779 at a pressure differential of 0.3 inches water gauge, or an equivalent method approved by the code official, and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope does not exceed 0.40 cfm/ft². Where compliance is based on such testing the building shall also comply with Item 2 of Section C402.4.1.1, and Sections C402.4.5, 402.4.6 and 402.4.7.

C402.4.1.2 Air barrier compliance options. A continuous air barrier for the opaque portions of the building thermal envelope shall comply with Sections C402.4.1.2.1, and C402.4.1.2.4, or Sections C402.4.1.2.2, or and C402.4.1.2.4.

C402.4.1.2.4 Continuous air barrier commissioning. Prior to the final inspection, the registered design professional shall provide evidence of commissioning of the continuous air barrier by an approved agency. A final commissioning report shall be delivered to the building owner, and shall include at a minimum:

1. A field inspection checklist showing the requirements necessary for proper installation of the continuous air barrier.
2. Results of any building air leakage testing.
3. Reports from field inspections during project construction showing compliance with continuous air barrier requirements including but not limited to proper material handling and storage, use of approved materials and approved substitutes, proper material and surface preparation, air barrier continuity at building thermal envelope penetrations

Commenter's Reason: The committee approved CE 164 but disapproved a similar proposal in CE 169. In Disapproving CE 169, the Committee stated that the idea was good, but that the language needed to be clear that "Commissioning should not be limited to Registered Design Professionals" and that "testing is not the only way to determine compliance".

This public comment accomplishes what the committee stated by providing compliance options, and by making important simplifications and clarifications to the air barrier commissioning language.

In order to clarify the issue regarding Registered Design Professionals, this Comment applies the definitions of "registered design professionals", "commissioning", and "approved agency" already used in the IECC and the IgCC. The Comment then uses these terms in a duplicate of the existing language in Section C408.2 of the IECC that clearly specifies that the registered design professional only has to provide the documentation that Commissioning has been completed. The Commissioning itself may be done by any Approved Agency.

CE164-13

Final Action: AS AM AMPC____ D

CE165-13
C402.4

Proposed Change as Submitted

Proponent: Mark S. Graham, National Roofing Contractors Association (mgraham@nrca.net)

Revise as follows:

C402.4 Air leakage (Mandatory). The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8.

Exception: The provisions of this section shall not be required for roof repairs, roof recovering and roof replacement where the alterations, renovations or repairs to the building do not also include alterations, renovations or repairs to the remainder of the building envelope.

Reason: This code change proposal is intended to clarify the Code's intent regarding when air barriers are and are not required as components of buildings' thermal envelopes.

In existing buildings that do not currently include an air barrier in the building's thermal envelope, it can be interpreted the addition of an air retarder is required in roof repair, roof recover or roof replacement projects where the project's scope does not otherwise require alterations, renovations or repairs to the remainder of the building's thermal envelope. In these situations, the addition of an air retarder to the roof assembly only will do little to and be ineffective in improving the building envelope's overall air leakage performance.

This Exception provides clarity by specifically indicating an air retarder is not required for roof repairs, roof recovering or roof replacement where the scope of the project does not also include alterations, renovations or repairs to the remainder of the building envelope.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4-EC-GRAHAM.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee found the exception too broad. It would waive any opportunity to improve the efficiency of the roof assembly where only the roof assembly was being upgraded. Finally, the proposal is located in the wrong portion of the code. It should be located with other existing building provisions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jason Wilen, AIA, CDT, RRO, National Roofing Contractors Association, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
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.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed,
7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.
9. Air barriers shall not be required for roof repair, roof recover, and roof replacement where the alterations, renovations or repairs to the building do not also include alterations, renovations or repairs to the remainder of the building envelope.

Commenter's Reason: Following the committee's recommendations, this proposal is being modified by relocating the new text from section C402.4 as originally proposed to section C101.4.3. The text is changed slightly from the original proposal to match the format of section C101.4.3.

Also, because proposal CE56-13 was approved as modified by the committee, the terms "Roof Recover", "Roof Repair" and "Roof Replacement" are now defined in the IECC.

CE165-13

Final Action: AS AM AMPC_____ D

CE166-13
C402.4.1

Proposed Change as Submitted

Proponent: Theresa A. Weston, PhD., DuPont Building Innovations
(theresa.a.weston@usa.dupont.com)

Revise as follows:

C402.4.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.4.1.1 and C402.4.1.2.

~~**Exception:** Air barriers are not required in buildings located in Climate Zones 1, 2 and 3.~~

Reason: This proposal deletes the exception for air barriers in Climate Zones 1, 2 and 3. Air barrier use is important to the energy efficiency, moisture performance and comfort in all climate zones and therefore should be included for all climate zones. This change would also make the provisions within the IECC more consistent with both ASHRAE 90.1 and the IgCC.

Cost Impact: The code change proposal will increase the cost of construction in zones 1, 2 and 3.

C402.4.1-EC-WESTON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal is too broad. The committee felt that air barriers should be waived in the dry climate zones of 2B and 3B.

Assembly Action:

Approved as Submitted

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Submitted and because public comments were received.

Public Comment 1:

Theresa W. Weston, DuPont Building Innovations, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.4.1.1 and C402.4.1.2.

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

Commenter's Reason: The original proposal removed the exception for air barriers in Climate Zones 1, 2 and 3, thus requiring air barriers in all climate zones. Air barrier use is important to the energy efficiency, moisture performance and comfort in all climate zones. A NIST Report investigated direct energy savings from reduced air leakage, and found energy savings from infiltration in all climate zones, including cooling dominated climates.

Simulated Location	Climate Zone	Building Type	Annual Energy Savings
Phoenix, AZ	2B	Office Building	\$745
Phoenix, AZ	2B	Retail Building	\$1169
Phoenix, AZ	2B	Multi-unit Residential Building	\$133
Miami, FL	1A	Office Building	\$769
Miami, FL	1A	Retail Building	\$1231
Miami, FL	1A	Multi-unit Residential Building	\$411

This report found air barriers to be cost effective with the exception of office building with masonry backup in climate zones 1 and 2.

In addition to the direct energy efficiency benefits of air barriers, there are indirect energy efficiency benefits from preventing moisture “piggy-backing” on air intruding and accumulating within building assemblies. When insulation gets wet its R-value can be reduced 60 to 70%. This is a critical in hot humid climates.

Analyzing the data in light of the committee’s opinion that the proposal was too broad, this modification leaves the exception in place for zone 2B. The modified proposal would increase consistency with both ASHRAE 90.1 (which has an exception for masonry construction in Climate Zone 2B) and the IgCC (which has no exceptions).

NISTIR 7238, “Investigation of the impact of Commercial Building Envelope Airtightness on HVAC Energy Use”, S. J. Emmerich, Tim McDowell, W. Anis

Controlling the Transfer of Heat, Air & Moisture through the Building Envelope M.C. Swinton, W.C. Brown, G.A. Chown

Public Comment 2:

Duane Jonlin, City of Seattle, Department of Planning and Development, requests Approval as Submitted.

Commenter’s Reason: Air barriers provide the most cost-effective source of energy conservation of any provision in this code. The committee report states “The proposal is too broad. The committee felt that air barriers should be waived in the dry climate zones of 2B and 3B.” Climate Zones 2B and 3B, comprised of Southern California, Arizona, New Mexico and West Texas, experiences hot summers and cold winters, Phoenix alone has a temperature range of 16 to 122 degrees, and Abilene varies between a low of minus-9 and a high of plus-110 degrees. A 2005 NIST report (NISTIR 7238) shows 77% gas savings and 9% electrical savings resulting from air barrier installation in a Phoenix office building, while in a Phoenix retail building the savings were 64% for gas and 14% for electricity. Air barriers represent sensible and economical energy-saving technology across all US climate zones.

CE166-13

Final Action: AS AM AMPC____ D

CE167-13
C402.4.1.1, C402.4.2

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.4.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with Section C402.4.2. 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 from wind, stack effect and mechanical ventilation.
3. Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals associated with penetrations shall be sealed in the same manner or taped or covered with moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed and shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.
- ~~3.~~ 4. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

Exception: Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and ~~4~~.

~~**C402.4.2 Air barrier penetrations.** Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals shall be sealed in the same manner or taped or covered with moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed. 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 from wind, stack effect and mechanical ventilation.~~

Reason: This proposal clarifies the language pertaining to the sealing of penetrations in the building envelope. The objective of the proposal is to increase the simplicity of the code.

The provisions of C402.4.2 are currently out of place. They have the same standing in the order of the code as C402.4.1 yet are actually a component of the air barrier provisions. They are more appropriately located as a part of the code text addressing air barrier construction. In addition, the present item 2 is duplicated by C402.4.2 to a large degree so the text has been revised to focus on penetrations.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4.2-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal relocates one of the criteria for air barrier construction from a separate section to be listed with the other criteria. There is no change to the technical requirements.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. ~~Air barrier penetrations shall be sealed in accordance with Section C402.4.2.~~ 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 from wind, stack effect and mechanical ventilation.
3. Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seats associated with penetrations shall be sealed in the same manner or taped or covered with moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed and shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.
4. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

Exception: Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and 3.

Commenter's Reason: This change is needed to address a single housekeeping item. The deletion of the reference to Section C402.4.2 of the code regarding the sealing of air barrier penetrations is needed, because pursuant to this change the provisions that were in C402.4.2 are now located in the new numbered item 3 to Section C402.4.1.1 above, and are therefore not available at C402.4.2 for reference. Note that there was no opposing testimony, adverse comment or committee concern raised about CE167-13 at the first public hearing.

CE167-13

Final Action:

AS

AM

AMPC____

D

CE168-13

C402.4.1.2, C402.4.1.2.1, C402.4.1.2.2, C402.4.1.2.3

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

Revise as follows:

C402.4.1.2 Air barrier testing compliance options. A continuous air barrier for the building envelope shall comply with Section C402.4.1.2.1, C402.4.1.2.2, or C402.4.1.2.1.

C402.4.1.2.1 Materials. Materials with an air permeability no greater than 0.004 cfm/ft² (0.02 L/s · m²) under a pressure differential of 0.3 inches water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2178 shall comply with this section. Materials in Items 1 through 15 shall be deemed to comply with this section provided 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 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12 mm).
5. Closed cell spray foam a minimum density of 1.5 pcf (2.4 kg/m³) having a thickness of not less than 1 1/2 inches (36 mm).
6. Open cell spray foam with a density between 0.4 and 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 mm).
8. Cement board having a thickness of not less than 1/2 inch (12 mm).
9. Built up roofing membrane.
10. Modified bituminous roof membrane.
11. Fully adhered single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (16 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.

C402.4.1.2.2 Assemblies. Assemblies of materials and components with an average air leakage not to exceed 0.04 cfm/ft² (0.2 L/s · m²) under a pressure differential of 0.3 inches of water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 and 2 shall be deemed to comply provided joints are sealed and requirements of Section C402.4.1.1 are met.

1. Concrete masonry walls coated with one application either of block filler and two applications of a paint or sealer coating;
2. A Portland cement/sand parge, stucco or plaster minimum 1/2 inch (12 mm) in thickness.

C402.4.1.2.3 Building test. The completed building shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s · m² at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to code official and the building owner. Where the tested rate exceeds 0.40 cfm/ft², a visual inspection of the air barrier shall be conducted and any leaks noted shall be sealed to the extent practicable. An additional report identifying the corrective actions taken to seal air leaks shall be

submitted to the code official and the building owner, and shall be deemed to satisfy the requirements of this section.

Reason: This proposed amendment requires air barrier testing for building envelopes.

Air leakage through building envelopes wastes significant HVAC energy, and provides a pathway for moisture intrusion into building envelope assemblies. Losses of 30% of conditioned air through uncontrolled air leakage are frequently reported, and mechanical systems must be oversized to accommodate this risk. Air barrier testing greatly reduces loss of conditioned air, providing the best energy savings returns per dollar invested of any technology.

The lists of air barrier materials and assemblies in the 2009 code include common materials such as gypsum board and plywood that in practice qualify almost any contemporary building to meet the code requirements. However, the materials and assemblies themselves are not the main source of air barrier leakage problems – instead, most leakage occurs in the transitions between various materials. Field testing is the only method, short of continuous third-party inspection, that a continuous air barrier can be ensured. Seattle's experience, after mandating that air barriers be tested during this current code cycle (but not requiring that air barriers must meet the test standard) is that all buildings have passed the test.

The proposal eliminates most of the text between C402.4.1.2 and C402.4.1.2.3.1. However with the legislative format it is a little confusing. The net result of this proposal is Section D402.4.1.2 would read as follows:

C402.4.1.2 Air barrier testing. A continuous air barrier for the building envelope shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s · m² at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to code official and the building owner. Where the tested rate exceeds 0.40 cfm/ft², a visual inspection of the air barrier shall be conducted and any leaks noted shall be sealed to the extent practicable. An additional report identifying the corrective actions taken to seal air leaks shall be submitted to the code official and the building owner, and shall be deemed to satisfy the requirements of this section.

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

C402.4.1.2-EC-KRANZ.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee preferred to maintain the three avenues for determining compliance in air barrier construction. A test only requirement is not practicable for all buildings. The proposal was unclear regarding whether third parties could be used to conduct and evaluate the testing.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.4.1.2 Air barrier compliance options. A continuous air barrier for the opaque building envelope shall comply with Sections C402.4.1.2.1 through C402.4.1.2.4, C402.4.1.2.2, or C402.4.1.2.3.

C402.4.1.2.1 Air barrier materials. ~~Materials with Air barriers shall have an air permeability no greater than 0.004 cfm/ft² (0.02 L/s · m²) under a pressure differential of 0.3 inches water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2178, or shall be one of the following; shall comply with this section. Materials in Items 1 through 15 shall be deemed to comply with this section provided 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 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12 mm).
5. Closed cell spray foam a minimum density of 1.5 pcf (2.4 kg/m³) having a thickness of not less than 1-1/2 inches (36 mm).

6. Open cell spray foam with a density between 0.4 and 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 mm).
8. Cement board having a thickness of not less than 1/2 inch (12 mm).
9. Built up roofing membrane.
10. Modified bituminous roof membrane.
11. Fully adhered single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (16 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.

C402.4.1.2.2 C402.4.1.1 Air barrier construction. The continuous air barrier shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with Section C402.4.2. 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 from wind, stack effect and mechanical ventilation.
3. Penetrations of the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals associated with penetrations shall be sealed in the same manner or taped or covered with moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed and shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation
4. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

Exception: Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and 3.

C402.4.1.2.3 C402.4.1.2.2 Assemblies. Assemblies forming part of an air barrier shall have an air permeability of materials and components with an average air leakage not to exceed 0.04 cfm/ft² (0.2 L/s · m²) under a pressure differential of 0.3 inches of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 and 2 shall be deemed to comply provided joints are sealed and requirements of Section C402.4.1.1 are met. ~~or shall be one of the following:~~

1. Concrete masonry walls coated with one application either of block filler and two applications of a paint or sealer coating;
2. A Portland cement/sand parge, stucco or plaster minimum 1/2 inch (12 mm) in thickness.

C402.4.1.2.43 Building test. The completed building shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s · m² at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to code official and the building owner. Where the tested rate exceeds 0.40 cfm/ft², a visual inspection of the air barrier shall be conducted and any leaks noted shall be sealed to the extent practicable. An additional report identifying the corrective actions taken to seal air leaks shall be submitted to the code official and the building owner, and shall be deemed to satisfy the requirements of this section.

C402.4.2 Air barrier penetrations. ~~Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed. 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 from wind, stack effect and mechanical ventilation.~~

Commenter's Reason: If approved, this public comment will require pressure testing of commercial buildings to confirm that the building envelope complies with the air leakage limits in the code. Effective air barriers provide the best energy savings per construction dollar invested so insuring their effectiveness is very important. Air barrier testing creates an incentive for builders to take greater care during the design and construction process to select appropriate materials, seal cracks, joints and annular space around penetrations to effectively reduce the loss of conditioned air. Air leakage through building envelopes wastes significant HVAC energy, and provides a pathway for moisture intrusion into building envelope assemblies. Losses of 30% of conditioned air through uncontrolled air leakage are frequently reported, and mechanical systems must be oversized to accommodate this risk.

This public comment reorganizes some of the text in Section C402.4 related to "Air leakage" to be more user-friendly and makes all four subsections mandatory. These include: 1) Air barrier materials, 2) Air barrier construction, 3) Assemblies, and 4) Building testing. Item #3 in Section C402.4.1.2.2, related to penetrations of barriers, is currently found in Section C402.4.2. It is moved to Section C402.4.1.2.2 because it more closely relates to air barrier construction. Section 402.4.2 is proposed to be deleted.

This public comment also responds to industry concerns that the existing list of materials and assemblies deemed to form air barriers, and which was originally proposed to be deleted, should remain in the code so that code officials can determine whether the plans submitted for permit meet the minimum specified standard

CE168-13

Final Action:

AS

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CE177-13, Part I

C402.4.1.2 (New), R402.1.2 (New), (IRC N1102.4.1.2 (New))

Proposed Change as Submitted

Proponent: Brent Ursenbach, Salt Lake County representing Utah Chapter ICC and Utah Association of Plumbing and Mechanical Officials Chapter ICC (bursenbach@slco.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C 402.4.1.2 Combustion air openings. In climate zones 3 through 8, where open combustion air ducts provide combustion air to open combustion space conditioning fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table C402.1.2 or C402.2, where the walls shall meet a minimum of the below-grade wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section C403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections 901, 902, 903, 904, and 905 of the International Mechanical Code, and Section 2111.13 of the International Building Code.

Reason: (Part I) The entire section C402.4 Air leakage- is of little value when a combustion air duct is installed, open to the conditioned space, virtually placing a large hole through the thermal envelope. The building testing option for leakage in C402.4.1.2.3 cannot be accomplished with a combustion air opening inside the thermal envelope. Testers regularly block these opening as this is the only way they can pressurize the building; only to be opened after the test is completed. Ideally, direct vent, sealed combustion appliances solve the problem. Where less efficient, open combustion fuel burning appliances are used, it is reasonable and proper to isolate the appliances and the required combustion air from inside the thermal envelope.

(Part II) The entire section N1102.4 Air leakage- is of little value when a combustion air duct is installed, open to the conditioned space, virtually placing a large hole through the thermal envelope. Blower door testing as now required by the code cannot be accomplished with a combustion air opening inside the thermal envelope. Testers regularly block these opening as this is the only way they can pressurize the home; only to be opened after the test is completed. Ideally, direct vent, sealed combustion appliances solve the problem. Where less efficient, open combustion fuel burning appliances are used, it is reasonable and proper to isolate the appliances and the required combustion air from inside the thermal envelope.

Cost Impact: The code change proposal will increase the cost of construction, while it will reduce the energy consumption and cost throughout the life of the home.

C402.4.1.2 (NEW)-EC-URSENBACH.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The text proposal is unclear. Application is not clear. Would it inadvertently control other equipment such as gas dryers. The proposal seems to be describing a 'thermal isolation' without using the defined term.

Assembly Action:

Approved as Modified

Modify the proposal as follows:

C402.4.1.2 Combustion air openings. In climate zones 3 through 8, where open combustion air ducts provide combustion air to open combustion space conditioning fuel burning appliances, the appliances and combustion air openings shall be located outside of the building thermal envelope or enclosed in a room isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table C402.1.2 or Table C402.2, where the walls, floors and ceilings shall meet the minimum of the below-grade wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section C403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

(Portions of proposal not shown remain unchanged)

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Modified and because a public comment was received.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Disapproval.

Commenter's Reason: The proposal would require an unrealistic design solution to this issue. Creating little 'out of thermal envelope' closets for each apartment in a building is an incredibly expensive solution. The proposal dictates a single design solution; and one that is too restrictive. It doesn't allow for testing and balancing of systems which can achieve compliance with the code. There are other design options for providing outside air to individual furnace installations.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE177-13, Part I

Final Action: AS AM AMPC_____ D

CE177-13, Part II

C402.4.1.2 (NEW), R402.1.2 (NEW), (IRC N1102.4.1.2 (NEW))

Proposed Change as Submitted

Proponent: Brent Ursenbach, Salt Lake County representing Utah Chapter ICC and Utah Association of Plumbing and Mechanical Officials Chapter ICC (bursenbach@slco.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R402.4.1.2 (N1102.4.1.2) Combustion air openings. In climate zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the *building thermal envelope* or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.1, where the walls shall meet a minimum of the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section 402.4.2 and Section R1006 of the *International Residential Code*.

Reason: (Part I) The entire section C402.4 Air leakage- is of little value when a combustion air duct is installed, open to the conditioned space, virtually placing a large hole through the thermal envelope. The building testing option for leakage in C402.4.1.2.3 cannot be accomplished with a combustion air opening inside the thermal envelope. Testers regularly block these opening as this is the only way they can pressurize the building; only to be opened after the test is completed. Ideally, direct vent, sealed combustion appliances solve the problem. Where less efficient, open combustion fuel burning appliances are used, it is reasonable and proper to isolate the appliances and the required combustion air from inside the thermal envelope.

(Part II) The entire section N1102.4 Air leakage- is of little value when a combustion air duct is installed, open to the conditioned space, virtually placing a large hole through the thermal envelope. Blower door testing as now required by the code cannot be accomplished with a combustion air opening inside the thermal envelope. Testers regularly block these opening as this is the only way they can pressurize the home; only to be opened after the test is completed. Ideally, direct vent, sealed combustion appliances solve the problem. Where less efficient, open combustion fuel burning appliances are used, it is reasonable and proper to isolate the appliances and the required combustion air from inside the thermal envelope.

Cost Impact: The code change proposal will increase the cost of construction, while it will reduce the energy consumption and cost throughout the life of the home.

C402.4.1.2 (NEW)-EC-URSENBACH.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: The committee disapproved this consistent with action taken on RE62-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brent Ursenbach, Salt Lake County Representing Utah Chapter ICC; Hope Medina, Cherry Hills Village, representing Colorado Chapter ICC, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

R402.4.1.2 Combustion air openings. In climate zones 3 through 8, where open combustion air ducts provide combustion air to open combustion, space conditioning fuel burning appliances, the appliances and combustion air openings shall be located outside of the building thermal envelope, or enclosed in a room isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.1, where the walls, floors and ceilings shall meet the minimum of the below- grade wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section 402.4.2 and Section R1006 of the *International Residential Code*.

Commenter's Reason: This proposal, after failing on the residential side was modified as shown above, resulting in approval by assembly action on the commercial side.

The entire section R402.4 Air leakage- is of little value when a combustion air duct is installed, open to a conditioned space, virtually placing a large hole through the thermal envelope. The building testing requirement for leakage in R402.4. 1.2 is extremely difficult to accomplish, with a combustion air opening inside the thermal envelope. Ideally, direct vent, sealed combustion appliances solve the problem. Where less efficient, open combustion fuel burning appliances are used, which require outside combustion, it is reasonable and proper to isolate the appliances and the required combustion air from inside the thermal envelope.

Addressing opponents concerns:

Opposition was expressed to the original proposal as the higher R-values for floors and ceilings were correctly considered excessive, hence this modification where the R-values for all surfaces separating the equipment room from conditioned space met the R-value of U-Factor for basement walls from Tables R402.1.1. With this modification, this was approved on the commercial side through assembly action. The temperature inside these rooms will not reach the outside extremes; therefore the insulation R-value has been decreased.

The committee listed to reason for disapproval as being consistent with RE62. RE62 addressed insulation only to the full level of the thermal envelope and did not address sealing, which is a mandatory requirement in the IECC.

An opponent expressed opposition based on a 12 year old AGA study which discourages insulating these equipment rooms, based on the large quantities of heat leaking and radiating off appliances is beneficial to the conditioned space. That was the case prior to the much tighter duct sealing, increased duct insulation requirements, and increased IECC enforcement. This study is out dated.

A committee member expressed reservations that somehow this proposal would require combustion air for gas dryers. Please note the proposal states in the first sentence- '**where** open combustion air ducts'- this proposal only applies where combustion air ducts are required. There is not an outside combustion requirement for gas dryers in the IFGC.

Several expressed opposition, seeking the addition of definitions and testing procedures of the Combustion Appliance Zone (CAZ). This proposal is not in opposition of CAZ, as CAZ addresses situations, typically in existing buildings, where combustion air is drawn from within the conditioned space, not through an open duct to outside. CAZ methods undoubtedly should be applied to those situations.

CE177-13, Part II

Final Action: AS AM AMPC____ D

CE179-13, Part I

C402.4.2, Table R402.4.1.1 (IRC Table N1102.4.1.1)

Proposed Change as Submitted

Proponent: Jeffrey M. Hugo, CBO, National Fire Sprinkler Association (hugo@nfsa.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C402.4.2 Air barrier penetrations. Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed. 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 from wind, stack effect and mechanical ventilation.

Exception:

1. Penetrations of the air barrier for automatic sprinkler systems installed according to the International Building Code or the International Fire Code.

Reason: (Part I) This proposal seeks to exempt fire sprinkler systems, specifically pendent sprinklers (and other similar sprinklers), that penetrate the typical building envelope at the ceilings by adding an exception.

Section C402.4.2 of the 2012 IECC states that the penetrations in the air barrier shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Caulking the sprinkler, escutcheon, or cover plate could delay, cease or interrupt the flow of the fire sprinkler. In cases when a concealed pendent fire sprinkler is used, the caulk may adhere to the cover plate to the ceiling material and severely delay the fast response of the sprinkler.



Caulked Concealed

The same IECC section above, also states that the “sealing materials shall be appropriate to the construction materials being sealed”. Caulk and other sealants are never compatible with the sprinklers, escutcheons and cover plates. In fact, some caulks and

sealants are chemically incompatible with certain piping and the pipe manufacturers shall be consulted prior to applying any material.

The fire sprinkler, escutcheon and cover plate are designed to fit together without any adhesive. Escutcheons and cover plates can have gaps or spaces that are required to meet certain specification tolerances for activation of the sprinkler, but in most cases the escutcheons and cover plates should fit tightly to the wall or ceiling.

Furthermore, the intent of the IECC (Section C101.3) is not "intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances." When fire sprinklers are installed or required by other codes such as the IBC, they are installed according to those referenced standards. Fire sprinklers are installed by NFPA 13 (Standard for the Installation of Sprinkler Systems), NFPA 13R (Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height) and NFPA 13D (Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes) along with IRC Section P2904.

These codes and standards require that all fire sprinklers, escutcheons and cover plates be listed and installed according to that listing. The testing and listing process (of fire sprinklers, escutcheons, and cover plates) does not take into account any additional field applied materials on the sprinkler, escutcheon and cover plate, such as: paint, caulk, drywall compound, and other construction materials. This prohibition is not only reiterated, but is enforced by NFPA 13 and NFPA 25 (Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems) as both of these standards require full replacement of the affected components when found. When a fire sprinkler is properly installed, the escutcheon and/or cover plate should adequately seal the penetration.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4.2-EC-HUGO. doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proposal implies there is no method by which sprinkler systems can be installed and at the same time maintaining adequate air barrier sealing. Appropriate sealants are available.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Adolf Zubia, Chairman IAFC Fire and Life Safety Section, representing ICC Fire Code Action Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4.2 Air barrier penetrations. Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed. 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 from wind, stack effect and mechanical ventilation. Sealing of concealed fire sprinklers, when required, shall be in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.

Exception:

1. Penetrations of the air barrier for *automatic* sprinkler systems installed according to the *International Building Code* or the *International Fire Code*,

Commenter's Reason: This proposal is submitted by the ICC Fire Code Action Committee (FCAC). This ICC committee was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portions

thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the Fire-CAC has held 6 open meetings and numerous Regional Work Group and Task Group meetings and conference calls which included members of the committees as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the FAC website at: <http://www.iccsafe.org/cs/CAC/Pages/default.aspx>.

This public comment is no longer asking for a blanket exception for all components of an automatic sprinkler system that penetrate an air barrier. It is putting the previous criteria into the body of the charging paragraph and is narrowed down to the concealed sprinkler. There are two types of concealed sprinkler; pendent and sidewall. The most common air barrier penetration is the pendent concealed sprinkler, however, there may be times when a sidewall concealed sprinkler is used. This public comment seeks to address both, since it is critical to life safety and property protection that when a concealed sprinkler is sealed that it be sealed accordingly and maintain its listings and approvals.

The primary purpose of this change stays the same, which is to prohibit field caulking or sealing of concealed sprinklers. Concealed sprinklers are popular for designers and architects as they are virtually hidden on the surface and cover plates can be colored to match decor. They are the most preferred sprinkler in many occupancies. Because of their makeup and function, when they are caulked or sealed in the field by using sealants, caulk or other methods, it impairs the operation of the sprinkler. Concealed sprinklers with foreign materials attached such as caulk, paint, sealants, foam, tape, etc are no longer considered compliant with their listing and approvals.

Sprinkler manufacturers do have products available to appropriately seal these sprinklers to meet the commercial energy code.

This public comment is to insert language to assist the code official and user of the energy code. Installing sprinklers contrary to their listing is prohibited by the IECC, IFC, IBC, NFPA 13 and NFPA 25 already.

CE179-13, Part I

Final Action: AS AM AMPC____ D

CE179-13, Part II

C402.4.2, Table R402.4.1.1 (IRC Table N1102.4.1.1)

Proposed Change as Submitted

Proponent: Jeffrey M. Hugo, CBO, National Fire Sprinkler Association (hugo@nfsa.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

**TABLE R402.4.1.1 (N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	CRITERIA ^a
Automatic sprinkler systems	Penetrations of the building envelope for <i>automatic</i> sprinkler systems installed according to the <i>International Residential Code, International Building Code</i> and <i>International Fire Code</i> are exempt from being sealed.
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.

COMPONENT	CRITERIA ^a
Narrow cavities	Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

Reason: (Part II) This proposal seeks to exempt fire sprinkler systems, specifically pendent sprinklers (and other similar sprinklers), which penetrate the typical building envelope at the ceilings by adding a new automatic sprinkler systems row in the component and criteria columns of Table R402.4.1.1.

NFSA fire sprinkler contractors are reporting that local authorities and building owners are caulking fire sprinklers in order to pass the air leakage testing. Caulking the sprinkler, escutcheon, or cover plate could delay, cease or interrupt the flow of the fire sprinkler. In cases when a concealed pendent fire sprinkler is used, the caulk may adhere to the cover plate to the ceiling material and severely delay the fast response of the sprinkler.

Caulk and other sealants are never compatible with the sprinklers, escutcheons and cover plates. In fact, some caulks and sealants are chemically incompatible with certain piping and the pipe manufacturers shall be consulted prior to applying any material.

The fire sprinkler, escutcheon and cover plate are designed to fit together without any adhesive. Escutcheons and cover plates can have gaps or spaces that are required to meet certain specification tolerances for activation of the sprinkler, but in most cases the escutcheons and cover plates should fit tightly to the wall or ceiling.

The intent of the IECC (Section R101.3) is not "intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances." When fire sprinklers are installed or required by other codes such as the IBC, they are installed according to those referenced standards. Fire sprinklers are installed by NFPA 13 (Standard for the Installation of Sprinkler Systems), NFPA 13R (Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height) and NFPA 13D (Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes) along with IRC Section P2904.

These codes and standards require that all fire sprinklers, escutcheons and cover plates be listed and installed according to that listing. The testing and listing process (of fire sprinklers, escutcheons, and cover plates) does not take into account any additional field applied materials on the sprinkler, escutcheon and cover plate, such as: paint, caulk, drywall compound, and other construction materials. This prohibition is not only reiterated, but is enforced by NFPA 13 and NFPA 25 (Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems) as both of these standards require full replacement of the affected components when found. When a fire sprinkler is properly installed, the escutcheon and/or cover plate should adequately seal the penetration.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4.2-EC-HUGO. doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: Sprinkler systems provide a hole in the building thermal envelope that needs to be addressed somehow. If malfunction of the sprinkler system is possible the manufacturer of the system needs to specify an appropriate method.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jeffrey M. Hugo, CBO, National Fire Sprinkler Association, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	CRITERIA
<u>Fire Sprinklers</u>	<u>Where required, penetrations of the building envelope from concealed sprinklers shall be sealed according to the manufacturers installation instructions.</u>
COMPONENT	CRITERIA
<u>Automatic sprinkler systems</u>	<u>Penetrations of the building envelope from <i>Automatic sprinkler systems</i> installed according to the <i>International Residential Code, International Building Code and International Fire Code</i> are exempt from being sealed.</u>

Commenter's Reason: This public comment is no longer asking for a blanket exception for all components of an automatic sprinkler system that penetrate the building envelope. The primary concern is the concealed sprinkler in the ceiling that penetrates the building envelope. There are two types of concealed sprinkler; pendent and sidewall. This public comment seeks to address both, since it is critical to life safety and property protection that when a concealed sprinkler is sealed that it be sealed according to the manufacturer's instructions and maintain its listings and approvals.

The primary purpose of this change stays the same, which is to prohibit field caulking or sealing of concealed sprinklers. Concealed sprinklers are popular for designers and architects as they are virtually hidden on the surface and cover plates can be colored to match decor. They are the most preferred sprinkler in many occupancies. Because of their makeup and function, when they are caulked or sealed in the field by using sealants, caulk or other methods, it impairs the operation of the sprinkler possibly causing delays in the operation of the sprinkler, distorting the spray, or preventing the sprinkler from operating at all. Concealed sprinklers with foreign materials attached such as caulk, paint, sealants, foam, tape, etc are no longer considered compliant with their listing and approvals.

This public comment addresses the concealed sprinkler as "where required". It may not be necessary in testing the home to seal the concealed sprinklers due to their tight tolerance and minimal leakage.

Finally, this addition to the residential energy code is in place to assist those in the enforcing or constructing to the energy code that fire sprinklers are a critical life safety component in the IRC. In no way does the energy code permit fire sprinklers to be impaired or installed contrary to the listing. Unlike commercial occupancies, where the NFPA 25 and fire code inspections are being performed on a frequent basis, residential occupancies covered by this code may never have a re-inspection to catch an impaired system.

Public Comment 2:

Adolf Zubia, Chairman IAFC Fire and Life Safety Section, representing ICC Fire Code Action Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	CRITERIA
Concealed sprinklers	Where required, penetrations of the building envelope from concealed sprinklers shall be sealed according to the manufacturers installation instructions. <u>When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</u>

COMPONENT	CRITERIA
Automatic sprinkler systems	Penetrations of the building envelope from <i>Automatic sprinkler systems</i> installed according to the <i>International Residential Code, International Building Code and International Fire Code</i> are exempt from being sealed.

Commenter's Reason: This proposal is submitted by the ICC Fire Code Action Committee (FCAC). This ICC committee was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portions thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the Fire-CAC has held 6 open meetings and numerous Regional Work Group and Task Group meetings and conference calls which included members of the committees as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the FAC website at: <http://www.iccsafe.org/cs/CAC/Pages/default.aspx>.

This public comment is no longer asking for a blanket exception for all components of an automatic sprinkler system that penetrate the building envelope. The primary concern is the concealed sprinkler in the ceiling that penetrates the building envelope. There are two types of concealed sprinkler; pendent and sidewall. This public comment seeks to address both, since it is critical to life safety and property protection that when a concealed sprinkler is sealed that it be sealed according to the manufacturer's instructions and maintain its listings and approvals.

The primary purpose of this change stays the same, which is to prohibit field caulking or sealing of concealed sprinklers. Concealed sprinklers are popular for designers and architects as they are virtually hidden on the surface and cover plates can be colored to match decor. They are the most preferred sprinkler in many occupancies. Because of their makeup and function, when they are caulked or sealed in the field by using sealants, caulk or other methods, it impairs the operation of the sprinkler possibly causing delays in the operation of the sprinkler, distorting the spray, or preventing the sprinkler from operating at all. Concealed sprinklers with foreign materials attached such as caulk, paint, sealants, foam, tape, etc. are no longer considered compliant with their listing and approvals.

This public comment addresses the concealed sprinkler as "where required". It may not be necessary in testing the home to seal the concealed sprinklers due to their tight tolerance and minimal leakage. A concealed sprinkler may only contribute up to 10 cfm, the same as a swinging door.

Finally, this addition to the residential energy code is in place to assist those in the enforcing or constructing to the energy code that fire sprinklers are a critical life safety component in the IRC. In no way does the energy code permit fire sprinklers to be impaired or installed contrary to the listing. Unlike commercial occupancies, where the NFPA 25 and fire code inspections are being performed on a frequent basis, residential occupancies covered by this code may never have a re-inspection to catch an impaired system.

CE179-13, Part II

Final Action: AS AM AMPC_____ D

CE180-13
Table C402.4.3

Proposed Change as Submitted

Proponent: Jeff Inks, Window & Door Manufacturers Association (jinks@wdma.com)

Revise as follows:

**TABLE C402.4.3
 MAXIMUM AIR INFILTRATION RATE
 FOR FENESTRATION ASSEMBLIES**

FENESTRATION ASSEMBLY	MAXIMUM RATE (CFM/FT ²)	TEST PROCEDURE
Fixed W indows	0.20 ^a	AAMA/WDMA/ CSA101/I.S.2/A440 or NFRC 400
<u>Operable windows</u>	<u>0.30</u>	
Sliding doors	0.20 ^a <u>0.30</u>	
Swinging doors	0.20 ^a <u>0.50</u>	
Skylights — with condensation weepage openings	0.30	
Skylights — all others	0.20 ^a	

(Portions of Table not shown remain unchanged)

For SI: 1 cubic foot per minute = 0.47L/s, 1 square foot = 0.093 m².

- a. ~~The maximum rate for windows, sliding and swinging doors, and skylights is permitted to be 0.3 cfm per square foot of fenestration or door area when tested in accordance with AAMA/WDMA/CSA101/I.S.2/A440 at 6.24 psf (300 Pa).~~

Reason: During the last code development cycle as part of the comprehensive commercial revisions included in EC-147-09/10, air infiltration rates for windows, skylights, sliding doors and swinging doors were arbitrarily lowered without sound technical justification. Rather the only substantiation that was cited was debatable modeling which was said to show such reductions in air infiltration rates may improve performance by 1-2% in some types of commercial buildings and was not sufficiently comprehensive to justify lowering the rates to 0.20 cfm, especially for all types of commercial construction covered by the IECC. Other modeling can show gains are far less 1-2%.

Regardless of what modeling is used, the energy efficiency gains in the envelope and overall building efficiency as a result of the reduced rates are minimal at best and need to be more thoughtfully weighed against the negative impacts that result from them, primarily for operable fenestration which is the focus of this proposal. These include added costs to production, testing, and labeling for all products, increase in operational force (especially sliding fenestration products) which impairs operability for all users (and adds difficulty in meeting accessibility requirements) because of the additional sealing that would be required. In addition, the values also conflict with the values in AAMA/WDMA/CSA 101/I.S.2/A440.

In addition, if there are concerns that air infiltration rates for operable fenestration need to be made more stringent, they should be addressed in AAMA/WDMA/CSA 101/I.S.2/A440 and not in the body of the IECC.

For these reasons coupled with the minimal gains in building efficiency that may be achieved, we believe the reduction in air infiltration rates for operable fenestration is unjustified and unnecessary and that the rates should therefore be returned as proposed. It should be noted that this proposal maintains the air infiltration rate of 0.20 cfm for fixed windows.

Cost Impact: This code change proposal will not increase the cost of construction. This code change proposal will decrease the cost of construction.

C402.4.3-EC-INKS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal reduces stringency in the code and would put the IECC significantly out of agreement with ASHRAE 90.1. This would set up dueling manufacturing standards.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeff Inks, Window & Door Manufacturers Association, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C402.4.3
MAXIMUM AIR INFILTRATION RATE
FOR FENESTRATION ASSEMBLIES**

FENESTRATION ASSEMBLY	MAXIMUM RATE (CFM/FT ²)	TEST PROCEDURE
Fixed Windows	0.20	AAMA/WDMA/ CSA101/I.S.2/A440 or NFRC 400
Operable windows	0.30	
Sliding doors	0.30	
Swinging doors	0.50 0.30	
Skylights	0.30	
<i>(remainder of table unchanged)</i>	<i>(remainder of table unchanged)</i>	<i>(remainder of table unchanged)</i>

For SI: 1 cubic foot per minute = 0.47L/s, 1 square foot = 0.093 m².

Commenter's Reason: This public comment amends the original proposal by reducing the maximum air infiltration permitted for swinging doors from 0.5 to 0.3 CFM/FT².

Regarding the original proposal as modified by this public comment, we are urging AMPC for the following reasons.

During the last code development cycle as part of the comprehensive commercial revisions included in EC-147-09/10, air infiltration rates for windows, skylights, sliding doors and swinging doors were arbitrarily lowered without sound technical justification. Rather the only substantiation that was cited was debatable modeling which was said to have shown that such reductions in air infiltration rates may improve performance by 1-2% in some types of commercial buildings. Sufficiently comprehensive data to justify lowering the fenestration rates to 0.20 cfm/ft², especially for all types of commercial construction covered by the IECC was not provided. Furthermore, other modeling can show gains are far less than the 1-2% reported for some types of commercial construction.

Regardless of what modeling is used, the energy efficiency gains in the envelope and overall building efficiency as a result of the reduced rates are minimal at best and need to be more thoughtfully weighed against the potential negative impacts, primarily for operable fenestration which is the focus of this proposal. (It should be noted that this proposal maintains the air infiltration rate of 0.20 cfm/ft² for fixed windows.)

These negative impacts include added costs to production, testing, and labeling for all products, and increases in operational force (especially sliding fenestration products) because of additional sealing which impairs operability for all users and adds further difficulty in meeting accessibility requirements. In addition, the rates also conflict with the rates set in the North American Fenestration Standard/Specification for Windows, Doors, and Skylights - AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS) which sets the rate at 0.30 cfm/ft² and is the fenestration standard relied upon by the I-codes.

The rates established in NAFS are the appropriate standard. If there are concerns that air infiltration rates for operable fenestration need to be made more stringent, they should be addressed in NAFS and not in the body of the IECC.

Regarding the committee's reason statement, while it can be argued that this proposal is a reduction in stringency from the 2012 edition, it will have very very little impact on the whole building energy performance which is why it should never have been reduced in the 2012 edition. As for concerns that restoring the more appropriate air infiltration rates of 0.30 cfm/ft² will put the IECC significantly out of agreement with ASHRAE 90.1, the two documents are already out of agreement in other areas, especially with respect to commercial fenestration requirements.

Finally, with respect to setting up dueling standards, that actually occurred when the reduced rates were approved for the 2012 edition in conflict with NAFS. This proposal eliminates the dueling standards that resulted from the 2012 revisions rather than creating them. NAFS is the standard that both the IECC and ASHRAE 90.1 should rely upon, and again, if there are concerns that air infiltration rates for operable fenestration need to be made more stringent, they should be addressed in NAFS and not in the body of the IECC.

For these reasons coupled with the minimal gains in building efficiency that may be achieved, we believe the reduction in air infiltration rates for operable fenestration is unjustified and unnecessary and that more appropriate rates should therefore be restored as proposed.

CE180-13

Final Action: AS AM AMPC_____ D

CE183-13
C402.4.4

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C402.4.4 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 in Section C402.4.3 shall ~~either meet the requirements of Section C402.4.3 or shall be gasketed, weatherstripped or sealed.~~

Exception: Door openings required to comply with Section 716 ~~or 716.4~~ of the *International Building Code*; or doors and door openings required to comply with UL 1784 by the International Building Code ~~to comply with UL 1784 shall not be required to comply with Section C402.4.4.~~

Reason: This proposal clarifies the components covered in the section on doors and access openings to shafts, chutes, stairways, and elevator lobbies are subject to air leakage provisions as components of the building thermal envelope, and provides a distinction between these doors and other doors that are already covered within the scope of fenestration assemblies. The objective of this proposal is to clarify the code to foster implementation and compliance verification.

Some doors are covered by Section C402.4.3 and the intent of the code should be that doors within the scope of fenestration that can be tested and listed *should* be tested and listed in accordance with and meet the provisions of Section C402.4.3. This leaves those doors that cannot be so tested and listed subject to the caulking and sealing criterion. This clarification is needed because the current code allows some doors that could (and should) be assessed as meeting the provisions of Section C402.4.3 through testing and listing only required to be "caulked or sealed." The exception is revised to provide clarification and to eliminate the ending statement—an exception by definition means something is not required to comply.

Cost Impact: The code change proposal does not increase the cost of construction.

Analysis: Section C402.4.4 of the IECC contains errata with respect to the sections of the IBC referenced in the exception. The proper references: 716 and 716.4 are shown in this code change proposal.

C402.4.4-EC-WILLIAMS.doc

Committee Action Hearing Results

Errata for this proposal is contained in the [Updates to the 2013 Proposed Changes](http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf) posted on the ICC website. Please go to <http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf> for more information.

Committee Action:

Disapproved

Committee Reason: Deleting reference to Section 716.4 is inappropriate.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4.4 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 in Section C402.4.3 shall be gasketed, weatherstripped or sealed.

Exception: Door openings required to comply with Section 716 or 716.4 of the International Building Code; or doors and door openings required to comply with UL 1784 by the International Building Code.

Commenter's Reason: At the code development hearing, there was a singular point of opposition from the floor. A concern was raised about omitting the reference to Section 716.4 of the IBC, because it has a particular application to a certain type of door and access opening cover. The proponent asked for retention of Section 716.4 in the code change proposal as a floor modification, but the chair ruled that out of order. In the original change, DOE argued that by default, since Section 716.4 is a subsection of Section 716, it would automatically be referenced. The proposal, as originally submitted, was denied by a committee vote of 5 to 4. This public comment simply retains the current reference in the code to Section 716.4. No other modifications to the code change proposal are proposed, because there was no opposing testimony on those parts of the code change proposal, and, as outlined in the original reason statement, they are relevant and appropriate in ensuring increased clarity of the code.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE183-13

Final Action: AS AM AMPC _____ D

CE190-13
C402.4.7

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD) (lkranz@bellevuewa.gov)

Revise as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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.

The exterior envelope of conditioned vestibules shall comply with the requirements for a conditioned space. Either the interior or exterior of unconditioned vestibules shall comply with building envelope requirements. The building lobby shall not be considered a vestibule.

Exceptions:

1. Buildings in Climate Zones 1 and 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 an atmospherically-separated space less than 3,000 square feet (298 m²) in area that is not used as the entrance to areas of the building larger than 3000 square feet.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
7. Building entrances in buildings that are less than four stories above grade and less than 10,000 square feet in area.

Reason: This change clarifies the requirements for continuity of the building thermal envelope at vestibules (and that only the inner wall or the outer wall of the vestibule must comply). Exception 4 adds a phrase that is necessary to clarify that the exception does not apply to lobbies and similar building entrances. Exception 7 adds a new exception for very small buildings, because the vestibule could impose a disproportionate burden for them.

Cost Impact: The code change proposal will not increase the cost of construction.

C402.4.7-EC-KRANZ.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that the code should allow this as an owner option and not a requirement. They felt that the 'reserved area' concept is not workable over time. Residential use buildings should be exempted. Even if it is in an appendix, it needed to be acceptable code language.

Assembly Action:

Approved as Modified

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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:

1. Buildings in Climate Zones 1 and 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. Building entrances in buildings that are less than 10,000 (929 m²) square feet in area.

Commenter's Reason: This Public Comment only changes the existing ICC code text by adding exception #7, eliminating the vestibule requirement for buildings smaller than 10,000 square feet.

Public Comment 2:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Replace the proposal as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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.

The exterior envelope of conditioned vestibules shall comply with the requirements for a conditioned space. Either the interior or exterior of unconditioned vestibules shall comply with building envelope requirements. The building lobby shall not be considered a vestibule.

Exceptions:

1. Buildings in Climate Zones 1 and 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 that is not used as the entrance to a building larger than 3000 square feet.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

Commenter's Reason: Two significant issues are addressed in this comment: First – clarification for code officials and architects that only the inside or outside doors serving an unconditioned vestibule need to meet the energy code. Second – clarification that the building lobby is not a vestibule, even if smaller than 3,000 square feet. (The 3,000 square foot rule in exception 4 is clearly

applicable to storefronts and small offices with doors directly to the street, but not to an elevator lobby or similar space that forms the main entrance into a large building.)

CE190-13

Final Action: AS AM AMPC____ D

CE191-13

C402.4.7

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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:

1. Buildings in Climate Zones 1 and 2.
2. Doors not intended to be used regularly to gain access to the building by the public, such as doors to mechanical or electrical equipment rooms, or doors intended solely for emergency egress employee use.
3. Doors opening directly from a sleeping unit or dwelling unit.
4. Doors that open directly from a space in buildings less than 3,000 1,000 square feet (298 100 m²) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, does not match the exceptions that are shown in the IECC. The current vestibule requirements are similar, but additional work has been done by SSPC 90.1. This change ensures continued consistency between the IECC and standard 90.1-2010.

Cost Impact: The code change proposal will increase the cost of construction for buildings that now need vestibules that previously did not need them.

C402.4.7-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that the justification provided that the change would align the IECC with ASHRAE 90.1 was not sufficient. They committee also felt reducing exception 4 to buildings of less than 1000 square feet was not appropriate.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Submitted.

Commenter's Reason: In response to the committee reason statements from the Committee Action Hearings:

Substantial cost analysis was done in order to optimize the stringency of vestibule requirements in each climate zone in Standard 90.1. The cost analysis considered available construction costs, estimated energy savings, Fuel prices (\$1.22/therm for heating fuel costs and \$0.0939 / kWh for electricity), a nominal escalation rate and fuel escalation rate of 3.7%, a Federal tax rate of 34%, a State tax rate of 5%, a Nominal discount rate of 7%, and a Nominal interest rate of 7%. Using this criteria, SSPC 90.1 found the requirements in this proposal to be cost effective.

CE191-13

Final Action: AS AM AMPC_____ D

CE192-13

C202 (NEW), C402.4.7, Chapter 5

Proposed Change as Submitted

Proponent: Amanda Hickman, InterCode Incorporated, representing AMCA International (amanda@intercodeinc.com)

Revise as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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 1 and 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 that have an installed air curtain that has been tested in accordance with ANSI/AMCA 220. Air curtains shall be controlled with the opening and closing of the door.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

AIR CURTAIN. A device that generates and discharges a laminar air stream installed at the building entrance intended to prevent the infiltration of external, unconditioned air into the conditioned spaces, or the loss of interior, conditioned air to the outside.

Add new standard to Chapter 5 as follows:

AMCA

220-05 Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Rating.

Reason: This code change will allow an air curtain to be used as a low cost, low maintenance alternative to a vestibule, thereby saving valuable floor space and creating an invisible, energy saving barrier when the door is open. An air curtain's base function requires nothing more than ambient air. Air curtains can save from 1-10% of the building energy use, depending on climate zone, building size, wind exposure and traffic volume. On average, an air curtain saves 60 - 80% of the energy lost through an open unprotected doorway, while consuming as little as 7.5% of that energy to operate. They require minimal annual maintenance (such as cleaning or vacuuming) and have a life expectancy of 15 to 25 years.

Air curtains installed on the interior of a building provides a coherent sheet of air created by an air stream and the surrounding entrained air. This sheet of air is able to bend and resist thermal exchange over an opening by way of support from the building's interior pressure and the stability created as the air stream meets a return grill or splits when it meets a surface, such as a floor, or another air stream.

An additional benefit of using an air curtain is a cleaner environment. They prevent the infiltration of dirt, fumes and debris and repel flying insects. They are approved for use in the food service industry as a means of insect control for customer entry doors, kitchen service, and delivery doors. They also have less of a propensity to be unintentional defeated like a vestibule, by common situations such as high traffic or being held open for egress.

Numerous studies have been published that evaluate the effectiveness of air curtains. When compared to that of a vestibule, air curtains consistently outperform vestibules in energy savings. Recent studies take advantage of current technology to evaluate the air curtains efficiencies and effectiveness.

Cost Impact: The code change proposal will not increase the cost of construction. It will decrease the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, AMCA 220-05 Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Rating, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

Note: The term 'air curtain' is currently defined in the IgCC. The definition is the same as proposed here.

C402.4.7-EC-HICKMAN.doc

Committee Action Hearing Results

For staff analysis of the content of AAMCA 220-05 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Modified

Further modify the proposal as follows:

6. Doors that have an ~~installed~~ air curtain with a minimum velocity of 2 m/s at the floor, that has been tested in accordance with ANSI/AMCA 220 and installed in accordance with manufacturer's instructions. Air curtains shall be controlled with the opening and closing of the door.

(Portions of proposal not shown remain unchanged)

Committee Reason: Modification provides the technical minimum needed for the air curtain to function as intended as well as specifying manufacturer's installation instructions. The proposal adds an effective alternative to a constructed vestibule.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C402.4.7 Vestibules. All building entrances shall be protected with an enclosed vestibule, with all 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 1 and 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 that have an air curtain with a minimum velocity of 2 m/s at the floor, ~~that has have~~ been tested in accordance with ANSI/AMCA 220 and installed in accordance with manufacturer's instructions. ~~Air curtains shall be controlled 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.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This modification is to provide clarification to the modified approved language that came out of the committee hearings in Dallas. There were some words that seemed unnecessary and made the section hard to read. Also added to this proposal were control requirements to make the air curtains consistent with other systems regulated by this code. All systems, whether lighting or mechanical have control requirements that include functional performance testing.

CE192-13

Final Action: AS AM AMPC____ D

CE194-13

C202 (NEW), C402.1, C402.5 (NEW), C403.1, C403.5 (NEW), C403.6, C405.1, C405.10 (NEW)

Proposed Change as Submitted

Proponent: Tim Nogler, Washington Building Code Council (tim.nogler@des.wa.gov)

Revise as follows:

C402.1 General (Prescriptive). The building thermal envelope shall comply with Section C402.1.1. Section C402.1.2 shall be permitted as an alternative to the *R*-values specified in Section C402.1.1. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C402.5.

C402.5 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with all of the following:

1. Be equipped with automatic door closers that firmly close walk-in doors that have been closed to within 1 inch of full closure.

Exception: Automatic closers are not required for doors wider than 3 feet 9 inches or taller than 7 feet.

2. Doorways shall have strip doors, curtains, spring-hinged doors, or other method of minimizing infiltration when doors are open.
3. Walk-in coolers and refrigerated warehouse coolers shall contain wall, ceiling, and door insulation of not less than R-25 and walk-in freezers and refrigerated warehouse freezers shall contain wall, ceiling, and door insulation of not less than R-32.

Exception: Glazed portions of doors or structural members need not be insulated.

4. Walk-in freezers shall contain floor insulation of not less than R-28.
5. Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass, either filled with inert gas or with heat-reflective treated glass.
6. Windows and transparent reach-in doors for walk-in coolers doors shall be of double-pane or triple-pane, inert gas-filled, heat-reflective treated glass.

C403.1 General. Mechanical systems and equipment serving the building heating, cooling, or ventilating needs shall comply with Section C403.2 (referred to as the mandatory provisions) and either:

1. Section C403.3 (Simple systems); or
2. Section C403.4 (Complex systems).

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.5.

C403.5 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with all of the following:

1. Evaporator fan motors that are less than 1 horsepower and less than 460 volts shall use electronically commutated motors, brushless direct current motors, or 3-phase motors.
2. Condenser fan motors that are less than 1 horsepower shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.
3. Where anti-sweat heaters without anti-sweat heater controls are provided, they shall have a total door rail, glass, and frame heater power draw of not more than 7.1 Watts per square foot of door opening for *walk-in freezers*, and 3.0 Watts per square foot of door opening for *walk-in coolers*.
4. Where anti-sweat heater controls are provided, they shall reduce the energy use of the anti-sweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

C405.1 General (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior applications, electrical energy consumption, and minimum acceptable lighting equipment for exterior applications.

Exception: Dwelling units within commercial buildings shall not be required to comply with Sections C405.2 through C405.5 provided that not less than 75 percent of the permanently installed light fixtures, other than low voltage lighting, shall be fitted for, and contain only, high efficacy lamps. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C405.10.

C405.10 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. Lights in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall either use light sources with an efficacy of not less than 40 lumens per Watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per Watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

Add new definitions as follows:

SECTION C202 GENERAL DEFINITIONS

REFRIGERATED WAREHOUSE COOLER. An enclosed storage space capable of being refrigerated to temperatures above 32°F that can be walked into and has a total chilled storage area of not less than 3,000 square feet.

REFRIGERATED WAREHOUSE FREEZER: An enclosed storage space capable of being refrigerated to temperatures at or below 32°F that can be walked into and has a total chilled storage area of not less than 3,000 square feet.

WALK-IN COOLER. An enclosed storage space capable of being refrigerated to temperatures above 32°F that can be walked into and has a total chilled storage area of less than 3,000 square feet.

WALK-IN FREEZER: An enclosed storage space capable of being refrigerated to temperatures at or below 32°F that can be walked into and has a total chilled storage area of less than 3,000 square feet.

Reason: Refrigeration is one of the largest unregulated electrical loads in buildings. This proposal provides basic minimum performance levels for walk-in coolers and freezers, and for refrigerated warehouse coolers and refrigerated warehouse freezers. The national model code should set a minimum performance for these significant energy using systems. This proposal is based on industry standard practice.

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

C402.1-EC-NOGLER.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was concern about the option allowing clear glass in the doors of this equipment.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Tim Nogler, Washington State Building Code Council, requests Approval as Submitted.

Commenter's Reason: The committee expressed concern about the glazing in cooler and freezer enclosures fogging up. However, this proposal, based on industry practice, defines the required thermal quality of this glazing, which not only limits heat transfer but also limits interior condensation. Federal law contains criteria for walk-in coolers and walk-in freezers. Incorporation of these criteria will keep the IECC in compliance with Federal law. Also, without including these criteria, the baseline for tradeoffs or taking credit for insulation is not readily apparent. Designers, contractors, and building department staff would need to locate the information in the Federal register. Incorporating the criteria in the IECC eliminates the need to track down this information. This proposal provides a baseline for tradeoffs or for taking credit for additional insulation.

CE194-13

Final Action:

AS

AM

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D

CE198-13
C403.2.2

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C403.2.2 Equipment and system sizing. The output capacity of heating and cooling equipment and systems shall not exceed the loads calculated in accordance with Section C403.2.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exceptions:

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load.

Reason: This proposal clarifies intent that the provisions are written to apply to the output capacity of the equipment that provides heating or cooling functions.

While not defined, there is a distinct difference between systems and equipment. The equipment refers to the piece of equipment (or the appliance) that converts delivered energy into heating or cooling capability. The system is much broader in scope and includes not only the equipment but the distribution system, controls, etc. The design loads in Section C403.2.1 will cover the distribution system loads such that the loads in question and the point of comparison with size occurs at the output to the equipment.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.2-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal simplifies the code by putting the focus, where it should be, on equipment.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.2 Equipment sizing. The output capacity of heating and cooling equipment shall not exceed the loads calculated in accordance with Section C403.2.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exceptions:

1. Required standby equipment ~~and systems~~ provided with controls and devices that allow such ~~systems or~~ equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load

Commenter's Reason: As indicated in the original proposal, which received no opposing testimony at the first public hearing, there is a need to clarify that the provisions are written to apply to the output capacity of the equipment that provides heating or cooling functions. In preparing the code change, the reference to systems in the exception was missed, and should also be addressed so the exception is technically consistent with the provisions to which the exception applies.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE198-13

Final Action: AS AM AMPC____ D

CE200-13

Table C403.2.3(1), Table C403.2.3(2), Table C403.2.3(3), Table C403.2.3(8), Chapter 5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

**TABLE C403.2.3(1)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS**

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY			TEST PROCEDURE ^a
				Before 6/1/2011	As of 6/1/2011 Before 1/1/2016	As of 1/1/2016	
Air conditioners, air cooled	< 65,000 Btu/h ^b	All	Split System	13.0 SEER	13.0 SEER	<u>13.0 SEER</u>	AHRI 210/240
			Single Package	13.0 SEER	13.0 14.0 SEER	<u>14.0 SEER</u>	
Through-the-wall (air cooled)	≤ 30,000 Btu/h ^b	All	Split system	12.0 SEER	12.0 SEER	<u>12.0 SEER</u>	
			Single Package	12.0 SEER	12.0 SEER	<u>12.0 SEER</u>	
Small-duct high-velocity (air cooled)	< 65,000 Btu/h ^b	All	Split System	10.0 SEER	10.0 11.0 SEER	<u>11.0 SEER</u>	
Air conditioners, air cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.2 EER 11.4 IEER	11.2 EER 11.4 IEER	<u>11.2 EER</u> <u>12.8 IEER</u>	
		All other	Split System and Single Package	11.0 EER 11.2 IEER	11.0 EER 11.2 IEER	<u>11.0 EER</u> <u>12.6 IEER</u>	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.2 IEER	11.0 EER 11.2 IEER	<u>11.0 EER</u> <u>12.4 IEER</u>	
		All other	Split System and Single Package	10.8 EER 11.0 IEER	10.8 EER 11.0 IEER	<u>10.8 EER</u> <u>12.2 IEER</u>	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.0 EER 10.1 IEER	10.0 EER 10.1 IEER	<u>10.0 EER</u> <u>11.6 IEER</u>	
		All other	Split System and Single Package	9.8 EER 9.9 IEER	9.8 EER 9.9 IEER	<u>9.8 EER</u> <u>11.4 IEER</u>	
	≥ 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.7 EER 9.8 IEER	9.7 EER 9.8 IEER	<u>9.7 EER</u> <u>11.2 IEER</u>	
		All other	Split System and Single Package	9.5 EER 9.6 IEER	9.5 EER 9.6 IEER	<u>9.5 EER</u> <u>11.0 IEER</u>	

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY			TEST PROCEDURE ^a		
				Before 6/1/2011	As of 6/1/2011 Before 1/1/2016	As of 1/1/2016			
Air conditioners, water cooled	< 65,000 Btu/h ^b	All	Split System and Single Package	12.1 EER 12.3 IEER	12.1 EER 12.3 IEER	<u>12.1 EER</u> <u>12.3 IEER</u>	AHRI 210/240		
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.5 EER 11.7 IEER	12.1 EER 12.3 IEER	<u>12.1 EER</u> <u>13.9 IEER</u>	AHRI 340/360		
		All other	Split System and Single Package	11.3 EER 11.5 IEER	11.9 EER 12.1 IEER	<u>11.9 EER</u> <u>13.7 IEER</u>			
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.2 IEER	12.5 EER 12.5 IEER	<u>12.5 EER</u> <u>13.9 IEER</u>			
		All other	Split System and Single Package	10.8 EER 11.0 IEER	12.3 EER 12.5 IEER	<u>12.3 EER</u> <u>13.7 IEER</u>			
	≥ 240,000 Btu/h And < 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.1 IEER	12.4 EER 12.6 IEER	<u>12.4 EER</u> <u>13.6 IEER</u>			
		All other	Split System and Single Package	10.8 EER 10.9 IEER	12.2 EER 12.4 IEER	<u>12.2 EER</u> <u>13.4 IEER</u>			
	≥ 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.1 IEER	12.2 EER 12.4 IEER	<u>12.2 EER</u> <u>13.5 IEER</u>			
		All other	Split System and Single Package	10.8 EER 10.9 IEER	12.0 EER 12.2 IEER	<u>12.0 EER</u> <u>13.3 IEER</u>			
	Air conditioners, evaporatively cooled	< 65,000 Btu/h ^b	All	Split System and Single Package	12.1 EER 12.3 IEER	12.1 EER 12.3 IEER		<u>12.1 EER</u> <u>12.3 IEER</u>	AHRI 210/240
		≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.5 EER 11.7 IEER	12.1 EER 12.3 IEER		<u>12.1 EER</u> <u>12.3 IEER</u>	AHRI 340/360
			All other	Split System and Single Package	11.3 EER 11.5 IEER	11.9 EER 12.1 IEER		<u>11.9 EER</u> <u>12.1 IEER</u>	
< 135,000 Btu/h and < 240,000 Btu/h		Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.2 IEER	12.0 EER 12.2 IEER	<u>12.0 EER</u> <u>12.2 IEER</u>			
		All other	Split System and Single Package	10.8 EER 11.0 IEER	11.8 EER 12.0 IEER	<u>11.8 EER</u> <u>12.0 IEER</u>			
< 240,000 Btu/h and < 760,000 Btu/h		Electric Resistance (or None)	Split System and Single Package	11.0 ERR 11.1 IERR	11.9 ERR 12.1 IERR	<u>11.9 ERR</u> <u>12.1 IEER</u>			
		All other	Split System and Single Package	10.8 EER 10.9 IEER	12.2 11.7 ERR 11.9 IEER	<u>11.7 ERR</u> <u>11.9 IEER</u>			
≥ 760,000 Btu/h		Electric Resistance (or None)	Split System and Single Package	11.0 ERR 11.1 EER	11.7 ERR 11.9 ERR	<u>11.7 ERR</u> <u>11.9 ERRT</u>			

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY			TEST PROCEDURE ^a
				Before 6/1/2011	As of 6/1/2011 Before 1/1/2016	As of 1/1/2016	
		All other	Split System and Single Package	10.8 ERR 10.9 ERR	11.5 ERR 11.7 ERR	<u>11.5 ERR</u> <u>11.7 ERR</u>	
Condensing units, air cooled	≥ 135,000 Btu/h			10.1 EER 11.4 IEER	10.5 EER 11.8 IEER	<u>10.5 EER</u> <u>11.8 IEER</u>	AHRI 365
Condensing units, water cooled	≥ 135,000 Btu/h			13.1 EER 13.6 IEER	13.5 EER 14.0 IEER	<u>13.5 EER</u> <u>14.0 IEER</u>	
Condensing units, evaporatively cooled	≥ 135,000 Btu/h			13.1 EER 13.6 IEER	13.5 EER 14.0 IEER	<u>13.5 EER</u> <u>14.0 IEER</u>	

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

- a. Chapter 5 of the referenced standard contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.
- b. Single-phase, air-cooled air conditioners less than 65,000 Btu/h are regulated by NAECA. SEER values are those set by NAECA.

TABLE C403.2.3(2)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
				Before 1/1/2016	As of 1/1/2016	
Air cooled (cooling mode)	< 65,000 Btu/h ^b	All	Split System	13.0 <u>14.0</u> SEER	<u>14.0 SEER</u>	AHRI 210/240
			Single Packaged	13.0 <u>14.0</u> SEER	<u>14.0 SEER</u>	
Through-the-wall, air cooled	≤ 30,000 Btu/h ^b	All	Split System	13.0 <u>12.0</u> SEER	<u>12.0 SEER</u>	
			Single Packaged	13.0 <u>12.0</u> SEER	<u>12.0 SEER</u>	
Single-duct high-velocity air cooled	< 65,000 Btu/h ^b	All	Split System	10.0 <u>11.0</u> SEER	<u>11 SEER</u>	
Air cooled (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER 11.2 IEER	<u>11.0 EER</u> <u>12.0 IEER</u>	
		All other	Split System and Single Package	10.8 EER 11.0 IEER	<u>10.8 EER</u> <u>11.8 IEER</u>	

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
				Before 1/1/2016	As of 1/1/2016	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.6 EER 10.7 IEER	<u>10.6 EER</u> <u>11.6 IEER</u>	
		All other	Split System and Single Package	10.4 EER 10.5 IEER	10.4 EER <u>11.4 IEER</u>	
	≥ 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.5 EER 9.6 IEER	9.5 EER <u>10.6 IEER</u>	
		All other	Split System and Single Package	9.3 EER 9.4 IEER	9.3 EER <u>10.4 IEER</u>	
Water source (cooling mode)	< 17,000 Btu/h	All	86°F entering water	41.2 EER		ISO-13256-1
	≥ 17,000 Btu/h and < 65,000 Btu/h	All	86°F entering water	42.0 EER		
	≥ 65,000 Btu/h and < 135,000 Btu/h	All	86°F entering water	42.0 EER		
Ground water source (cooling mode)	< 135,000 Btu/h	All	59°F entering water	46.2 EER		
		All	77°F entering water	43.4 EER		
Water source water to water (cooling mode)	< 135,000 Btu/h	All	86°F entering water	46.3 EER		ISO-13256-2
			59°F entering water	46.3 EER		
Ground water source Brine to water (cooling mode)	< 135,000 Btu/h	All	77°F entering fluid	46.3 EER		
Air cooled (heating mode)	< 65,000 Btu/h ^b	—	Split System	7.7 HSPF		AHRI 210/240
		—	Single Package	7.7 HSPF		

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
				Before 1/1/2016	As of 1/1/2016	
Through-the-wall, (air-cooled, heating mode)	≤ 30,000 Btu/h ^b (cooling capacity)	—	Split-System	7.4 HSPF		
		—	Single-Package	7.4 HSPF		
Small-duct high-velocity (air-cooled, heating mode)	< 65,000 Btu/h ^b	—	Split-System	6.8 HSPF		
Air-cooled (heating mode)	≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity)	—	47°F db/43°F wb Outdoor Air	3.3 COP		AHRI 340/360
		—	17°F db/15°F wb Outdoor Air	2.25 COP		
	—	47°F db/43°F wb Outdoor Air	3.2 COP			
	—	17°F db/15°F wb Outdoor Air	2.05 COP			
Water source (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	4.2 COP		ISO 13256-1
Ground-water source (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	3.6 COP		
Ground source (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering fluid	3.1 COP		
Water-source water-to-water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	3.7 COP		ISO 13256-2
		—	50°F entering water	3.1 COP		
Ground source brine-to-water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering fluid	2.5 COP		
Water to Air: Water Loop (cooling mode)	< 17,000 Btu/h	All	86 °F entering water	12.2 EER	12.2 EER	ISO 13256-1

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
				Before 1/1/2016	As of 1/1/2016	
	$\geq 17,000$ Btu/h and $< 65,000$ Btu/h	All	86 °F entering water	13 EER	13 EER	
	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h	All	86 °F entering water	13 EER	13 EER	
<u>Water to Air: Ground Water (cooling mode)</u>	$< 135,000$ Btu/h	All	59 °F entering water	18.0 EER	18.0 EER	ISO 13256-1
<u>Brine to Air: Ground Loop (cooling mode)</u>	$< 135,000$ Btu/h	All	77 F entering water	14.1 EER	14.1 EER	ISO 13256-1
<u>Water to Water: Water Loop (cooling mode)</u>	$< 135,000$ Btu/h	All	86 °F entering water	10.6 EER	10.6 EER	ISO-13256-2
<u>Water to Water: Ground Water (Cooling Mode)</u>	$< 135,000$ Btu/h	All	59 °F entering water	16.3 EER	16.3 EER	
<u>Brine to Water: Ground Loop (cooling mode)</u>	$< 135,000$ Btu/h	All	77 °F entering water	12.1 EER	12.1 EER	
<u>Air cooled (heating mode)</u>	$< 65,000$ Btu/h ^b	=	Split System	8.2 HSPF	8.2 HSPF	AHRI 210/240
		=	Single Package	8.0 HSPF	8.0 HSPF	
<u>Through-the-wall, (air cooled, heating mode)</u>	$\leq 30,000$ Btu/h ^b (cooling capacity)	=	Split System	7.4 HSPF	7.4 HSPF	
		=	Single Package	7.4 HSPF	7.4 HSPF	
<u>Small-Duct high velocity (air cooled, heating mode)</u>	$< 65,000$ Btu/h ^b	=	Split System	6.8 HSPF	6.8 HSPF	
<u>Air Cooled (Heating Mode)</u>	$\geq 65,000$ Btu/h and $< 135,000$ Btu/h (Cooling Capacity)	=	47°F db/43°F wb Outdoor Air	3.3 COP	3.3 COP	AHRI 340/360
			17°F db/15°F wb Outdoor Air	2.25 COP	2.25 COP	

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
				Before 1/1/2016	As of 1/1/2016	
	≥135,000 Btu/h (Cooling Capacity)	=	47°F db/43°F wb Outdoor Air	3.2 COP	3.2 COP	
			17°F db/15°F wb Outdoor Air	2.05 COP	2.05 COP	
<u>Water to Air:</u> <u>Water Loop</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	68 °F entering water	4.3 COP	4.3 COP	<u>ISO 13256-1</u>
<u>Water to Air</u> <u>Ground Water</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	50 °F entering water	3.7 COP	3.7 COP	
<u>Brine to Air:</u> <u>Ground Loop</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	32 °F entering fluid	3.2 COP	3.2 COP	
<u>Water to Water:</u> <u>Water Loop</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	68 °F entering water	3.7 COP	3.7 COP	<u>ISO 13256-2</u>
<u>Water to Water:</u> <u>Ground Water</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	50 °F entering water	3.1 COP	3.1 COP	
<u>Brine to Water:</u> <u>Ground Loop</u> <u>(heating mode)</u>	<135,000 Btu/h (cooling capacity)	=	32 °F entering fluid	2.5 COP	2.5 COP	

For SI: 1 British thermal unit per hour = 0.2931 W. °C = [(°F) – 32]/1.8

- a. Chapter 5 of the referenced standard contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.
- b. Single-phase, air-cooled air conditioners less than 65,000 Btu/h are regulated by NAECA. SEER values are those set by NAECA.

TABLE C403.2.3(3)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS,
PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS,
SINGLE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE ^a
			Before 10/08/2012	As of 10/08/2012	
PTAC (cooling mode) new construction	All Capacities	95°F db outdoor air	$12.5 - (0.213 \times \text{Cap}/1000) \text{ EER}$	$13.8 - (0.300 \times \text{Cap}/1000) \text{ EER}$ $14.0 - (0.300 \times \text{Cap}/1000) \text{ EER}$ ^c	AHRI 310/380
PTAC (cooling mode) replacements ^b	All Capacities	95°F db outdoor air	$10.9 - (0.213 \times \text{Cap}/1000) \text{ EER}$	$10.9 - (0.213 \times \text{Cap}/1000) \text{ EER}$	
PTHP (cooling mode) new construction	All Capacities	95°F db outdoor air	$12.3 - (0.213 \times \text{Cap}/1000) \text{ EER}$	$14.0 - (0.300 \times \text{Cap}/1000) \text{ EER}$	
PTHP (cooling mode) replacements ^b	All Capacities	95°F db outdoor air	$10.8 - (0.213 \times \text{Cap}/1000) \text{ EER}$	$10.8 - (0.213 \times \text{Cap}/1000) \text{ EER}$	
PTHP (heating mode) new construction	All Capacities	—	$3.2 - (0.026 \times \text{Cap}/1000) \text{ COP}$	$3.2 - (0.026 \times \text{Cap}/1000) \text{ COP}$	
PTHP (heating mode) replacements ^b	All Capacities	—	$2.9 - (0.026 \times \text{Cap}/1000) \text{ COP}$	$2.9 - (0.026 \times \text{Cap}/1000) \text{ COP}$	
SPVAC (cooling mode)	< 65,000 Btu/h	95°F db/ 75°F wb outdoor air	9.0 EER	9.0 EER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	95°F db/ 75°F wb outdoor air	8.9 EER	8.9 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	95°F db/ 75°F wb outdoor air	8.6 EER	8.6 EER	
SPVHP (cooling mode)	< 65,000 Btu/h	95°F db/ 75°F wb outdoor air	9.0 EER	9.0 EER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	95°F db/ 75°F wb outdoor air	8.9 EER	8.9 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	95°F db/ 75°F wb outdoor air	8.6 EER	8.6 EER	
SPVHP (heating mode)	<65,000 Btu/h	47°F db/ 43°F wb outdoor air	3.0 COP	3.0 COP	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h	47°F db/ 43°F wb outdoor air	3.0 COP	3.0 COP	

	≥ 135,000 Btu/h and < 240,000 Btu/h	47°F db/ 75°F wb outdoor air	2.9 COP	2.9 COP	
Room air conditioners, with louvered slides	< 6,000 Btu/h	—	9.7 SEER	9.7 SEER	ANSI/AHAM RAC-1
	≥ 6,000 Btu/h and < 8,000 Btu/h	—	9.7 EER	9.7 EER	
	≥ 8,000 Btu/h and < 14,000 Btu/h	—	9.8 EER	9.8 EER	
	≥ 14,000 Btu/h and < 20,000 Btu/h	—	9.7 SEER	9.7 SEER	
	≥ 20,000 Btu/h	—	8.5 EER	8.5 EER	
Room air conditioners, with louvered slides	< 8,000 Btu/h	—	9.0 EER	9.0 EER	
	≥ 8,000 Btu/h and < 20,000 Btu/h	—	8.5 EER	8.5 EER	
	≥ 20,000 Btu/h	—	8.5 EER	8.5 EER	
Room air-conditioner heat pumps with louvered sides	< 20,000 Btu/h	—	9.0 EER	9.0 EER	
	≥ 20,000 Btu/h	—	8.5 EER	8.5 EER	
Room air-conditioner heat pumps without louvered sides	< 14,000 Btu/h	—	8.5 EER	8.5 EER	
	≥ 14,000 Btu/h	—	8.0 EER	8.0 EER	
Room air conditioner casement only	All capacities	—	8.7 EER	8.7 EER	
Room air conditioner casement-slider	All capacities	—	9.5 EER	9.5 EER	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8.

"Cap" = The rated cooling capacity of the project in Btu/h. If the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations

- a. Chapter 5 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- b. Replacement unit shall be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) in height and less than 42 inches (1067 mm) in width.

TABLE C403.2.3(8)
MINIMUM EFFICIENCY REQUIREMENTS:
HEAT REJECTION EQUIPMENT

EQUIPMENT TYPE^a	TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITIONⁱ	PERFORMANCE REQUIRED^{b, c, d, g, h}	TEST PROCEDURE^{e, f}
Propeller or axial fan open circuit cooling towers	All	95°F Entering Water 85°F Leaving Water 75°F Entering wb	≥ 38.2 ≥ 40.2 gpm/hp	CTI ATC-105 and CTI STD-201
Centrifugal fan open circuit cooling towers	All	95°F Entering Water 85°F Leaving Water 75°F Entering wb	≥ 20.0 gpm/hp	CTI ATC-105 and CTI STD-201
Propeller or axial fan closed circuit cooling towers	All	102°F Entering Water 90°F Leaving Water 75°F Entering wb	≥ 14.0 gpm/hp	CTI ATC-105S and CTI STD-201
Centrifugal closed circuit cooling towers	All	102°F Entering Water 90°F Leaving Water 75°F Entering wb	≥ 7.0 gpm/hp	CTI ATC-105S and CTI STD-201
Propeller or axial fan evaporative condensers	All	<u>Ammonia Test Fluid</u> 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 134,000 Btu/h·hp	<u>CTI ATC-106</u>
Centrifugal fan evaporative condensers	All	<u>Ammonia Test Fluid</u> 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 110,000 Btu/h·hp	<u>CTI ATC-106</u>
Propeller or axial fan evaporative condensers	All	<u>R-507A Test Fluid</u> 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 157,000 Btu/h·hp	<u>CTI ATC-106</u>
Centrifugal fan evaporative condensers	All	<u>R-507A Test Fluid</u> 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 135,000 Btu/h·hp	<u>CTI ATC-106</u>
Air-cooled condensers	All	125°F Condensing Temperature R-22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering db	≥ 176,000 Btu/h·hp	ARI 460

For SI: °C = [(°F)-32]/1.8, L/s · kW = (gpm/hp)/(11.83), COP = (Btu/h · hp)/(2550.7)
db = dry bulb temperature, °F, wb = wet bulb temperature, °F.

- a. The efficiencies and test procedures for both open and closed circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of wet and dry heat exchange sections.
- b. For purposes of this table, open circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the fan nameplate rated motor power.
- c. For purposes of this table, closed circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the sum of the fan nameplate rated motor power and the spray pump nameplate rated motor power.
- d. For purposes of this table, air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate rated motor power.
- e. Chapter 6 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. The certification requirements do not apply to field erected cooling towers.
- f. If a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program, or, if a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report.
- g. All cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project specific accessories and / or options included in the capacity of the cooling tower
- h. For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power
- i. Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than R-507A shall meet the minimum efficiency requirements listed above with R-507A as the test fluid.

Add new standards as follows:

CTI

ATC 105S-11 Acceptance Test Code for Closed Circuit Cooling Towers

ATC 106-11 Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers

Reason: For consistency with Standard 90.1. This proposal contains all of the increased equipment efficiency requirements found in standard 90.1. As that standard is an alternative path to compliance with the IECC and there is a desire to maintain equivalency of the IECC with 90.1.

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

Analysis: A review of the standard proposed for inclusion in the code, CTI -ATC 105S-2011 Acceptance Test Code for Closed Circuit Cooling Towers, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

A review of the standard proposed for inclusion in the code, CTI-ATC 106-2011 Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C403.2.3(1)T-EC-FERGUSON.doc

Committee Action Hearing Results

For staff analysis of the content of ATC 105S-11 and ATC 106-11 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: The proposal updates the equipment efficiencies to federal minimum provisions and those contained in ASHRAE 90.1.

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C403.2.3(1)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS**

Air conditioners air cooled	<65,000 Btu/h ^b	All	Split System	13 SEER	13 SEER	AHRI 210/240
			Single Package	<u>13</u> 14-SEER ^c	14 SEER ^c	

c. Minimum efficiency as of 1/1/2015".

(Portions of code change proposal not remain unchanged)

**TABLE C403.2.3(2)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS**

Air cooled (cooling mode)	<65,000 Btu/h ^b	All	Split System	<u>13</u> 14-SEER ^c	<u>13</u> 14.0 SEER ^c	AHRI 210/240
			Single Package	<u>13</u> 14-SEER ^c	14.0 SEER ^c	

Air cooled (heating mode)	<65,000 Btu/h ^b	-	Split System	<u>8.27</u> .7 HSPF ^c	8.2 HSPF ^c	AHRI 210/240
			Single Package	<u>8.07</u> .7 HSPF ^c	8.0 HSPF ^c	

c. Minimum efficiency as of 1/1/2015”.

(Portions of code change proposal not remain unchanged)

TABLE C403.2.3(3)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS,
PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS,
SINGLE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS

PTAC (cooling mode) New Construction	All Capacities	95 F db outdoor air	Split System Single Package		14.0 – (0.300 × Cap/1000) EER ^g	AHRI 310/380
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c. Before 1/1/2015 the minimum efficiency shall be 13.8 – (0.300 × Cap/1000) EER

Commenter’s Reason: On June 27, 2011, the Department of Energy (DOE) issued a final rule amending the federal minimum energy efficiency standards for the single-phase residential central air conditioners and heat pumps. This proposal harmonizes the minimum energy efficiencies of three-phase air-cooled commercial air conditioners and heat pumps less than 65,000 Btu/h with the efficiencies adopted by DOE for residential central air conditioners. The new SEERs and HSPFs will become effective on January 1, 2015.

The current format of the table has a date of January 1, 2016 as the switchover date for all equipment efficiencies (where applicable), due to the formatting, it’s difficult to add a new column for the few efficiencies that go into effect on January 1, 2015. This proposes to add a footnote indicating those efficiencies go into effect a year earlier.

CE200-13

Final Action: AS AM AMPC_____ D

CE201-13

C202 (NEW), Table 403.2.3(9) (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new Table as follows:

TABLE C403.2.3 (9)
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity ^a	Minimum SCOP-127 ^b Efficiency Downflow units / Upflow units	Test Procedure
Air conditioners, air cooled	65,000 Btu/h	2.20 / 2.09	ANSI/ASHRAE 127
	≥65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥240,000 Btu/h	1.90 / 1.79	
Air conditioners, water cooled	65,000 Btu/h	2.60 / 2.49	
	≥65,000 Btu/h and < 240,000 Btu/h	2.50 / 2.39	
	≥240,000 Btu/h	2.40 / 2.29	
Air conditioners, water cooled with fluid economizer	65,000 Btu/h	2.55 / 2.44	
	≥65,000 Btu/h and < 240,000 Btu/h	2.45 / 2.34	
	≥240,000 Btu/h	2.35 / 2.24	
Air conditioners, glycol cooled (rated at 40% propylene glycol)	65,000 Btu/h	2.50 / 2.39	
	≥65,000 Btu/h and < 240,000 Btu/h	2.15 / 2.04	
	≥240,000 Btu/h	2.10 / 1.99	
Air conditioners, glycol cooled (rated at 40% propylene glycol) with fluid economizer	65,000 Btu/h	2.45 / 2.34	
	≥65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥240,000 Btu/h	2.05 / 1.94	

a. Net sensible cooling capacity: The total gross cooling capacity less the latent cooling less the energy to the air movement system. (Total Gross – latent – Fan Power)

b. Sensible coefficient of performance (SCOP-127): a ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watts (excluding re-heaters and humidifiers) at conditions defined in ASHRAE Standard 127. The net sensible cooling capacity is the gross sensible capacity minus the energy dissipated into the cooled space by the fan system.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data and that has a design electronic data equipment power density exceeding 20 watts/ft² of conditioned floor area.

Add new standard to Chapter 5 as follows:

ASHRAE

127-07 Method of Testing for Raining Computer and Data Processing Room Unitary Air Conditioners

Reason: Computer rooms, due to the unique nature of the space, have a significant level of internal heat generation that must be addressed to ensure the equipment therein functions properly. This generally “trumps” any consideration of the sensible or latent loads associated with the people in the space. The cooling equipment that addresses the loads associated with these spaces operates differently and responds to different loads and schedules. This necessitates the efficiency of such equipment be addressed differently than more traditional cooling equipment. ANSI/ASHRAE Standard 127 has been developed for use in measuring and expressing the performance of this equipment for this particular and unique application. This equipment is currently addressed by ASHRAE/IES 90.1-2010, which is adopted as an alternative means of compliance with the IECC. This proposed change addresses the need to cover this unique energy efficiency opportunity in a manner consistent with 90.1-2010. Without this change the IECC Commercial Provisions could not be deemed equivalent to 90.1-2010 or subsequent editions of 90.1 that retain these provisions. More importantly if this change is not approved then the equipment efficiency provisions currently in the IECC would continue to be applied to equipment serving such spaces inappropriately

Cost Impact: The code change proposal will increase the cost of construction as there were previously no requirements for this equipment.

Analysis: A review of the standard proposed for inclusion in the code, ASHRAE 127-2007 Method of Testing for Raining Computer and Data Processing Room Unitary Air Conditioners, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C403.2.3(9)T-EC-FERGUSON.doc

Committee Action Hearing Results

For staff analysis of the content of ASHRAE 127-07 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: Computer rooms develop substantial heat and need specific air-conditioning equipment. The proposal would establish minimum efficiencies for these systems. A public comment is needed to provide a reference to this table within the requirements of the chapter.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.3 HVAC equipment performance requirements. Equipment shall meet the minimum efficiency requirements of Tables C403.2.3(1), C403.2.3(2), C403.2.3(3), C403.2.3(4), C403.2.3(5), C403.2.3(6), C403.2.3(7), and C403.2.3(8) and C403.2.3(9) when tested and rated in accordance with the applicable test procedure. Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table ~~C403.2.3(9)~~-C403.2.3(10). The efficiency shall be verified through certification under an *approved* certification program or, if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements. Where components, such as indoor or outdoor coils, from different manufacturers are used, calculations and supporting data shall be furnished by the designer that demonstrates that the combined efficiency of the specified components meets the requirements herein.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The original proposal adds important criteria for the limitation of energy usage in computer rooms. It adds another equipment table in the pantheon of C403.2.3 tables. What it fails to do is provide a reference to such table in the text. The proposed modification simply cleans up the proposal by adding reference to it in Section C403.2.3.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE201-13

Final Action: AS AM AMPC_____ D

CE212-13

C403.2.6

Proposed Change as Submitted

Proponent: Tim Manz, City of Blaine, MN, representing the Association of Minnesota Building Officials (tmanz@ci.blaine.mn.us)

Revise as follows:

C403.2.6 Energy recovery ventilation systems. Where the supply airflow rate of a fan system exceeds the values specified in Table C403.2.6, the system shall include an energy recovery system. The energy recovery system shall have the capability to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls which permit operation of the economizer as required by Section C403.4

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *International Mechanical Code*.
2. Laboratory fume hood systems that include at least one of the following features:
 - 2.1. Variable-air-volume hood exhaust and room supply systems capable of reducing exhaust and makeup air volume to 50 percent or less of design values except when higher volumes are required to maintain safe operating conditions.
 - 2.2. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) above room setpoint, cooled to no cooler than 3°F (1.7°C) below room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
5. Heating energy recovery in Climate Zones 1 and 2.
6. Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.
9. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table C403.2.6
10. Systems exhausting toxic, flammable, paint, or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

Reason: Public health, safety and welfare takes precedence over reducing energy consumption, and the revision to Item 2.1 recognizes that with laboratory fume hoods. Additional exceptions 10 and 11 identify systems where energy recovery should not be used because what is being exhausted could be detrimental or destructive to any energy recovery equipment. All of these provisions are contained in the current Minnesota Commercial Energy Code.

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

C403.2.6-EC-MANZ.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal adds systems to the list of exceptions for which energy recovery systems would be inappropriate because the things being vented are dangerous or toxic. The committee identified that the change to Item 2.1 needs to be revised. It provides an exception within an exception and is unclear.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Eric Makela, Britt/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.6 Energy recovery ventilation systems. Where the supply airflow rate of a fan system exceeds the values specified in Table C403.2.6, the system shall include an energy recovery system. The energy recovery system shall have the capability to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls which permit operation of the economizer as required by Section C403.4

Exceptions: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *International Mechanical Code*.
2. Laboratory fume hood systems that include at least one of the following features:
 - 2.1 Variable-air-volume hood exhaust and room supply systems capable of reducing exhaust and makeup air volume to 50 percent of less of design values, ~~except when higher volumes are required to maintain safe operating conditions.~~
 - 2.2 Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) above room setpoint, cooled to no cooler than 3°F (1.7°C) below room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
5. Heating energy recovery in Climate Zones 1 and 2.
6. Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design *outdoor air* flow rate.
9. Systems expected to operate less than 20 hours per week at the *outdoor air* percentage covered by Table C403.2.6
10. Systems exhausting toxic, flammable, paint, or corrosive fumes or dust.
11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

Commenter's Reason: The term "safe operating conditions" is not defined and would be open to interpretation. The addition to Exception 2.1, which is currently included in the 2012 IECC, would weaken the provision as designers could claim the need for additional air volumes which would increase energy use. Without a threshold built into the code provision it would be difficult to make determination as to what was safe or not safe relating to operating conditions.

CE212-13

Final Action:

AS

AM

AMPC____

D

CE214-13
Table C403.2.6

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

TABLE C403.2.6
ENERGY RECOVERY REQUIREMENT

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	$\geq 10\%$ and $< 20\%$	$\geq 20\%$ and $< 30\%$	$\geq 30\%$ and $< 40\%$	$\geq 40\%$ and $< 50\%$	$\geq 50\%$ and $< 60\%$	$\geq 60\%$ and $< 70\%$	$\geq 70\%$ and $< 80\%$	$\geq 80\%$
	DESIGN SUPPLY FAN AIRFLOW RATE (cfm)							
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	NR	NR	≥ 5000 NR	≥ 5000 NR
1B, 2B, 5C	NR	NR	NR	NR	≥ 26000	≥ 12000	≥ 5000	≥ 4000
6B	≥ 28000	≥ 26500	≥ 11000	≥ 5500	≥ 4500	≥ 3500	≥ 2500	≥ 1500
1A, 2A, 3A, 4A, 5A, 6A	≥ 26000	≥ 16000	≥ 5500	≥ 4500	≥ 3500	≥ 2000	≥ 1000	> 0
7, 8	≥ 4500	≥ 4000	≥ 2500	≥ 1000	> 0	> 0	> 0	> 0

NR = not required

Reason: This proposal revises the requirements for the use of exhaust air energy recovery as defined in table C403.2.6

The current table requires energy recovery as a function of the percent outdoor air and design supply fan airflow. The current table defines requirements for energy recover for outdoor air ventilation rates above 30%. Many buildings operate with ventilation rates below 30%. Typical buildings in this category include offices, motels, hotels, grocery, and warehouses which represent a significant part of the market. Therefore by extending the table down we can save additional energy on these buildings where economically justified. SSPC 90.1 ran full 8760 hr simulation runs for building office, school and retail applications down to 10% outdoor air and then selected least restrictive cfm values for the table based on the 2010 scalar ratio methodology using a design life of 15 years. This results in additional requirements for energy recovery on larger systems in zones 1A, 2A, 3A, 4A, 5A, 6A, 7 and 8. These zones represent 30.8% of the market.

In addition to the changes to extend the table down low percent outdoor air ventilation rates, this also proposes to modify the requirements for zone 3B, 3C, 4B, 4C and 5B as they are not economical justified and have scalar values of 20.3 yrs up to infinity. We have received feedback that other studies have also confirmed that these values are not cost effective and it is felt these values need to be corrected.

The change ensures continued consistency between the IECC and Standard 90.1.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.6-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: These categories allow for cost effective application of energy recovery and should be included in the requirement.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

TABLE C403.2.6 (1)

ENERGY RECOVERY REQUIREMENT (ventilation systems operating <8000 hr/yr)

(Portions of code change proposal not shown remain unchanged)

TABLE C403.2.6 (2) Energy Recovery Requirement (ventilation systems operating ≥8000 hrs/yr)

Zone	% Outdoor Air at Full Design Airflow Rate							
	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and <80%	≥80%
	Design Supply Fan Airflow Rate (cfm)							
3C	NR	NR	NR	NR	NR	NR	NR	NR
1B, 2B, 3B, 4C, 5C	NR	≥19500	≥9000	≥5000	≥4000	≥3000	≥1500	>0
1A, 2A, 3A, 4B, 5B	≥2500	≥2000	≥1000	≥500	>0	>0	>0	>0
4A, 5A, 6A, 6B, 7, 8	>0	>0	>0	>0	>0	>0	>0	>0

NR – Not required

Commenter's Reason: In 2012 addendum BT to 90.1 2010 standard was developed to expand the range for the use of exhaust air energy recovery down to 10% rates ventilation rate, which was matched in the original CE214. At that time the requirements were adjusted based on the latest performance and economics analysis and energy recovery was removed for climate zones 3B, 3C, 4B, 4C, and 5B for >70% outside air.

This modification will make the IECC consistent with the latest addenda to ASHRAE 90.1 that will be published in the 2013 version of the standard.

Additional studies have been completed for buildings with continuous ventilation operation (assumed to be ≥8,000 hrs) and a second table has been developed to cover buildings with the higher ventilation operation which expands the requirements for the use of energy recovery.

CE214-13

Final Action: AS AM AMPC_____ D

CE215-13
C403.2.7

Proposed Change as Submitted

Proponent: Ron Burton, PTW Advisors, LLC, representing BOMA International
(ronburton@ptwadvisors.com)

Revise as follows:

C403.2.7 Duct and plenum insulation and sealing. All supply and return air ducts and plenums shall be insulated with a minimum of R-6 insulation where located in unconditioned spaces and a minimum of R-8 insulation where located outside the building. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by minimum of R-8 insulation.

Exceptions:

1. Where located within equipment
2. Where the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15° F (8°C).

All ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the *International Mechanical Code*.

Exception: Ducts and plenums located completely inside the building thermal envelope

Reason: To provide an exception to not require insulation on ducts and plenums, when the ducts and plenums are completely inside the building thermal envelope. This is the same as the provision already allowed in the residential portion of the code. Heat loss or gain from the ducts and plenums inside the conditioned space is only released to the conditioned area and thus does not have an impact on energy use.

Cost Impact: This code change proposal will not increase the cost of construction. The change will have a cost savings by exempting the required insulation on ducts and plenums.

C403.2.7-EC-BURTON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal may result in conflicts with the *International Mechanical Code*. The text was unclear whether it meant ducts and plenums located within the walls, floor and ceilings which constitute the building thermal envelope, or if it meant to apply to those that would be located within the conditioned space created by the assemblies which create the thermal envelope.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ron Burton, PTW Advisors, LLC, representing Building Owners and Managers Association (BOMA), International requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.7 Duct and plenum insulation and sealing. All supply and return ducts and plenums shall be insulated with a minimum of R-6 insulation where located in unconditioned spaces and a minimum of R-8 insulation where located outside the buildings. Where located within the building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by minimum of R-8 insulation.

Exceptions:

1. Where located within equipment
2. Where the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15° F (8° C)
3. Where located inside of the conditioned space within the building thermal envelope.

All ducts, air handlers and filter boxes shall be sealed. Joints and seams shall be comply with Section 603.9 of the *International Mechanical Code*.

~~**Exception:** Ducts and plenums located completely inside the building thermal envelope.~~

Commenter's Reason: To respond to the committee concern that the exception would conflict with the *International Mechanical Code* and to clarify the committee concern about unclear language as to the location of the ducts in relationship to the building thermal envelope. The intent is to provide an exception to the requirement for duct and plenum insulation when the ducts are entirely within the conditioned space created by the building envelope. The same exception currently exists in the IECC residential portion of the code.

CE215-13

Final Action: AS AM AMPC_____ D

CE220-13

C403.2.7 (NEW), Table C403.2.7 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.2.7 Kitchen exhaust systems. Replacement air introduced directly into the exhaust hood cavity shall not exceed 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space containing a kitchen hood shall not exceed the greater of the ventilation rate required to meet the space heating or cooling load or the hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

When total kitchen hood exhaust airflow rate is greater than 5,000 cfm each hood shall have a maximum exhaust rate in accordance with Table C403.2.7 and shall meet one of the following:

1. At least 50 percent of all replacement air is transfer air that would otherwise be exhausted.
2. Demand ventilation systems on at least 75 percent of the exhaust air that are capable of at least 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 at least 40 percent on at least 50 percent of the total exhaust airflow.

When a single hood, or hood section, is installed over appliances with different duty ratings, then 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: When at least 75 percent of all the replacement air is transfer air that would otherwise be exhausted

TABLE C403.2.7
MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH

<u>Type of Hood</u>	<u>Light Duty Equipment</u>	<u>Medium Duty Equipment</u>	<u>Heavy Duty Equipment</u>	<u>Extra Heavy Duty Equipment</u>
<u>Wall-mounted canopy</u>	<u>140</u>	<u>210</u>	<u>280</u>	<u>385</u>
<u>Single island</u>	<u>280</u>	<u>350</u>	<u>420</u>	<u>490</u>
<u>Double island (per side)</u>	<u>175</u>	<u>210</u>	<u>280</u>	<u>385</u>
<u>Eyebrow</u>	<u>175</u>	<u>175</u>	<u>Not allowed</u>	<u>Not allowed</u>
<u>Backshelf/Pass-over</u>	<u>210</u>	<u>210</u>	<u>280</u>	<u>Not allowed</u>

Reason: For consistency with Standard 90.1-2010. Considering that the IECC Commercial Provisions are intended to be technically compatible with that standard to facilitate adoption and implementation, ASHRAE is interested in keeping 2012 IECC Commercial Provisions aligned with ANSI/ASHRAE/IESNA Standard 90.1-2010.

The proposal basically outlaws "short-circuit" hoods.

Research and California Energy Commission has shown that direct supply of makeup air, in excess of 10% of hood exhaust airflow, into the hood cavity significantly deteriorates the Capture and Containment (C&C) performance of hoods. This research has also demonstrated that short-circuit hoods waste energy and degrade kitchen environment and hygiene. If we assume a generic baseline C&C rate for a cooking process, studies show the exhaust rates for short-circuit hoods generally exceed those for exhaust-only hoods by at least the amount of air short-circuited, thus decreasing performance and increasing energy consumption.

Engineers are often in the habit of simply providing makeup air units in kitchens to provide makeup air equal to the exhaust flow rate even when “free” transfer air is available from adjacent spaces. Adding makeup air when transfer air is available is a wasteful design practice and should be prohibited. Using available transfer air saves energy and reduces the first cost of the makeup unit and exhaust system in the adjacent spaces. It simply requires some engineering and coordination to provide a path for the transfer air. The proposed change is also intended to get rid of a wasteful common practice: specifying excessive exhaust airflow by selecting hoods that are not listed or have not been subjected to a recognized performance test. The exhaust airflow flow rates in Table C403.2.7 are 30% below the minimum airflow rates in ASHRAE Standard 154-2003.

ASHRAE Research Project 1202 shows that hoods listed per UL Standard 710 and/or are engineered and tested per ASTM/ANSI 1704 have exhaust rates that are at least 30% less than the exhaust airflow requirements for unlisted or untested hoods. The intent is to conserve energy through the use of engineered hoods or performance based hoods that have been validated based on consensus standard test methods it should be noted that ASHRAE research has not demonstrated that exhaust rate reductions substantially beyond the 30% can or should be recommended at this time. This requirement should not increase first cost and in many cases will reduce first cost through downsizing of exhaust, supply and cooling equipment.

The 5,000 CFM threshold recognizes small restaurants. In addition makeup air can be fully conditioned. As a result there are now cost effective opportunities to reduce energy with demand ventilation systems or energy recovery devices.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.7 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee recognized that there is significant potential for energy savings, but expressed concern that these systems are already difficult to balance properly without this added challenge. The proposal needs better coordination with the *International Mechanical Code*.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.7 Kitchen Exhaust Systems. Replacement air introduced directly into the exhaust hood cavity shall not exceed 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space containing a kitchen hood shall not exceed the greater of the ventilation rate required to meet the space heating or cooling load or the hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

When total kitchen hood exhaust airflow rate is greater than 5,000 cfm, each hood shall be a factory-built commercial exhaust hood listed by a nationally recognized testing laboratory to comply with the requirements of UL710. Each hood shall have a maximum exhaust rate in accordance with Table C403.2.7 and shall meet one of the following:

(Portions of proposal not shown remain unchanged)

Commenter’s Reason: This will make the IECC consistent with 90.1-2010 and 90.1-2013. Considering that the IECC Commercial Provisions are intended to be technically compatible with that standard to facilitate adoption and implementation, ASHRAE is interested in keeping 2012 IECC Commercial Provisions aligned with ANSI/ASHRAE/IESNA Standard 90.1-2010.

The proposal basically outlaws “short-circuit” hoods.

Research and California Energy Commission has shown that direct supply of makeup air, in excess of 10% of hood exhaust airflow, into the hood cavity significantly deteriorates the Capture and Containment (C&C) performance of hoods. This research has also demonstrated that short-circuit hoods waste energy and degrade kitchen environment and hygiene. If we assume a generic baseline C&C rate for a cooking process, studies show the exhaust rates for short-circuit hoods generally exceed those for exhaust-only hoods by at least the amount of air short-circuited, thus decreasing performance and increasing energy consumption.

Engineers are often in the habit of simply providing makeup air units in kitchens to provide makeup air equal to the exhaust flow rate even when “free” transfer air is available from adjacent spaces. Adding makeup air when transfer air is available is a wasteful design practice and should be prohibited. Using available transfer air saves energy and reduces the first cost of the makeup unit and exhaust system in the adjacent spaces. It simply requires some engineering and coordination to provide a path for the transfer air.

The proposed change is also intended to get rid of a wasteful common practice: specifying excessive exhaust airflow by selecting hoods that are not listed or have not been subjected to a recognized performance test. The exhaust airflow flow rates in Table C403.2.7 are 30% below the minimum airflow rates in ASHRAE Standard 154-2003.

ASHRAE Research Project 1202 shows that hoods listed per UL Standard 710 and/or are engineered and tested per ASTM/ANSI 1704 have exhaust rates that are at least 30% less than the exhaust airflow requirements for unlisted or untested hoods. The intent is to conserve energy through the use of engineered hoods or performance based hoods that have been validated based on consensus standard test methods it should be noted that ASHRAE research has not demonstrated that exhaust rate reductions substantially beyond the 30% can or should be recommended at this time. This requirement should not increase first cost and in many cases will reduce first cost through downsizing of exhaust, supply and cooling equipment.

The 5,000 CFM threshold recognizes small restaurants. In addition makeup air can be fully conditioned. As a result there are now cost effective opportunities to reduce energy with demand ventilation systems or energy recovery devices. This comment adds a requirement that hoods must be listed (which is required by the IMC to utilize exhaust rates lower than the IMC has for unlisted hood values).

Equipment manufacturers reviewed and agreed to the values proposed in the new table. To address the Code Development Committee's concerns, this proposal has been modified to be such that hoods must be listed (which is required by the IMC to utilize exhaust rates lower than the IMC has for unlisted hood values).

Staff Note: The UL 710 standard is already a referenced standard in the *International Mechanical Code*.

CE220-13

Final Action: AS AM AMPC_____ D

CE223-13
C403.2.7.1.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C403.2.7.1.1 Low-pressure duct systems. All longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches water gauge shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the *International Mechanical Code*.

Exception: ~~Continuously welded and locking-type longitudinal joints and seams need not be sealed as specified in this section on ducts operating at static pressures less than 2 inches water gauge (w.g.) (500 Pa) pressure classification.~~

Reason: This proposal clarifies that locked joint construction methods for duct systems meet the code for longitudinal seams. The requirement clearly allows welded longitudinal seams to be acceptable, so that is not needed in the exception. As currently stated in the exception, it might be interpreted that the longitudinal seam must be both welded and locking. That is clearly not the intent, as welding and locking together are not typical duct sealing approaches.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.7.1.1-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal, similar to CE222-13, clarifies the exception.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.2.7.1.1 Low-pressure duct systems. All longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches water gauge shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the *International Mechanical Code*.

Exception: Locking-type longitudinal joints and seams of other than the snap-lock and button-lock types need not be sealed as specified in this section.

Commenter's Reason: At the code development hearing, there was no opposition to CE223-13 and it was approved as submitted. Related changes to CE223-13 are CE222-13 and CE224-13. CE224-13 was recommended for disapproval based on testimony by the proponent that action on prior code change proposals (CE222 and CE223) eliminated the need for CE224-13. CE222-13 was recommended for approval and per that code change proposal the exception would read as follows:

"For ducts having a static pressure classification of less than 2 inches of water column (500 Pa), additional closure systems shall not be required for continuously welded joints and seams and locking-type joints and seams of other than the snap-lock and button-lock types."

DOE is submitting this public comment in an attempt to reconcile CE222-13 and CE223-13, both of which were approved as submitted. As currently written, CE222 would essentially 'wipe out' CE223-13. CE222-13 has errors that the language proposed in this public comment addresses.

- There is no need to indicate in the exception a threshold of 2 inches static pressure, because that threshold is covered in the parent section to which the exception applies. This is a flaw with the current code that CE223-13 addresses, but is not addressed in CE222-13.
- The parent section shows sealing with welds to be an acceptable method of closure, and as such there is then no need to exempt welded joints and seams from that requirement. This is a flaw with the current code that CE223-13 addresses but is not addressed in CE222-13.
- In addressing the above two issues with the current code text CE223-13 results in simplifying the code with respect to what ends up being exempted—locking type longitudinal joints and seams. CE222-13, after addressing the above two issues that CE222-13 carries over from the current code, essentially exempts locking type joints and seams of other than snap-lock and button-lock types.
- The public comment modifies CE223-13 to embody the simplicity and clarification of the current code intended in CE223-13 along with the new technical focus that exempts all locking type longitudinal joints and seams EXCEPT those of the snap lock and button lock types.

The code change proposal as modified by this public comment will ensure the desired consistency with the IMC and applicability of the code to certain joints and seams, as embodied in CE222-13. In addition, the code change proposal as modified by this public comment will capture the simplicity and clarity embodied in CE223-13. Both CE222-13 and CE223-13 were recommended for approval as submitted but, as noted above, it would be challenging to reconcile if both were approved as submitted at the final action hearing. This public comment allows the voting members of ICC to review and vote on how these two approved changes would be reconciled and appear in the 2015 IECC.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE223-13

Final Action: AS AM AMPC_____ D

CE227-13
C403.2.8 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.2.8 Laboratory exhaust systems. Buildings with laboratory exhaust systems having a total exhaust rate greater than 5,000 cfm shall be provided with at least one of the following:

1. A VAV laboratory exhaust and room supply system capable of reducing exhaust and makeup air flow rates to the minimum required in the *International Mechanical Code*
2. A VAV laboratory exhaust and room supply system capable of reducing exhaust and makeup air flow rates by at least 50 percent of design condition.
3. A heat recovery system to precondition makeup air from laboratory exhaust with at least a 50 percent sensible recovery effectiveness.
- 3.4. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust air flow rate that is not heated above room setpoint or cooled below room setpoint and does not utilize non-adiabatic humidification.

Reason: For consistency with Standard 90.1-2010. Considering that the IECC Commercial Provisions are intended to be technically compatible with that standard to facilitate adoption and implementation, ASHRAE is interested in keeping 2012 IECC Commercial Provisions aligned with ANSI/ASHRAE/IES Standard 90.1-2010.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.8 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal adds a cost effective area to obtain additional energy savings.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Code development is a process. A key part of that process is having a rationale for the content of the code and a good reason for making changes. The process should give all parties a chance to read, hear and weigh the arguments. We cannot allow "because I think it's a good idea" or "I said so" to become the metric by which proposals are approved.

The appropriate rationale for a particular proposal will vary. Sometimes only a short rationale is required; other times the issues are more difficult and suggest a broader rationale. Often a summary of an analysis, with a pointer to more fleshed out information works well.

ASHRAE is legitimately an active player in the I-code development process, submitting approximately 40 proposed changes this cycle alone. An effective code development process requires interaction between viewpoints. There is no requirement that the I-Codes reflect every single thing proposed or included in the ASHRAE standards. In fact, ASHRAE 90.1 is considered an alternate path of compliance recognized in the IECC and it becomes counterproductive to make sure the two match as it takes away that

additional option for energy compliance.

Granting the fact that ASHRAE meetings are public, evaluating submissions should not require attending the numerous and lengthy meetings, subcommittee meetings and phone calls. Given an extended history of ASHRAE changes often lacking reasons beyond "consistency with ASHRAE", the policy of needing a rationale for inclusion in the code should be enforced. For that reason, disapproval of 12 proposals is requested. This is not meant to suggest ASHRAE proposals necessarily lack merit, but rather that without a reason other than "it's because it is in the ASHRAE standard", it is impossible to judge that merit.

The following proposals are included, but only the first two will have this larger reason statement. The subsequent nine proposals will have brief reasons statements. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333.

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE227-13

Final Action: AS AM AMPC_____ D

CE230-13, Part I

C403.2.8.2 (New), R403.3.2 (New) (IRC N1103.2 (New))

Proposed Change as Submitted

Proponent: Howard Ahern, Airex Mfg., representing self (howard.ahern@airexmfg.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C403.2.8.2 Chilled water and refrigerant suction piping. Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall include a Class I or Class II vapor retarding facing located outside the insulation. Piping insulation protection shall be removable and reusable. Piping insulation shall be in accordance with Section C403.2.8.1.

Reason: The use of Vapor Retarders with suction line pipe insulation has been a requirement of the ASHRAE 90.1 Standard going back to 2004. This code change is needed to specify requirements for Chilled water and refrigerant suction piping. This change will ensure steady, long-term thermal performance, and prevent the transference of moisture. Preventing moisture exchange will help prevent Wet insulation and maintain system integrity, sustainability, and energy savings of the insulation. Preventing moisture transference will also help prevent the growth of mold.

All AC units require periodic maintenance. The frequency varies with how hard the unit operates, exterior temperature, preventive maintenance program, and many others. In every occasion, maintenance provides an excuse for the suction line insulation to be touched and or removed. Pipe insulation removal from suction lines often results in damage to the insulation itself requiring replacement.

Protection for the suction piping insulation therefore need to be removable and reusable. This will help insure system integrity and sustainability of the pipe insulation, reducing replacement.

Cost Impact: This code change will increase cost; For the vapor retarders only and not will not increase cost in those jurisdictions that use ASHRAE Standard 90.1 as vapor retarders has been part of ASHRAE Standard 90.1 since 2004.

C403.2.8.2-EC-AHERN.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Approved as Modified

Modify the proposal as follows:

C403.2.8.2 Chilled water and refrigerant suction piping. Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall include a Class I or Class II vapor retarding facing located outside of the insulation, or the insulation shall be installed at a thickness which qualifies as a Class I or Class II vapor retarder. Piping insulation protection shall be removable and reusable. Piping insulation shall be in accordance with Section C403.2.8.1.

Committee Reason: The modification eliminates the requirement for the insulation to be removable and reusable. Installations of insulation should not be limited to that criteria. The proposal provides better design for this piping when located outside of conditioned space.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jim Young, Technical Director, representing ITW Insulation Systems, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C403.2.8.2 Chilled water and refrigerant suction piping. Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall include a ~~Class I or Class II~~ vapor retarding facing with a permeance of less than or equal to 0.02 perms measured in accordance with Procedure A of ASTM E96 located outside of the insulation, or the insulation shall be installed at a thickness that achieves a permeance of less than or equal to 0.02 perms. ~~qualifies as a Class I or Class II vapor retarder.~~

Commenter's Reason: This proposal introduces the concept of vapor retarder class as defined in the IBC and proposes applying it to the vapor retarders (VRs) used on pipe insulation. This is a mistake since the VR properties required in the IBC are not appropriate to pipe insulation. The Vapor retarder classes as defined in the IBC apply to applications located on building envelopes (walls and roofs) where there can be vapor flow in either direction depending on the season or even the time of day. The permeance in these applications is appropriately required to be "Class I: 0.1 perm or less" or "Class II: 0.1 < perm ≤ 1.0 perm".

Insulation systems on cold pipe have a unidirectional flow of moisture from the ambient surroundings toward the cold pipe. As a result, the classes of vapor retarder listed in the IBC and used in this proposal for pipe insulation applications do not require a low enough permeance. The typical permeance of vapor retarders on insulation for use on pipe should be ≤0.02 perms as measured using Procedure A (desiccant method at 73.4°F) of ASTM E96.

References to a permeance requirement for cold pipe of ≤0.02 perms are contained in the following locations:

- 2010 ASHRAE Handbook of Refrigeration, Chapter 10, "Insulation Systems for Refrigerant Piping"
 - Page 10.7, Section on Vapor Retarders which says, "Insulation materials should be protected by a continuous vapor retarder with a maximum permeance of 0.02 perm, either integral to the insulation or a vapor retarder material applied to the exterior surface of the insulation."
- 2013 ASHRAE Handbook of Fundamentals, Chapter 23, "Insulation for Mechanical Systems"
 - Page 23.9, section on Water vapor Permeability which says, "In below-ambient applications, it is important to minimize the rate of water vapor flow to the cold surface. This is normally accomplished by using vapor retarders or insulation materials (e.g. cellular glass insulation) with a permeance less than or equal to 0.02 perm, or both."
 - Page 23.14, section on Insulation Finish for Below-Ambient Temperatures which says, "Sheet-type vapor retarders used on below ambient pipe insulation should have a maximum permeance of 0.02 perm, when tested per ASTM Standard E96, procedure A (desiccant method) or B (water method). Insulation materials that meet the permeance requirements of an application can be installed without separate vapor retarders, relying on the low permeability and thickness of the insulation material to resist vapor flow, but must be carefully sealed or cemented at all joints to avoid gaps in the insulation."

Based on the above information, this proposed change to the IECC must be modified such that the permeance requirement for pipe insulation is in agreement with the standard industry recommendation of ≤0.02 perms.

CE230-13, Part I

Final Action: AS AM AMPC_____ D

CE230-13, Part II

C403.2.8.2 (New), R403.3.2 (New) (IRC N1103.2 (New))

Proposed Change as Submitted

Proponent: Howard Ahern, Airex Mfg., representing self (howard.ahern@airexmfg.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART II – IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R403.3.2 (N1103.3.2) Refrigerant suction piping. Insulation covering refrigerant suction piping located outside the conditioned space shall include a Class I or Class II vapor-retardant facing located on the outside of the insulation. Piping insulation protection shall be removable and reusable. Piping insulation shall be in accordance with Section R403.3.

Reason: The use of Vapor Retarders with suction line pipe insulation has been a requirement of the ASHRAE 90.1 Standard going back to 2004. This code change is needed to specify requirements for Chilled water and refrigerant suction piping. This change will ensure steady, long-term thermal performance, and prevent the transference of moisture. Preventing moisture exchange will help prevent Wet insulation and maintain system integrity, sustainability, and energy savings of the insulation. Preventing moisture transference will also help prevent the growth of mold.

All AC units require periodic maintenance. The frequency varies with how hard the unit operates, exterior temperature, preventive maintenance program, and many others. In every occasion, maintenance provides an excuse for the suction line insulation to be touched and or removed. Pipe insulation removal from suction lines often results in damage to the insulation itself requiring replacement.

Protection for the suction piping insulation therefore need to be removable and reusable. This will help insure system integrity and sustainability of the pipe insulation, reducing replacement.

Cost Impact: This code change will increase cost; For the vapor retarders only and not will not increase cost in those jurisdictions that use ASHRAE Standard 90.1 as vapor retarders has been part of ASHRAE Standard 90.1 since 2004.

C403.2.8.2-EC-AHERN.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Approved as Modified

Modify the proposal as follows:

R403.3.2 (N1103.3.2) Refrigerant suction piping. Insulation covering refrigerant suction piping located outside the conditioned space shall include a Class I or Class II vapor-retardant facing located on the outside of the insulation or the insulation shall be installed at a thickness that qualifies as a Class I or Class II vapor retarder. Piping insulation protection shall be removable and reusable. Piping insulation shall be in accordance with Section R403.3.

Committee Reason: This proposal would add an important feature dealing with HVAC systems that might otherwise be overlooked.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jim Young, Technical Director, representing ITW Insulation Systems, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

R403.3.2 (N1103.3.2) Refrigerant suction piping. Insulation covering refrigerant suction piping located outside the conditioned space shall include a Class I or Class II vapor-retardant facing with a permeance of less than or equal to 0.02 perms measured in accordance with Procedure A of ASTM E96 located on the outside of the insulation or the insulation shall be installed at a thickness that achieves a permeance of less than or equal to 0.02 perms, qualifies as a Class I or Class II vapor retarder.

Commenter's Reason: This proposal introduces the concept of vapor retarder class as defined in the IBC and proposes applying it to the vapor retarders (VRs) used on pipe insulation. This is a mistake since the VR properties required in the IBC are not appropriate to pipe insulation. The Vapor retarder classes as defined in the IBC apply to applications located on building envelopes (walls and roofs) where there can be vapor flow in either direction depending on the season or even the time of day. The permeance in these applications is appropriately required to be "Class I: 0.1 perm or less" or "Class II: 0.1 < perm ≤ 1.0 perm".

Insulation systems on cold pipe have a unidirectional flow of moisture from the ambient surroundings toward the cold pipe. As a result, the classes of vapor retarder listed in the IBC and used in this proposal for pipe insulation applications do not require a low enough permeance. The typical permeance of vapor retarders on insulation for use on pipe should be ≤0.02 perms as measured using Procedure A (desiccant method at 73.4°F) of ASTM E96.

References to a permeance requirement for cold pipe of ≤0.02 perms are contained in the following locations:

- 2010 ASHRAE Handbook of Refrigeration, Chapter 10, "Insulation Systems for Refrigerant Piping"
 - Page 10.7, Section on Vapor Retarders which says, "Insulation materials should be protected by a continuous vapor retarder with a maximum permeance of 0.02 perm, either integral to the insulation or a vapor retarder material applied to the exterior surface of the insulation."
- 2013 ASHRAE Handbook of Fundamentals, Chapter 23, "Insulation for Mechanical Systems"
 - Page 23.9, section on Water vapor Permeability which says, "In below-ambient applications, it is important to minimize the rate of water vapor flow to the cold surface. This is normally accomplished by using vapor retarders or insulation materials (e.g. cellular glass insulation) with a permeance less than or equal to 0.02 perm, or both."
 - Page 23.14, section on Insulation Finish for Below-Ambient Temperatures which says, "Sheet-type vapor retarders used on below ambient pipe insulation should have a maximum permeance of 0.02 perm, when tested per ASTM Standard E96, procedure A (desiccant method) or B (water method). Insulation materials that meet the permeance requirements of an application can be installed without separate vapor retarders, relying on the low permeability and thickness of the insulation material to resist vapor flow, but must be carefully sealed or cemented at all joints to avoid gaps in the insulation."

Based on the above information, this proposed change to the IECC must be modified such that the permeance requirement for pipe insulation is in agreement with the standard industry recommendation of ≤0.02 perms.

CE230-13, Part II

Final Action:	AS	AM	AMPC _____	D
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CE232-13
C403.2.10, C403.2.10.3 (NEW)

Proposed Change as Submitted

Proponent: Michael Ivanovich, AMCA International (mivanovich@amca.org)

Revise as follows:

C403.2.10 Air system design and control. Each HVAC system having a total fan system motor nameplate horsepower (hp) exceeding 5 horsepower (hp) (3.7 kW) shall meet the provisions of Sections C403.2.10.1 through ~~C403.2.10.2~~ C403.2.10.3.

C403.2.10.3 Fan efficiency verification. The efficiency of fans shall be verified through certification under an *approved* certification program or, where no certification program exists, the fan efficiency ratings shall be supported by data furnished by the manufacturer.

Reason: The energy usage of fans is under increasing scrutiny by designers, building owners, commissioning agents, code enforcement professionals, federal agencies, and other code users. This code change proposal requires fan manufacturers to provide relevant information related to the energy efficient performance of their products. The proposed language has been extracted from the IECC section on HVAC equipment in Section C403.2.3 as an equipment performance requirement. It is applicable to fan products.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.2.10-EC-IVANOVICH.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal was disapproved in light of the approval of CE234-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Amanda Hickman, Intercode, Inc, representing AMCA International, requests Approval as Submitted.

Commenter's Reason: Fan energy usage is under increasing scrutiny by designers, building owners, the DOE, and others. For this reason it would benefit code enforcement professionals, as well as building designers, if they had information on a fan's efficiency performance readily available. This language will provide the mechanism for doing just that by requiring fan manufacturers to provide relevant information to that effect and where established, verify the efficiency of their products through and *approved* certification program.

The proposed language has been extracted from the IECC section on HVAC equipment in Section C403.2.3 as an equipment performance requirement.

CE232-13

Final Action:

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AMPC_____

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CE239-13

C403.2.12 (NEW), Table C403.2.12(1) (NEW), Table C403.2.12 (2) (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.2.12 Refrigeration equipment performance. Refrigeration equipment shall have an energy use in kWh/day not greater than the values of Tables C403.2.12(1) and C403.2.12(2) when tested and rated in accordance with AHRI Standard 1200. The energy use shall be verified through certification under an approved certification program or, where no certification program exists, the energy use shall be supported by data furnished by the equipment manufacturer.

**TABLE C403.2.12(1)
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATION**

<u>Equipment Type</u>	<u>Application</u>	<u>Energy Use Limits (kWh per day)^a</u>	<u>Test Procedure</u>
<u>Refrigerator with solid doors</u>	<u>Holding Temperature</u>	<u>0.10 x V + 2.04</u>	<u>AHRI 1200</u>
<u>Refrigerator with transparent doors</u>		<u>0.12 x V + 3.34</u>	
<u>Freezers with solid doors</u>		<u>0.40 x V + 1.38</u>	
<u>Freezers with transparent doors</u>		<u>0.75 x V + 4.10</u>	
<u>Refrigerators/freezers with solid doors</u>		<u>the greater of 0.12 x V + 3.34 or 0.70</u>	
<u>Commercial refrigerators</u>	<u>Pulldown</u>	<u>0.126 x V + 3.51</u>	

^aV = volume of the chiller or frozen compartment as defined in AHAM-HRF-1

**TABLE C403.2.12(2)
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS**

<u>Equipment Type</u>				<u>Energy Use Limits (kWh/day) as of 1/1/2012^{a,b}</u>	<u>Test Procedure</u>
<u>Equipment Class^c</u>	<u>Family Code</u>	<u>Operating Mode</u>	<u>Rating Temperature</u>		
<u>VOP.RC.M</u>	<u>Vertical Open</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.82 x TDA + 4.07</u>	<u>AHRI 1200</u>
<u>SVO.RC.M</u>	<u>Semivertical Open</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.83 x TDA + 3.18</u>	
<u>HZO.RC.M</u>	<u>Horizontal Open</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.35 x TDA + 2.88</u>	
<u>VOP.RC.L</u>	<u>Vertical Open</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>2.27 x TDA + 6.85</u>	
<u>HZO.RC.L</u>	<u>Horizontal Open</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>0.57 x TDA + 6.88</u>	

Equipment Type				Energy Use Limits (kWh/day) as of 1/1/2012^{a,b}	Test Procedure
Equipment Class^c	Family Code	Operating Mode	Rating Temperature		
<u>VCT.RC.M</u>	<u>Vertical Transparent Door</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.22 TDA + 1.95</u>	
<u>VCT.RC.L</u>	<u>Vertical Transparent Door</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>0.56 × TDA + 2.61</u>	
<u>SOC.RC.M</u>	<u>Service Over Counter</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.51 × TDA + 0.11</u>	
<u>VOP.SC.M</u>	<u>Vertical Open</u>	<u>Self Contained</u>	<u>Medium Temperature</u>	<u>1.74 × TDA + 4.71</u>	
<u>SVO.SC.M</u>	<u>Semivertical Open</u>	<u>Self Contained</u>	<u>Medium Temperature</u>	<u>1.73 × TDA + 4.59</u>	
<u>HZO.SC.M</u>	<u>Horizontal Open</u>	<u>Self Contained</u>	<u>Medium Temperature</u>	<u>0.77 × TDA + 5.55</u>	
<u>HZO.SC.L</u>	<u>Horizontal Open</u>	<u>Self Contained</u>	<u>Low Temperature</u>	<u>1.92 × TDA + 7.08</u>	
<u>VCT.SC.I</u>	<u>Vertical Transparent Door</u>	<u>Self Contained</u>	<u>Ice Cream</u>	<u>0.67 × TDA + 3.29</u>	
<u>VCS.SC.I</u>	<u>Vertical Solid Door</u>	<u>Self Contained</u>	<u>Ice Cream</u>	<u>0.38 × V + 0.88</u>	
<u>HCT.SC.I</u>	<u>Horizontal Transparent Door</u>	<u>Self Contained</u>	<u>Ice Cream</u>	<u>0.56 × TDA + 0.43</u>	
<u>SVO.RC.L</u>	<u>Semivertical Open</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>2.27 × TDA + 6.85</u>	
<u>VOP.RC.I</u>	<u>Vertical Open</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>2.89 × TDA + 8.7</u>	
<u>SVO.RC.I</u>	<u>Semivertical Open</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>2.89 × TDA + 8.7</u>	
<u>HZO.RC.I</u>	<u>Horizontal Open</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>0.72 × TDA + 8.74</u>	
<u>VCT.RC.I</u>	<u>Vertical Transparent Door</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>0.66 × TDA + 3.05</u>	
<u>HCT.RC.M</u>	<u>Horizontal Transparent Door</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.16 × TDA + 0.13</u>	
<u>HCT.RC.L</u>	<u>Horizontal Transparent Door</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>0.34 × TDA + 0.26</u>	
<u>HCT.RC.I</u>	<u>Horizontal Transparent Door</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>0.4 × TDA + 0.31</u>	
<u>VCS.RC.M</u>	<u>Vertical Solid Door</u>	<u>Remote Condensing</u>	<u>Medium Temperature</u>	<u>0.11 × V + 0.26</u>	
<u>VCS.RC.L</u>	<u>Vertical Solid Door</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	<u>0.23 × V + 0.54</u>	
<u>VCS.RC.I</u>	<u>Vertical Solid Door</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	<u>0.27 × V + 0.63</u>	
<u>HCS.RC.M</u>	<u>Horizontal Solid</u>	<u>Remote Condensing</u>	<u>Medium</u>	<u>0.11 × V + 0.26</u>	

<u>Equipment Type</u>				<u>Energy Use Limits (kWh/day) as of 1/1/2012^{a,b}</u>	<u>Test Procedure</u>
<u>Equipment Class^c</u>	<u>Family Code</u>	<u>Operating Mode</u>	<u>Rating Temperature</u>		
	<u>Door</u>		<u>Temperature</u>		
<u>HCS.RC.L</u>	<u>Horizontal Solid Door</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	$0.23 \times V + 0.54$	
<u>HCS.RC.I</u>	<u>Horizontal Solid Door</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	$0.27 \times V + 0.63$	
<u>HCS.RC.I</u>	<u>Horizontal Solid Door</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	$0.27 \times V + 0.63$	
<u>SOC.RC.L</u>	<u>Service Over Counter</u>	<u>Remote Condensing</u>	<u>Low Temperature</u>	$1.08 \times TDA + 0.22$	
<u>SOC.RC.I</u>	<u>Service Over Counter</u>	<u>Remote Condensing</u>	<u>Ice Cream</u>	$1.26 \times TDA + 0.26$	
<u>VOP.SC.L</u>	<u>Vertical Open</u>	<u>Self Contained</u>	<u>Low Temperature</u>	$4.37 \times TDA + 11.82$	
<u>VOP.SC.I</u>	<u>Vertical Open</u>	<u>Self Contained</u>	<u>Ice Cream</u>	$5.55 \times TDA + 15.02$	
<u>SVO.SC.L</u>	<u>Semivertical Open</u>	<u>Self Contained</u>	<u>Low Temperature</u>	$4.34 \times TDA + 11.51$	
<u>SVO.SC.I</u>	<u>Semivertical Open</u>	<u>Self Contained</u>	<u>Ice Cream</u>	$5.52 \times TDA + 14.63$	
<u>HZO.SC.I</u>	<u>Horizontal Open</u>	<u>Self Contained</u>	<u>Ice Cream</u>	$2.44 \times TDA + 9.0$	
<u>SOC.SC.I</u>	<u>Service Over Counter</u>	<u>Self Contained</u>	<u>Ice Cream</u>	$1.76 \times TDA + 0.36$	
<u>HCS.SC.I</u>	<u>Horizontal Solid Door</u>	<u>Self Contained</u>	<u>Ice Cream</u>	$0.38 \times V + 0.88$	

^aV = Volume of the case, as measured in accordance with Appendix C of AHRI 1200.

^bTDA = Total display area of the case, as measured in accordance with Appendix D of AHRI 1200.

^cEquipment class designations consist of a combination (in sequential order separated by periods(AAA).(BB).(C)) of:

(AAA) An equipment family code where:

VOP=vertical open
SVO=semivertical open
HZO=horizontal open,
VCT=vertical transparent doors
VCS=vertical solid doors
HCT=horizontal transparent doors
HCS=horizontal solid doors
SOC=service over counter

(BB) An operating mode code, either

RC=remote condensing, or
SC=self-contained).

(C) A rating temperature code, either:

M=medium temperature (38 °F)
L=low temperature (0 °F), or
I=ice-cream temperature (15 °F).

For example, "VOP.RC.M" refers to the "vertical open, remote condensing, medium temperature" equipment class.

Add new standards to Chapter 5 as follows:

AHRI

1200-10 Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets.

AHAM

HRF-1 2007 Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised to address energy efficiency opportunities available from commercial refrigeration and freezing equipment. In buildings where such equipment is located it contributes to the energy use of the building and now that there is a test procedure for efficiency of this equipment and minimum efficiencies are in standard 90.1-2010 it seems reasonable to include them in the IECC, noting this type of equipment is addressed in the IMC as to health and life safety. The change ensures continued consistency between the IECC and standard 90.1-2010.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, AHRI 1200-2010 Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

A review of the standard proposed for inclusion in the code, AHAM-HRF-1-2007 Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C403.2.12 (NEW) #1-EC-FERGUSON.doc

Committee Action Hearing Results

For staff analysis of the content of AHRI 1200-10 and AHAM HRF-1 2007 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: The proposal incorporates new federal standards applicable to freezers and commercial refrigeration installations.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Code development is a process. A key part of that process is having a rationale for the content of the code and a good reason for making changes. The process should give all parties a chance to read, hear and weigh the arguments. We cannot allow "because I think it's a good idea" or "I said so" to become the metric by which proposals are approved.

The appropriate rationale for a particular proposal will vary. Sometimes only a short rationale is required; other times the issues are more difficult and suggest a broader rationale. Often a summary of an analysis, with a pointer to more fleshed out information works well.

ASHRAE is legitimately an active player in the I-code development process, submitting approximately 40 proposed changes this cycle alone. An effective code development process requires interaction between viewpoints. There is no requirement that the I-Codes reflect every single thing proposed or included in the ASHRAE standards. In fact, ASHRAE 90.1 is considered an alternate path of compliance recognized in the IECC and it becomes counterproductive to make sure the two match as it takes away that additional option for energy compliance.

Granting the fact that ASHRAE meetings are public, evaluating submissions should not require attending the numerous and lengthy meetings, subcommittee meetings and phone calls. Given an extended history of ASHRAE changes often lacking reasons beyond "consistency with ASHRAE", the policy of needing a rationale for inclusion in the code should be enforced. For that reason, disapproval of 12 proposals is requested. This is not meant to suggest ASHRAE proposals necessarily lack merit, but rather that without a reason other than "it's because it is in the ASHRAE standard", it is impossible to judge that merit.

The following proposals are included, but only the first two will have this larger reason statement. The subsequent nine proposals will have brief reasons statements. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333.

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current*

Code provisions and explains how such proposals will improve the Code.

3.3.5.3 Substantiation: The proponent shall substantiate the proposed code change based on technical information and substantiation. ...

CE239-13

Final Action:

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CE240-13

C202 (NEW), C403.2.12 (NEW), C403.2.13 (NEW), C403.5 (NEW), C403.5.1 (NEW), C403.5.2 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.2.12 Walk-in Coolers and Walk-in Freezers. Site assembled or site constructed walk-in coolers and walk-in freezers shall comply with the following:

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch of full closure.

Exception: Closers are not required for doors over 3 feet 9 inches wide or 7 feet tall.

2. Doorways shall be provided with strip doors, curtains, spring-hinged doors, or other method of minimizing infiltration when the doors are open.
3. Walls shall be provided with insulation having a thermal resistance of not less than R-25, ceilings shall be provided with insulation having a thermal resistance of not less than R-25 and doors of walk-in coolers and walk-in freezers shall be provided with insulation having a thermal resistance of not less than R-32.

Exception: Insulation is not required for glazed portions of doors or at structural members associated with the walls, ceiling or door frame.

4. The floor of walk-in freezers shall be provided with insulation having a thermal resistance of not less than R-28.
5. Evaporator fan motors that are less than 1 horsepower and less than 460 volts shall be electronically commutated motors or 3-phase motors.
6. Light sources shall have an efficacy of not less than 40 lumens per Watt, including any ballast losses or shall be provided with a device that automatically turns off the lights within 15 minutes of when the walk-in cooler or walk-in freezer was last occupied.
7. Transparent reach-in doors for and windows in opaque walk-in freezer doors shall be provided with triple-pane glass having the interstitial spaces filled with inert gas or provided with heat-reflective treated glass.
8. Transparent reach-in doors for and windows in opaque walk-in cooler doors shall be double-pane heat-reflective treated glass having the interstitial space gas filled;
9. Anti-sweat heaters that are not provided with anti-sweat heater controls shall have a total door rail, glass, and frame heater power draw not greater than 7.1 Watts per square foot of door opening for walk-in freezers, and not greater than 3.0 Watts per square foot of door opening for walk-in coolers.

10. Anti-sweat heater controls shall be capable of reducing the energy use of the anti-sweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. Condenser fan motors that are less than 1 horsepower in capacity shall be of the electronically commutated or permanent split capacitor-type or shall be 3-phase motors.

Exception: Fan motors in *walk-in coolers* and *walk-in freezers* combined in a single enclosure greater than 3,000 square feet in floor area are exempt.

C403.2.13 Refrigerated display cases. Site assembled or site constructed refrigerated display cases shall comply with the following:

1. Lighting in refrigerated display cases and glass doors installed on walk-in coolers and freezers shall be controlled by one of the following:
 - 1.1 Automatic time switch controls to turn off lights during non-business hours. Timed overrides for display cases or walk-in coolers and freezers may be used to turn the lights on for up to one hour and shall automatically time out to turn the lights off.
 - 1.2 Motion sensor controls on each display case or walk-in door section that reduce lighting power by at least 50 percent within 3 minutes after the area within the sensor range is vacated. how about is 'unoccupied' as you have used in other proposals.
2. All low temperature display cases shall incorporate temperature based defrost termination control with a time limit default. The defrost cycle shall terminate first on an upper temperature limit breach and second upon a time limit breach.
3. Anti-sweat heater controls shall reduce the energy use of the anti-sweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

C403.5 Refrigeration systems Refrigerated display cases, *walk-in coolers* or *walk-in freezers* that are served by remote compressors and remote condensers not located in a *condensing unit*, shall meet the requirements of Section C403.5.and C403.5.2.

Exception: Systems where the working fluid in the refrigeration cycle goes through both subcritical and supercritical states (transcritical) or systems that use ammonia refrigerant are exempt.

C403.5.1 Condensers serving refrigeration systems. Fan-powered condensers shall comply with the following:

1. The design *saturated condensing temperatures* for air-cooled condensers shall not exceed the design dry bulb temperature plus 10°F for *low temperature refrigeration systems*, and the design dry bulb temperature plus 15°F for *medium temperature refrigeration systems* where the *saturated condensing temperature* for blend refrigerants shall be determined using the average of liquid and vapor temperatures as converted from the condenser drain pressure
2. Condenser fan motors that are less than 1 horsepower shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.
3. All condenser fans for air-cooled condensers, evaporatively cooled condensers, air or water cooled fluid coolers or cooling towers shall reduce fan motor demand to no more than 30% of design wattage at 50% of design air volume, and incorporate one of the following continuous variable speed fan control approaches:

- 3.1 Refrigeration system condenser control for air-cooled condensers shall use variable setpoint control logic to reset the condensing temperature setpoint in response to ambient drybulb temperature.
- 3.2 Refrigeration system condenser control for evaporatively cooled condensers shall use variable setpoint control logic to reset the condensing temperature setpoint in response to ambient wetbulb temperature.
4. Multiple fan condensers shall be controlled in unison.
5. The minimum condensing temperature setpoint shall be no greater than 70°F.

C403.5.2 Compressor systems. Refrigeration compressor systems shall comply with the following:

1. Compressors and multiple-compressor systems suction groups shall include control systems that use floating suction pressure control logic to reset the target suction pressure temperature based on the temperature requirements of the attached refrigeration display cases or walk-ins.

Exception. Controls are not required for the following:

1. Single compressor systems that do not have variable capacity capability.
2. Suction groups that have a design saturated suction temperature of 30°F or higher, suction groups that comprise the high stage of a two-stage or cascade system or suction groups that primarily serve chillers for secondary cooling fluids.
2. Liquid sub-cooling shall be provided for all low temperature compressor systems with a design cooling capacity equal to or greater than 100,000 Btu/hr with a design saturated suction temperature of -10°F or lower. The sub-cooled liquid temperature shall be controlled at a maximum temperature setpoint t of 50°F at the exit of the sub-cooler using either compressor economizer (inter-stage) ports or a separate compressor suction group operating at a saturated suction temperature of 18°F or higher.
 - 2.1 Insulation for liquid lines with a fluid operating temperature less than 60°F are shall comply with Table C403.2.8.
3. All compressors that incorporate internal or external crankcase heaters shall provide a means to cycle the heaters off during compressor operation.

Add new definitions as follows:

**SECTION C202
GENERAL DEFINITIONS**

BUBBLE POINT. The refrigerant liquid saturation temperature at a specified pressure

CONDENSING UNIT. A factory-made assembly of refrigeration components designed to compress and liquefy a specific refrigerant. The unit consists of one or more refrigerant compressors, refrigerant condensers (air-cooled, evaporatively – cooled, and/or water-cooled), condenser fans and motors (where used) and factory-supplied accessories.

REFRIGERANT DEW POINT. The refrigerant vapor saturation temperature at a specified pressure.

REFRIGERATION SYSTEM, LOW TEMPERATURE. Systems for maintaining food product in a frozen state in refrigeration applications.

REFRIGERATION SYSTEM, MEDIUM TEMPERATURE. Systems for maintaining food product above freezing in refrigeration applications.

SATURATED CONDENSING TEMPERATURE. The saturation temperature corresponding to the measured refrigerant pressure at the condenser inlet for single component and azeotropic refrigerants, and the arithmetic average of the dew point and *bubble point* temperatures corresponding to the refrigerant pressure at the condenser entrance for zeotropic refrigerants.

WALK-IN COOLER. An enclosed storage space less than 3,000 square feet in floor area, designed to maintain the space warmer than 32°F but cooler than 55°F that has a ceiling height of not less than 7 feet

WALK-IN FREEZER. An enclosed storage space less than 3,000 square feet in floor area, designed to maintain the space at no greater than 32°F that has a ceiling height of not less than 7 feet

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised to address the energy efficiency associated with refrigeration systems and coolers. These systems and equipment are prevalent in many building types and should be addressed in the IECC because they represent an opportunity to save additional energy. The change ensures continued consistency between the IECC and standard 90.1.

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

C403.2.12 (NEW) #2-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Provides construction and efficiency standards for walk-in coolers and freezers as well as similar refrigeration equipment and systems consistent with new federal standards.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE240-13

Final Action:

AS

AM

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D

CE241-13

C403.1, C403.3, C403.3.1.1 (New), C403.1.1.1, C403.3.3.1.1.2, C403.3.1.2 (New), C403.3.1.1.3, Table C403.3.1.1(1), Table C403.3.1.1.3(2), C403.3.1.1.4, C403.3.1.4 (New), C403.3.1.4.1 (New), C403.3.1.4.2 (New), C403.3.2, C403.4 through C403.4.3.5

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

C403.1 General. Mechanical systems and equipment serving the building heating, cooling or ventilating needs shall comply with Section C403.2 (referred to as the mandatory provisions) and ~~either: shall~~ comply with Sections C403.3 and C403.4 based on the equipment and systems provided.

- ~~1. Section C403.3 (Simple systems); or~~
- ~~2. Section C403.4 (Complex systems).~~

C403.3 Simple HVAC systems and equipment Economizers (Prescriptive). This section applies to buildings served by ~~unitary or packaged~~ HVAC equipment listed in Tables C403.2.3(1) through C403.2.3(8). ~~; each serving one zone and controlled by a single thermostat in the zone served. It also applies to two-pipe heating systems serving one or more zones, where no cooling system is installed~~

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.4.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve *residential* spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of *outdoor air* for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling *efficiency* meets or exceeds the *efficiency* requirements in Table C403.3.1(2).

C403.3.1.1 Integrated economizer control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to meet the remainder of the cooling load.

Exceptions:

1. Direct expansion systems that include controls that reduce the quantity of *outdoor air* required to prevent coil frosting at the lowest step of compressor unloading, provided this lowest step is no greater than 25 percent of the total system capacity.
2. Individual direct expansion units that have a rated cooling capacity less than 54,000 Btu/h (15 827 W) and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.

C403.3.1.2 Economizer heating system impact. HVAC system design and economizer controls shall be such that economizer operation does not increase the building heating energy use during normal operation.

Exception: Economizers on VAV systems that cause zone level heating to increase due to a reduction in supply air temperature.

**TABLE C403.3.1(1)
ECONOMIZER REQUIREMENTS**

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	Economizers on all cooling systems ≥ 33,000 Btu/h ^a

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

- a. The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater.

**TABLE C403.3.1(2)
EQUIPMENT EFFICIENCY
PERFORMANCE EXCEPTION FOR ECONOMIZERS**

CLIMATE ZONES	COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)
2B	10% Efficiency Improvement
3B	15% Efficiency Improvement
4B	20% Efficiency Improvement

C403.3.1.4 C403.3.1.3 Air economizers. Air economizers shall comply with Sections C403.3.1.4.1 through C403.3.1.4.4. C403.3.1.3.1 through C403.3.1.3.4.

C403.3.1.4.1 C403.3.1.3.1 Design capacity. Air economizer systems shall be capable of modulating outdoor air and return air dampers to provide up to 100 percent of the design supply air quantity as outdoor air for cooling.

C403.3.1.4.2 C403.3.1.3.2 Control signal. Economizer dampers shall be capable of being sequenced with the mechanical cooling equipment and shall not be controlled by only mixed air temperature.

Exception: The use of mixed air temperature limit control shall be permitted for systems controlled from space temperature (such as single-zone systems).

C403.3.1.4.3. C403.3.1.3.3 High-limit shutoff. Air economizers shall be capable of automatically reducing outdoor air intake to the design minimum outdoor air quantity when outdoor air intake will no longer reduce cooling energy usage. High-limit shutoff control types for specific climates shall be chosen from Table C403.3.1.4.3(1) C403.3.1.3.3(1). High-limit shutoff control settings for these control types shall be those specified in Table C403.3.1.4(2) C403.3.1.3.3(2).

TABLE C403.3.1.1(1) C403.3.1.3.3(1)
HIGH-LIMIT SHUTOFF CONTROL OPTIONS FOR AIR ECONOMIZERS

CLIMATE ZONES	ALLOWED CONTROL TYPES	PROHIBITED CONTROL TYPES
1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	Fixed dry bulb Differential dry bulb Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	Fixed enthalpy
1A, 2A, 3A, 4A	Fixed dry bulb Fixed enthalpy Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	Differential dry bulb
All other climates	Fixed dry bulb Differential dry bulb Fixed enthalpy Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	—

a. Electronic enthalpy controllers are devices that use a combination of humidity and dry-bulb temperature in their switching algorithm.

TABLE C403.3.1.1.3(2) C403.3.1.3.3(2)
HIGH-LIMIT SHUTOFF CONTROL SETTING FOR AIR ECONOMIZERS

DEVICE TYPE	CLIMATE ZONE	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN):	
		EQUATION	DESCRIPTION
Fixed dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	$T_{OA} > 75^{\circ}\text{F}$	Outdoor air temperature exceeds 75°F
	5A, 6A, 7A	$T_{OA} > 70^{\circ}\text{F}$	Outdoor air temperature exceeds 70°F
	All other zones	$T_{OA} > 65^{\circ}\text{F}$	Outdoor air temperature exceeds 65°F
Differential dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$T_{OA} > T_{RA}$	Outdoor air temperature exceeds return air temperature
Fixed enthalpy	All	$h_{OA} > 28 \text{ Btu/lb}^a$	Outdoor air enthalpy exceeds 28 Btu/lb of dry air ^a
Electronic Enthalpy	All	$(T_{OA}, RH_{OA}) > A$	Outdoor air temperature/RH exceeds the "A" setpoint curve ^b
Differential enthalpy	All	$h_{OA} > h_{RA}$	Outdoor air enthalpy exceeds return air enthalpy
Dew-point and dry bulb temperatures	All	$DP_{OA} > 55^{\circ}\text{F}$ or $T_{OA} > 75^{\circ}\text{F}$	Outdoor air dry bulb exceeds 75°F or outside dew point exceeds 55°F (65 gr/lb)

For SI: °C = (°F - 32) × 5/9, 1 Btu/lb = 2.33 kJ/kg.

- At altitudes substantially different than sea level, the Fixed Enthalpy limit shall be set to the enthalpy value at 75°F and 50-percent relative humidity. As an example, at approximately 6,000 feet elevation the fixed enthalpy limit is approximately 30.7 Btu/lb.
- Setpoint "A" corresponds to a curve on the psychrometric chart that goes through a point at approximately 75°F and 40-percent relative humidity and is nearly parallel to dry-bulb lines at low humidity levels and nearly parallel to enthalpy lines at high humidity levels.

C403.3.1.1.4 C403.3.1.3.4 Relief of excess outdoor air. Systems shall be capable of relieving excess *outdoor air* during air economizer operation to prevent over-pressurizing the building. The relief air outlet shall be located to avoid recirculation into the building.

C403.3.1.4 Water-side economizers. Water-side economizers shall comply with Sections C403.3.1.4.1 through C403.3.1.4.2

C403.3.1.4.1 Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at *outdoor air* temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) and below.

Exception: Systems in which a water economizer is used and where dehumidification requirements cannot be met using outdoor air temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) shall satisfy 100 percent of the expected system cooling load at 45°F dry bulb (7.2°C dry bulb)/40°F wet bulb (4.5°C wet bulb).

C403.3.1.4.2 Maximum pressure drop. Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15 feet (4572 mm) of water or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the circulating pumps when the system is in the normal cooling (noneconomizer) mode.

C403.3.2 Hydronic system controls. Hydronic systems of at least 300,000 Btu/h (87 930 W) design output capacity supplying heated and chilled water to comfort conditioning systems shall include controls that meet the requirements of Section C403.4.3.

C403.4 Complex Hydronic and multi-zone HVAC system controls and equipment. (Prescriptive). This section applies to buildings served by HVAC equipment and systems not covered in Section C403.3. Hydronic and multi-zone HVAC system controls and equipment shall comply with this section.

C403.4.1 Economizers. Economizers shall comply with Sections C403.4.1.1 through C403.4.1.4.

C403.4.1.1 Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at *outdoor air* temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) and below.

Exception: Systems in which a water economizer is used and where dehumidification requirements cannot be met using outdoor air temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) shall satisfy 100 percent of the expected system cooling load at 45°F dry bulb (7.2°C dry bulb)/40°F wet bulb (4.5°C wet bulb).

C403.4.1.2 Maximum pressure drop. Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15 feet (4572 mm) of water or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the circulating pumps when the system is in the normal cooling (noneconomizer) mode.

C403.4.1.3 Integrated economizer control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to meet the remainder of the cooling load.

Exceptions:

- 1.—Direct expansion systems that include controls that reduce the quantity of *outdoor air* required to prevent coil frosting at the lowest step of compressor unloading, provided this lowest step is no greater than 25 percent of the total system capacity.

- ~~2. Individual direct expansion units that have a rated cooling capacity less than 54,000 Btu/h (15 827 W) and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.~~

~~**C403.4.1.4 Economizer heating system impact.** HVAC system design and economizer controls shall be such that economizer operation does not increase the building heating energy use during normal operation.~~

~~**Exception:** Economizers on VAV systems that cause zone level heating to increase due to a reduction in supply air temperature.~~

~~**C403.4.2 C403.4.1 Variable air volume (VAV) fan control.** Individual VAV fans with motors of 7.5 horsepower (5.6 kW) or greater shall be:~~

- ~~1. Driven by a mechanical or electrical variable speed drive;~~
- ~~2. Driven by a vane-axial fan with variable-pitch blades; or~~
- ~~3. The fan shall have controls or devices that will result in fan motor demand of no more than 30 percent of their design wattage at 50 percent of design airflow when static pressure set point equals one-third of the total design static pressure, based on manufacturer's certified fan data.~~

~~**C403.4.2.1 C403.4.1.1 Static pressure sensor location.** Static pressure sensors used to control VAV fans shall be placed in a position such that the controller setpoint is no greater than one-third the total design fan static pressure, except for systems with zone reset control complying with Section C403.4.2.2. For sensors installed down-stream of major duct splits, at least one sensor shall be located on each major branch to ensure that static pressure can be maintained in each branch.~~

~~**C403.4.2.2 C403.4.1.2 Set points for direct digital control.** For systems with direct digital control of individual zone boxes reporting to the central control panel, the static pressure set point shall be reset based on the zone requiring the most pressure, i.e., the set point is reset lower until one zone damper is nearly wide open.~~

~~**C403.4.3 C403.4.2 Hydronic systems controls.** The heating of fluids that have been previously mechanically cooled and the cooling of fluids that have been previously mechanically heated shall be limited in accordance with Sections ~~C403.4.3.1 through C403.4.3.3~~ C403.4.2.1 through C403.4.2.3. Hydronic heating systems comprised of multiple-packaged boilers and designed to deliver conditioned water or steam into a common distribution system shall include automatic controls capable of sequencing operation of the boilers. Hydronic heating systems comprised of a single boiler and greater than 500,000 Btu/h (146 550 W) input design capacity shall include either a multistaged or modulating burner.~~

~~**C403.4.3.1 C403.4.2.1 Three-pipe system.** Hydronic systems that use a common return system for both hot water and chilled water are prohibited.~~

~~**C403.4.3.2 C403.4.2.2 Two-pipe changeover system.** Systems that use a common distribution system to supply both heated and chilled water shall be designed to allow a dead band between changeover from one mode to the other of at least 15°F (8.3°C) outside air temperatures; be designed to and provided with controls that will allow operation in one mode for at least 4 hours before changing over to the other mode; and be provided with controls that allow heating and cooling supply temperatures at the changeover point to be no more than 30°F (16.7°C) apart.~~

~~**C403.4.3.3 C403.4.2.3 Hydronic (water loop) heat pump systems.** Hydronic heat pump systems shall comply with Sections ~~C403.4.3.3.1 C403.4.2.3.1,~~ through ~~C403.4.3.3.3~~ C403.4.2.3.2.~~

~~**C403.4.3.3.4 C403.4.2.3.1 Temperature dead band.** Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition shall have controls that are~~

capable of providing a heat pump water supply temperature dead band of at least 20°F (11.1°C) between initiation of heat rejection and heat addition by the central devices.

Exception: Where a system loop temperature optimization controller is installed and can determine the most efficient operating temperature based on realtime conditions of demand and capacity, dead bands of less than 20°F (11°C) shall be permitted.

~~C403.4.3.3.2~~ C403.4.2.3.2 Heat rejection. Heat rejection equipment shall comply with Sections ~~C403.4.3.3.2.1~~ and ~~C403.4.3.3.2.2~~. C403.4.2.3.2.1 and C403.4.2.3.2.2

Exception: Where it can be demonstrated that a heat pump system will be required to reject heat throughout the year.

~~C403.4.3.3.2.1~~ C403.4.2.3.2.1 Climate Zones 3 and 4. For climate zones 3 and 4:

1. If a closed-circuit cooling tower is used directly in the heat pump loop, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower, or lower leakage positive closure dampers shall be provided.
2. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower.
3. If an open- or closed-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the cooling tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

~~C403.4.3.3.2.2~~ C403.4.2.3.2.2 Climate Zones 5 through 8. For Climate Zones 5 through 8, if an open- or closed-circuit cooling tower is used, then a separate heat exchanger shall be provided to isolate the cooling tower from the heat pump loop, and heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop and providing an automatic valve to stop the flow of fluid.

~~C403.4.3.3.3~~ C403.4.2.3.3 Two position valve. Each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 horsepower (hp) (7.5 kW) shall have a two-position valve.

~~C403.4.3.4~~ C403.4.3.3 Part load controls. Hydronic systems greater than or equal to 300,000 Btu/h (87 930 W) in design output capacity supplying heated or chilled water to comfort conditioning systems shall include controls that have the capability to:

1. Automatically reset the supply-water temperatures using zone-return water temperature, building-return water temperature, or outside air temperature as an indicator of building heating or cooling demand. The temperature shall be capable of being reset by at least 25 percent of the design supply-to-return water temperature difference; or
2. Reduce system pump flow by at least 50 percent of design flow rate utilizing adjustable speed drive(s) on pump(s), or multiple-staged pumps where at least one-half of the total pump horsepower is capable of being automatically turned off or control valves designed to modulate or step down, and close, as a function of load, or other *approved* means.

~~C403.4.3.5~~ C403.4.3.4 Pump isolation. Chilled water plants including more than one chiller shall have the capability to reduce flow automatically through the chiller plant when a chiller is shut down. Chillers piped in series for the purpose of increased temperature differential shall be considered as one chiller.

Boiler plants including more than one boiler shall have the capability to reduce flow automatically through the boiler plant when a boiler is shut down.

Reason: This proposal was submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings

and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Reasons for this specific proposal:

2012C has multiple conflicts:

- a. Air economizer only applied to simple systems.
- b. Water systems and references to "cooling" within the Simple System language (C403.3.1)
- c. Directing language that should apply to all economizer types was only under Complex (Integrated economizer, economizer control, relief of outdoor air). This language moved to Section 403.3.1 (basic economizer requirements, which requires either air or water economizers).
- d. Section C403.3.2, Hydronic system controls (under Simple Systems) references "chilled water", which is not a simple system. This same language is duplicated under Section C403.4.3.4 (Part Load controls). All hydronic controls are combined under this proposal to be under the retitled Section "C403.4 Complex Hydronic and multi-zone HVAC systems controls and equipment. (Prescriptive)". Any special multi-zone or hydronic requirements (formerly complex system) are under this section.
- e. A complex system could have air and water economizers. Where exceptions apply becomes a complicated process.
- f. Language in Section 403.3 (simple systems), includes references to Tables C403.2.3(1) through C403.2.3(8), which includes all equipment, including centrifugal chillers and cooling towers (always part of a complex system).

Complex and simple systems do not have a use in the IECC. These systems have no definitions. There are no other references to these systems anywhere else in the IECC. The need for these divisions in the IECC is no longer necessary and only leads to confusion and/or conflicting code requirements as noted in this proposal.

The intent of this proposal is to do the following:

1. An Economizer section with general requirements for all economizers in the same location. Requirements for Air and Water economizers are outlined. Exceptions are the same for either economizer type.
2. Complex Systems becomes a general prescriptive section for hydronic and multiple zone systems and the control of these systems.

A key element to making the revised provisions work, is revision to Section 403.1. As it stands in the 2012 code, Section 403.1 has a serious flaw that allows you to pick and choose a compliance path by saying "use either simple or complex" path requirements. The language is an "either A or B". It does not have a path to use both simple and complex when you have a building with both equipment types. It also allows cherry-picking of a path.

Section 403.1 does NOT require that a chilled water systems use the complex system Section 403.4 control/pump requirements. It can pick the Section 403.3 simple system path. A building can install an air economizer on a 100 ton (chilled water) VAV rooftop and not have to meet ANY of the requirements of Section 403.4 for VAV systems... And since an air economizer is included with most every VAV rooftop, that creates a gaping hole in code. And very little applies code will apply to a boiler or chiller you may have on the site.

Cost Impact: The 2012 code was flawed and the result would be inconsistent application of the economizer provisions. Because the 2012 does state specifically that an economize is required for complex systems, this could be viewed as an increase to the cost of construction. However since the energy savings envisioned by the balance of the HVAC requirements would not be realized without an installed economizer, most systems would be provided with one (or more) anyway.

C403.1-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: While the committee saw the value in reorganizing these provisions and making their application clearer, the proposal needed to better address chilled water.

Assembly Action:

Approved as Submitted

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Submitted and public comments.

Public Comment 1:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair; Jeremiah Williams, U.S. Department of Energy, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.1 General. Mechanical systems and equipment serving the building heating, cooling or ventilating needs shall comply with Section C403.2 (referred to as the mandatory provisions) and shall comply with Sections C403.3 and C403.4 based on the equipment and systems provided.

C403.3 Economizers (Prescriptive). This section applies to buildings served HVAC equipment listed in Tables C403.2.3(1) through C403.2.3(8). ~~C403.3.1 Economizers.~~ Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 C403.3.1 through C403.3.1.4 C403.3.4.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1). ~~C403.3(1)~~
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve *residential* spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of *outdoor air* for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling *efficiency* meets or exceeds the *efficiency* requirements in Table C403.3.1(2). ~~C403.3(2)~~

~~C403.3.1.1~~ **C403.3.1 Integrated economizer control.** Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to meet the remainder of the cooling load.

Exceptions:

1. Direct expansion systems that include controls that reduce the quantity of *outdoor air* required to prevent coil frosting at the lowest step of compressor unloading, provided this lowest step is no greater than 25 percent of the total system capacity.
2. Individual direct expansion units that have a rated cooling capacity less than 54,000 Btu/h (15 827 W) and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.

~~C403.3.1.2~~ **C403.3.2 Economizer heating system impact.** HVAC system design and economizer controls shall be such that economizer operation does not increase the building heating energy use during normal operation.

Exception: Economizers on VAV systems that cause *zone* level heating to increase due to a reduction in supply air temperature.

~~Table C403.3.1(1)~~ **C403.3(1)** ECONOMIZER REQUIREMENTS

~~Table C403.3.1(2)~~ **C403.3(2)** EQUIPMENT EFFICIENCY PERFORMANCE EXCEPTION FOR ECONOMIZERS

~~C403.3.1.3~~ **C403.3.3 Air economizers.** Air economizers shall comply with Sections C403.3.1.3.1 C403.3.3.1 through C403.3.1.3.4. C403.3.3.4

~~C403.3.1.3.1~~ **C403.3.3.1 Design capacity.** Air economizer systems shall be capable of modulating *outdoor air* and return air dampers to provide up to 100 percent of the design supply air quantity as *outdoor air* for cooling.

~~C403.3.1.3.2~~ **C403.3.3.2 Control signal.** Economizer dampers shall be capable of being sequenced with the mechanical cooling equipment and shall not be controlled by only mixed air temperature.

Exception: The use of mixed air temperature limit control shall be permitted for systems controlled from space temperature (such as single-zone systems).

C403.3.1.3.3 C403.3.3.3 High-limit shutoff. Air economizers shall be capable of automatically reducing *outdoor air* intake to the design minimum *outdoor air* quantity when *outdoor air* intake will no longer reduce cooling energy usage. High-limit shutoff control types for specific climates shall be chosen from Table C403.3.1.3.3(1). C403.3.3.3(1) High-limit shutoff control settings for these control types shall be those specified in Table C403.3.1.3.3(2). C403.3.3.3(2)

**Table C403.3.1.3.3(1) C403.3.3.3(1)
HIGH-LIMIT SHUTOFF CONTROL OPTIONS FOR AIR ECONOMIZERS**

**Table C403.3.1.3.3(2) C403.3.3.3(2)
HIGH-LIMIT SHUTOFF CONTROL SETTING FOR AIR ECONOMIZERS**

C403.3.1.3.4 C403.3.3.4 Relief of excess outdoor air. Systems shall be capable of relieving excess *outdoor air* during air economizer operation to prevent over-pressurizing the building. The relief air outlet shall be located to avoid recirculation into the building.

C403.3.1.4 C403.3.4 Water-side economizers. Water-side economizers shall comply with Sections C403.3.1.4.1 C403.3.4.1 through C403.3.1.4.2 C403.3.4.2

C403.3.1.4.1 C403.3.4.1 Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at *outdoor air* temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) and below.

Exception: Systems in which a water economizer is used and where dehumidification requirements cannot be met using outdoor air temperatures of 50°F dry bulb (10°C dry bulb)/45°F wet bulb (7.2°C wet bulb) shall satisfy 100 percent of the expected system cooling load at 45°F dry bulb (7.2°C dry bulb)/40°F wet bulb (4.5°C wet bulb).

C403.3.1.4.2 C403.3.4.2. Maximum pressure drop. Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15 feet (4572 mm) of water or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the circulating pumps when the system is in the normal cooling (non-economizer) mode.

C403.4 Hydronic and multi-zone HVAC system controls and equipment. (Prescriptive). ~~This section applies to buildings served by HVAC equipment and systems not covered in Section C403.3.~~ Hydronic and multi-zone HVAC system controls and equipment shall comply with this section.

(Portions of proposal not shown remain unchanged)

Commenter's Reason:

(Thompson): At the code development hearing it was noted that the language originally intended to define simple systems was applied to economizers in the proposal. As a result, the new economizer charging paragraph no longer included requirements for economizers on air handlers with chilled water coils, as they are not listed in Tables C403.2.3(1) through C403.2.3(8). The stated intent of the original proposal was to eliminate the distinction between simple and complex systems and reduce confusion in the code. There was no intent to reduce economizer requirements in the code, which was the reason given by the committee for disapproval.

The modifications proposed in this public comment addresses the committee's reason for disapproval by maintaining the current economizer requirements, and renumbering the sections and tables as needed. There is also remaining language related to the complex and simple systems in section C403.4 that the proposed modification removes. The SEHPCAC believes that the modification adjusts the proposal to align with the original proponent's intent and corrects the unintended oversight noted by the committee that would have reduced the provisions in the code for economizers on air handling units associated with chilled water coils.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

(Williams): At the code development hearing, DOE noted that the language originally intended to define simple systems was applied to economizers in the proposal. As a result, the new economizer charging paragraph no longer included requirements for economizers on air handlers with chilled water coils, as they are not listed in Tables C403.2.3(1) through C403.2.3(8). The stated intent of the original proposal was to eliminate the distinction between simple and complex systems, and reduce confusion in the code. We believe there was no intent to reduce economizer requirements in the code, which was the reason given by the committee for disapproval.

The modification proposed in the public comment addresses the committee reason for disapproval by maintaining the current economizer requirements, and renumbering the sections and tables as needed. There is also remaining language related to the

complex and simple systems in section C403.4 that the proposed modification removes. DOE believes the modification adjusts the proposal to align with the original proponent's intent, and corrects the unintended oversight by the proponent noted by the committee that would have reduced the provisions in the code for economizers on air handling units associated with chilled water coils.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE241-13

Final Action:

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CE244-13
C403.3.1, Table C403.3.1(1)

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.4.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve *residential* spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of *outdoor air* for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling *efficiency* meets or exceeds the *efficiency* requirements in Table C403.3.1(2).
7. Systems under 110,000 Btu/h total cooling capacity that utilize multiple stage cooling capacity control and multiple speed fan control.

TABLE C403.3.1(1)
ECONOMIZER REQUIREMENTS

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	Economizers on all cooling systems ≥ 33,000 ≥ 54,000 Btu/h ^a

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

- a. The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per *building*, or 20 percent of its air economizer capacity, whichever is greater.

Reason: This proposal was submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Reasons for this specific proposal:

The current trigger values for economizers are in conflict with current ASHRAE Standard 90.1. The modification to the 2012 IECC was based on the Green standard 189.1 additional energy measures; prescriptive requirements should not come from an optional code or standard. ASHRAE 90.1 reduced their trigger to 54,000 Btu/h in the 2010 version and is not decreasing the trigger in any addenda for the 2013 version. Intent is to align the code and standard. For 2013, California Title 24 revisited economizers and did not drop their trigger value below 54,000 Btu/h. No other mandatory code or standard has reduced below 54,000 Btu/h.

The first part of this proposal recommends matching Table C403.3.1(1) to the trigger to other codes and standards.

The second part of this proposal allows for one additional exception: small units (under 110,000 Btu/h) are not required to have an economizer if the units have multiple speed fans and multiple stage cooling capacity.

For this proposal, the efficiency measure is similar to a prescriptive requirement that California added for small units. We are proposing an exception to economizers for small units. As part of the 2013 California Title 24 proposals, multiple stage compressor and fan control for small HVAC units (under the current 110,000 Btu/h trigger for multiple speed fans) was economically viable as a prescriptive measure and was included in Title 24.

http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Nonresidential/HVAC/2013_CASE_NR_Fan_Control_Integrated_Economizers_Sept_2011.pdf has the complete report. Taylor Engineering performed the energy modeling. They report a possible 2-year payback for addition of multi-speed compressor & fan.

Per cost figures furnished to California by Dick Lord of Carrier, this proposed exception would be less than or equal to the cost of an economizer. So there is no cost impact.

Oregon BCD energy modeling used the Taylor Engineering baseline concept. We looked at the same building with these small HVAC units. We compared a building without economizers (not required in California for the HVAC size range) with the same units with economizer and with just the multi-speed configuration. Adding multi-speed configuration saves nearly 4-times more energy than adding an economizer.

So the proposed exception not only has an equal or lower cost, it will save a greater amount of energy.

Additional study performed by PNNL of economizers and other measures for small packaged HVAC equipment provides additional insight. PNNL Study #PNNL-20995 (http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20955.pdf), even though relative to retrofit of existing equipment, gives insight on the relative effectiveness of economizers, multi-speed control and Demand Control Ventilation (DCV). Multi-speed control is a more effective conservation measure than an economizer. See page 37:

- Multi-speed fan control and DCV are the two control strategies that contribute most to the HVAC energy savings. Specifically, multi-speed fan control dominates the impact in a small number of cases, including all four building types in Miami and the small office building in Houston, Phoenix and Los Angeles. DCV dominates the impact for all other cases. The multi-speed fan contribution to savings can be negative in cold climates (e.g. Duluth and Fairbanks for all building types).
- Adding an air-side economizer after multi-speed fan control does not have a large impact on HVAC energy savings except for a few cases, such as the small office building in Los Angeles. In comparison with a nonintegrated economizer, the integrating economizer has negligible impact on HVAC energy savings.

Overall, this proposal provides both alignment with other standards and codes and is an improvement in energy conservation for anyone taking the new exception path.

So we are basing a request for modifying the levels on additional analysis conducted by Oregon Building Codes Division.

The analysis methods referenced for this proposal use the same energy models developed by ASHRAE and the Department of Energy (PNNL) for the Final Determination of ASHRAE 90.1-2010 in the Federal Register. We used the US DOE prototype energy model files and EnergyPlus software. NO new models were used; the simulation software was the same. Weighting of building types was the same as used by PNNL. Only buildings from the 90.1 determination that have packaged HVAC units in this size range were considered (not office buildings with VAV units). See these studies by PNNL for the analysis:

1. For the description for the modeling method
http://www.energycodes.gov/sites/default/files/documents/BCEP_Energy_Cost_Savings_STD2010_May2011_v00.pdf
2. The DOE certification of 90.1-2010 (references the linked PNNL-20405 above)
http://www.energycodes.gov/sites/default/files/documents/BCEP_FinalQuantitativeAnalysisReport901-2010Determination_Oct2011_v00.pdf

The national weighted-average annual energy savings per economizer for systems between 33,000 Btu/h and 110,000 Btu/h is \$41 per year per economizer. Using a first cost of \$750/economizer (including installation, set-up, initial testing) and a 15-year life cycle, economizers never provide a return on the cost premium, much less recover the cost of maintenance. On the basis of these models, we feel the trigger levels should be re-examined. Weighting of life cycle costs were based on EIA national average utility costs, 15-year life cycle and 3% discount rate for the \$750 average first cost and \$50/year for maintenance.

The table below is the raw data of savings per economizer by building type and climate zone. Weighting used the same data from the DOE/PNNL studies. Green highlights show over \$85/year, which might cover first costs and maintenance.

ANNUAL SAVINGS PER ECONOMIZER (RAW DATA)														
BUILDING PROTOTYPE/ CLIMATE ZONE	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8
Fast Food Restaurant					\$ 65		\$ 135	\$ 94		\$ 87		\$ 82	\$ 69	\$ 38
Small Hotel	\$ 109	\$ 123	\$ 128	\$ 108		\$ 85		\$ 80	\$ 80	\$ 67	\$ 82		\$ 63	
Strip Mall Retail	\$ 18	\$ 26	\$ 16	\$ 41	\$ 76	\$ 22	\$ 32	\$ 75	\$ 29	\$ 50	\$ 54	\$ 58	\$ 37	\$ 31
Strip Mall Office	\$ 18	\$ 4	\$ 11	\$ 23		\$ 26	\$ 34	\$ 33	\$ 25	\$ 29	\$ 35	\$ 32	\$ 28	\$ 23
Warehouse	\$ 11	\$ (14)	\$ 9	\$ 10		\$ 0	\$ (1)	\$ (3)		\$ (2)	\$ (3)	\$ (4)		\$ (3)
Stand Alone Retail	\$ 76	\$ 99	\$ 96	\$ 105	\$ 210	\$ 102	\$ 152	\$ 130	\$ 99	\$ 122	\$ 123	\$ 134	\$ 126	\$ 119
Primary School	\$ 31	\$ 35	\$ 31	\$ 39	\$ 105	\$ 42	\$ 57	\$ 48	\$ 41	\$ 49	\$ 42	\$ 135	\$ 160	\$ 163

When looking at the Life Cycle Costs by building type, there is not a return on investment. And this simulation testing considers a perfectly functioning economizer. If the weighting were to include a factor for non-functioning economizers, becomes difficult to justify any economizer below 110,000 Btu/h.

WEIGHTED LIFE CYCLE COST BY BUILDING TYPE							
BUILDING TYPE	FAST FOOD	SMALL HOTEL	STRIP MALL	SMALL OFFICE	WAREHOUSE	STAND-ALONE RETAIL	PRIMARY SCHOOL
WEIGHTED LCC	(\$288)	(\$201)	(\$1,014)	(\$1,097)	(\$1,286)	(\$128)	(\$875)

Buildings are more efficient due to improvements in the codes. Contributing reasons why these systems no longer viable at the current triggers:

1. Improvements to the building envelope: glazing improvements reduce solar gain; envelope insulation delays thermal conductivity gains.
2. Reduced lighting power: 30-45% reductions from 2006 levels.
3. Equipment efficiency improvements: 30% increase in SEER requirement for 60,000 Btu/h (5-ton) units and smaller.

With less cooling required during the year (the building is more efficient), there is a smaller "pool of energy use" to reduce with this measure. And because of the improved building characteristics, there are fewer hours where cooling needs overlap with outdoor conditions suitable for economizer operation. An economizer on units in this size range has little chance of paying back its cost premium during the life cycle of the unit. The effects of code improvements over the years could not be analyzed without a full energy model. And the DOE/PNNL files are among the best available and are used by DOE for analyzing 90.1.

The current 33,000 Btu/h trigger (thru 110,000 Btu/h) only returns its cost over the life of the equipment when there are either high load conditions (computer closets) or nearly continuous operation (18-24 hours per day, 7-days per week). And positive returns are only found in a few climate zones, not on a national weighting by building type. The 33,000 Btu/h figure should only remain if there are exceptions for smaller units with operating hours of under 112 hours per week (above the 20 hour per week exception already in code) or if there are high internal loads. But this is difficult to put into enforceable code language.

We propose to match the current 90.1-2010 level of 54,000 Btu/h; 90.1 is not considering any further revisions below this level. The weighted average economizer savings increases slightly closer to a level where it might pay back.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.3.1(1)T-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal removes too many buildings from needing to comply with the economizer requirements.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.4.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve *residential* spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of *outdoor air* for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling *efficiency* meets or exceeds the *efficiency* requirements in Table C403.3.1(2).

7. ~~Systems under 110,000 Btu/h total cooling capacity that utilize multiple stage cooling capacity control and multiple speed fan control.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The Commercial IECC Development Committee concluded that the original proposal would result in too many systems being exempted from the economizer requirement. The proposal is amended to remove the proposed exception 7 which would be the cause of many systems being exempted. The SEHPCAC believes the change from 33,000 to 54,000 in the table is still valid based on the reasons originally submitted, which provides alignment with ASHRAE 90.1 and CE245-13 submitted by ASHRAE, and should be approved. Item 7 has been deleted as its inclusion is not necessary to achieve the stated intent of the original proposal to simply align the economizer requirements with ASHRAE 90.1.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE244-13

Final Action: AS AM AMPC_____ D

CE245-13

C403.3.1, Table C403.3.1(1), C403.3.1.4, C403.3.1.5 (NEW), Table C403.3.1.1.3(2), C403.3.1.2 (NEW), C403.3.1.2.1 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through ~~C403.3.1.4.~~ C403.3.1.5.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve residential spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of outdoor air for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.3.1(2).
7. Systems that include a heat recovery system in accordance with Section C403.4.6.
8. Systems that serve spaces whose sensible cooling load at design conditions, excluding transmission and infiltration loads, is not more than the transmission and infiltration losses at an outdoor temperature of 60°F.

**TABLE C403.3.1(1)
ECONOMIZER REQUIREMENTS**

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	Economizers on all cooling systems ≥ 33,000 <u>54,000</u> Btu/h ^a

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

- a. The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per *building*, or 20 percent of its air economizer capacity, whichever is greater.

C403.3.1.1.4 Dampers. Return, exhaust/relief, and outdoor air dampers shall in accordance with Section C402.4.5.2

C403.3.1.1.5 Relief of excess outdoor air. Systems shall be capable of relieving excess outdoor air during air economizer operation to prevent over-pressurizing the building. The relief air outlet shall be located to avoid recirculation into the building.

**TABLE C403.3.1.1.3(2)
HIGH-LIMIT SHUTOFF CONTROL SETTING FOR AIR ECONOMIZERS**

DEVICE TYPE	CLIMATE ZONE	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN):	
		EQUATION	DESCRIPTION
Fixed dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$TOA > 75^{\circ}\text{F}$	Outdoor air temperature exceeds 75°F
	5A, 6A, 7A	$TOA > 70^{\circ}\text{F}$	Outdoor air temperature exceeds 70°F
	All other zones	$TOA > 65^{\circ}\text{F}$	Outdoor air temperature exceeds 65°F
Differential dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$TOA > TRA$	Outdoor air temperature exceeds return air temperature
Fixed enthalpy	All <u>2A, 3A, 4A, 5A, 6A</u>	$hOA > 28 \text{ Btu/lb}^a$	Outdoor air enthalpy exceeds 28 Btu/lb of dry air ^a
Electronic Enthalpy	All	$(TOA, RHOA) > A$	Outdoor air temperature/RH exceeds the "A" setpoint curve ^b
Differential enthalpy	All	$hOA > hRA$	Outdoor air enthalpy exceeds return air enthalpy
Dew-point and dry bulb temperatures	All	$DPOA > 55^{\circ}\text{F}$ or $TOA > 75^{\circ}\text{F}$	Outdoor air dry bulb exceeds 75°F or outside dew point exceeds 55°F (65 gr/lb)

For SI: °C = (°F - 32) × 5/9, 1 Btu/lb = 2.33 kJ/kg.

- At altitudes substantially different than sea level, the Fixed Enthalpy limit shall be set to the enthalpy value at 75°F and 50-percent relative humidity. As an example, at approximately 6,000 feet elevation the fixed enthalpy limit is approximately 30.7 Btu/lb.
- Setpoint "A" corresponds to a curve on the psychrometric chart that goes through a point at approximately 75°F and 40-percent relative humidity and is nearly parallel to dry-bulb lines at low humidity levels and nearly parallel to enthalpy lines at high humidity levels.

C403.3.1.2 Water economizers. Water economizers shall comply with Sections C403.3.1.2.1 through C403.3.1.2.2.

C403.3.1.2.1 Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at outdoor air temperatures not greater than 50°F dry bulb/45°F wet bulb.

Exceptions:

- Systems primarily serving computer rooms in which 100 percent of the expected system cooling load at 40°F dry bulb/35°F wet bulb is met with evaporative water economizers.
- Systems primarily serving computer rooms with dry cooler water economizers which satisfy 100 percent of the expected system cooling load at 35°F dry bulb.
- Systems where dehumidification requirements cannot be met using outdoor air temperatures of 50°F dry bulb/45°F wet bulb and where 100 percent of the expected system cooling load at 45°F (7°C) dry bulb/40°F (4°C) wet bulb is met with evaporative water economizers.

C403.3.1.2.2 Maximum pressure drop. Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15 feet of

water (45 kPa) or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the circulating pumps when the system is in the normal cooling (non-economizer) mode.

Reason: This proposal makes the air economizer requirements consistent with ANSI/ASHRAE/IES Standard 90.1. Quite a bit of collaboration has gone into this proposal to achieve consensus, and is a result of many years of research investigating the cost effectiveness of economizer use in each climate zone.

In addition, new requirements for water economizers are being added.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.3.1-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee found the proposed exception #8 to Section 403.3.1 to be vague.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.5.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve residential spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of outdoor air for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.3.1(2).
7. Systems that include a heat recovery system in accordance with Section C403.4.6.
8. Systems that serve spaces whose sensible cooling load at design conditions, excluding transmission and *infiltration* loads, is not more than the transmission and *infiltration* losses at an outdoor temperature of 60°F.

**TABLE C403.3.1(1)
ECONOMIZER REQUIREMENTS**

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	Economizers on all cooling systems ≥ 54,000 Btu/h ^a

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

- a. The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per *building*, or 20 percent of its air economizer capacity, whichever is greater.

C403.3.1.1.4 Dampers. Return, exhaust/relief, and outdoor air dampers shall in accordance with Section C402.4.5.2

C403.3.1.1.5 Relief of excess outdoor air. Systems shall be capable of relieving excess outdoor air during air economizer operation to prevent over-pressurizing the building. The relief air outlet shall be located to avoid recirculation into the building.

**TABLE C403.3.1.1.3(1)
HIGH LIMIT SHUTOFF CONTROL OPTIONS FOR AIR ECONOMIZERS**

**TABLE C403.3.1.1.3(2)
HIGH-LIMIT SHUTOFF CONTROL SETTING FOR AIR ECONOMIZERS^b**

DEVICE TYPE	CLIMATE ZONE	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN):	
		EQUATION	DESCRIPTION
Fixed dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$T_{OA} > 75^{\circ}\text{F}$	Outdoor air temperature exceeds 75°F
	<u>5A, 6A</u>	$T_{OA} > 70^{\circ}\text{F}$	Outdoor air temperature exceeds 70°F
	<u>1a, 2a, 3a, 4a</u>	$T_{OA} \geq 65^{\circ}\text{F}$	<u>Outdoor air temperature exceeds 65°F</u>
Differential dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$T_{OA} > T_{RA}$	Outdoor air temperature exceeds return air temperature
Fixed enthalpy with fixed dry-bulb temperature	<u>All 2A, 3A, 4A, 5A, 6A</u>	$h_{OA} > 28 \text{ Btu/lb}^a$ or $T_{OA} > 75^{\circ}\text{F}$	Outdoor air enthalpy exceeds 28 Btu/lb of dry air ^a or <u>Outdoor air temperature exceeds 75°F</u>
Electronic Enthalpy	All	$(T_{OA}, RH_{OA}) > A$	Outdoor air temperature/RH exceeds the "A" setpoint curve ^b
Differential enthalpy with fixed dry-bulb temperature	All	$h_{OA} > h_{RA}$ or $T_{OA} > 75$	Outdoor air enthalpy exceeds return air enthalpy or <u>Outdoor air temperature exceeds 75°F</u>
Dew-point and dry bulb temperatures	All	$DP_{OA} > 55^{\circ}\text{F}$ or $T_{OA} > 75^{\circ}\text{F}$	Outdoor air dry bulb exceeds 75°F or outside dew point exceeds 55°F (65 gr/lb)

For SI: °C = (°F - 32) × 5/9, 1 Btu/lb = 2.33 kJ/kg.

- At altitudes substantially different than sea level, the Fixed Enthalpy limit shall be set to the enthalpy value at 75°F and 50-percent relative humidity. As an example, at approximately 6,000 feet elevation the fixed enthalpy limit is approximately 30.7 Btu/lb.
- Setpoint "A" corresponds to a curve on the psychrometric chart that goes through a point at approximately 75°F and 40-percent relative humidity and is nearly parallel to dry-bulb lines at low humidity levels and nearly parallel to enthalpy lines at high humidity levels. Devices with selectable setpoints shall be capable of being set to within 2°F and 2 Btu/lb of the setpoint listed.

C403.3.1.2 Water economizers Water economizers shall comply with Sections C403.3.1.2.1 through C403.3.1.2.2.

C403.3.1.2.1 Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at outdoor air temperatures not greater than 50°F dry bulb/45°F wet bulb.

Exceptions:

- Systems primarily serving computer rooms in which 100 percent of the expected system cooling load at 40°F dry bulb/35°F wet bulb is met with evaporative water economizers.
- Systems primarily serving computer rooms with dry cooler water economizers which satisfy 100 percent of the expected system cooling load at 35°F dry bulb.
- Systems where dehumidification requirements cannot be met using outdoor air temperatures of 50°F dry bulb/45°F wet bulb and where 100 percent of the expected system cooling load at 45°F(7°C) dry bulb/40°F (4°C) wet bulb is met with evaporative water economizers.

C403.3.1.2.2 Maximum pressure drop. Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15 feet of water (45 kPa) or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the circulating pumps when the system is in the normal cooling (non-economizer) mode.

Commenter's Reason: This comment incorporates modifications from a new addendum has been approved to Standard 90.1, which will be incorporated into 90.1-2013. Analysis has shown that temperature and humidity sensor measurement error has a large impact on energy performance of air economizer high limit devices. The analysis shows that by far the most reliable device is the simply dry-bulb switch. Even with $\pm 2^\circ\text{F}$ error, it is the best in most climates at set points that are adjusted by climate, lower in humid climates and higher in dryer climates. Differential enthalpy sensors can have the worst performance of all devices because they have four sensors (return air dry bulb and RH and outdoor air dry-bulb and RH) each of which can have error. This is true even with very accurate RH sensors, but studies at the Iowa Energy Center have shown that actual accuracy is much worse than nominal accuracy. Thus to ensure enthalpy high limits maintain good performance despite sensor error and when coils are dry, this modification requires that they be used along with fixed dry bulb switches.

Fixed dry-bulb switches set to 65°F in humid climates are reinstated. They was allowed in the 2007 and earlier versions of Standard 90.1 at this setpoint. They were eliminated in 2010 due to concerns about high resulting space humidity, but that concern only applies to single compressor DX units with two stage thermostats and the impact is minimized by the low 65°F setpoint. With fully integrated economizers, high limit switches have no space humidity impact.

Electronic enthalpy switches are eliminated because they have been supplanted in the marketplace by better performing and lower cost switches that use superior fixed enthalpy plus fixed dry-bulb logic.

The dewpoint high limit that was added in the 2004 version is also proposed to be deleted since does not make sense theoretically and did not perform well in our simulations.

The comment also adds tolerances to the high limit change over sensors which are aligned with tolerances recently added to Title 24 2013

Public Comment 2:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.3.1 Economizers. Each cooling system that has a fan shall include either an air or water economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.4.

Exception: Economizers are not required for the systems listed below.

1. Individual fan-cooling units with a supply capacity less than the minimum listed in Table C403.3.1(1).
2. Where more than 25 percent of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35°F (1.7 °C) dew-point temperature to satisfy process needs.
3. Systems that serve residential spaces where the system capacity is less than five times the requirement listed in Table C403.3.1(1).
4. Systems expected to operate less than 20 hours per week.
5. Where the use of outdoor air for cooling will affect supermarket open refrigerated casework systems.
6. Where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.3.1(2).
7. Systems that include a heat recovery system in accordance with Section C403.4.6.
8. ~~Systems that serve spaces whose sensible cooling load at design conditions, excluding transmission and infiltration loads, is not more than the transmission and infiltration losses at an outdoor temperature of 60°F.~~

Commenter's Reason: During the development of 90.1-2013, it was also determined that economizers should not be required for systems that include heat recovery. Exception 7, proposed in the original proposal, reflects that finding. This public comment removes proposed Exception 8, in response to committee comments. Note that Exception 7 will be retained, as originally proposed in this code change proposal. During the development of 90.1-2013, it was also determined that economizers should not be required for systems that include heat recovery. Exception 7, proposed in the original proposal, reflects that finding. This public comment is primarily intended to allow consideration of this exception on its own merits.

CE245-13

Final Action: AS AM AMPC_____ D

CE246-13
C202 (NEW), Table C403.3.1.1.3(1)

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

TABLE C403.3.1.1.3(1)
HIGH-LIMIT SHUTOFF CONTROL OPTIONS FOR AIR ECONOMIZERS

CLIMATE ZONES	ALLOWED CONTROL TYPES	PROHIBITED CONTROL TYPES
1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	Fixed dry bulb Differential dry bulb Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	Fixed enthalpy
1A, 2A, 3A, 4A	Fixed dry bulb Fixed enthalpy Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	Differential dry bulb
All other climates	Fixed dry bulb Differential dry bulb Fixed enthalpy Electronic enthalpy ^a Differential enthalpy Dew-point and dry-bulb temperatures	—

a. Electronic enthalpy controllers are devices that use a combination of humidity and dry-bulb temperature in their switching algorithm.

Add new definition as follows:

SECTION C202
GENERAL DEFINITIONS

ELECTRONIC ENTHALPY CONTROLLER. A device that uses a combination of humidity and dry bulb temperature in its switching algorithm.

Reason: This proposal was submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 3 open meetings and over 30 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

The footnote is a definition of a device. It provides no information that enhances the enforcement of the table other than defining one of the pieces of equipment. Chapter 2 is the preferred location for definitions. If this is approved, the SEHPCAC will submit a companion code change in 2014 to address parallel provisions in the IgCC.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.3.1.3(1)T-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action: **Disapproved**

Committee Reason: The proposed definition doesn't address devices which may be digital or analog.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Approval as Submitted.

Commenter's Reason: The Commercial IECC Development Committee disapproved this simple proposal based on the concept that there were multiple types of electronic enthalpy devices. While there may be, the SEHPCAC proposal was simple, take what appears to be an existing definition, buried in a footnote and relocate it to Chapter 2 – the home of definitions. If there is a change in technology, we leave it to others to address changing the code to address that issue. Our proposal is a simple relocation of existing text.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE246-13

Final Action: AS AM AMPC ____ D

CE250-13

C403.4.1.3, Table C403.4.1.3 (NEW), C403.4.2.1 (NEW), Table C403.4.2.1 (NEW), C403.4.2.1, C403.4.2.2, C403.4.7

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C403.4.1.3 Integrated economizer control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to meet the remainder of the cooling load. Controls shall not be capable of creating a false load the mechanical cooling systems by limiting or disabling the economizer or any other means, such as hot gas bypass except at the lowest stage of mechanical cooling.

Units that include an air economizer shall comply with the following:

1. Unit controls shall have the mechanical cooling capacity control interlocked with the air economizer controls such that the outdoor air damper is at the 100 percent open position when *mechanical cooling* is on and the outdoor air damper does not begin to close to prevent coil freezing due to minimum compressor run time until the leaving air temperature is less than 45°F.
2. DX units that control 75,000 Btu/h or greater of rated capacity of the capacity of the mechanical cooling directly based on occupied space temperature shall have no fewer than 2 stages of mechanical cooling capacity
3. All other DX units including those that control space temperature by modulating the airflow to the space shall be in accordance with Table C403.4.1.3

Exceptions:

- ~~1. Direct expansion systems that include controls that reduce the quantity of *outdoor air* required to prevent coil frosting at the lowest step of compressor unloading, provided this lowest step is no greater than 25 percent of the total system capacity.~~
- ~~2. Individual direct expansion units that have a rated cooling capacity less than 54,000 Btu/h (15 827 W) and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.~~

**TABLE C403.4.1.3
DX COOLING STATESTAGE REQUIREMENTS FOR MODULATING AIRFLOW UNITS**

<u>Rating Capacity</u>	<u>Minimum Number of Mechanical Cooling Stages</u>	<u>Minimum Compressor Displacement^a</u>
<u>≥65,000 Btu/h and <240,000 Btu/h</u>	<u>3 stages</u>	<u>≤35% of full Load</u>
<u>≥240,000 Btu/h</u>	<u>4 stages</u>	<u>≤25% full load</u>

- a. For *mechanical cooling* stage control that does not use variable compressor displacement the percent displacement shall be equivalent to the mechanical cooling capacity reduction evaluated at the full load rating conditions for the compressor.

C403.4.2 Variable air volume (VAV) fan control. Individual VAV fans with motors of 7.5 horsepower (5.6 kW) or greater shall be:

- ~~1. Driven by a mechanical or electrical variable speed drive;~~

- ~~2. Driven by a vane axial fan with variable pitch blades; or~~
- ~~3. The fan shall have controls or devices that will result in fan motor demand of no more than 30 percent of their design wattage at 50 percent of design airflow when static pressure set point equals one third of the total design static pressure, based on manufacturer's certified fan data~~

C403.4.2.1 Fan airflow control Each cooling system listed in Table C403.4.2.1 shall be designed to vary the indoor fan airflow as a function of load and shall comply with the following requirements.

1. DX and chilled water cooling units that control the capacity of the mechanical cooling directly based on space temperature shall have no fewer than 2 stages of fan control. Low or minimum speed shall not exceed 66 percent of full speed. At low or minimum speed the fan system shall draw no more than 40 percent of the fan power at full fan speed. Low or minimum speed shall be used during periods of low cooling load and ventilation only operation.
2. All other units including DX cooling units and chilled water units that control the space temperature by modulating the airflow to the space shall have modulating fan control. Minimum speed shall not exceed 50 percent of full speed. At minimum speed the fan system shall draw no more than 30 percent of the power at full fan speed. Low or minimum speed shall be used during periods of low cooling load and ventilation only operation.
3. Units that include an airside economizer to meet the requirements of Section C403.3.1 shall have no fewer than of 2 speeds of fan control during economizer operation

Exceptions:

1. Modulating fan control is not required for chilled water and evaporative cooling units with fan motors of less than 1 HP where the units are not used to provide *ventilation air* and the indoor fan cycles with the load.
2. Where the volume of outdoor air required to meet the *ventilation* requirements of the *International Mechanical Code* at low speed exceeds the air that would be delivered at the speed defined in Section C403.4.2 then the minimum speed shall be selected to provide the required *ventilation air*.

**TABLE C403.4.2.1
EFFECTIVE DATES FOR FAN CONTROL**

<u>Cooling System Type</u>	<u>Fan Motor Size</u>	<u>Mechanical Cooling Capacity</u>
<u>DX Cooling</u>	<u>any</u>	<u>≥75,000 Btu/h (before 1/1/2016)</u>
		<u>≥65,000 Btu/h (after 1/1/2016)</u>
<u>Chilled Water and Evaporative cooling</u>	<u>≥5 HP</u>	<u>Any</u>
	<u>≥1/4 HP</u>	<u>Any</u>

C403.4.2.1 C403.2.2 VAV Static pressure sensor location. Static pressure sensors used to control VAV fans shall be placed in a position such that the controller setpoint is no greater than one-third the total design fan static pressure, except for systems with *zone* reset control complying with Section C403.4.2.2. For sensors installed down-stream of major duct splits, at least one sensor shall be located on each major branch to ensure that static pressure can be maintained in each branch.

C403.4.2.2 C403.4.2.3 VAV Set points for direct digital control. For systems with direct digital control of individual *zone* boxes reporting to the central control panel, the static pressure set point shall be reset

based on the zone requiring the most pressure, i.e., the set point is reset lower until one zone damper is nearly wide open.

C403.4.7 Hot gas bypass limitation. Cooling systems shall not use hot gas bypass or other evaporator pressure control systems unless the system is designed with multiple steps of unloading or continuous capacity modulation. The capacity of the hot gas bypass shall be limited as indicated in Table C403.4.7 as limited by Section C403.4.1.3

Exception: Unitary packaged systems with cooling capacities not greater than 90,000 Btu/h (26 379 W).

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, does not contain the exceptions that are shown in the IECC. Those exceptions were in standard 90.1-2007 but were removed in standard 90.1-2010. The change ensures continued consistency between the IECC and standard 90.1-2010.

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

C403.4.1.3-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee did not feel sufficient justification for the change was provided.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Submitted.

Commenter's Reason: Integrated economizers allow for the use of economizers and mechanical cooling to meet the cooling loads of the building. With advanced controls for economizers it is now possible to eliminate the exception 6.5.1.3c which exempted zones 1, 2, 3a, 4a, 5a, 5b, 6, 7 and 8 from using integrated economizers. The results of the analysis showed a market volume weighted average cooling energy savings for the HVAC system cooling power of 24% for the small office, 22.1% for a large office, and 33% for a hospital.

This makes changes to the requirements for fan control for both constant volume and VAV units including extending the fan part load power requirements down to ¼ HP. In addition it defines the requirements for integrated economizer control and defines DX unit capacity staging requirements.

A full economic analysis has been done using the 2013 economic scalar justification requirements and payback periods of 0.6 to 4.2 years have been estimated and with a design life of 15 years is well below the scalar limit of 9.086 yrs used by SSPC 90.1

For clarification we have included most of the text from these sections so it is easier to understand the changes being made.

CE250-13

Final Action:

AS

AM

AMPC____

D

CE251-13
C403.4.2.1, C403.4.2.2

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C403.4.2.1 Static pressure sensor location. Static pressure sensors used to control VAV fans shall be placed in a position located such that the controller setpoint is no greater than ~~one-third the total design fan static pressure, except for systems with zone reset control complying with Section C403.4.2.2.1.2~~ inches w.c. ~~For sensors~~ Where this results in one or more sensors being installed located down-stream of major duct splits, at least one sensor shall be located on each major branch to ensure that static pressure can be maintained in each branch.

C403.4.2.2 Set points for direct digital control. For systems with direct digital control of individual ~~zone boxes~~ zones reporting to the central control panel, the static pressure set point shall be reset based on the zone requiring the most pressure, i.e., the set point is reset lower until one zone damper is nearly wide open. The direct digital controls shall be capable of monitoring zone damper positions; or shall have an alternative method of indicating the need for static pressure which is capable of all of the following:

1. Automatically detecting any zone which excessively drives the reset logic;
2. Generating an alarm to the system operational location; and
3. Allowing an operator to readily remove one or more zones from the reset algorithm.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised with respect to controls for certain aspects of HVAC systems. The change ensures continued consistency between the IECC and standard 90.1-2010.

Cost Impact: The code change proposal will increase the cost of construction where controls will now be required.

C403.4.2.1-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal clarifies the location of static pressure sensors in relationship to VAV fans and systems with direct digital controls.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, Shauna Mzingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following

proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE251-13

Final Action:

AS

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AMPC ____

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CE252-13

C403.4.3.3.2, C403.4.3.3.2.1, C403.4.3.3.2.2

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C403.4.3.3.2 Heat rejection. For heat pump systems ~~Heat rejection equipment shall comply with Sections C403.4.3.3.2.1 and C403.4.3.3.2.2.~~ in Climate Zones 3 through 8:

1. Where a closed-circuit cooling tower is used directly in the heat pump loop, one of the following shall be provided.:
 - 1.1 An automatic valve capable of providing a bypass to all but a minimal flow of water around the tower; or
 - 1.2 Low leakage positive closure dampers.
2. Where an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed capable of providing a bypass of all heat pump water flow around the tower.
3. Where an open-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the cooling tower from the heat pump loop, then heat loss shall be capable of being controlled by shutting down the circulation pump on the cooling tower loop.

Exception: Where it can be demonstrated that a heat pump system will be required to reject heat throughout the year.

~~**C403.4.3.3.2.1 Climate Zones 3 and 4.** For Climate Zones 3 and 4:~~

- ~~1. If a closed-circuit cooling tower is used directly in the heat pump loop, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower, or lower leakage positive closure dampers shall be provided.~~
- ~~2. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower.~~
- ~~3. If an open- or closed-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the cooling tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.~~

~~**C403.4.3.3.2.2 Climate Zones 5 through 8.** For Climate Zones 5 through 8, if an open- or closed-circuit cooling tower is used, then a separate heat exchanger shall be provided to isolate the cooling tower from the heat pump loop, and heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop and providing an automatic valve to stop the flow of fluid.~~

Reason: For consistency with ASHRAE/IES 90.1-2010. . As that standard is an alternative path to compliance with the IECC and there is a desire to maintain equivalency of the IECC with 90.1 the issue of energy use for freeze protection systems must also be addressed in the IECC. These requirements for heat pump heat loss have been in 90.1 for a few years. This change will bring the requirements in line with 90.1.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.4.3.3.2-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proponent requested disapproval because the reason statement lacked sufficient information for the committee to take action.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Submitted.

Commenter's Reason: The original proposal was disapproved because it lacked sufficient justification.

Here is additional justification for the change.

Heat rejection for a hydronic heat pump loop can be provided by a closed circuit cooling tower, an open circuit cooling tower / heat exchanger combination, or an open circuit cooling tower. This change is justified as the heat rejection requirements for hydronic heat pump systems for all three heat rejection types should apply equally to climate zones 3 through 8, rather than separate requirements for Climate Zones 3 and 4 and Climate Zones 5 through 8. This is because the requirements are actually the same except for the mis-directed constraint in C403.4.3.3.2.2 calling for a secondary heat exchanger in Climate Zones 5 through 8.

The additional heat exchanger currently called for in climate zones 5 through 8 is unnecessary for systems utilizing any of the three options for heat rejection mentioned above. This requirement adds substantial, unnecessary cost to such systems, especially the case where a closed circuit cooling tower is utilized (a closed circuit tower combines the functions of a heat exchanger and cooling tower in one compact unit). For the case where an open tower is used without an isolation heat exchanger, there is a requirement for a bypass around the tower to prevent unnecessary heat loss in the proposed text.

Besides correcting the discrepancy in this section, this new language makes the IECC language consistent with ASHRAE/IES 90.1-2010 while at the same time simplifying the code language. As that standard is an alternative path to compliance with the IECC and there is a desire to maintain equivalency of the IECC with Standard 90.1, this issue must be addressed. Note that the requirements for hydronic heat pump heat loss have been in Standard 90.1 for many years and this change will bring the requirements in line with Standard 90.1.

CE252-13

Final Action:

AS

AM

AMPC_____

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CE254-13

C202 (NEW), C403.4.3.5 (NEW), Table C403.4.3.5 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.4.3.5 Boiler Turndown. Boiler systems with design input of greater than 1,000,000 Btu/h shall comply with the turndown ratio specified in Table 403.4.3.5.

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 403.4.3.5
BOILER TURNDOWN**

<u>Boiler System Design Input (Btu/h)</u>	<u>Minimum Turndown Ratio</u>
<u>≥ 1,000,000 and less than or equal to 5,000,000</u>	<u>3 to 1</u>
<u>> 5,000,000 and less than or equal to 10,000,000</u>	<u>4 to 1</u>
<u>> 10,000,000</u>	<u>5 to 1</u>

Add new definitions as follows:

SECTION C202 GENERAL DEFINITIONS

BOILER, MODULATING. A boiler that is capable of more than a single firing rate in response to a varying temperature or heating load.

BOILER SYSTEM. One or more boilers, their piping and controls that work together to supply steam or hot water to heat output devices remote from the boiler.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised to include boiler turndown requirements for boilers larger than 1,000,000 Btu/h. These requirements are in addition to the efficiency requirements in TABLE C403.2.8. The change ensures continued consistency between the IECC and Standard 90.1-2010.

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

C403.4.3.5-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The definitions are needed to properly regulate boilers. The provision for part loads allow the boilers to be more efficient.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self; Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE254-13

Final Action:

AS

AM

AMPC_____

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CE255-13

C403.4.4, C403.4.4.1 (NEW), C403.4.4.2 (NEW), C403.4.4.2.1 (NEW), C403.4.4.2.2 (NEW), C403.4.4.3, C403.4.4.4 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C403.4.4 Heat rejection equipment fan speed control. Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two-thirds of full speed or less, and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device.

Exception: Factory-installed heat rejection devices within HVAC equipment tested and rated in accordance with Tables C403.2.3(6) and C403.2.3(7).

C403.4.4.1 General. Heat rejection equipment such as air-cooled condensers, dry coolers, open-circuit cooling towers, closed-circuit cooling towers, and evaporative condensers used for comfort cooling applications shall comply with this section.

Exception: Heat rejection devices whose energy usage is included in the equipment efficiency ratings listed in Tables C403.2.3 (6) and C403.2.3 (7).

C403.4.4.2 Fan speed control. The fan speed shall be controlled as follows:

C403.4.4.2.1 Fan motors at least 7.5 hp. Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two-thirds of full speed or less, and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device.

Exceptions: The following fan motors over 7.5 hp are exempt:

1. Condenser fans serving multiple refrigerant circuits.
2. Condenser fans serving flooded condensers.
3. Installations located in climate zones 1 and 2.

C403.4.4.2.2 Multiple cell heat rejection equipment. Multiple cell heat rejection equipment with variable speed fan drives shall:

1. Be controlled to operate the maximum number of fans allowed that comply with the manufacturer's requirements for all system components, and
2. Be controlled so all fans can operate at the same fan speed required for the instantaneous cooling duty as opposed to staged (on/off) operation.

Minimum fan speed shall be the minimum allowable speed of the fan drive system in accordance with the manufacturer's recommendations.

C403.4.4.3 Limitation on centrifugal fan open-circuit cooling towers. Centrifugal fan open-circuit cooling towers with a combined rated capacity of 1100 gpm or greater at 95°F condenser water return, 85°F condenser water supply, and 75°F outdoor air wet-bulb temperature shall meet the energy efficiency requirement for axial fan open-circuit cooling towers listed in Table C403.2.3(8).

Exception: Centrifugal open-circuit cooling towers that designed with inlet or discharge ducts or require external sound attenuation.

C403.4.4.4 Tower flow turndown. Open circuit cooling towers used on water cooled chiller systems that are configured with multiple or variable speed condenser water pumps shall be designed so that all open circuit cooling tower cells can be run in parallel with the larger of the flow that is produced by the smallest pump at its minimum expected flow rate or at 50 percent of the design flow for the cell.

Reason: ASHRAE/IES Standard 90.1, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised to enhance the provisions applicable to cooling tower controls and supports further reductions in energy use. The change ensures continued consistency between the IECC and 90.1.

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

C403.4.4-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action: **Approved as Submitted**

Committee Reason: Enhances standards for cooling tower controls and will allow a savings of energy. Industry has developed these improved standards

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self; Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE255-13

Final Action: AS AM AMPC_____ D

CE257-13

C403.4.5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferuson@ashrae.org)

Revise as follows:

C403.4.5 Requirements for complex mechanical systems serving multiple zones. Sections C403.4.5.1 through C403.4.5.3 shall apply to complex mechanical systems serving multiple zones. Supply air systems serving multiple zones shall be VAV systems which, during periods of occupancy, are designed and capable of being controlled to reduce primary air supply to each *zone* to one of the following before reheating, recooling or mixing takes place:

1. Thirty percent of the maximum supply air to each *zone*.
2. Three hundred cfm (142 L/s) or less where the maximum flow rate is less than 10 percent of the total fan system supply airflow rate.
3. The minimum ventilation requirements of Chapter 4 of the *International Mechanical Code*.
4. Any higher rate that can be demonstrated to reduce overall system annual energy use by offsetting reheat/recool energy losses through a reduction in *outdoor air* intake for the system, as approved by the code official.
5. The air flow rate required to comply with applicable codes or accreditation standards, such as pressure relationships or minimum air change rates.

Exception: The following define where individual *zones* or where entire air distribution systems are exempted from the requirement for VAV control:

- ~~1. Zones where special pressurization relationships or cross-contamination requirements are such that VAV systems are impractical.~~
2. 1. Zones or supply air systems where at least 75 percent of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered or site-solar energy source.
- ~~3. 2. Zones where special humidity levels are required to satisfy process needs.~~
4. 3. Zones with a peak supply air quantity of 300 cfm (142 L/s) or less and where the flow rate is less than 10 percent of the total fan system supply airflow rate.
- ~~5. 4. Zones where the volume of air to be reheated, recooled or mixed is no greater than the volume of outside air required to meet the minimum ventilation requirements of Chapter 4 of the *International Mechanical Code*.~~
6. 5. Zones or supply air systems with thermostatic and humidistatic controls capable of operating in sequence the supply of heating and cooling energy to the *zones* and which are capable of preventing reheating, recooling, mixing or simultaneous supply of air that has been previously cooled, either mechanically or through the use of economizer systems, and air that has been previously mechanically heated.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, contains an important exception to zone minimum airflow that is not included in the IECC. The exception is important to allow optimization of multi-zone system ventilation, and saves significant energy nationally. The change ensures continued consistency between the IECC and standard 90.1-2010.

Cost Impact: The code change proposal will not increase the cost of construction.

C403.4.5 #2-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Provides for optimization of multi-zones systems and gives the code official the authority to accept systems which are shown to be more energy efficient. There was concern that the wording, especially of new item 4 was vague.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C407.5.2(3)
SPECIFICATIONS FOR THE STANDARD REFERENCE DESIGN HVAC SYSTEM DESCRIPTION**

- d. **VAV:** ~~Constant Volume can be modeled if the system qualifies for Exception 1, Section C403.4.5. Where the proposed design system modeled has a supply, return or relief fan motor 25 horsepower (hp) or larger, the corresponding fan in the VAV system of the standard reference design shall be modeled assuming a variable speed drive. For smaller fans, a forward-curved centrifugal fan with inlet vanes shall be. If the proposed design's system has a direct digital control system at the zone level, static pressure setpoint reset based on zone requirements in accordance with Section C403.4.1 shall be modeled.~~

(Portions of Table not show remain unchanged)

Commenter's Reason: In the original version of CE257, Exception 1 to Section 403.4.5 was deleted. Upon review of Table C407.5.1(3), there's a reference to that deleted exception in the existing IECC. This comment seeks to remove the reference to that exception as it would no longer be applicable if CE257 were approved as submitted.

CE257-13

Final Action: AS AM AMPC _____ D

CE258-13
C403.4.5.4 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.4.5.4 Fractional HP fan motors. Motors for fans that are 1/12 HP or greater and less than 1 HP shall be electronically-commutated motors or shall have a minimum motor efficiency of 70 percent rated in accordance with DOE 10 CFR 431 . These motors shall also have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing in lieu of a varying motor speed shall be permitted.

Exception Motors in the airstream within fan-coils and terminal units that only provide heating to the space served.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, contains an important exception to zone minimum airflow that is not included in the IECC. Research conducted by the California Energy Commission and others indicates that Electronically Commutated Motors (ECM) are more efficient and are cost effective compared to standard (e.g. PSC) motors in applications where the fan runs many hours per day (e.g. toilet exhaust fans, series fan-powered VAV boxes, and fan-coil units) other than those in the airstream that operate only when heating a space since the motor in that case behave essentially as an electric resistance heater. ECMs also reduce energy because their speed can be adjusted for balancing rather than throttling dampers. (ECMs can also be used for variable speed capacity control but that is not a requirement of this section.). The change ensures continued consistency between the IECC and standard 90.1-2010.

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

C403.4.5.4 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Modified

Modified the proposal as follows:

Exception Exceptions:

1. Motors in the airstream within fan-coils and terminal units that only provide heating to the space served.
2. Motors in space conditioning equipment that comply with Section C403.2.3.

(Portions of proposal not shown remain unchanged)

Committee Reason: The modification provides coordination with motors regulated by Section C403.2.3. The proposal adds efficiency requirements for smaller motors not regulated by Section C403.2.3.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.4.5.4 Fractional HP fan motors. Motors for fans that are 1/12 HP or greater and less than 1 HP shall be electronically-commutated motors or shall have a minimum motor efficiency of 70 percent rated in accordance with DOE 10 CFR 431 . These motors shall also have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing in lieu of a varying motor speed shall be permitted.

Exceptions: The following motors are not required to comply with this section:

1. Motors in the airstream within fan-coils and terminal units that only provide heating to the space served.
2. Motors in space conditioning equipment that comply with Section C403.2.3 or C403.2.10.
3. Motors that comply with C405.8

Commenter's Reason: Proposal CE331 was approved as submitted by the code development committee, which adds requirements for electric motors covered by federal law in Section C403.4.5.4. Previously this section of the code did not exist.

The intent of this modification is to be consistent with CE-331, and to exempt those motors that currently have and will have their efficiency requirements established by the US Department of Energy. In other words, this comment will exempt those electric motors that are already covered by federal law as shown in CE-331.

In addition, section 403.2.10 exempts individual exhaust fans less than 1 hp, and the intent of this proposal was not to address the efficiency of those exhaust fan motors.

CE258-13

Final Action: AS AM AMPC ____ D

CE259-13
C403.4.5.5 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.4.5.5 Multiple-zone VAV system ventilation optimization control. Multiple-zone VAV systems with direct digital control of individual zone boxes reporting to a central control panel shall have automatic controls configured to reduce outdoor air intake flow below design rates in response to changes in *system ventilation efficiency (E_v)* as defined by the *International Mechanical Code*.

Exceptions:

1. VAV systems with zonal transfer fans that recirculate air from other zones without directly mixing it with outdoor air, dual-duct dual-fan VAV systems, and VAV systems with fan-powered terminal units.
2. Systems having exhaust air energy recovery complying with Section C403.2.6.
3. Systems where total design exhaust airflow is more than 70 percent of total design outdoor air intake flow requirements.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has requirements for ventilation optimization control on VAV systems that are not included in the IECC. These provisions provide significant energy savings. The change ensures continued consistency between the IECC and standard 90.1-2010 and provides significant energy savings in IECC.

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

C403.4.5.5 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Where VAV's are optimized for multi-zone designs significant energy savings can be realized.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality, representing self; Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE259-13

Final Action: AS AM AMPC____ D

CE260-13
C403.4.8 (New)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C403.4.8 Window switch controls. Any conditioned space with operable wall or roof openings to the outdoors shall be provided with controls that, when any such opening is open:

1. Disable mechanical heating or reset the heating set point to 55°F or lower.
2. Disable mechanical cooling or reset the cooling set point to 90°F or greater unless the outside air temperature is below the conditioned space temperature

Exceptions: These controls are not required for:

1. Building entries with automatic closing devices
2. Any space without a thermostat
3. Alterations to existing buildings

Reason: When a space with operable windows has non-integrated mechanical heating and cooling, it is likely that annual HVAC energy will be increased when compared to the same space without operable windows. This can be attributed to operable windows being left open when conditions are not favorable, resulting in high infiltration loads on the HVAC system. There are many reasons why windows are opened when conditions are not favorable:

1. Occupant wants more fresh air and is inconsiderate or unaware of the energy penalty of opening the window when indoor/outdoor conditions are not favorable. This is particularly likely when the HVAC system has sufficient capacity to maintain the space indoor temperature at setpoint despite the increased infiltration load.
2. Occupant does not have sufficient information regarding the indoor air temperature, outdoor air temperature, or HVAC mode of operation to properly determine if opening the window will reduce or increase energy use.
3. Occupant opened the window during favorable conditions, but left the room while the window was open. During their time away from the space, the conditions transitioned to unfavorable.

The intent of this measure is to reduce unnecessary use of energy for heating or cooling of additional un-tempered air if an operable window is left open outside of times when it is beneficial to leave it open. This is accomplished with a simple mechanical switch that integrates the HVAC system operation with operable window position.

The change ensures continued consistency between the IECC and Standard 90.1-2010.

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

C403.4.8-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proponent requested disapproval to review the cost impact justification.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C403.4.8 Door Window Switches. Any conditioned space with a door, including doors with more than one-half glass, operable wall or roof openings to the outdoors shall be provided with controls that, when any such opening door is open:

1. Disable mechanical heating or reset the heating set point to 55°F or lower within 5 minutes of the door opening.
2. Disable mechanical cooling or reset the cooling set point to 90°F or greater. Mechanical cooling may remain enabled if outside air temperature is below space temperature within 5 minutes of the door opening.

Exceptions:

1. Building entries with automatic closing devices
2. Any space without a thermostat
3. Alterations to existing buildings
4. Loading docks

Commenter's Reason: *Based on public review comments received by ASHRAE, as well as recent votes by the 90.1 committee, the modifications shown alter the scope of this proposal, to be consistent with ASHRAE 90.1. The intent of this measure is to reduce unnecessary use of energy for heating or cooling of additional un-tempered air if an operable door is left open outside of times when it is beneficial to leave it open. This is accomplished with a simple mechanical switch that integrates the HVAC system operation with operable door position.*

It was determined that requiring these switches on all windows was impractical and not cost effective, so the scope has been reduced to only include switches on doors rather than all openings.

Public Comment 2:

Duane Jonlin, City of Seattle, Department of Planning & Development, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

C403.4.8 Window sSwitch controls for exterior openings. Any conditioned space with operable wall or roof openings to the outdoors shall be provided with controls that, when any such opening is open:

1. Disable mechanical heating or reset the heating set point to 55 F or lower.
2. Disable mechanical cooling or reset the cooling set point to 90°F or greater unless the outside air temperature is below the conditioned space temperature

Exceptions:

1. These controls are not required for:
 - 1.1. Building entries with automatic closing devices
 - 1.2. Any space without a thermostat
 - 1.3. Alterations to existing buildings
2. Controls are permitted to be configured so that the heating or cooling is not disabled and the set points are not reset when the opening remains open for time periods not exceeding two minutes.

Commenter's Reason: We support acceptance this code provision, as it saves significant energy by ensuring that the furnace or air conditioning system is not running while the windows are open.

Two modifications are proposed in this public comment: The title should be changed to clarify that the section applies to all "wall and roof openings to the outdoors" as stated in the text, and not just to windows. The added exception prevents rapid cycling of the HVAC system as people come and go through exterior doors.

CE260-13

Final Action: AS AM AMPC____ D

CE270-13, Part I

C404.5, IPC [E] 607.5

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. SEE THE TENTATIVE HEARING ORDERS FOR THE COMMITTEE.

Proponent: Steve Ferguson representing the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (sferguson@ashrae.org)

PART I-IECC-COMMERCIAL PROVISIONS

Delete and substitute as follows:

C404.5 Pipe insulation. For Automatic-circulating hot water and heat-traced systems, piping shall be insulated with not less than 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h × ft² × °F (1.53 W per 25 mm/m² × K). The first 8 feet (2438 mm) of piping in non-hot water-supply temperature maintenance systems served by equipment without integral heat traps shall be insulated with 0.5 inch (12.7 mm) of material having a conductivity not exceeding 0.27 Btu per inch/h × ft² × °F (1.53 W per 25 mm/m² × K).

Exception: Heat-traced piping systems shall meet the insulation thickness requirements per the manufacturer's installation instructions. untraced piping within a heat traced system shall be insulated with not less than 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h × ft² × °F (1.53 W per 25 mm/m² × K).

C404.5 Pipe insulation. Piping in circulating hot water systems and heat-trace temperature maintenance systems shall be insulated in accordance with Table C403.2.8. In hot water systems that have a storage tank and that do not have a circulating hot water system, the first 8 feet (2438 mm) of outlet water piping connecting to a storage water heater or a hot water storage tank shall be insulated in accordance with Table C403.2.8. The pipe between the inlet of a storage tank and a heat trap shall be insulated in accordance with Table C403.2.8.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, references the HVAC piping insulation provisions. The 2012 IECC Commercial Provisions have separate insulation requirements for service water heating piping. It seems logical that the heat loss of the pipe under identical conditions regardless of whether supplying potable water or water for HVAC applications would be the same and should be addressed in the same manner. This situation should be addressed in the IECC to ensure consistency between standard 90.1-2010 and the IECC.

Cost Impact: This code change proposal will increase the cost of construction where pipe insulation > 1 inch wall thickness is required.

C404.5-EC-FERGUSON.DOC

Committee Action Hearing Results

Part I of this code change was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The heat trace manufacturer's installation instructions could require different insulation requirements than Table C403.2.8.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C404.5 Pipe insulation. Piping in circulating hot water systems and heat-trace temperature maintenance systems shall be insulated in accordance with Table C403.2.8. ~~Where a hot water system includes that have a storage tank or a storage water heater, and the system does and that do not have a circulating hot water system, the inlet piping to the tank and the outlet piping from the tank shall be insulated in accordance with Table C403.2.8. The extent of the inlet piping insulation shall be from the tank to, and including the piping heat trap required by Section C404.4. The extent of the outlet piping insulation shall be from the tank to a point that is not less than 8 feet (2438 mm) developed length of outlet piping, the first 8 feet (2438 mm) of outlet water piping connecting to a storage water heater or a hot water storage tank shall be insulated in accordance with Table C403.2.8. The pipe between the inlet of a storage tank and a heat trap shall be insulated in accordance with Table C403.2.8.~~

Commenter's Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, references the HVAC piping insulation provisions. The 2012 IECC Commercial Provisions have separate insulation requirements for service water heating piping. It seems logical that the heat loss of the pipe under identical conditions regardless of whether supplying potable water or water for HVAC applications would be the same and should be addressed in the same manner. This situation should be addressed in the IECC to ensure consistency between standard 90.1-2010 and the IECC. More insulation does not negatively impact heat trace products. The insulation values in the tables were found to be cost effective using the ASHRAE cost effectiveness criteria.

The modifications to this proposal improve clarity of the original proposal, and do not substantively modify the original proposal.

CE270-13, Part I

Final Action: AS AM AMPC____ D

NOTE: PART II IS REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE270-13, PART II - IPC

[E] 607.5 Pipe insulation. Hot water piping in automatic temperature maintenance systems shall be insulated with 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K). The first 8 feet (2438 mm) of hot water piping from a hot water source that does not have heat traps shall be insulated with 0.5 inch (12.7 mm) of material having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/ m² • K). Piping in circulating hot water systems and heat-trace temperature maintenance systems shall be insulated in accordance with Table C403.2.8 of the International Energy Conservation Code. In hot water systems that have a storage tank and that do not have a circulating hot water system, the first 8 feet (2438 mm) of outlet water piping connecting to a storage water heater or a hot water storage tank shall be insulated in accordance with Table C403.2.8 of the International Energy Conservation Code. The pipe between the inlet of a storage tank and a heat trap shall be insulated in accordance with Table C403.2.8 of the International Energy Conservation Code. This section shall not apply to the piping in Group R2, R3 and R4 occupancies that are 3 stories or less in

height above grade plane. Piping in circulating hot water systems and heat-trace temperature maintenance systems in Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane shall be insulated in accordance with R403.4.2 of the *International Energy Conservation Code*.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, references the HVAC piping insulation provisions. The 2012 IECC Commercial Provisions have separate insulation requirements for service water heating piping. It seems logical that the heat loss of the pipe under identical conditions regardless of whether supplying potable water or water for HVAC applications would be the same and should be addressed in the same manner. This situation should be addressed in the IECC to ensure consistency between standard 90.1-2010 and the IECC.

Cost Impact: This code change proposal will increase the cost of construction where pipe insulation > 1 inch wall thickness is required.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Disapproved

Committee Reason: The heat trace manufacturer's installations could require different insulation requirements than Table C403.2.8.

Assembly Action:

None

CE271-13, Part I

C202 (NEW), C404.5, C404.5.1 (NEW), Table C404.5.1 (NEW), C404.5.2 (NEW), C404.5.3 (NEW), IPC [E]607.5

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS TWO SEPARATE CODE CHANGES.

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, gary@aim4sustainability.com

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C404.5 Pipe Insulation of piping. ~~For automatic-circulating hot water and heat-traced systems, piping shall be insulated with not less than 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K). The first 8 feet (2438 mm) of piping in non-hot water supply temperature maintenance systems served by equipment without integral heat traps shall be insulated with 0.5 inch (12.7 mm) of material having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K). Piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Sections C404.5.1, C404.5.2 and C404.5.2.3. Where tubular pipe insulation is used for insulating piping, the thermal conductivity, k, of such insulation shall be not greater than 0.28 Btu per inch/h•ft² • F [0.40 W/(m•K)] for water temperatures less than or equal to 140°F (60°C) and not greater than 0.29 Btu per inch/h•ft² • F [0.42 W/(m•K)] for water temperatures greater than 140°F (60°C) and less than or equal to 200°F (93.3°C). Tubular pipe insulation shall be installed in accordance with the insulation manufacturer's instructions. Pipe insulation shall be continuous except where the piping passes through a framing member. The minimum insulation thickness requirements of this section shall not supersede any greater insulation thickness requirements necessary for the protection of piping from freezing temperatures or the protection of personnel against external surface temperatures on the insulation. This section shall not be construed as requiring insulation on the following:~~

Exception: ~~Heat-traced piping systems shall meet the insulation thickness requirements per the manufacturer's installation instructions. Untraced piping within a heat traced system shall be insulated with not less than 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K).~~

1. The tubing from the connection at the termination of the fixture supply piping to a fixture fitting or a water consuming appliance.
2. Valves, pumps, strainers and threaded unions in piping that is 1 inch or less in nominal diameter
3. Piping from user-controlled shower and bath mixing valves to the water outlets.
4. Cold water piping of a demand recirculation water system.
5. Tubing from a hot drinking-water heating unit to the water outlet.
6. Piping at locations where a vertical support of the piping is installed.

C404.5.1 Circulating system piping and heat-traced piping. Heated water circulation system piping shall be insulated in accordance with Table C404.5.1. Piping that is heat-traced to maintain heated water temperature shall be insulated in accordance with Table C404.5.1 or shall have insulation thickness in accordance with the heat tracing manufacturer's requirements. Untraced piping within a heat-traced system shall be insulated in accordance with Table C404.5.1.

**TABLE C404.5.1
MINIMUM TUBULAR PIPE INSULATION WALL THICKNESS**

NOMINAL PIPE OR TUBE DIAMETER (inches)	MINIMUM INSULATION WALL THICKNESS (inches)	
	≤140 °F WATER TEMPERATURE	>140 °F to 200°F WATER TEMPERATURE
≤3/8	3/8	3/8
> 3/8 to <3/4	1/2	1/2
≥ 3/4 to <1	3/4	1
≥1 to <1 1/2	1	1 1/2
≥1 1/2 to <4	1 1/2	2
≥4 to <8	1 1/2	2
≥8	1 1/2	2

For SI: 1 inch = 25.4 mm, °C= [(°F – 32)/1.8]

C404.5.2 Inlet piping connecting to water heaters and storage tanks. Where a water heater or a heated water storage tank is not equipped with integral heat traps, the inlet piping within 8 feet (2438 mm) of piping length of the water heater or storage tank shall be insulated in accordance with Table C404.5.1. This requirement shall not supersede the water heater manufacturer's requirements for a greater insulation thickness on the inlet piping.

Exceptions:

1. Inlet piping or tubing to a water heater serving only *plumbing fixtures or plumbing appliances* that are within 8 feet (2438 mm) piping length of the water heater shall not be required to be insulated.
2. Valves, pumps, strainers and threaded unions in water heater or heated water storage inlet piping that is 1 inch (25.4 mm) nominal diameter or less shall not be required to be insulated.

C404.5.3 Other heated water piping. Piping conveying heated water that is not addressed by Sections C404.5.1 and C404.5.2 shall have insulation with a wall thickness of not less than that indicated in Table C404.5.1.

Exceptions:

1. Outlet piping or tubing from a water heater serving only *plumbing fixtures or plumbing appliances* that are within 8 feet (2438 mm) piping length of the water heater shall not be required to be insulated.
2. Piping or tubing that is completely surrounded by not less than 1 inch (25.4 mm) thickness of building thermal envelope insulation in walls, attics and crawl spaces shall not be required to be insulated with tubular pipe insulation provided that the piping or tubing is 1 inch (25.4 mm) nominal diameter or smaller.

Add new definition as follows:

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

Commenter's Reason: This section has generated a lot of questions over the many years since it was put into the IECC. Some people believe that this section requires all hot water piping to have 1 inch insulation. Others believe that this section only requires that hot water circulating system piping (or heat traced piping) have 1 inch of insulation. Another question that arises is what is meant by "hot water" as there is not a definition of such in the IECC. Other questions that arise are "Is the insulation required to be continuous along the piping?" and "Should really small piping and tubing be insulated?" The exception really isn't an exception but requirements for heat-traced systems.

There is no other place in the Commercial Provisions of the IECC that covers the insulation of Service Water Heating piping. This subject is important! In summary, the language in this section is a mess and the words do not clearly state the intended requirements. Let's stop dancing around this important aspect of lessening energy consumption.

The proposed revisions and why:

C404.5

The intent of the struck-out language can be found in new sections C404.5.1 and C404.5.2. The new language for this struck language is discussed later in this reason statement.

The phrase "water heated by a water heater" was used instead of "hot water" because the IECC does not have a definition for hot water. Code users could refer to the definition found in the IRC and the IPC for hot water which says water of a temperature 110F or greater. But what about tempered water (IPC definition of 85F to 110F)? Keep in mind that ASHRAE 90.1-2007 only requires insulation of service water piping conveying water of 105F or greater. It doesn't seem reasonable to say only "hot water" (as defined by the IPC). If necessary, the committee could request a public comment to amend this section to indicate that the section only covers water 105F and greater.

The statement about protection of personnel from external insulation temperatures and freezing conditions is really common sense but it is added for clarity. It also serves as a reminder for the designer to consider these important issues.

The language "The insulation shall be continuous along the piping." was added to answer the obvious and most often asked question. But keep in mind that this requirement could have serious structural implications when piping is routed through light frame construction members (wood studs and joist, metal studs and solid web joists). The holes to accommodate the piping diameter and insulation could become quite large and in some cases, making piping installation very difficult to perform unless soffits and chases are added and wall thicknesses are increased. Again, the committee could express its opinion on this issue by requesting that a public comment for *not* having insulation be continuous through wood studs and joist/metal studs and solid web joists. Either way, this question needs to be answered in a definitive manner.

The list of items where pipe insulation is not required is almost common sense but still, these items need to be stated to avoid confusion and possible misinterpretations by the code officials. Insulating valves is time consuming and if the right type of valve is not used, insulating is almost impossible (think ball valve without a raised handle). A few uninsulated valves in the system are not going to lose a lot of heat. Pumps are also difficult to insulate and in some cases, insulation might cause overheating of the pump motor. Threaded unions usually only occur in smaller diameter piping systems and are time consuming to insulate. Again, a small amount of heat loss compared to the entire system. Piping or tubing from a small tankless water heater serving one sink is too small to easily insulate. The heat loss is negligible.

C404.5.1

The first sentence of this section is saying exactly what the first struck out sentence in C404.5 says. The second sentence picks up the intent of the requirement in the first sentence of the struck out exception.

C404.5.2

The first sentence picks up the intent of the second sentence of struck-out language in C404.5. If a water heater (or heated water storage tank) does not have integral heat traps, there will be standby heat losses from convection of the heated water into the water inlet and outlet piping of the storage water heater or heated water storage tank. Insulating the inlet and outlet piping for 8 feet mitigates this heat loss. But it is not necessary to include the outlet piping in this section because new Section C404.5.3 requires insulating all other piping (which would include the heater or storage tank outlet piping). If the water (or heated water storage tank) serves a circulating system, then there is no convection of heat water into the piping connected to the heater and storage tank--the water is circulating and Section C404.5.1 takes care of the insulating requirement.

The statement about the water heater manufacturer's insulation thickness requirements is necessary because energy compliance listing for the water heater could require that the inlet and outlet piping be insulated with a thickness greater than ½ inch. And this section should not apply to tankless water heaters as they do not have storage that leads to standby heat losses.

C404.5.3

This section covers the insulation requirements for all other heated water piping that isn't addressed in the two preceding sections. The table of insulation thicknesses mirrors what is required by ASHRAE 90.1-2007 except an entry was added for 3/8 inch pipe or tubing. Some people would like to have the insulation thickness be 1 inch for all piping for "simplicity". But what they fail to realize is that such a requirement would make the installation of smaller piping near or at the ends (outlets) of the system very difficult to accomplish. For example, imagine trying to install ½ inch copper (or PEX) tubing (now 2 5/8 inch diameter with the required insulation) in a 3 ½ inch deep wall cavity with other piping crossing over. Or making that large diameter pass through wood or light frame steel members for a 3 ½ inch deep wall cavity. While ½ inch insulation thickness on ½ inch tubing is still a challenge to install, it is easier. Ideally, many fixtures could be installed using 3/8 inch tubing (only about 1 ¼ inch diameter with the required insulation) inside 3 ½ inch wall cavities. Let's be reasonable and in touch with how buildings are constructed.

Part II – IPC

Section 607.5 did not read exactly the same way as the IECC section (C404.5) that drives this section although the intent was the same. The proposal changes Section 607.5 makes the section read exactly the same way as proposed changes to C404.5. Also, because the IPC covers plumbing for Group R2, R3, R4 occupancies that are 3 stories or less above grade plane, Section 607.5 must have a statement to *exclude* those occupancies because there are different IECC requirements (the Residential provisions of IECC) for those occupancies.

Cost impact: None

C404.5-EC-KLEIN

Committee Action Hearing Results

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The existing section language is much simpler. There is no justification for adding such a complex set of rules for insulating piping.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C404.5 Insulation of piping. Piping to the inlet of a water heater and piping conveying water heated by from a water heater to the termination of the heated water fixture supply pipe shall be insulated in accordance with Table C403.2.8. On both the inlet and outlet piping of a storage water heater or heated water storage tank, the piping to a heat trap or the first 8 feet (2438 mm) of piping, whichever is less, shall be insulated. Piping that is heat traced shall be insulated in accordance with Table C403.2.8 or the heat trace manufacturer's instructions. Sections C404.5.1, C404.5.2 and C404.5.2.3. Where tubular pipe insulation is used for insulating piping, the thermal conductivity, k , of such insulation shall be not greater than 0.28 Btu per inch/h•ft² • F [0.40 W/(m•K)] for water temperatures less than or equal to 140°F (60°C) and not greater than 0.29 Btu per inch/h•ft² • F [0.42 W/(m•K)] for water temperatures greater than 140°F (60°C) and less than or equal to 200°F (93.3°C). Tubular pipe insulation shall be installed in accordance with the insulation manufacturer's instructions. Pipe insulation shall be continuous except where the piping passes through a framing member. The minimum insulation thickness requirements of this section shall not supersede any greater insulation thickness requirements necessary for the protection of piping from freezing temperatures or the protection of personnel against external surface temperatures on the insulation. This section shall not be construed as requiring insulation on the following:

Exception: Tubular pipe insulation shall not be required on the following:

1. The tubing from the connection at the termination of the fixture supply piping to a plumbing fixture or plumbing appliance fitting or a water consuming appliance.
2. Valves, pumps, strainers and threaded unions in piping that is 1 inch or less in nominal diameter
3. Piping from user-controlled shower and bath mixing valves to the water outlets.
4. Cold water piping of a demand recirculation water system.
5. Tubing from a hot drinking-water heating unit to the water outlet.
6. Piping at locations where a vertical support of the piping is installed.
7. Piping surrounded by building insulation with a thermal resistance (R-value) of not less than R-3.

C404.5.1 Circulating system piping and heat-traced piping. Heated water circulation system piping shall be insulated in accordance with Table C404.5.1. Piping that is heat-traced to maintain heated water temperature shall be insulated in accordance with Table C404.5.1 or shall have insulation thickness in accordance with the heat tracing manufacturer's requirements. Untraced piping within a heat-traced system shall be insulated in accordance with Table C404.5.1.

**TABLE C404.5.1
MINIMUM TUBULAR PIPE INSULATION WALL THICKNESS**

NOMINAL PIPE OR TUBE DIAMETER (inches)	MINIMUM INSULATION WALL THICKNESS (inches)	
	≤140 °F WATER TEMPERATURE	>140 °F to 200 °F WATER TEMPERATURE
≤3/8	3/8	3/8
>3/8 to <3/4	1/2	1/2
≥3/4 to <1	3/4	1
≥1 to <1 1/2	1	1 1/2
≥1 1/2 to <4	1 1/2	2
≥4 to <8	1 1/2	2
≥8	1 1/2	2

For SI: 1 inch = 25.4 mm, °C = [(°F - 32)/1.8]

C404.5.2 Inlet piping connecting to water heaters and storage tanks. Where a water heater or a heated water storage tank is not equipped with integral heat traps, the inlet piping within 8 feet (2438 mm) of piping length of the water heater or storage tank shall be insulated in accordance with Table C404.5.1. This requirement shall not supersede the water heater manufacturer's requirements for a greater insulation thickness on the inlet piping.

Exceptions:

1. Inlet piping or tubing to a water heater serving only *plumbing fixtures* or *plumbing appliances* that are within 8 feet (2438 mm) piping length of the water heater shall not be required to be insulated.
2. Valves, pumps, strainers and threaded unions in water heater or heated water storage inlet piping that is 1 inch (25.4 mm) nominal diameter or less shall not be required to be insulated.

C404.5.3 Other heated water piping. Piping conveying heated water that is not addressed by Sections C404.5.1 and C404.5.2 shall have insulation with a wall thickness of not less than that indicated in Table C404.5.1.

Exceptions:

1. Outlet piping or tubing from a water heater serving only *plumbing fixtures* or *plumbing appliances* that are within 8 feet (2438 mm) piping length of the water heater shall not be required to be insulated.
2. Piping or tubing that is completely surrounded by not less than 1 inch (25.4 mm) thickness of building thermal envelope insulation in walls, attics and crawl spaces shall not be required to be insulated with tubular pipe insulation provided that the piping or tubing is 1 inch (25.4 mm) nominal diameter or smaller.

Reason: Hot water supply piping should be insulated from the source of heated water to the termination of the fixture supply pipe for plumbing fixtures and plumbing appliances. The existing code text, while simple, is incomplete, covering only a portion of some systems.

We attempted to have these changes heard at the development hearing, but the floor modification was not accepted for discussion.

The key features are: reference to existing insulation provisions in the IECC-Commercial chapter that specify the wall thickness of pipe insulation for different diameter piping; clarifying that insulation does not need to be continuous when it passes through framing members; providing a list of exemptions specific to heated water piping and clarifying the insulation on the inlet and outlet piping to storage tanks.

We urge your support of this code change.

CE271-13, Part I

Final Action: AS AM AMPC_____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE271-13, PART II-IPC

Revise as follows:

[E] 607.5 Pipe Insulation of piping. Hot water piping in automatic temperature maintenance systems shall be insulated with not less than 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K). The first 8 feet (2438 mm) of hot water piping from a hot water source that does not have heat traps shall be insulated with 0.5 inch (12.7 mm) of material having a conductivity not exceeding 0.27 Btu per inch/h • ft² • °F (1.53 W per 25 mm/m² • K). For other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Sections C404.5 through C404.5.3 of the *International Energy Conservation Code*. For Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Section R403.4.2 of the *International Energy Conservation Code*.

Reason: This section has generated a lot of questions over the many years since it was put into the IECC. Some people believe that this section requires all hot water piping to have 1 inch insulation. Others believe that this section only requires that hot water circulating system piping (or heat traced piping) have 1 inch of insulation. Another question that arises is what is meant by "hot water" as there is not a definition of such in the IECC. Other questions that arise are "Is the insulation required to be continuous along the piping?" and "Should really small piping and tubing be insulated?" The exception really isn't an exception but requirements for heat-traced systems.

There is no other place in the Commercial Provisions of the IECC that covers the insulation of Service Water Heating piping. This subject is important! In summary, the language in this section is a mess and the words do not clearly state the intended requirements. Let's stop dancing around this important aspect of lessening energy consumption.

The proposed revisions and why:

C404.5

The intent of the struck-out language can be found in new sections C404.5.1 and C404.5.2. The new language for this struck language is discussed later in this reason statement.

The phrase "water heated by a water heater" was used instead of "hot water" because the IECC does not have a definition for hot water. Code users could refer to the definition found in the IRC and the IPC for hot water which says water of a temperature 110F or greater. But what about tempered water (IPC definition of 85F to 110F)? Keep in mind that ASHRAE 90.1-2007 only requires insulation of service water piping conveying water of 105F or greater. It doesn't seem reasonable to say only "hot water" (as defined by the IPC). If necessary, the committee could request a public comment to amend this section to indicate that the section only covers water 105F and greater.

The statement about protection of personnel from external insulation temperatures and freezing conditions is really common sense but it is added for clarity. It also serves as a reminder for the designer to consider these important issues.

The language "The insulation shall be continuous along the piping." was added to answer the obvious and most often asked question. But keep in mind that this requirement could have serious structural implications when piping is routed through light frame construction members (wood studs and joist, metal studs and solid web joists). The holes to accommodate the piping diameter and insulation could become quite large and in some cases, making piping installation very difficult to perform unless soffits and chases are added and wall thicknesses are increased. Again, the committee could express its opinion on this issue by requesting that a public comment for *not* having insulation be continuous through wood studs and joist/metal studs and solid web joists. Either way, this question needs to be answered in a definitive manner.

The list of items where pipe insulation is not required is almost common sense but still, these items need to be stated to avoid confusion and possible misinterpretations by the code officials. Insulating valves is time consuming and if the right type of valve is not used, insulating is almost impossible (think ball valve without a raised handle). A few uninsulated valves in the system are not going to lose a lot of heat. Pumps are also difficult to insulate and in some cases, insulation might cause overheating of the pump motor. Threaded unions usually only occur in smaller diameter piping systems and are time consuming to insulate. Again, a small amount of heat loss compared to the entire system. Piping or tubing from a small tankless water heater serving one sink is too small to easily insulate. The heat loss is negligible.

C404.5.1

The first sentence of this section is saying exactly what the first struck out sentence in C404.5 says. The second sentence picks up the intent of the requirement in the first sentence of the struck out exception.

C404.5.2

The first sentence picks up the intent of the second sentence of struck-out language in C404.5. If a water heater (or heated water storage tank) does not have integral heat traps, there will be standby heat losses from convection of the heated water into the water inlet and outlet piping of the storage water heater or heated water storage tank. Insulating the inlet and outlet piping for 8 feet mitigates this heat loss. But it is not necessary to include the outlet piping in this section because new Section C404.5.3 requires insulating all other piping (which would include the heater or storage tank outlet piping). If the water (or heated water storage tank) serves a circulating system, then there is no convection of heat water into the piping connected to the heater and storage tank--the water is circulating and Section C404.5.1 takes care of the insulating requirement.

The statement about the water heater manufacturer's insulation thickness requirements is necessary because energy compliance listing for the water heater could require that the inlet and outlet piping be insulated with a thickness greater than ½ inch. And this section should not apply to tankless water heaters as they do not have storage that leads to standby heat losses.

C404.5.3

This section covers the insulation requirements for all other heated water piping that isn't addressed in the two preceding sections. The table of insulation thicknesses mirrors what is required by ASHRAE 90.1-2007 except an entry was added for 3/8 inch pipe or tubing. Some people would like to have the insulation thickness be 1 inch for all piping for "simplicity". But what they fail to realize is that such a requirement would make the installation of smaller piping near or at the ends (outlets) of the system very difficult to accomplish. For example, imagine trying to install ½ inch copper (or PEX) tubing (now 2 5/8 inch diameter with the required insulation) in a 3 ½ inch deep wall cavity with other piping crossing over. Or making that large diameter pass through wood or light frame steel members for a 3 ½ inch deep wall cavity. While ½ inch insulation thickness on ½ inch tubing is still a challenge to install, it is easier. Ideally, many fixtures could be installed using 3/8 inch tubing (only about 1 ¼ inch diameter with the required insulation) inside 3 ½ inch wall cavities. Let's be reasonable and in touch with how buildings are constructed.

Part II – IPC

Section 607.5 did not read exactly the same way as the IECC section (C404.5) that drives this section although the intent was the same. The proposal changes Section 607.5 makes the section read exactly the same way as proposed changes to C404.5. Also, because the IPC covers plumbing for Group R2, R3, R4 occupancies that are 3 stories or less above grade plane,

Section 607.5 must have a statement to *exclude* those occupancies because there are different IECC requirements (the Residential provisions of IECC) for those occupancies.

Cost impact: None

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Disapproved

Committee Reason: The proposed new wording adds confusion and complexity to the code. There doesn't seem to be any payback for such complexity.

Assembly Action:

None

CE274-13

C202 (New), C404.5 (New), C404.5.1 (New), C404.5.1 (New), Table C404.5.1 (New), C404.5.2 (New), C404.5.2.1 (New)

Proposed Change as Submitted

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, gary@aim4sustainability.com

Add new text as follows:

C404.5 Efficient heated water supply piping. Heated water supply piping shall be in accordance with Section C404.5.1 or Section C404.5.2. The flow rate through ¼ inch piping shall not exceed 0.5 gpm (1.9 Lpm). The flow rate through 5/16 inch piping shall not exceed 1 gpm (3.8 Lpm). The flow rate through 3/8 inch piping shall not exceed 1.5 gpm (5.7 Lpm).

C404.5.1 Maximum allowable pipe length method. The maximum allowable piping length from the nearest source of heated water to the termination of the fixture supply pipe for *plumbing fixtures* and *plumbing appliances* shall be in accordance with the maximum piping length column in Table C404.5.1. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping in Table C404.5.1.

**TABLE C404.5.1
PIPING VOLUME AND MAXIMUM PIPING LENGTHS**

<u>NOMINAL PIPE SIZE (inch)</u>	<u>VOLUME (liquid ounces per foot length)</u>	<u>MAXIMUM PIPING LENGTH (feet)</u>	
		<u>WATER FROM A WATER HEATER</u>	<u>WATER FROM A RECIRCULATION LOOP OR HEAT TRACED PIPE</u>
1/4	0.33	50	50
5/16	0.5	50	48
3/8	0.75	50	32
1/2	1.5	43	16
5/8	2	32	12
3/4	3	21	8
7/8	4	16	6
1	5	13	5
1 ¼	8	8	3
1 ½	11	6	2
2 or larger	18	4	1

1 Gallon = 128 ounces. For SI: 1 inch=25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L

C404.5.2 Maximum allowable pipe volume method. The water volume in the piping shall be calculated in accordance with Section C404.5.2.1. The maximum volume from the nearest source of heated water to the termination of the fixture supply pipe for a *plumbing fixture* or *plumbing appliance* shall be 0.5 gallon (1.89 L) where the source of heated water is a water heater; and 0.19 gallon (0.7 L) where the source of heated water is a recirculating system or heat-traced piping.

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the volume column in Table C404.5.1. The volume contained within fixture shut off valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included

in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

Add new definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

Reason: This change speeds hot water to the user, saves energy and water, and potentially lowers construction costs. All these are accomplished by limiting the volume of water in the pipes.

We have all have turned on the hot water and waited for it to get hot. While we wait water runs down the drain, wasting clean water. While we wait, our time is wasted. When we are done there is still hot water in the pipes, water which cools thereby wasting as much energy as it took to heat the water in the pipes. Pipes with larger volumes take longer to fill, waste more and are potentially more expensive to build.

This proposal remedies the problems above by reducing the water volume between the source of heated water and the use. The first method (Section R403.4.2.1) requires no calculation; it limits the water volume in the pipes by limiting the pipe length. The second option (Section R403.4.2.1) requires a calculation of volume in the pipes, but provides a table that translates the pipe length into a volume (columns 1 and 2); and provides quick options for different pipe assumptions in columns 3 and 4.

In simple form, cutting the volume in half: cuts the wait time in half, cuts the clean water wasted down the drain in half, cuts the energy loss while water goes through the pipes in half, and cuts the loss of energy from hot water left in the pipes after use in half.

Why is the maximum volumes 0.5 gallon when the source of heated water is a water heater? So that following standard practice for plumbing engineers and meeting the minimum requirements in the energy code will be aligned. At present, they are not, with the result that hot water delivery times are greater than 30 seconds after the tap is opened; unacceptable performance according to the American Society of Plumbing Engineers.

The American Society of Plumbing Engineers (ASPE) provides plumbing engineers with the guidance for hot water distribution system design as shown in Figure 1. I believe that the minimum energy code should have at least marginal performance at typical actual flow rates. These actual flow rates generally range from 1-2 gpm for private lavatory faucets, showerheads, dishwashers and washing machines. This is true even though faucets are allowed to be 2.2 gpm @ 60 psi and showerheads 2.5 gpm @80 psi. The reason for actual flow rates being lower than rated flow rates is due to the fact that the pressure in the building is often less than the rated pressure. With fixed orifice aerators, common in minimally legal faucets and showerheads, the flow rate drops off rather rapidly as the pressure decreases.

It makes sense to me that the minimum code should provide for at least marginal performance in buildings that are supplied with low pressure. This means that we need to be sure that the time-to-tap is still reasonable even when flow rates are at the lower end of the typical range; that is close to 1 gpm. According to ASPE, marginal performance would mean that hot water needs to arrive in no longer than 30 seconds after the tap is opened. Figure 2 shows that this will be true when the volume of water between the source and the use does not exceed 0.5 gallon.

Figure 1 ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	1 – 10 seconds
	Marginal Performance	11 – 30 seconds
	Unacceptable Performance	31+ seconds

Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Figure 2 Converting Flow Rate and Pipe Volume to Time-to-Tap

Volume in the Pipe		Minimum Time-to-Tap (seconds) at Selected Flow Rates					
Gallons	Ounces	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
0.02	2	4	1.9	0.9	0.6	0.5	0.4
0.03	4	8	4	1.9	1.3	0.9	0.8
0.06	8	15	8	4	2.5	1.9	1.5
0.13	16	30	15	8	5	4	3
0.19	24	45	23	11	8	6	5
0.25	32	60	30	15	10	8	6
0.50	64	120	60	30	20	15	12
1.00	128	240	120	60	40	30	24

Why is the maximum volume 0.19 gallon when the source of heated water is a circulation loop or heat-traced pipe? In exchange for the flexibility in the location of the water heater relative to the plumbing fixtures and plumbing appliances, the allowable volume that

will be wasted has been reduced and the time-to-tap improved so that it will almost always fall into ASPE's range for Acceptable Performance.

The definition proposed is used in both the IPC and the IRC.

For more information and background on issues related to hot water distribution and for a more detailed analysis in support of this proposal please go to <http://www.aim4sustainability.com> Follow the link on the home page to Codes.

Cost impact: There are several ways to meet the requirements of this proposal, many of which cost less than current piping practices. I would recommend that builders and developers select one of the less expensive methods.

C404.5 #2 (New)-EC-KLEIN

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: There needs to be a better cost analysis to justify this complexity in piping design. The lengths seem to be too short for the recirculation loop column.

Assembly Action:

Approved as Submitted

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Submitted and Public Comments were submitted.

Public Comment 1:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

**TABLE C404.5.1
PIPING VOLUME AND MAXIMUM PIPING LENGTHS**

NOMINAL PIPE SIZE (inch)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (feet)	
		WATER FROM A WATER HEATER	WATER FROM A RECIRCULATION LOOP OR HEAT TRACED PIPE
1/4	0.33	50	50
5/16	0.5	50	48
3/8	0.75	50	32
1/2	1.5	43	16
5/8	2	32	12
3/4	3	21	8
7/8	4	16	6
1	5	13	5
1 ¼	8	8	3
1 ½	11	6	2
2 or larger	18	4	1

1 Gallon = 128 ounces. For SI: 1 inch=25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L

C404.5.2 Maximum allowable pipe volume method. The water volume in the piping shall be calculated in accordance with Section C404.5.2.1. The maximum volume from the nearest source of heated water to the termination of the fixture supply pipe for a *plumbing fixture or plumbing appliance* shall be 0.5 gallon (1.89 L), ~~where the source of heated water is a water heater; and 0.19 gallon (0.7 L) where the source of heated water is a recirculating system or heat-traced piping.~~ Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered sources of heated water.

Commenter's Reason: At this time hot water distribution systems in commercial buildings are required to limit the length between the source of hot water and the plumbing fixtures and plumbing appliances to 50 feet of developed length in accordance with provisions in the IPC.

However, meeting the maximum length provision does not ensure that hot water will arrive at fixtures in a timely manner. It also wastes energy. It also means that plumbing engineers cannot meet their standards of practice.

The purpose of this proposal is to provide better, more energy efficient, hot water service to the occupants of our buildings. We have all experienced the problem of waiting for hot water to arrive at plumbing fixtures. Installing the hot water piping so that the delivery is more efficient will stay with the building for 50-100 years. Similarly the pain of an inefficient system will last just as long.

This proposal brings the length limitation from the IPC into the IECC. Simplifying the original proposal further, there is now only one maximum length column. The length (and the volume) from all sources of heated water to any plumbing fixture or appliance will be the same.

Supporting this proposal will result in correlating the IECC with the marginal performance standards of practice for plumbing engineers (See the orange row in Figure 1).

Figure 1. ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	1 – 10 seconds
	Marginal Performance	11 – 30 seconds
	Unacceptable Performance	31+ seconds

Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Most plumbing fixtures operate from 1 – 2.5 gpm. Figure 2 shows that the volume in the piping will be a maximum of 64 ounces for plumbing fixtures with these flow rates. As can be seen, the same volume in the piping results in improved performance when the flow rates are at the higher end of the range.

Figure 2 Comparing Pipe Volume, Plumbing Fixture Flow Rate and the Time-to-Tap

Volume in the Pipe (ounces)	<u>Minimum</u> Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	4	1.9	0.9	0.6	0.5	0.4
4	8	4	1.9	1.3	0.9	0.8
8	15	8	4	2.5	1.9	1.5
16	30	15	8	5	4	3
24	45	23	11	8	6	5
32	60	30	15	10	8	6
64	120	60	30	20	15	12
128	240	120	60	40	30	24

I urge your support.

Public Comment 2:

Ryan Meres, Institute for Market Transformation, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows

C404.5 Efficient heated water supply piping. ~~From the nearest source of heated water to a plumbing fixture or plumbing appliance, the developed length shall not exceed 50 feet (15240 mm), or the time for heated water to arrive shall not exceed 30 seconds when the fixture or appliance is turned on to full hot, whichever is less. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered sources of heated water. Heated water supply piping shall be in accordance with Section C404.5.1 or Section C404.5.2. The flow rate through 1/4 inch piping shall not exceed 0.5 gpm (1.9 Lpm). The flow rate through 5/16 inch piping shall not exceed 1 gpm (3.8 Lpm). The flow rate through 3/8 inch piping shall not exceed 1.5 gpm (5.7 Lpm).~~

C404.5.1 Maximum allowable pipe length method. The maximum allowable piping length from the nearest source of heated water to the termination of the fixture supply pipe for *plumbing fixtures* and *plumbing appliances* shall be in accordance with the maximum piping length column in Table C404.5.1. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping in Table C404.5.1.

**TABLE C404.5.1
PIPING VOLUME AND MAXIMUM PIPING LENGTHS**

NOMINAL PIPE SIZE (inch)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (feet)	
		WATER FROM A WATER HEATER	WATER FROM A RECIRCULATION LOOP OR HEAT TRACED PIPE
1/4	0.33	50	50
5/16	0.5	50	48
3/8	0.75	50	32
1/2	1.5	43	16
5/8	2	32	12
3/4	3	21	8
7/8	4	16	6
1	5	13	5
1 1/4	8	8	3
1 1/2	11	6	2
2 or larger	18	4	1

1 Gallon = 128 ounces. For SI: 1 inch=25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L

C404.5.2 Maximum allowable pipe volume method. The water volume in the piping shall be calculated in accordance with Section C404.5.2.1. The maximum volume from the nearest source of heated water to the termination of the fixture supply pipe for a plumbing fixture or plumbing appliance shall be 0.5 gallon (1.89 L) where the source of heated water is a water heater; and 0.19 gallon (0.7 L) where the source of heated water is a recirculating system or heat-traced piping.

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the volume column in Table C404.5.1. The volume contained within fixture shut off valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

Commenter's Reason: At this time hot water distribution systems in commercial buildings are required to limit the length between the source of hot water and the plumbing fixtures and plumbing appliances to 50 feet of developed length in accordance with provisions in the IPC.

However, meeting the maximum length provision does not ensure that hot water will arrive at fixtures in a timely manner. It also wastes energy. It also means that plumbing engineers cannot meet their standards of practice.

The purpose of this proposal is to provide better, more energy efficient, hot water service to the occupants of our buildings. We have all experienced the problem of waiting for hot water to arrive at plumbing fixtures. Installing the hot water piping so that the delivery is more efficient will stay with the building for 50-100 years. Similarly the pain of an inefficient system will last just as long.

This proposal brings the length limitation from the IPC into the IECC. It adds the provision that the hot water supply shall deliver hot water within 30 seconds after the plumbing fixture has been turned on. This provision is in line with the marginal performance standards of practice for plumbing engineers (See the orange row in Figure 1).

Figure 1. ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	1 – 10 seconds
	Marginal Performance	11 – 30 seconds
	Unacceptable Performance	31+ seconds

Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Most plumbing fixtures operate from 1 – 2.5 gpm. Figure 2 shows that the volume in the piping will be a maximum of 64 ounces for plumbing fixtures with these flow rates. When flow rates are lower, the volume needs to be smaller.

Figure 2 Comparing Pipe Volume, Plumbing Fixture Flow Rate and the Time-to-Tap

Volume in the Pipe (ounces)	Minimum Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	4	1.9	0.9	0.6	0.5	0.4
4	8	4	1.9	1.3	0.9	0.8
8	15	8	4	2.5	1.9	1.5
16	30	15	8	5	4	3
24	45	23	11	8	6	5
32	60	30	15	10	8	6
64	120	60	30	20	15	12
128	240	120	60	40	30	24

The changes in this comment simplify the proposal by reducing the perceived complexity of having a table and also by making the requirements the same for all sources of hot water.
I urge your support.

CE274-13

Final Action: AS AM AMPC_____ D

CE275-13

C202 (NEW), C404.5 (NEW), C404.5.1 (NEW), Table C404.5.1 (NEW), C404.5.2 (NEW), C404.5.2.1 (NEW)

Proposed Change as Submitted

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

Add new text as follows:

C404.5 Efficient heated water supply piping. Heated water supply piping shall be in accordance with Section C404.5.1 or Section C404.5.2. The flow rate through ¼ inch piping shall not exceed 0.5 gpm (1.9 Lpm). The flow rate through 5/16 inch piping shall not exceed 1 gpm (3.8 Lpm). The flow rate through 3/8 inch piping shall not exceed 1.5 gpm (5.7 Lpm).

C404.5.1 Maximum allowable pipe length method. The maximum piping length from the nearest source of heated water to the termination of the fixture supply pipe for a public lavatory faucet shall be in accordance with the maximum piping length column in Table C404.5.1. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping in Table C404.5.1.

**TABLE C404.5.1
PIPING VOLUME AND MAXIMUM PIPING LENGTHS**

<u>NOMINAL PIPE SIZE (inch)</u>	<u>VOLUME (liquid ounces per foot length)</u>	<u>MAXIMUM PIPING LENGTH (feet)</u>
		<u>LAVATORY FAUCETS— PUBLIC</u>
1/4	0.33	6
5/16	0.5	4
3/8	0.75	3
1/2	1.5	2
5/8	2	1
3/4	3	0.5
7/8	4	0.5
1	5	0.5
1 ¼	8	0.5
1 ½	11	0.5
2 or larger	18	0.5

For SI: 1 inch=25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L

C404.5.2 Maximum allowable pipe volume method. The maximum piping volume from the nearest source of heated water to the termination of the fixture supply pipe for a public lavatory faucet shall be 2 ounces (0.06 L). The water volume in the piping shall be calculated in accordance with Section C404.5.2.1.

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the volume column in Table C404.5.1. The volume contained within fixture shut off valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where

heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

Add new definition as follows:

**SECTION C202
GENERAL DEFINITIONS**

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

Reason: The problem of heated water taking an excessively long time to arrive at lavatory faucets in public restrooms is well known. The length of time the faucets are used during each hand washing event is very short, often around 5 seconds. Federal law requires low flow rate or small, metered volumes for the faucets in these applications. Health codes expect heated water for washing hands in these applications. The dilemma is that the volume of not-hot water in the piping from the source of hot water to the faucets is much too large for the heated water to arrive in a timely fashion; even at the 50-foot limit currently required in the 2012 IPC.

Supporting this proposal will correlate the IECC with Federal law and local health codes by providing heated water for hand washing in a timely matter.

The delivery of hot water to public lavatory faucets needs to be considered separately because of potential health issues. The events are short and the flow rates are low. Table 1 shows the time-to-tap performance based on the requirements in the proposal. The 0.25 and 0.5 gpm columns are typical of the flow rates for public lavatory faucets. The volume in the pipe was chosen so that heated water would arrive in the first part of the hot water event so that every person who uses the public lavatory will have the benefits of hot water.

Table 1 Time-to-Tap Performance when the Volume in the Piping from the Source to the Use is 2 ounces

Volume in the Pipe (ounces)	Minimum Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	3.8	1.9	0.9	0.6	0.5	0.4

The energy savings comes from not losing the heat from the water as it tries to arrive at the faucets. For more information and background on issues related to hot water distribution please read the 4-part series at: http://www.allianceforwaterefficiency.org/Residential_Hot_Water_Distribution_System_Introduction.aspx

Cost impact: There are several ways to meet the requirements of this proposal, some of which cost less than current heated water system practices. I would recommend that builders and developers select one of the less expensive methods.

C404.5 #3 (NEW)-EC-KLEIN

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee couldn't grasp the energy savings issue of the proposal. This seems to be more of a comfort issue that is really not the concern of the IECC.

Assembly Action:

Approved as Submitted

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action and public comments were submitted.

Public Comment 1:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Submitted.

Reason: This proposal focuses on the delivery of heated water to public lavatory faucets, a problem all of us are familiar with.

While comfort is important to the user, current plumbing practice results in a significant waste of energy, without actually providing the intended or code required (health) service. The waste occurs when the water in the branches and fixture supplies cools down between the intermittent uses that occur in public bathrooms. Making the volume between the source of hot water

The purpose of this proposal is to provide better, more energy efficient, hot water service to the occupants of our buildings. Installing the hot water piping so that the delivery is more efficient will stay with the building for 50-100 years. Similarly the pain of an inefficient system will last just as long.

I urge your support.

Public Comment 2:

Ryan Meres, Institute for Market Transformation, representing self, requests Approval as Modified by this Public Comment.

C404.5 Efficient heated water supply piping. From the nearest source of heated water to a public lavatory faucet, the time for heated water to arrive shall not exceed 5 seconds when the faucet is turned on to full hot, or for hands-free faucets, with the mixing valve set to the specified outlet temperature. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered sources of heated water. Heated water supply piping shall be in accordance with Section C404.5.1 or Section C404.5.2. The flow rate through 1/4 inch piping shall not exceed 0.5 gpm (1.9 Lpm). The flow rate through 5/16 inch piping shall not exceed 1 gpm (3.8 Lpm). The flow rate through 3/8 inch piping shall not exceed 1.5 gpm (5.7 Lpm).

C404.5.1 Maximum allowable pipe length method. The maximum piping length from the nearest source of heated water to the termination of the fixture supply pipe for a public lavatory faucet shall be in accordance with the maximum piping length column in Table C404.5.1. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping in Table C404.5.1.

**TABLE C404.5.1
PIPING VOLUME AND MAXIMUM PIPING LENGTHS**

NOMINAL PIPE SIZE (inch)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (feet)
		LAVATORY FAUCETS—PUBLIC
1/4	0.33	6
5/16	0.5	4
3/8	0.75	3
1/2	1.5	2
5/8	2	1
3/4	3	0.5
7/8	4	0.5
1	5	0.5
1 1/4	8	0.5
1 1/2	11	0.5
2 or larger	18	0.5

For SI: 1 inch=25.4 mm, 1 foot = 304.8 mm, 1 liquid ounce = 0.030 L

C404.5.2 Maximum allowable pipe volume method. The maximum piping volume from the nearest source of heated water to the termination of the fixture supply pipe for a public lavatory faucet shall be 2 ounces (0.06 L). The water volume in the piping shall be calculated in accordance with Section C404.5.2.1.

C404.5.2.1 Water volume determination. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the volume column in Table C404.5.1. The volume contained within fixture shut off valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where

heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

Commenter's Reason: This proposal focuses on the delivery of heated water to public lavatory faucets a problem all of us are familiar with.

While comfort is important to the user, current plumbing practice results in a significant waste of energy, without actually providing the intended or code required (health) service. The waste occurs when the water in the branches and fixture supplies cools down between the intermittent uses that occur in public bathrooms.

The purpose of this proposal is to provide better, more energy efficient, hot water service to the occupants of our buildings. Installing the hot water piping so that the delivery is more efficient will stay with the building for 50-100 years. Similarly the pain of an inefficient system will last just as long.

This comment simplifies the original proposal by saying that the hot water supply piping shall deliver hot water within 5 seconds after the public lavatory faucet has been turned on. This time limit is important because the actual amount of time a public lavatory faucet is used is generally less than 10 seconds. It only makes sense to have a code that delivers hot water in the first portion of the short event. This revised code section is now in line with the acceptable performance standards of practice for plumbing engineers (See the green row in Figure 1).

Figure 1. ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	1 – 10 seconds
	Marginal Performance	11 – 30 seconds
	Unacceptable Performance	31+ seconds

Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Public lavatory faucets are a special case in the code as their flow rate is generally 0.5 gpm or less. However, since most public lavatory faucets are hands-free, the hot water portion of the mix is closer to 0.25 gpm. Figure 2 shows that the volume in the piping needs to be small for the heated water to arrive quickly at the faucets.

Figure 2 Comparing Pipe Volume, Plumbing Fixture Flow Rate and the Time-to-Tap

Volume in the Pipe (ounces)	Minimum Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	4	1.9	0.9	0.6	0.5	0.4
4	8	4	1.9	1.3	0.9	0.8
8	15	8	4	2.5	1.9	1.5
16	30	15	8	5	4	3
24	45	23	11	8	6	5
32	60	30	15	10	8	6
64	120	60	30	20	15	12
128	240	120	60	40	30	24

The changes in this comment simplify the proposal by reducing the complexity of having a table. I urge your support.

CE275-13

Final Action: AS AM AMPC_____ D

CE277-13, Part II

C404.5.1 (New), R403.3 (New) (N1103.3 (New))

PART I OF THIS CODE CHANGE WAS WITHDRAWN BY PROPONENT

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE IECC-COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Howard Ahern representing Airex Mfg. (howard.ahern@airexmfg.com)

PART II IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R403.4.3 (N1103.3) Water heater piping insulation protection. Exposed water piping that is insulated and that is connected to a water heater shall have the insulation protected from damage by a removable and reusable covering. The covering shall extend for not less than 5 feet (1524 mm) from the water heater. The covering shall not be adhesive tape.

Reason. This code change is needed to insure integrity of the water heater piping insulation. Pipe insulation is often silt open to install over water heating piping, the slits often stay open or adhesive used to glue slit close degrade and slits open wasting energy and money. Removable and reusable covering will insure pipe insulation slits are closed to save energy. This change will ensure steady, long-term thermal performance and maintain system integrity, sustainability, of the insulation saving energy. Water Heating equipment require periodic maintenance. The frequency varies with how hard the unit operates, exterior temperature, preventive maintenance program, and many others. In every occasion, maintenance provides an excuse for the piping insulation to be touched and or removed. Pipe insulation removal often results in damage to the insulation itself requiring replacement. Protection for piping insulation therefore needs to be removable and reusable. This will help insure system integrity and sustainability of the pipe insulation, reducing replacement.

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

C404.5.1 (NEW)-EC-AHERN.DOC

Committee Action Hearing Results

Errata for this proposal is contained in the [Updates to the 2013 Proposed Changes](http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf) posted on the ICC website. Please go to <http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf> for more information.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: This requirement would be too difficult to enforce.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Howard Ahern, Airex Mfg. representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R403.4.3 (N1103.3) Outdoor water heater piping insulation protection. ~~Exposed Insulated~~ water piping that is insulated and that is connected to a water heater and that is exposed to the outdoors shall have the insulation protected from damage by a removable and reusable covering. The covering shall extend for not less than 5 feet (1524 mm) from the water heater. The covering shall not be adhesive tape

Commenter's Reason: This code change is needed to insure integrity of the water heater piping insulation that is exposed to weather. This change will ensure steady, long-term thermal performance and maintain system integrity, sustainability, of the insulation saving energy.

Water heating equipment requires periodic maintenance. Pipe insulation is often slit open to install over water heating piping, the slits often stay open or adhesive used to glue slit close degrade and slits open wasting energy and money. Removable and reusable covering will insure pipe insulation slits are closed to save energy. The frequency varies with how hard the unit operates, exterior temperature, preventive maintenance program, and many others. In every occasion, maintenance provides an excuse for the piping insulation to be touched and or removed. Pipe insulation removal often results in damage to the insulation itself requiring replacement.

Protection for piping insulation therefore needs to be removable and reusable.

CE277-13, Part II

Final Action: AS AM AMPC____ D

CE278-13, Part I

C404.6, C404.7 (NEW), IPC [E] 607.2.1, IPC [E] 607.2.1.1 (NEW)

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

Proponent: Steve Ferguson representing the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (sferguson@ashrae.org)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C404.6 Hot water temperature maintenance system controls. For hot water distribution system circulating hot water system pumps ~~or~~ and heat trace, the pumps and heat trace shall be arranged to be turned off either automatically or manually when there is ~~limited~~ not hot water demand. Operating controls shall be readily accessible.

C404.7.1 Storage tank hot water circulation systems. Circulating pumps intended to maintain storage tank water temperature shall have controls that will limit operation of the pump from heating cycle start up to not greater than 5 minutes after the end of the cycle. Ready access shall be provided to the operating controls.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the criteria of the IECC Commercial Provisions, has a provision to circulating system pump controls. This situation is not addressed in the IECC and needs to be to ensure consistency between standard 90.1-2010 and the IECC.

Cost Impact: The code change proposal will not increase the cost of construction.

C404.6-EC-FERGUSON.DOC

Committee Action Hearing Results

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The language of the proposal is too specific such that it would restrict new technologies.

Assembly Action:

Approved as Modified

Modify the proposal as follows:

~~**C404.7.1 Storage tank hot water circulation systems.** Circulating pumps intended to maintain storage tank water temperature shall have controls that will limit operation of the pump from heating cycle start up to not greater than 5 minutes after the end of the cycle. Ready access shall be provided to the operating controls.~~

C404.6.1 Controls for hot water storage. The controls on pumps that circulate water between a water heater and a heated water storage tank shall limit operation of the pump from heating cycle startup to not greater than 5 minutes after the end of the cycle.

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action and a Public Comment was received.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by Assembly Floor Action as Published in the ROH.

Commenter's Reason: The purpose of this Public Comment is to support the Assembly Action, which was to Approve the proposal As Modified. This Assembly Action will correlate the language on this topic in the IECC and the IPC.

I am asking you to support the Assembly Action because of a misunderstanding that occurred during the development hearing in which my comments were taken by the Committee to be in opposition rather than in support. The Committee understood the misunderstanding when it considered CE278-13, Part II and approved that proposal as modified, but it was too late to correct the decision on Part I.

Thank you for your consideration in supporting this Assembly Action.

CE278-13, Part I

Final Action: AS AM AMPC____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE278-13, PART II-IPC

Revise as follows:

[E] 607.2.1 Hot water temperature maintenance system controls. ~~Automatic For hot water distribution system circulating hot water system pumps or and heat trace, the pumps and heat trace shall be arranged to be conveniently turned off either automatically or manually when there hot water system is not in operation. is limited not hot water demand. Ready access shall be provided to the operating controls. This section and Section 607.2.1.1 shall not apply to hot water temperature maintenance system controls in Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane. Hot water temperature maintenance system controls in Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane shall be in accordance with Section R403.4.1 of the *International Energy Conservation Code.*~~

[E] 607.2.1.1 Storage tank hot water circulation systems. ~~Circulating pumps intended to maintain storage tank water temperature shall have controls that will limit operation of the pump from heating cycle start up to not greater than 5 minutes after the end of the cycle. Ready access shall be provided to the operating controls.~~

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the criteria of the IECC Commercial Provisions, has a provision to circulating system pump controls. This situation is not addressed in the IECC and needs to be to ensure consistency between standard 90.1-2010 and the IECC.

Cost Impact: The code change proposal will not increase the cost of construction.

PART II – IPC

Committee Action:

Approved as Modified

Modify the proposal as follows:

[E] 607.2.1.1 Storage tank hot water circulation systems. ~~Circulating pumps intended to maintain storage tank water temperature shall have controls that will limit operation of the pump from heating cycle start up to not greater than 5 minutes after the end of the cycle. Ready access shall be provided to the operating controls.~~

[E] 607.2.1.1 Controls for hot water storage. ~~The controls on pumps that circulate water between a water heater and a heated water storage tank shall limit operation of the pump from heating cycle startup to not greater than 5 minutes after the end of the cycle.~~

Committee Reason: The modification was made to address concerns about what pumps are being discussed. The overall proposal was approved because The *International Plumbing Code* needs to make the correct references to sections in the IECC.

Assembly Action:

None

CE279-13, Part I

C404.6, C404.6.1 (NEW), C404.6.2 (NEW), Chapter 5, IPC [E]607.2.1, IPC [E]607.2.1.1 (NEW), IPC [E]607.2.1.1.1 (NEW), IPC [E]607.2.1.1.2 (NEW), IPC Chapter 14

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND TWO WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART I-IECC-COMMERCIAL PROVISIONS

Revise as follows:

C404.6 Circulating hot Heated water circulating and temperature maintenance systems controls (Mandatory). ~~Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use~~ Heated water circulation systems shall be in accordance with Section C404.6.1. Heat trace temperature maintenance systems shall be in accordance with Section C404.6.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily accessible.

C404.6.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Circulation system pump controls shall be demand activated. The controls shall start the pump upon sensing the presence of a user of a fixture or appliance, receiving a signal from the action of an action of a user of a fixture or appliance or sensing the flow of heated water to a fixture or appliance. The controls shall limit the water temperature increase in the return water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the return piping and shall limit the return water temperature to 102°F (38.9°C).

C404.6.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1. Controls for such systems shall be able to automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

Add new standard to Chapter 5 as follows:

IEEE The Institute of Electrical and Electronic Engineers, Inc.
3 Park Avenue
New York, NY 1016-5997

515.1-2012 IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications

Reason: There are 2 primary reasons for this proposed change. 1) Correlate the language in the IECC and the IPC; 2) Clarify the requirements for heated water circulation systems and for heat trace systems, if they are installed. The proposed changes do not require the use of circulation or heat trace.

The current code language is not the same in the IECC and the IPC. It should be.

The current language allows for continuously operating circulation pumps, which creates inefficiency in the hot water distribution system. It also does not address the use of heat trace in both codes and there is currently no requirement that the heat trace be suitable for the application. The consequence is that water heating energy consumption is increased.

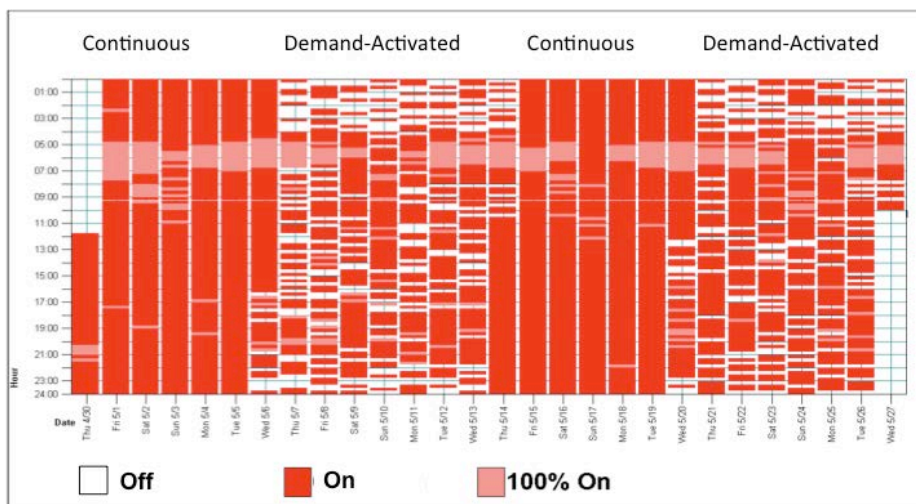
Figure 1 shows that demand activated circulation is significantly more energy efficient than any other type of heated water circulation system. The annual energy needed to keep the loop hot with water heated electrically or with natural gas are shown separately from the energy needed for the pump. The majority of the energy is lost in keeping the water in the loop at the desired temperature (all of it if there is a gravity loop). A small loop, 100 feet including the supply and the return was analyzed. The savings ranges from 87.5 percent when compared to a recirculation system that runs only 2-hours per day to 99 percent when compared to a recirculation system that runs only 24-hours per day. The operating costs and savings remain proportional as the length of the circulation loop and the flow rate of the pump increase.

Figure 1 Annual Energy Requirements for Demand Activated Circulation and Standard Recirculation

	Standard Recirculation						Demand Activated Circulation
	Daily Hours of Operation						
	24	12	8	6	4	2	
Loop Heat Losses							
Natural Gas (therms)	292	146	97	73	49	24	3
Electric (kWh)	6,388	3,194	2,129	1,597	1,065	532	67
Pump Energy (kWh)	438	219	146	110	73	37	8

Figure 2 shows the differences in run-time at the water heater (or boiler) between a continuously pumped recirculation loop and one that has a demand activated pump control. Blank space (white) means the water heater was off. Red means some percent of run-time between zero and continuous. Pink means the water heater or boiler was running continuously. The test results come from studies done by Southern California Gas Company on a sample of more than 300 multi-family buildings with central water heaters and recirculation systems. Most systems tested were built before insulation was required on hot water recirculation loops. Savings ranged from 10-30 percent of the water heating energy use and 84 percent of the pump electricity use. The costs for installing the retrofit were paid back in just about one year. In new construction, the marginal costs would be recovered in just a few months

Figure 2 Run-time of Water Heater with Two Different Pump Controls



Why is demand-activated circulation such an efficient strategy? The 2012 IECC, IPC and IRC require that the hot water piping in automatic temperature maintenance systems in new buildings be insulated with pipe insulation. This means the water in the circulation loop will stay hot for a very long time – up to 45 minutes for ¾ inch nominal pipe up to 2 hours for 2-inch nominal pipe – even if the circulating pump is shut off. If this is the case, why run the pump when the water is still hot? Why run the pump when no one is in the building or when no one is demanding hot water? The only time it makes sense to run the pump is shortly before hot water is needed: hence the requirement that the pump be controlled on-demand.

The requirements for heat trace are partly to ensure that the systems can be operated in the most energy efficient manner consistent with providing heated water to the occupancy. The reference standards are included to ensure that installed systems are safe for the intended application. The energy consequences of using heat trace are very reasonable. Figure 3 presents the energy requirements for a heat trace system with the same hot water supply piping as the circulation systems shown in Figure 1. The energy requirements of keeping the trunk line hot – the same as keeping the supply portion of the loop hot in a circulating system – are 701 kWh per year, assuming 12 hours at high temp (115F) and 12 hours at economy temp (105F). This is equivalent to operating the loop about 3 hours per day, but with hot water available 24/7 in the supply trunk! This is a significant savings when water heating is done electrically or with a similarly expensive fuel. If the branches are also traced, we can deliver heated water even more quickly to the fixtures using only 1,682 kWh per year, which is the same energy as running the loop a little more than 6 hours a day.

Figure 3. Annual Energy Needed for Electric Heat Trace Systems

Heat Trace			
	(kWh per year)		
	Trunk	Br	T-Br
Supply Heat Losses			
High Temp	394	552	946
Economy Temp	307	429	736
Total Electricity	701	981	1,682

Cost impact: The proposal does not require either circulation or heat trace; however if either is selected, it clarifies the requirements for installation. Most recirculation systems today are installed with some form of control, usually a timer, a bandwidth thermostat (aquastat) or both. Some come with more sophisticated controls, such as programmable or are connected to an energy management system. In some cases, switching from these control strategies to demand activated controls will cost less. In other cases, the demand-activated controls will cost more.

Analysis: A review of the standards proposed for inclusion in the code, CSA 22.2 No. 130 and UL 515 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1 2013.

C404.6-EC-KLEIN

Committee Action Hearing Results

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The proposal has too many holes and would create problems with heat trace manufacturers that already list and label their products to UL 515.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C404.6 Heated water circulating and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section C404.6.1. Heat trace temperature maintenance systems shall be in accordance with Section C404.6.2. Automatic controls, temperature sensors and pumps shall be *accessible*. Manual controls shall be *readily accessible*.

C404.6.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Circulation system pump controls shall be demand-activated. The controls shall start the pump upon sensing the presence of a user of a fixture or appliance, receiving a signal from the action of an action of a user of a fixture or appliance or sensing the flow of heated water to a fixture or appliance. The controls shall limit the water temperature increase in the return water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the return piping and shall limit the return water temperature to 402°F (38.9°C). Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

Reason: The purpose of this proposal is to clarify the requirements for heated water circulation systems and for heat trace systems, if they are installed. The proposed changes do not require the use of circulation or heat trace.

At the development hearing we were unable to hear a floor modification that would have resolved the Committee's concerns. The modifications shown in this comment remove the holes. The IECC-RE development Committee was able to hear these modifications and approved RE125 as modified by the committee. Those provisions are incorporated into this comment.

Supporting this modification will correlate the language in the Commercial and Residential chapters of the IECC. Circulating systems and heat trace cannot tell what occupancy they have been installed in and the energy efficiency issues are similar enough that the provisions should be the same for all occupancies.

I urge your support.

CE279-13, Part I

Final Action:

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CE279-13, Part II

C404.6, C404.6.1 (NEW), C404.6.2 (NEW), Chapter 5, IPC [E]607.2.1, IPC [E]607.2.1.1 (NEW), IPC [E]607.2.1.1.1 (NEW), IPC [E]607.2.1.1.2 (NEW), IPC Chapter 14

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND TWO WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART II-IPC

Revise as follows:

[E] 607.2.1 ~~Hot~~ Heated water circulation and temperature maintenance systems controls. For Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane, ~~automatic circulating hot water systems pumps or heat trace shall be arranged to be provided with a conveniently turned off, automatically or manually switch having ready access or an automatic switch, that can turn off when the hot water circulating pump when the system is not in use operation.~~ Heated water circulation and temperature maintenance systems for other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane shall be in accordance with Section 607.2.1.1.

[E] 607.2.1.1 For other than Group R2, R3 and R4 occupancies 3 stories or less. This section shall apply to other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane. Heated water circulation systems shall be in accordance with Section 607.2.1.1.1. Heat trace temperature maintenance systems shall be in accordance with Section 607.2.1.1.2. Access to automatic controls, temperature sensors and pumps shall be provided. Ready access to manual controls shall be provided.

[E] 607.2.1.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Circulation system pump controls shall be demand activated. The controls shall start the pump upon sensing the presence of a user of a fixture or appliance, receiving a signal from the action of an action of a user of a fixture or appliance or sensing the flow of heated water to a fixture or appliance. The controls shall limit the water temperature increase in the return water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the return piping and shall limit the return water temperature to 102°F (38.9°C).

[E] 607.2.1.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1. Controls for such systems shall be able to automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

Add new standard to Chapter 14 as follows:

The Institute of Electrical and Electronic Engineers, Inc.
3 Park Avenue
New York, NY 1016-5997

515.1-2012 IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications

Reason: There are 2 primary reasons for this proposed change. 1) Correlate the language in the IECC and the IPC; 2) Clarify the requirements for heated water circulation systems and for heat trace systems, if they are installed. The proposed changes do not require the use of circulation or heat trace.

The current code language is not the same in the IECC and the IPC. It should be. The current language allows for continuously operating circulation pumps, which creates inefficiency in the hot water distribution system. It also does not address the use of heat trace in both codes and there is currently no requirement that the heat trace be suitable for the application. The consequence is that water heating energy consumption is increased.

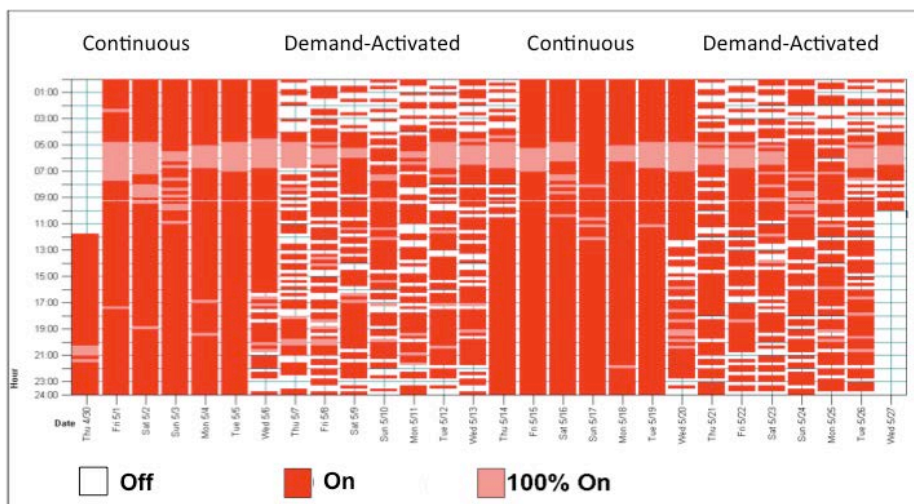
Figure 1 shows that demand activated circulation is significantly more energy efficient than any other type of heated water circulation system. The annual energy needed to keep the loop hot with water heated electrically or with natural gas are shown separately from the energy needed for the pump. The majority of the energy is lost in keeping the water in the loop at the desired temperature (all of it if there is a gravity loop). A small loop, 100 feet including the supply and the return was analyzed. The savings ranges from 87.5 percent when compared to a recirculation system that runs only 2-hours per day to 99 percent when compared to a recirculation system that runs only 24-hours per day. The operating costs and savings remain proportional as the length of the circulation loop and the flow rate of the pump increase.

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Figure 2 Run-time of Water Heater with Two Different Pump Controls



Why is demand-activated circulation such an efficient strategy? The 2012 IECC, IPC and IRC require that the hot water piping in automatic temperature maintenance systems in new buildings be insulated with pipe insulation. This means the water in the circulation loop will stay hot for a very long time – up to 45 minutes for ¾ inch nominal pipe up to 2 hours for 2-inch nominal pipe – even if the circulating pump is shut off. If this is the case, why run the pump when the water is still hot? Why run the pump when no one is in the building or when no one is demanding hot water? The only time it makes sense to run the pump is shortly before hot water is needed: hence the requirement that the pump be controlled on-demand.

The requirements for heat trace are partly to ensure that the systems can be operated in the most energy efficient manner consistent with providing heated water to the occupancy. The reference standards are included to ensure that installed systems are safe for the intended application. The energy consequences of using heat trace are very reasonable. Figure 3 presents the energy requirements for a heat trace system with the same hot water supply piping as the circulation systems shown in Figure 1. The energy requirements of keeping the trunk line hot – the same as keeping the supply portion of the loop hot in a circulating system – are 701 kWh per year, assuming 12 hours at high temp (115F) and 12 hours at economy temp (105F). This is equivalent to operating the loop about 3 hours per day, but with hot water available 24/7 in the supply trunk! This is a significant savings when water heating is done electrically or with a similarly expensive fuel. If the branches are also traced, we can deliver heated water even more quickly to the fixtures using only 1,682 kWh per year, which is the same energy as running the loop a little more than 6 hours a day.

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Total Electricity	701	981	1,682

Cost impact: The proposal does not require either circulation or heat trace; however if either is selected, it clarifies the requirements for installation. Most recirculation systems today are installed with some form of control, usually a timer, a bandwidth thermostat (aquastat) or both. Some come with more sophisticated controls, such as programmable or are connected to an energy management system. In some cases, switching from these control strategies to demand activated controls will cost less. In other cases, the demand-activated controls will cost more.

Analysis: A review of the standards proposed for inclusion in the code, CSA 22.2 No. 130 and UL 515 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1 2013.

C404.6-EC-KLEIN

Committee Action Hearing Results

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Disapproved

Committee Reason: The proposal has too many holes and would create problems with heat trace manufacturers that already list and label their products to UL 515.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~[E] 607.2.1 Heated water circulating and heat trace temperature maintenance systems. For Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane, heated water circulation and heat trace systems shall be installed in accordance with Section R403.4.2 of the International Energy Conservation Code. For other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane, controls for heated water circulation and heat trace systems shall be installed in accordance with Sections C404.6 of the International Energy Conservation Code. circulating hot water systems shall be arranged to be provided with a manual switch having ready access, or an automatic switch, that can turn off the hot water circulating pump when the system is not in use. Heated water circulation and temperature maintenance systems for other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane shall be in accordance with Section 607.2.1.1.~~

~~[E] 607.2.1.1 For other than Group R2, R3 and R4 occupancies 3 stories or less.~~ This section shall apply to other than Group R2, R3 and R4 occupancies that are 3 stories or less in height above grade plane. Heated water circulation systems shall be in accordance with Section 607.2.1.1.1. Heat trace temperature maintenance systems shall be in accordance with Section 607.2.1.1.2. Access to automatic controls, temperature sensors and pumps shall be provided. Ready access to manual controls shall be provided.

~~[E] 607.2.1.1 Circulation systems.~~ Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Circulation system pump controls shall be demand activated. The controls shall start the pump upon sensing the presence of a user of a fixture or appliance, receiving a signal from the action of an action of a user of a fixture or appliance or sensing the flow of heated water to a fixture or appliance. The controls shall limit the water temperature increase in the return water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the return piping and shall limit the return water temperature to 102°F (38.9°C).

~~[E] 607.2.1.2 Heat trace systems.~~ Electric heat trace systems shall comply with IEEE 515.1 2012. Controls for such systems shall be able to automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

Add standards to Chapter 14 as follows:

IEEE

515.1 2012 IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications

Commenter's Reason: The purpose of this proposal is to clarify the requirements for heated water circulation systems and for heat trace systems, if they are installed. The proposed changes do not require the use of circulation or heat trace.

At the development hearing we were unable to hear a floor modification that would have resolved the Committee's concerns.

The requirements for efficient heated water circulation and electrical heat trace systems belong in the IECC. However, it is important for those implementing the IPC to know what is required of them when installing these systems. These systems affect the design and layout of the overall domestic piping supply, and need to carry a reference to avoid lapses in coordination with other requirements of the system controls.

In order to decrease the possibility of conflicting language appearing in the two documents, it makes sense to have the provisions in the IECC and the pointer in the IPC. This greatly simplifies the code language.

Supporting this modification will correlate the language in the IPC with that in the IECC.

I urge your support.

CE279-13, Part II

Final Action: AS AM AMPC_____ D

CE280-13, Part I

C404.6, C404.6.1 (New), C404.6.2 (New), IPC [E] 607.2.1, IPC [E] 607.2.1.1, IPC [E] 607.2.1.2, R403.4.1 (IRC N1103.4.1), R403.4.1.1 (New) (IRC N1103.4.1.1 New), R403.4.1.2 (New) (IRC N1103.4.1.2 New)

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC-COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, Grundfos, representing self (gtowsley@grundfos.com)

PART I - IECC-COMMERCIAL PROVISIONS

Revise as follows:

C404.6 Hot Heated water system controls. Circulating hot water system pumps or heat trace water temperature maintenance systems shall be controlled in accordance with Sections C404.6.1 and C406.6.2, arranged to be turned off either automatically or manually when there is limited hot water demand. Ready access shall be provided to the operating controls. Automatic controls, temperature sensors, and pumps shall be accessible. Manual controls shall be readily accessible. Heated water circulation systems without controls such as gravity and thermo-syphon circulation systems, shall be prohibited. Continuous operation of pumps in heated water circulation systems shall be prohibited.

C404.6.1 Circulation pumps. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for heated water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

C404.6.2 Heat trace. Heat trace controls shall automatically adjust the energy input to the piping to maintain the desired water temperature in the piping system. The controls shall adjust the energy input to the heat tracing when the controls identify demand for heated water.

Reason: The current code text allows for the use of continuously operating circulation pumps in a hot water system. With no limitation of prohibiting pumps that operate continuously, this control methodology is not energy efficient, even when there is no need for hot water or there is ample hot water available in the system.

Energy can be saved with circulating hot water systems by operating the pump only when there is a demand for hot water. In addition, the pump does not need to operate when the hot water system is capable of providing the hot water at the desired temperature.

Cost Impact: The code change proposal will not increase the cost of construction.

C404.6-EC-TOWSLEY.DOC

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: The committee liked the intent of the proposal but there could be some unintended consequences with regard to prohibiting continuous operation of pumps.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C404.6 Heated water system controls. Circulating hot water system pumps or heat trace water temperature maintenance systems shall be controlled in accordance with Sections C404.6.1 and C406.6.2. Automatic controls, temperature sensors, and pumps shall be *accessible*. Manual controls shall be *readily accessible*. Heated water circulation systems without controls such as gravity and thermo-syphon circulation systems, shall be prohibited. Continuous operation of pumps in heated water circulation systems shall be prohibited.

C404.6.1 Circulation pumps. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for heated water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

~~**C404.6.2 Heat trace.** Heat trace controls shall automatically adjust the energy input to the piping to maintain the desired water temperature in the piping system. The controls shall adjust the energy input to the heat tracing when the controls identify demand for heated water.~~

Commenter's Reason: The Committee liked the intent of the original proposal because of the opportunity to reduce pumping energy in domestic hot water system AND allow for new automated and intuitive technologies to controls pumps. The Committee rejected this proposal because of concerns with "unintended consequences with regard to prohibiting continuous operation of pumps." In trying to research a response for the Committee's concern, I was unable to find any potential "unintended consequences" I was actually able to determine that California, Europe and the IGCC actually allow stopping or prohibiting continuous operation of the circulation pumps. As this proposal is for the IECC, it should be included in the code. The modifications shown above focuses the code change only on the circulating pump controls and eliminates any newly proposed reference to "heat trace" systems that are covered under other proposals.

CE280-13, Part I

Final Action:

AS

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CE280-13, Part II

C404.6, C404.6.1 (New), C404.6.2 (New), IPC [E] 607.2.1, IPC [E] 607.2.1.1, IPC [E] 607.2.1.2, R403.4.1 (IRC N1103.4.1), R403.4.1.1 (New) (IRC N1103.4.1.1 New), R403.4.1.2 (New) (IRC N1103.4.1.2 New)

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC-COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, Grundfos, representing self (gtowsley@grundfos.com)

PART II - IPC

Revise as follows:

[E] 607.2.1 Hot water system controls. ~~Automatic~~ Circulating hot water system pumps ~~or~~ and heat trace water temperature maintenance systems shall be controlled in accordance with Sections 607.2.1.1 and 607.2.1.2. arranged to be turned off automatically or manually when there is limited hot water demand. Ready access shall be provided to the operating controls. Access shall be provided to automatic controls, temperature sensors, and pumps. Ready access shall be provided to manual controls. Hot water circulation systems without controls such as gravity and thermo-syphon circulation systems, shall be prohibited. Continuous operation of pumps in hot water circulation systems shall be prohibited.

[E] 607.2.1.1 Circulation pumps. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for heated water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

[E] 607.2.1.2 Heat trace. Heat trace controls shall automatically adjust the energy input to the piping to maintain the desired water temperature in the piping system. The controls shall adjust the energy input to the heat tracing when the controls identify demand for heated water.

Reason: The current code text allows for the use of continuously operating circulation pumps in a hot water system. With no limitation of prohibiting pumps that operate continuously, this control methodology is not energy efficient, even when there is no need for hot water or there is ample hot water available in the system.

Energy can be saved with circulating hot water systems by operating the pump only when there is a demand for hot water. In addition, the pump does not need to operate when the hot water system is capable of providing the hot water at the desired temperature.

Cost Impact: The code change proposal will not increase the cost of construction.

C404.6-EC-TOWSLEY.DOC

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Disapproved

Committee Reason: The committee liked the intent of the proposal but there could be some unintended consequences with regard to prohibiting continuous operation of pumps.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

[E] 607.2.1 Hot water system controls. Circulating hot water system pumps and heat trace water temperature maintenance systems shall be controlled in accordance with Sections 607.2.1.1 and ~~607.2.1.2~~. Access shall be provided to automatic controls, temperature sensors, and pumps. Ready access shall be provided to manual controls. Hot water circulation systems without controls such as gravity and thermo-syphon circulation systems, shall be prohibited. Continuous operation of pumps in hot water circulation systems shall be prohibited.

E] 607.2.1.1 Circulation pumps. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for heated water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

~~**[E] 607.2.1.2 Heat trace.** Heat trace controls shall automatically adjust the energy input to the piping to maintain the desired water temperature in the piping system. The controls shall adjust the energy input to the heat tracing when the controls identify demand for heated water.~~

Commenter's Reason: The Committee liked the intent of the original proposal because of the opportunity to reduce pumping energy in domestic hot water system AND allow for new automated and intuitive technologies to controls pumps. The Committee rejected this proposal because of concerns with "unintended consequences with regard to prohibiting continuous operation of pumps." In trying to research a response for the Committee's concern, I was unable to find any potential "unintended consequences" I was actually able to determine that California, Europe and the IGCC actually allow stopping or prohibiting continuous operation of the circulation pumps. As this proposal is for the IECC, it should be included in the code. The modifications shown above focuses the code change only on the circulating pump controls and eliminates any newly proposed reference to "heat trace" systems that are covered under other proposals.

CE280-13, Part II

Final Action:

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**CE280-13, Part III
C202 (New), R202 (New) (IRC N1101.9 (New)), IPC 202 (New)**

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PARTS I AND II WILL BE HEARD BY THE IECC COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AS 2 SEPARATE CODE CHANGES. PART III WILL BE HEARD BY THE IECC RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Greg Towsley, LEED AP BD+C Grundfos representing Grundfos (gtowsley@grundfos.com)

PART III – IECC-RESIDENTIAL PROVISIONS

Add new definition as follows:

**SECTION R202 (N1101.9)
GENERAL DEFINITIONS**

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

Reason: A definition of a “circulating hot water system” does not exist in the code, yet it is referenced in the IRC and other ICC codes. This definition brings clarity to how a “circulating hot water system” should be designed and operated. In the codes and sections where “circulating hot water system” is used, this definition would also reduce the probability of confusion between hot water systems used for space heating or tempered water. Currently, the only place that the term CIRCULATING HOT WATER SYSTEM shows up in the code is IECC Section C404.6, IPC [E] 607.2.1 and IECC Section R403.4.1 (IRC N1103.4.1). Other proposals by other proponents will most likely be adding language that uses this term so it is important to have the term defined.

As referenced in CHAPTER 50 - SERVICE WATER HEATING of *ASHRAE Handbook-HVAC Applications* (2011, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.), “Some recirculation-loop systems...are equipped with circulating pumps to force water through the piping and back to the water heater, thus keeping water in the piping hot.” Adding this definition in the code will be consistent with industry’s understanding.

Cost Impact: The code change proposal will not increase the cost of construction.

C202-CIRCULATING HOT WATER SYSTEM (NEW)-EC-TOWLSEY.doc

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

**PART III – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: There needs to be a definition for heat trace because it is not understood what that is.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

R403.4.1 (N1103.4.1) Circulating hot water systems (Mandatory). ~~Circulating hot water systems and heat trace water temperature maintenance systems shall be controlled in accordance with Sections R403.4.1.1 and R403.4.1.2. Automatic controls, temperature sensors, and pumps shall be *accessible*. Manual controls shall be *readily accessible*. Hot water circulation systems without controls such as gravity and thermo-syphon circulation systems, shall be prohibited. Continuous operation of pumps in hot water circulation systems shall be prohibited.~~

R403.4.1.1 (N1103.4.1.1) Circulation pumps. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

R403.4.1.2 (N1103.4.1.2) Heat trace. ~~Heat trace controls shall automatically adjust the energy input to the piping to maintain the desired water temperature in the piping system. The controls shall adjust the energy input to the heat tracing when the controls identify demand for heated water.~~

Commenter's Reason: The Committee generally thought the proposal was good because of the energy saving opportunity, especially the prohibition of gravity and thermo-syphon circulation systems and "openness" of the circulation pump control wording to allow for new, innovative technologies to be developed. The Committee rejected this proposal because of lack of a definition for heat trace. There was a lack of clarity as it related to "heat trace" systems in this section. To eliminate the confusion or understanding, especially as it relates to the focus of circulating systems with pumps, the proposal is being revised to delete the modification to add "heat trace".

CE280-13, Part III

Final Action: AS AM AMPC ____ D

CE282-13, Part I

C404.7 (New), IPC Chapter 2, IPC [E]607.2.1.1 (New)

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND TWO WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART I – IECC-COMMERCIAL PROVISIONS

Add new text as follows:

C404.7 Demand recirculation controls. A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a demand recirculation water system. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the water temperature increase in the cold water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the piping and limits the temperature entering the cold water piping to 102°F (38.9 °C).

Reason: The purpose of this code change proposal is to clarify the requirements for installing circulation pumps in applications that use a cold water supply pipe to circulate the water back to the water heater. Demand recirculation water systems are significantly more energy efficient than other recirculation systems and are inherently safer when the cold water supply is used as the return.

Figure 1 shows that demand activated circulation is significantly more energy efficient than any other type of heated water circulation system. The annual energy needed to keep the loop hot with water heated electrically or with natural gas are shown separately from the energy needed for the pump. The majority of the energy is lost in keeping the water in the loop at the desired temperature (all of it if there is a gravity loop). A small loop, 100 feet including the supply and the return was analyzed. The savings ranges from 87.5 percent when compared to a recirculation system that runs only 2-hours per day to 99 percent when compared to a recirculation system that runs only 24-hours per day. The operating costs and savings remain proportional as the length of the circulation loop and the flow rate of the pump increase.

Figure 1 Annual Energy Requirements for Demand Activated Circulation and Standard Recirculation

	Standard Recirculation						Demand Activated Circulation
	Daily Hours of Operation						
	24	12	8	6	4	2	
Loop Heat Losses							0.25
Natural Gas (therms)	292	146	97	73	49	24	3
Electric (kWh)	6,388	3,194	2,129	1,597	1,065	532	67
Pump Energy (kWh)	438	219	146	110	73	37	8

The inherently better safety comes from the fact that the controls specified for demand recirculation water systems limit the flow of water from the hot water supply into the cold water supply to only minutes a day and because they limit the temperature of the water that is allowed to go into the cold water supply. There are five other control strategies for heated water recirculation systems (thermosyphon (gravity), continuous pumping, timer controlled, bandwidth temperature sensor (aquastat) controlled and a combination of timer and bandwidth temperature sensor (aquastat) controlled and none of them has the ability to meet these stringent requirements.

The requirements of this section should be identical in both the IECC and the IPC, since the language for the controls does not depend on occupancy

For more information and background on issues related to hot water distribution and for a more detailed analysis in support of this proposal please go to <http://www.aim4sustainability.com> Follow the link on the home page to Codes.

Cost impact: This proposal will not increase the cost of construction, as it does not require the use of demand recirculation water systems. In addition, the ability to use cold-water supply piping as a return pipe may reduce the cost of installing a circulation loop.

C404.7-EC-KLEIN

Committee Action Hearing Results

Both parts of this code changes were heard by the Commercial Energy Conservation Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Approved as Submitted

Committee Reason: The proposal was approved to be consistent with a similar proposal that was approved for the IECC-Residential Provisions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Submitted.

Commenter's Reason: I agree with the Committee's reason and urge your support of this proposal.

Public Comment 2:

Greg Towsley, Grundfos representing self, requests Approval as Modified by this Public Comment

Modify the proposal as follows:

[E] 607.2.1.1 Demand recirculation controls. A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a demand recirculation water system. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the ~~water temperature increase in the cold water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the piping and limits the temperature of the water entering the cold water piping to 102°F (38.9 °C)~~ 104°F (40°C).

Commenter's Reason: The addition of the comma after fixture clarifies that there are three (3) options on how the pump will start. Eliminating the requirement of a temperature rise allows for innovation and reduces restriction of technology from only one design. Most thermostats available in the market are designed for 104°F, not 102°F.

CE282-13, Part I

Final Action:

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CE282-13, Part II
C404.7 (New), IPC Chapter 2, IPC [E]607.2.1.1 (New)

Proposed Change as Submitted

THIS IS A 2 PART CODE CHANGE PROPOSAL. PARTS I AND TWO WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

Proponent: Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART II-IPC

Add new text as follows:

[E] 607.2.1.1 Demand recirculation controls. A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a demand recirculation water system. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the water temperature increase in the cold water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the piping and limits the temperature entering the cold water piping to 102°F (38.9 °C).

Add definition as follows:

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system where one more pumps prime the service hot water piping with heated water upon demand for hot water.

Reason: The purpose of this code change proposal is to clarify the requirements for installing circulation pumps in applications that use a cold water supply pipe to circulate the water back to the water heater. Demand recirculation water systems are significantly more energy efficient than other recirculation systems and are inherently safer when the cold water supply is used as the return.

Figure 1 shows that demand activated circulation is significantly more energy efficient than any other type of heated water circulation system. The annual energy needed to keep the loop hot with water heated electrically or with natural gas are shown separately from the energy needed for the pump. The majority of the energy is lost in keeping the water in the loop at the desired temperature (all of it if there is a gravity loop). A small loop, 100 feet including the supply and the return was analyzed. The savings ranges from 87.5 percent when compared to a recirculation system that runs only 2-hours per day to 99 percent when compared to a recirculation system that runs only 24-hours per day. The operating costs and savings remain proportional as the length of the circulation loop and the flow rate of the pump increase.

Figure 1 Annual Energy Requirements for Demand Activated Circulation and Standard Recirculation

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Electric (kWh)	6,388	3,194	2,129	1,597	1,065	532	67
Pump Energy (kWh)	438	219	146	110	73	37	8

The inherently better safety comes from the fact that the controls specified for demand recirculation water systems limit the flow of water from the hot water supply into the cold water supply to only minutes a day and because they limit the temperature of the water that is allowed to go into the cold water supply. There are five other control strategies for heated water recirculation systems

(thermosiphon (gravity), continuous pumping, timer controlled, bandwidth temperature sensor (aquastat) controlled and a combination of timer and bandwidth temperature sensor (aquastat) controlled and none of them has the ability to meet these stringent requirements.

The requirements of this section should be identical in both the IECC and the IPC, since the language for the controls does not depend on occupancy

For more information and background on issues related to hot water distribution and for a more detailed analysis in support of this proposal please go to <http://www.aim4sustainability.com> Follow the link on the home page to Codes.

Cost impact: This proposal will not increase the cost of construction, as it does not require the use of demand recirculation water systems. In addition, the ability to use cold-water supply piping as a return pipe may reduce the cost of installing a circulation loop.

C404.7-EC-KLEIN

Committee Action Hearing Results

Parts I and II of this code changes were heard by the Commercial Energy Conservation Code Development Committee and Part III was heard by the Residential Energy Conservation Code Development Committee.

PART II – IPC

Committee Action:

Approved as Submitted

Committee Reason: The proposal properly aligns the *International Plumbing Code* with the IECC-CE and adds a necessary definition to the IPC.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Gary Klein, Affiliated International Management, LLC, representing self, requests Approval as Submitted.

Commenter's Reason: I agree with the Committee's reason and urge your support of this proposal.

Public Comment 2:

Greg Towsley, Grundfos, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

[E] 607.2.1.1 Demand recirculation controls. A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a demand recirculation water system. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the water temperature increase in the cold water piping to not more than 10°F (5.6 °C) greater than the initial temperature of the water in the piping and limits the temperature of the water entering the cold water piping to 102°F (38.9 °C) 104°F (40°C).

Commenter's Reason: The addition of the comma after fixture clarifies that there are three (3) options on how the pump will start. Eliminating the requirement of a temperature rise allows for innovation and reduces restriction of technology from only one design. Most thermostats available in the market are designed for 104°F, not 102°F.

CE282-13, Part II

Final Action:

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CE283-13, Part I

C404.7 (NEW), Table C407.5.1(1), Chapter 5, R403.4.3 (NEW) (N1103.5 (NEW)), Chapter 5, IRC P2903.11 (NEW)

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART III.

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE IECC-COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART III WILL BE HEARD BY THE IRC-PLUMBING COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Gerald Van Decker, RenewABILITY Energy Inc., representing self (gerald@renewability.com), Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART I IECC-COMMERCIAL PROVISIONS

Revise as follows:

C404.7 Drain water heat recovery units. Drain water heat recovery units shall comply with CSA 55.2. Potable water-side pressure loss shall be less than 10 psi at maximum design flow. For Group R occupancies, the efficiency of drain water heat recovery unit efficiency shall be in accordance with CSA 55.1.

**TABLE C407.5.1(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating ^{f,g,h,i}	<p>Fuel type: same as proposed</p> <p>Efficiency: in accordance with Table C404.2</p> <p>Capacity: same as proposed</p> <p>Where a service water hot water system does not exist or is not specified in the proposed design, a service hot water heating shall not be modeled.</p>	<p>As proposed</p> <p><u>For Group R, as proposed multiplied by SWHF</u></p> <p><u>For other than Group R, as proposed multiplied by efficiency as provided by the manufacturer of the DWHR unit.</u></p> <p>As proposed</p>

(Portions of Table not shown remain unchanged)

i. SWHF means service water heat recovery factor. DWHR means drain water heat recovery. The SWHF shall be applied as follows:

$$= (1 - (\text{DWHR unit efficiency} \times 0.36))$$

where potable water from the DWHR unit supplies not less than 1 shower and not greater than 2 showers, of which the drain water from the same showers flows through the DWHR unit.
= (1 – (DWHR unit efficiency x 0.33))
where potable water from the DWHR unit supplies not less than 3 showers and not greater than 4 showers, of which the drain water from the same showers flows through the DWHR unit.
= (1 – (DWHR unit efficiency x 0.26))
where potable water from the DWHR unit supplies not less than 5 showers and not greater than 6 showers, of which the drain water from the same showers flows through the DWHR unit.
= 1.0
where the other conditions are not met.

Add new standards to Chapter 5 as follows:

CSA

CSA 55.1-2012 Test method for measuring efficiency and pressure loss of drain water heat recovery units

CSA 55.2-2012 Drain water heat recovery units

Reason: There are two reasons for this proposal. 1) To enable developers to take credit for efficiency improvements due to the use of drain water heat recovery devices in the performance calculations in the energy code; and 2) to make comparisons of the efficiency of different units based on an existing standard.

Drain water heat recovery (DWHR) works particularly well where heated water flows down the drain at the same time as water flows in that needs to be heated; this “coincident flow” occurs in occupancies with showering and lavatory use. Performance of a DWHR unit is characterized by both efficiency and pressure loss. It is important to ensure that DWHR devices do not impose large pressure losses in the piping in order to minimize the impact on water flow in the building. Given the available DWHR efficiencies, savings are typically 10% to 35% of the energy used for heating water. Over 25,000 drain water heat recovery units have been installed in homes in Canada and the United States.

This change adds two standards for drain water heat recovery units (DWHR units). Drain water heat recovery is often a cost effective way to add to energy efficiency by recapturing hot water energy that is literally “going down the drain”. The proposed standards have already been in use by designers for 10 years and the resulting ratings are in use by a variety of energy efficiency programs. Commercial (i.e. non multi-unit residential) applications are engineered systems while multi-unit residential applications are non-engineered and straightforward.

CSA B55.2 standard is for fabrication and material quality of DWHR units. The CSA B55.1 standard is for testing and labeling of DWHR units efficiency and pressure loss at 2.5gpm (9.5lpm). These existing standards were developed through a consensus process by the Canadian Standards Association and are referenced by the Ontario Building Code.

A typical drain water heat recovery unit is shown below:

POWER-PIPE®

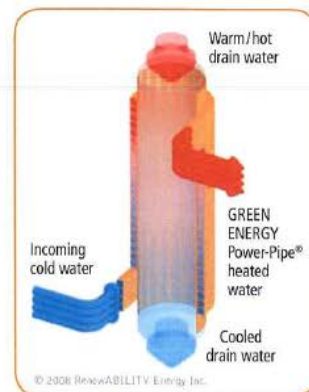
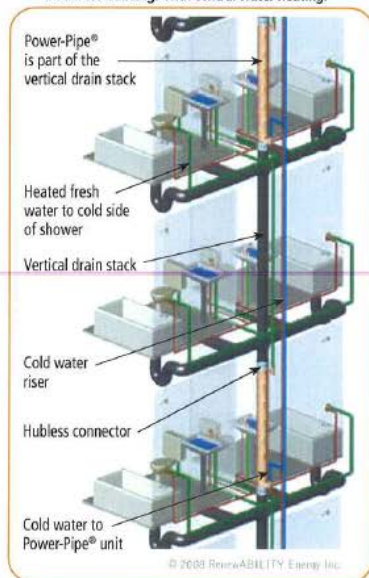
Drain Water Heat Recovery Systems

Reduce Operating Costs for Multi-Unit Residential Buildings

Cost-Effective Green Energy Technology

- The Power-Pipe® is **proven, practical, affordable** and in use today saving energy for thousands of residential suites.
- **Water heating is typically the second highest energy cost** in multi-unit residential buildings; in fact it can even be the highest energy cost.
- As building envelopes have become more efficient in recent years water heating has become an even larger portion of the remaining energy costs.
- Much of the drain water leaving a residential building carries with it valuable and recoverable heat energy.
- The all copper Power-Pipe is a double-wall heat exchanger that can **reduce water heating costs by 20-40%** by recovering heat energy from drain (waste) water in multi-residential building drain (waste) stacks.
- The patented and patent pending Power-Pipe design is the only heat exchanger that efficiently allows for up to 4 apartment suites to be plumbed without noticeable loss in water pressure... in fact this results in a **2 to 4 times faster payback** than other heat exchangers.
- The Power-Pipe is very **simple to specify and install** and its savings typically translate to a **3 to 4 year simple payback**; even faster with government or utility incentives.

Detail for buildings with central water heating:



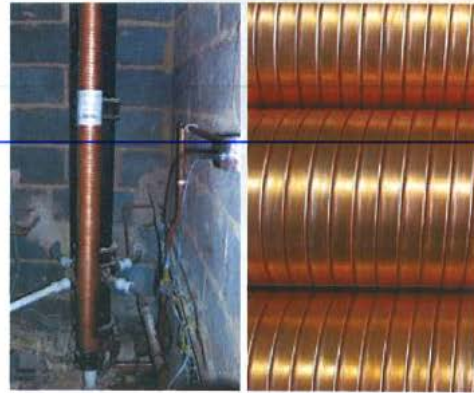
How It Works

- 1 As drain water falls down any vertical drain stack it clings to the inner wall, rather than going down the middle of the pipe. This results in a quickly falling thin film.
- 2 The energy (heat) from this falling film of drain water is easily and efficiently transferred through the copper to the fresh cold water which is flowing around the drain pipe in the outer coils.
- 3 Cold fresh water is plumbed into the bottom of the Power-Pipe from the main cold water riser.
- 4 Power-Pipe heated water is then plumbed to either:
 - the cold side of up to 4 showers, for buildings with central water heating, thereby reducing hot water demand
 - the cold side of the shower and water heater, for buildings with in-suite water heaters

877-606-5559
www.renewability.com

Advantages of the Power-Pipe®

- The Power-Pipe® is **very simple to install** during new construction and it integrates with any plumbing system
- The Power-Pipe **can be retrofit** in buildings where there is access to the drain stacks and fresh water lines
- Maintenance-free, 50+ year life
- The Power-Pipe will increase effective hot water capacity, thereby reducing the risk of running out of hot water
- **Quality** is never compromised; the coils of every Power-Pipe unit consist of 100% Type L or heavier copper tube
- The Power-Pipe also provides significant cost-effective **reductions in green house gases** as a result of reduced primary energy demand
- The performance of the Power-Pipe has been **verified by the Canadian Government** (*Ministry of Natural Resources Canada and the University of Waterloo*) in independent third-party testing
- The Power-Pipe will **assist in obtaining LEED Certification** (and similar programs) for your building
- Many Governments and Utilities also offer **financial incentives** resulting in a quicker payback
- The Power-Pipe is the most proven, most used drain water heat recovery technology; many building designers have been specifying the Power-Pipe as a standard in their buildings for many years now, there are now thousands of suites in which Power-Pipes are saving money and energy daily.



Sampling of Projects

Regent Park Toronto, Ontario New Construction - Affordable Housing	Hotel North Battleford, Saskatchewan New Construction
OMHM Montreal, Quebec New Construction - Affordable Housing	National Defense Halifax, Nova Scotia Officers Residence
University of Toronto Toronto, Ontario Student Dorm	Eastern Oregon University Eugene, Oregon Student Dorm
University of Oregon Eugene, Oregon Student Dorm	Maison Transitionelle Montreal, Quebec New Construction - Affordable Housing
Yee Kang Centre Montreal, Quebec New Construction - Affordable Housing	Benny Farms Montreal, Quebec LEED Platinum Status and International Award
Bury Court Bedford, England Retrofit - Affordable Housing	ETS Montreal, Quebec Student Dorm
Prison North Bend, Oregon Retrofit - Government Facility	Cloverdale Housing Coop Montreal, Quebec Retrofit - Affordable Housing
University of Waterloo Waterloo, Ontario Student Townhouses	
Adelaide Project Toronto, Ontario New Construction - Affordable Housing	

Applications Include:

- | | |
|-----------------------|-----------------|
| • CONDOMINIUMS | • STUDENT DORMS |
| • APARTMENT BUILDINGS | • HOSPITALS |
| • HOTELS | • PRISONS |
| • AFFORDABLE HOUSING | • TOWNHOUSES |

Developed and manufactured by:



What We Provide:

- We provide free and full support including feasibility analysis, design consultation, CAD drawing elements, and training.
- 10 Year Warranty



SAVINGS VERIFIED BY
Natural Resources Canada

877-606-5559
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Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standards proposed for inclusion in the code, CSA B55.1 and B55.2 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

R405.5.2(1)T-EC-VANDECKER.DOC

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee, Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Plumbing Code Development Committee.

For staff analysis of the content of CSA 55.1-2012 and CSA 55.2-2012 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

**PART I – IECC - Commercial
Committee Action:**

Disapproved

Committee Reason: Drain waste heat recovery seems to be a valuable energy saving idea but there is some confusion about whether the proposal has the correct computational method to adjust (increase) the efficiency of the service water heating system when these products are installed.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Klein, Affiliated International Management, LLC, representing self; Gerald Van Decker, RenewABILITY Energy Inc, representing self, request Approval as Submitted

Commenter's Reason: I agree with the Committee's reason that it is important for code officials, contractors and building owners to have recognized standards regarding safety and performance for building components. This code change provides these standards for drain water heat recovery units, and I urge your support of this code change.

CE283-13, Part I

Final Action: AS AM AMPC_____ D

CE283-13, Part III

C404.7 (NEW), Table C407.5.1(1), Chapter 5, R403.4.3 (NEW) (N1103.5 (NEW)), Chapter 5, IRC P2903.11 (NEW)

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED FOR INFORMATION PURPOSES FOLLOWING ALL OF PART III.

Proposed Change as Submitted

THIS IS A 3 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE IECC-COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART II WILL BE HEARD BY THE IECC-RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE. PART III WILL BE HEARD BY THE IRC-PLUMBING COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

Proponent: Gerald Van Decker, RenewABILITY Energy Inc., representing self (gerald@renewability.com), Gary Klein, Affiliated International Management, LLC, representing self, (gary@aim4sustainability.com)

PART III IRC-P

Add new text as follows:

P2903.11 Drain water heat recovery units. Drain water heat recovery units shall be in accordance with Section N1103.4.3

Reason: There are two reasons for this proposal. 1) To enable developers to take credit for efficiency improvements due to the use of drain water heat recovery devices in the performance calculations in the energy code; and 2) to make comparisons of the efficiency of different units based on an existing standard.

Drain water heat recovery (DWHR) works particularly well where heated water flows down the drain at the same time as water flows in that needs to be heated; this "coincident flow" occurs in occupancies with showering and lavatory use. Performance of a DWHR unit is characterized by both efficiency and pressure loss. It is important to ensure that DWHR devices do not impose large pressure losses in the piping in order to minimize the impact on water flow in the building. Given the available DWHR efficiencies, savings are typically 10% to 35% of the energy used for heating water. Over 25,000 drain water heat recovery units have been installed in homes in Canada and the United States.

This change adds two standards for drain water heat recovery units (DWHR units). Drain water heat recovery is often a cost effective way to add to energy efficiency by recapturing hot water energy that is literally "going down the drain". The proposed standards have already been in use by designers for 10 years and the resulting ratings are in use by a variety of energy efficiency programs. Commercial (i.e. non multi-unit residential) applications are engineered systems while multi-unit residential applications are non-engineered and straightforward.

CSA B55.2 standard is for fabrication and material quality of DWHR units. The CSA B55.1 standard is for testing and labeling of DWHR units efficiency and pressure loss at 2.5gpm (9.5lpm). These existing standards were developed through a consensus process by the Canadian Standards Association and are referenced by the Ontario Building Code.

A typical drain water heat recovery unit is shown below:

POWER-PIPE®

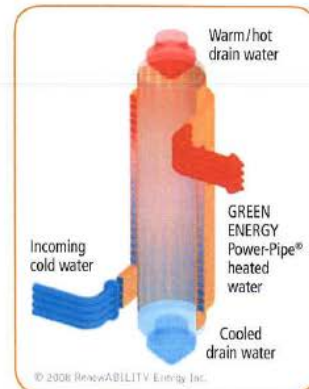
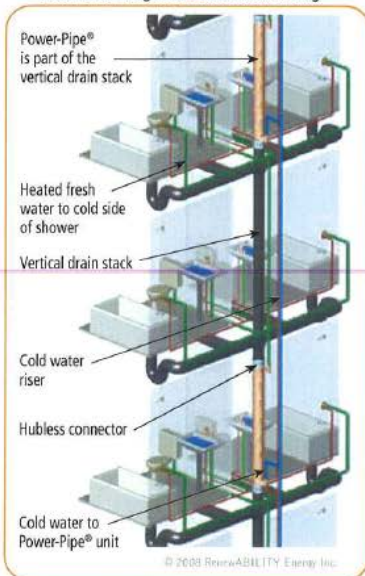
Drain Water Heat Recovery Systems

Reduce Operating Costs for Multi-Unit Residential Buildings

Cost-Effective Green Energy Technology

- The Power-Pipe® is **proven, practical, affordable** and in use today saving energy for thousands of residential suites.
- **Water heating is typically the second highest energy cost** in multi-unit residential buildings; in fact it can even be the highest energy cost.
- As building envelopes have become more efficient in recent years water heating has become an even larger portion of the remaining energy costs.
- Much of the drain water leaving a residential building carries with it valuable and recoverable heat energy.
- The all copper Power-Pipe is a double-wall heat exchanger that can **reduce water heating costs by 20-40%** by recovering heat energy from drain (waste) water in multi-residential building drain (waste) stacks.
- The patented and patent pending Power-Pipe design is the only heat exchanger that efficiently allows for up to 4 apartment suites to be plumbed without noticeable loss in water pressure... in fact this results in a **2 to 4 times faster payback** than other heat exchangers.
- The Power-Pipe is very **simple to specify and install** and its savings typically translate to a **3 to 4 year simple payback**; even faster with government or utility incentives.

Detail for buildings with central water heating:



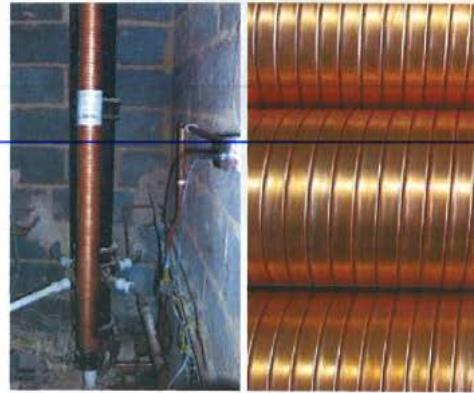
How It Works

- 1 As drain water falls down any vertical drain stack it clings to the inner wall, rather than going down the middle of the pipe. This results in a quickly falling thin film.
- 2 The energy (heat) from this falling film of drain water is easily and efficiently transferred through the copper to the fresh cold water which is flowing around the drain pipe in the outer coils.
- 3 Cold fresh water is plumbed into the bottom of the Power-Pipe from the main cold water riser.
- 4 Power-Pipe heated water is then plumbed to either:
 - the cold side of up to 4 showers, for buildings with central water heating, thereby reducing hot water demand
 - the cold side of the shower and water heater, for buildings with in-suite water heaters

877-606-5559
www.renewability.com

Advantages of the Power-Pipe®

- The Power-Pipe® is **very simple to install** during new construction and it integrates with any plumbing system
- The Power-Pipe **can be retrofit** in buildings where there is access to the drain stacks and fresh water lines
- Maintenance-free, 50+ year life
- The Power-Pipe will increase effective hot water capacity, thereby reducing the risk of running out of hot water
- **Quality** is never compromised; the coils of every Power-Pipe unit consist of 100% Type L or heavier copper tube
- The Power-Pipe also provides significant cost-effective **reductions in green house gases** as a result of reduced primary energy demand
- The performance of the Power-Pipe has been **verified by the Canadian Government** (*Ministry of Natural Resources Canada and the University of Waterloo*) in independent third-party testing
- The Power-Pipe will **assist in obtaining LEED Certification** (and similar programs) for your building
- Many Governments and Utilities also offer **financial incentives** resulting in a quicker payback
- The Power-Pipe is the most proven, most used drain water heat recovery technology; many building designers have been specifying the Power-Pipe as a standard in their buildings for many years now, there are now thousands of suites in which Power-Pipes are saving money and energy daily.



Sampling of Projects

Regent Park Toronto, Ontario New Construction - Affordable Housing	Hotel North Battleford, Saskatchewan New Construction
OMHM Montreal, Quebec New Construction - Affordable Housing	National Defense Halifax, Nova Scotia Officers Residence
University of Toronto Toronto, Ontario Student Dorm	Eastern Oregon University Eugene, Oregon Student Dorm
University of Oregon Eugene, Oregon Student Dorm	Maison Transitionelle Montreal, Quebec New Construction - Affordable Housing
Yee Kang Centre Montreal, Quebec New Construction - Affordable Housing	Benny Farms Montreal, Quebec LEED Platinum Status and International Award
Bury Court Bedford, England Retrofit - Affordable Housing	ETS Montreal, Quebec Student Dorm
Prison North Bend, Oregon Retrofit - Government Facility	Cloverdale Housing Coop Montreal, Quebec Retrofit - Affordable Housing
University of Waterloo Waterloo, Ontario Student Townhouses	
Adelaide Project Toronto, Ontario New Construction - Affordable Housing	

Applications Include:

- | | |
|-----------------------|-----------------|
| • CONDOMINIUMS | • STUDENT DORMS |
| • APARTMENT BUILDINGS | • HOSPITALS |
| • HOTELS | • PRISONS |
| • AFFORDABLE HOUSING | • TOWNHOUSES |

Developed and manufactured by:



What We Provide:

- We provide free and full support including feasibility analysis, design consultation, CAD drawing elements, and training.
- 10 Year Warranty



SAVINGS VERIFIED BY
Natural Resources Canada

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Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standards proposed for inclusion in the code, CSA B55.1 and B55.2 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

R405.5.2(1)T-EC-VANDECKER.DOC

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Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee, Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Plumbing Code Development Committee.

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**PART III – IRC – Plumbing
Committee Action:**

Disapproved

Committee Reason: There is no need to have this pointer in the plumbing chapter as the information is contained in the IRC and not some other publication.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Klein, Affiliated International Management, LLC, representing self; Gerald Van Decker, RenewABILITY Energy Inc, representing self, request Approval as Modified by this Public Comment.

Modify proposal as follows:

P2903.11 Drain water heat recovery units. Drain water heat recovery units that are installed for heat recovery shall be in accordance with meet the requirements of Section N1103.4.3.

Commenter's Reason: Drain water heat recovery systems are relatively uncommon in residential construction at this time. Their installation affects the design and layout of the overall domestic piping supply and may affect other building subsystems. Having a reference in the plumbing chapter will help to avoid lapses in coordination with other trades and will improve the ease of compliance.

CE283-13, Part III

Final Action: AS AM AMPC____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

PART II IECC-RESIDENTIAL PROVISIONS

Add new text as follows:

R403.4.3 (N1103.4.3) Drain water heat recovery units. Drain water heat recovery units shall comply with CSA 55.2. Drain water heat recovery units shall be in accordance with CSA 55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi (20.7 kPa) for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi (13.8 kPa) for individual units connected to three or more showers.

Add new standards to Chapter 5 as follows:

CSA

PART III IRC-P

Add new text as follows:

P2903.11 Drain water heat recovery units. Drain water heat recovery units shall be in accordance with Section N1103.4.3

Reason: There are two reasons for this proposal. 1) To enable developers to take credit for efficiency improvements due to the use of drain water heat recovery devices in the performance calculations in the energy code; and 2) to make comparisons of the efficiency of different units based on an existing standard.

Drain water heat recovery (DWHR) works particularly well where heated water flows down the drain at the same time as water flows in that needs to be heated; this “coincident flow” occurs in occupancies with showering and lavatory use. Performance of a DWHR unit is characterized by both efficiency and pressure loss. It is important to ensure that DWHR devices do not impose large pressure losses in the piping in order to minimize the impact on water flow in the building. Given the available DWHR efficiencies, savings are typically 10% to 35% of the energy used for heating water. Over 25,000 drain water heat recovery units have been installed in homes in Canada and the United States.

This change adds two standards for drain water heat recovery units (DWHR units). Drain water heat recovery is often a cost effective way to add to energy efficiency by recapturing hot water energy that is literally “going down the drain”. The proposed standards have already been in use by designers for 10 years and the resulting ratings are in use by a variety of energy efficiency programs. Commercial (i.e. non multi-unit residential) applications are engineered systems while multi-unit residential applications are non-engineered and straightforward.

CSA B55.2 standard is for fabrication and material quality of DWHR units. The CSA B55.1 standard is for testing and labeling of DWHR units efficiency and pressure loss at 2.5gpm (9.5lpm). These existing standards were developed through a consensus process by the Canadian Standards Association and are referenced by the Ontario Building Code.

A typical drain water heat recovery unit is shown below:

Advantages of the Power-Pipe®

- The Power-Pipe® is **very simple to install** during new construction and it integrates with any plumbing system
- The Power-Pipe can be **retrofit** in buildings where there is access to the drain stacks and fresh water lines
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Yee Kang Centre Montreal, Quebec New Construction - Affordable Housing	Bury Court Bedford, England Retail - Affordable Housing
Prison North Bend, Oregon Retail - Government Facility	ETS Montreal, Quebec Student Dorm
University of Waterloo Waterloo, Ontario Student Dormitories	Claytondale Housing Coop Montreal, Quebec Retail - Affordable Housing
Adelaide Project Toronto, Ontario New Construction - Affordable Housing	

Applications Include:

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- APARTMENT BUILDINGS
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- 10 Year Warranty



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Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standards proposed for inclusion in the code, CSA B55.1 and B55.2 with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee, Part II was heard by the Residential Energy Conservation Code Development Committee and Part III was heard by the Residential Plumbing Code Development Committee.

For staff analysis of the content of CSA 55.1-2012 and CSA 55.2-2012 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

**PART II – IECC – Residential
Committee Action:**

Approved as Submitted

Committee Reason: Massachusetts recognizes drain waste heat recovery units in their “stretch” code. If these units are going to be installed, then there needs to be requirements to make sure the units operate properly and provide the intended performance.

Assembly Action:

None

CE285-13, Part I

C202, C405.1, R202 (IRC N1109.1) R404.1 (IRC N1104.1)

NOTE: PART II DID NOT RECEIVE A PUBLIC COMMENT AND IS ON THE CONSENT AGENDA, PART II IS REPRODUCED ONLY FOR INFORMATION PURPOSES FOLLOWING ALL OF PART I.

Proposed Change as Submitted

Proponent: Deborah Frankhouser, Four Point Lighting Design, representing the International Association of Lighting Designers (deborah@fourpointlighting.com)

THIS IS A 2 PART CODE CHANGE PROPOSAL. PART I WILL BE HEARD BY THE COMMERCIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE AND PART II WILL BE HEARD BY THE RESIDENTIAL ENERGY CONSERVATION CODE DEVELOPMENT COMMITTEE.

PART I – IECC-COMMERCIAL PROVISIONS

Revise as follows:

C405.1 General (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior applications, electrical energy consumption, and minimum acceptable lighting equipment for exterior applications.

Exception: Dwelling units within commercial buildings shall not be required to comply with Sections C405.2 through C405.5 provided that they comply with Section R404.1. ~~not less than 75 percent of the permanently installed light fixtures, other than low voltage lighting, shall be fitted for, and contain only, high efficacy lamps.~~

Delete definition without substitution as follows:

SECTION C202 GENERAL DEFINITIONS

~~**HIGH EFFICACY LAMPS.** Compact fluorescent lamps, T-8 or smaller diameter fluorescent lamps, or lamps with a minimum efficacy of:~~

- ~~1. 60 lumens per watt for lamps over 40 watts,~~
- ~~2. 50 lumens per watt for lamps over 15 watts to 40 watts,~~
- ~~3. 40 lumens per watt for lamps 15 watts or less.~~

Reason: (Part I) The exception to C405.1 establishes a different standard for lighting efficiency in dwellings from Section R404.1. Section C405.1 is a luminaire-based standard, whereas Section R404.1 is a lamp-based standard. There is no reason for the code to set an efficiency standard for lighting within dwelling units in multi-family buildings that is different from the standard for lighting in detached houses. Residential lighting is the same regardless of the building it is located in.

(Part II):

1. Increases the overall requirement for high-efficiency luminaires from 75% to 100% with certain exceptions designed to save energy and provide maximum flexibility to designers, owners and code officials.
2. Changes the Chapter 2 definitions from *high efficacy lamps* to *high efficiency luminaires* as determined by lamp efficacy. This means owners, designers, and building code officials would count luminaires (light fixtures) vs. counting light bulbs to determine the amount of high or low efficient lighting on a project. Luminaires often have multiple lamps, making counting more cumbersome for both the owner/designer as well as the code official. By counting luminaires, the code official simply has to identify lamp type, but doesn't have to count individual lamps within each luminaire.
3. Allows for an optional and more flexible energy savings approach for owners and designers by allowing up to 50% low efficiency luminaires as long as lighting controls are used to reduce or turn off the low efficiency luminaires.

The current code requires 75% of lighting to be *high-efficacy*. However, there is a high amount of dissatisfaction with compact fluorescents because of their poor color, noise, incompatibility with dimming, and mercury content. (Reference,

Dept. of Energy's "Compact Fluorescent Lighting in America: Lessons Learned on the Way to Market," prepared by Pacific Northwest National Laboratory, June 2006) LED technology is still emerging and many of the inexpensive LED's continue to have poor color and incompatibility with dimming.

The most efficient light is the one that is off. The current code does not use lighting controls as a means of energy savings. Regardless of efficacy, light sources achieve maximum energy savings when they are off or reduced to the minimum required by the task. For 120 volt incandescent/halogen sources, dimming reduces energy use, increases lamp life, and dimmers are inexpensive. Automatic controls turn lighting off when not being used. (See reference documentation listed below.)

Cost implications: In most cases, the required high efficiency Fluorescent and LED light fixtures are more expensive than their low efficiency 120 volt incandescent equivalents simply because fluorescent and LED have additional required components such as ballasts and drivers. Dimmers vary significantly in cost, but a 120v incandescent dimmer can be purchased for as little as \$15. When installed with the less expensive 120v incandescent lighting, this combination can be less expensive than purchasing many fluorescent or LED versions controlled by a switch. There are many options for owners and adding dimmers does not necessarily equal adding dollars when comparing low efficiency and high efficiency luminaires. Also, in residential, dimming is important for reasons other than energy savings and dimming fluorescent and LED sources can significantly increase dimming costs.

Residential is not commercial. In residences, it is very common for decorative lighting to be the main lighting source in a room. Decorative chandeliers are often only available in 120v incandescent medium or candelabra based sockets. Often times these chandeliers exceed the current allowance (25%) even when using high efficacy light sources for other types of architectural lighting such as down lights, task lighting, etc. These fixtures do not qualify for the Low Voltage Exception currently in the code. The proposed Exception 2 gives a greater allowance for 120v incandescent/halogen luminaires than the current code allows to accommodate these decorative products, but encourages energy savings through the use of controls.

4. Clarifies the low voltage lighting exception currently in the code and adds stringency by requiring lighting controls as an energy savings approach for these light fixture types. The current code allows for the use of low voltage with no limits. They are lower in VOLTAGE not WATTAGE. Adding controls will increase the overall energy efficiency of these products.

References

Several reports document savings from using controls residentially, such as:

- <http://www.lrc.rpi.edu/programs/lightingTransformatio/economics/table2.asp> [shows 20% to 40% savings depending on space type for using occupancy sensors]
- [http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Lighting/open Residential Lighting PDF](http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Lighting/open%20Residential%20Lighting%20PDF) and see page 32 [shows 10% savings from dimmers, 30% savings from occupancy sensors]
- Heschong Mahone Group Lighting Efficiency Technology Report Vol. 1, see page 83. www.energy.ca.gov/efficiency/lighting/VOLUME01.PDF [shows 20% savings from dimmers and 54% savings from occupancy sensors]

Cost Impact: The code change proposal will not increase the cost of construction.

C405.1-EC-FRANKHOUSER.doc

Committee Action Hearing Results

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

PART I – IECC - Commercial

Committee Action:

Approved as Submitted

Committee Reason: Lighting within residential units should comply with consistent standards. Those are provided best in the Residential portion of the IECC.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Donald J. Vigneau, AIA, representing Northeast Energy Efficiency Partnerships Inc, requests Disapproval.

Commenter's Reason: The proposal may be well-intentioned but essentially flawed. It eliminates a general definition for all high-efficiency bulbs that is needed for compliance with other Section C405 lighting requirements; the Residential Committee AS decision referenced would allow for lighting inconsistent with the requirements of Table C405.5.2(1). The proposal also eliminates other lighting solutions that are not encompassed by the minimal number of lamp types listed. Disapproval is needed for consistency with the RE Committee recommendation for Disapproval.

CE285-13, Part I

Final Action: AS AM AMPC _____ D

NOTE: PART II REPRODUCED FOR INFORMATION PURPOSES ONLY – SEE ABOVE

CE285-13, PART II – IECC-RESIDENTIAL PROVISIONS

Revise as follows:

R404.1 (N1104.1) Lighting equipment (Mandatory). ~~A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of the permanently installed lighting fixtures shall contain only high efficacy lamps.~~ All permanently installed lighting shall be *high efficiency luminaires*.

Exception: ~~Low-voltage lighting shall not be required to use high-efficiency lamps.~~

1. Luminaires that utilize lamps that operate at less than 25 volts if separately controlled by a dimmer or an *automatic control device* and controlled separately from *high-efficiency luminaires*.
2. Up to 50 percent of the luminaires not qualifying for Exception 1 shall be permitted to be other than *high-efficiency luminaires* if they are controlled by a dimmer or *automatic control device*. *High- efficiency luminaires* shall be controlled separately from non *high-efficiency luminaires*.

Revise definition as follows:

SECTION R202 (N1101.9) GENERAL DEFINITIONS

HIGH-EFFICIENCY EFFICACY LAMPS LUMINAIRES. Luminaires containing only compact fluorescent lamps, T-8 or smaller diameter fluorescent lamps with electronic ballasts, or lamps or light emitting diodes (LED's) with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts,
2. 50 lumens per watt for lamps over 15 watts to 40 watts,
3. 40 lumens per watt for lamps 15 watts or less.

Reason:

(Part I) The exception to C405.1 establishes a different standard for lighting efficiency in dwellings from Section R404.1. Section C405.1 is a luminaire-based standard, whereas Section R404.1 is a lamp-based standard. There is no reason for the code to set an efficiency standard for lighting within dwelling units in multi-family buildings that is different from the standard for lighting in detached houses. Residential lighting is the same regardless of the building it is located in.

(Part II):

5. Increases the overall requirement for high-efficiency luminaires from 75% to 100% with certain exceptions designed to save energy and provide maximum flexibility to designers, owners and code officials.
6. Changes the Chapter 2 definitions from *high efficacy lamps* to *high efficiency luminaires* as determined by lamp efficacy. This means owners, designers, and building code officials would count luminaires (light fixtures) vs. counting light bulbs to determine the amount of high or low efficient lighting on a project. Luminaires often have multiple lamps, making counting more cumbersome for both the owner/designer as well as the code official. By counting luminaires, the code official simply has to identify lamp type, but doesn't have to count individual lamps within each luminaire.
7. Allows for an optional and more flexible energy savings approach for owners and designers by allowing up to 50% low efficiency luminaires as long as lighting controls are used to reduce or turn off the low efficiency luminaires.

The current code requires 75% of lighting to be *high-efficacy*. However, there is a high amount of dissatisfaction with compact fluorescents because of their poor color, noise, incompatibility with dimming, and mercury content. (Reference,

Dept. of Energy's "Compact Fluorescent Lighting in America: Lessons Learned on the Way to Market," prepared by Pacific Northwest National Laboratory, June 2006) LED technology is still emerging and many of the inexpensive LED's continue to have poor color and incompatibility with dimming.

The most efficient light is the one that is off. The current code does not use lighting controls as a means of energy savings. Regardless of efficacy, light sources achieve maximum energy savings when they are off or reduced to the minimum required by the task. For 120 volt incandescent/halogen sources, dimming reduces energy use, increases lamp life, and dimmers are inexpensive. Automatic controls turn lighting off when not being used. (See reference documentation listed below.)

Cost implications: In most cases, the required high efficiency Fluorescent and LED light fixtures are more expensive than their low efficiency 120 volt incandescent equivalents simply because fluorescent and LED have additional required components such as ballasts and drivers. Dimmers vary significantly in cost, but a 120v incandescent dimmer can be purchased for as little as \$15. When installed with the less expensive 120v incandescent lighting, this combination can be less expensive than purchasing many fluorescent or LED versions controlled by a switch. There are many options for owners and adding dimmers does not necessarily equal adding dollars when comparing low efficiency and high efficiency luminaires. Also, in residential, dimming is important for reasons other than energy savings and dimming fluorescent and LED sources can significantly increase dimming costs.

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8. Clarifies the low voltage lighting exception currently in the code and adds stringency by requiring lighting controls as an energy savings approach for these light fixture types. The current code allows for the use of low voltage with no limits. They are lower in VOLTAGE not WATTAGE. Adding controls will increase the overall energy efficiency of these products.

References

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- <http://www.lrc.rpi.edu/programs/lightingTransformatio/economics/table2.asp> [shows 20% to 40% savings depending on space type for using occupancy sensors]
- [http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Lighting/open Residential Lighting PDF](http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Residential/Lighting/open%20Residential%20Lighting%20PDF) and see page 32 [shows 10% savings from dimmers, 30% savings from occupancy sensors]
- Heschong Mahone Group Lighting Efficiency Technology Report Vol. 1, see page 83. www.energy.ca.gov/efficiency/lighting/VOLUME01.PDF [shows 20% savings from dimmers and 54% savings from occupancy sensors]

Cost Impact: The code change proposal will not increase the cost of construction.

Part I of this code changes was heard by the Commercial Energy Conservation Code Development Committee and Part II was heard by the Residential Energy Conservation Code Development Committee.

**PART II – IECC – Residential
Committee Action:**

Disapproved

Committee Reason: This code change proposal was disapproved in favor of RE150-13.

Assembly Action:

None

CE286-13

C405.1, C405.8 (New)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C405.1 General (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior applications, electrical energy consumption, controls for electric receptacles, and minimum acceptable lighting equipment for exterior applications.

Exception: Dwelling units within commercial buildings shall not be required to comply with Sections C405.2 through C405.5 provided that not less than 75 percent of the permanently installed light fixtures, other than low voltage lighting, shall be fitted for, and contain only, high efficacy lamps.

C405.8 Automatic receptacle control. Automatic controls shall be provided for at least 50 percent of the 125 volt 15- and 20-Ampere receptacles in private offices, computer classrooms and individual workstations and receptacles associated with branch circuit feeds that are installed to supply electrical power to modular furniture in such spaces. These receptacles shall be labeled "Automatic Control Receptacle". The automatic controls shall:

1. Be capable of operating on a scheduled basis using a time-of-day operated control device that will turn receptacles off at specific programmed times and provide for an independent program schedule for areas not larger than 25,000 square feet but not larger than one floor, or
2. Be an occupant sensor that is capable of turning receptacles off within 30 minutes of all occupants leaving a space, or
3. Be capable of providing a signal to another control or alarm system that indicates the area is unoccupied.

Exceptions: Automatic receptacle controls need not be provided for:

1. Receptacles specifically designated for equipment requiring 24 hour operation.
2. Spaces where an automatic shutoff would endanger the safety or security of the room or building occupants.

Reason: Energy is used in supplying power to receptacles in offices, computer classrooms, individual work stations and modular furniture in such spaces. As with occupancy sensors that can reduce energy use associated with lighting and mechanical ventilation, the equipment supported by electrical receptacles is also subject to use and non-use based on occupancy. ASHRAE/IES Standard 90.1, which is adopted by reference in the IECC Commercial Provisions, contains provisions to provide for at least half of the electrical receptacles in certain spaces to have automatic controls as enhanced by addendum v to the standard. This change ensures consistency between the IECC Commercial Provisions and the latest criteria in standard 90.1.

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

C405.1-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The technology to reduce power usage should be within the equipment and not rely on the building circuitry. Modular furniture is too easily broken down and reused to allow this to be enforceable by the code official.

Assembly Action:

Approved as Modified

Modify the proposal as follows:

C405.8 Automatic receptacle control. Automatic controls shall be provided for at least 50 percent of the 125 volt 15- and 20-ampere receptacles in private offices, computer classrooms, individual workstations and receptacles associated with branch circuit feeds that are installed to supply electrical power to modular furniture in such spaces. ~~These receptacles shall be labeled "Automatic Control Receptacle."~~

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Modified and because public comments were submitted.

Public Comment 1:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C405.8 Automatic receptacle control. Automatic controls shall be provided for at least 50 percent of the 125 volt 15- and 20-ampere receptacles in private offices, computer classrooms, individual workstations and receptacles associated with branch circuit feeds that are installed to supply electrical power to modular furniture in such spaces. ~~These receptacles shall be labeled "Automatic Control Receptacle."~~ All controlled receptacles shall be permanently marked to visually differentiate them from uncontrolled receptacles.

Commenter's Reason: The previous language was too precise in handling how receptacles that are controlled are labeled. The intent was not to specify exact language that must appear on controlled receptacles. There must be some sort of way to visually differentiate controlled receptacles from non-controlled receptacles. This comment adds language to clarify that.

Public Comment 2:

Duane Jonlin, City of Seattle, Department of Planning and Development requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.8 Automatic receptacle control. Automatic controls shall be provided for at least 50 percent of the 125 volt 15- and 20-Ampere receptacles in private offices, computer classrooms and individual workstations and receptacles associated with branch circuit feeds that are installed to supply electrical power to modular furniture in such spaces. ~~These receptacles shall be labeled "Automatic Control Receptacle."~~ These receptacles shall be visibly differentiated from non-controlled receptacles. The automatic controls shall:

1. Be capable of operating on a scheduled basis using a time-of-day operated control device that will turn receptacles off at specific programmed times and provide for an independent program schedule for areas not larger than 25,000 square feet but not larger than one floor. The device shall be capable of being overridden for periods of up to two hours by an override timer switch accessible to occupants. Each override switch shall control the controlled receptacles for a maximum area of 5,000 square feet (465 m²), and shall be permitted to control the lighting for the same area, or
2. Be an occupant sensor that is capable of turning receptacles off within 30 minutes of all occupants leaving a space, or
3. Be capable of providing a signal to another control or alarm system that indicates the area is unoccupied.

Exceptions: Automatic receptacle controls need not be provided for:

1. Receptacles specifically designated for equipment requiring 24 hour operation.
2. Spaces where an automatic shutoff would endanger the safety or security of the room or building occupants.

Commenter's Reason: We support this code provision as an effective means of reducing building energy use. We propose that the automatic time switch controls include an override switch to provide for convenient off-hours use of the receptacles controlled by the time switch. This parallels the override switch provisions for lighting controls, and in most cases can be provided with the same override switch.

In addition, we propose that the controlled receptacles be visually differentiated from the non-controlled receptacles.

Public Comment 3:

Andrei Moldoveanu, representing The National Electrical Manufacturers Association (NEMA), requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.8 Automatic receptacle control. Automatic controls shall be provided for at least 50 percent of the 125 volt 15- and 20-ampere receptacles in private offices, computer classrooms, individual workstations and receptacles associated with branch circuit feeds that are installed to supply electrical power to modular furniture in such spaces.

Use the following guidelines for determining how to meet the requirement:

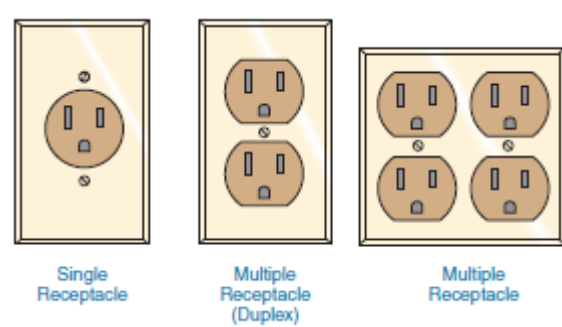
- If the receptacle outlets are single receptacles then 50 percent of them must be controlled. It may be necessary to add controlled receptacles.
- If the receptacle outlets are duplex receptacles then the devices may be split wired with one half being controlled. Alternatively additional controlled duplex receptacles could be added nearby.
- If the receptacle outlet consists of multiple receptacles then the devices may be split wired as above or half of the receptacles may be separately wired to achieve the 50 percent controlled requirement.
- In a defined workspace such as with modular partitions, 50 percent of the receptacles in each area accessible to the occupant must be controlled, i.e. one area would be above the desktop and another area might be below. See receptacle definitions below.

Receptacle Definitions according to 2011 NEC.

Receptacle: A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

Receptacle Outlet: An outlet where one or more receptacles are installed.

Each of the three pictures below is a Receptacle Outlet as there are one or more receptacles installed at the location. 1 & 2 are also simple Receptacles as the contact devices are all on one yoke.



Commenter's Reason: The requirement language is difficult to interpret in the field: as written it's not clear if it calls for half of a duplex receptacle or half of the outlets in a room to be controlled.

Public Comment 3:

Hope Medina, City of Cherry Hills Village, CO, representing self, requests Disapproval.

Commenter's Reason: The committee's reasoning behind disapproving this code change has merit. We should be looking at the equipment to reduce power usage not the building's circuitry. This change no longer holds industry responsible for reducing it's energy usage.

This change not only over reaches the philosophy of this is a minimum/base code it potentially creates a life safety issue. When faced with receptacles providing power under these conditions an alternative means will be found, and it will involve power strips plugged into extension cords plugged into power strips plugged into extension cords.

CE286-13

Final Action:

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CE287-13

C202 (New), C405.2, C405.2.1, C405.2.1.1, C405.2.2, C405.2.2.1, C405.2.1.1, C405.2.1.2, C405.2.2, C405.2.2.1, C405.2.2.3, C405.2.2.3.1, C405.2.2.3.2, C405.2.2.3.3, C405.2.3, C405.2.4

Proposed Change as Submitted

Proponent: Brenda A. Thompson, Clark County Development Services, Clark County, Nevada, representing Sustainable/Energy/High Performance Code Action Committee (bat@clarkcounty.gov)

Revise as follows:

C405.2 Lighting Controls (Mandatory). Lighting systems shall be provided with controls as specified in Sections C405.2.1, C405.2.2, C405.2.3, and C405.2.4, and C405.2.5.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted;
2. Stairways and corridors; and
3. Emergency egress lighting that is normally off.

~~**C405.2.1 Manual lighting controls.** All buildings shall include manual lighting controls that meet the requirements of Sections C405.2.1.1 and C405.2.1.2.~~

~~**C405.2.2 C405.2.1 Occupant sensors sensor controls.** *Occupant sensors sensor controls* shall be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, storage rooms and janitorial closets, and other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions. ~~These automatic control devices shall be installed to~~~~

~~**C405.2.1.1 Occupant sensor control function.** Occupant sensor controls shall comply with the following:~~

- ~~1. Automatically turn off lights within 30 minutes of all occupants leaving the space; and~~
- ~~2. Shall either be manual on or shall be controlled to automatically turn the lighting on to not more than 50 percent power; and~~
- ~~3. Shall incorporate a *manual control* to allow occupants to turn lights off.~~

~~**Exception:** Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants~~

~~**C405.2.1.1 Interior lighting controls.** Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting serving that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.~~

~~**Exceptions:**~~

- ~~1. Areas designated as security or emergency areas that need to be continuously lighted.~~
- ~~2. Lighting in stairways or corridors that are elements of the means of egress.~~

~~**C405.2.2 Additional lighting Time switch controls.** Each area that is required to have a manual control shall also have controls that meet the requirements of Sections C405.2.2.1, C405.2.2.2 and C405.2.2.3.~~

Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time switch controls* complying with Section C405.2.2.1.

Exceptions: Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, automatic controls additional lighting controls need not be provided shall not be required for the following:

1. *Sleeping units.*
2. Spaces where patient care is directly provided.
3. Spaces where an automatic shutoff would endanger occupant safety or security.
4. Lighting intended for continuous operation.

C405.2.2.1 Automatic Time switch control devices function. ~~Automatic time switch controls shall be installed to control lighting in all areas of the building. Each space provided with *time switch controls* shall also be provided with a *manual control* for light reduction in accordance with Section C405.2.2.2. *Time switch controls* shall include an override switching device that complies with the following:~~

Exceptions:

- ~~1. Emergency egress lighting does not need to be controlled by an automatic time switch.~~
- ~~2. Lighting in spaces controlled by occupancy sensors does not need to be controlled by automatic time switch controls.~~

~~The automatic time switch control device shall include an override switching device that complies with the following:~~

- ~~1. The override switch shall be a *manual control* in a readily accessible location;~~
- ~~2. The override switch shall be located where the lights controlled by the switch are visible; or the switch shall provide a mechanism which announces the area controlled by the switch;~~
- ~~3. The override switch shall permit manual operation;~~
- ~~2.4. The override switch, when initiated, shall permit the controlled lighting to remain on for a maximum duration of 2 hours; and~~
3. Any individual override switch shall control the lighting for a maximum area of 5,000 square feet (465 m²).

Exceptions:

1. Within malls, arcades, auditoriums, single tenant retail spaces, industrial facilities and arenas:
 - ~~4. 1.1.~~ The time limit shall be permitted to exceed 2 hours provided the override switch is a captive key device; and
 - ~~2. 1.2.~~ The area controlled by the override switch is permitted to exceed 5,000 square feet (465 m²), but shall not exceed 20,000 square feet (1860 m²).
2. Where provided with *manual control*, the following areas are not required to have light reduction control:
 - 2.1. Spaces that have only one luminaire with a rated power of less than 100 watts;
 - 2.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m²); and
 - 2.3. Corridors, equipment rooms, public lobbies, electrical or mechanical rooms.

C405.2.1.2 C405.2.2.2 Light reduction controls. ~~Each area that is required to have a manual control shall also allow the occupant to~~ Spaces required to have light reduction controls shall have a *manual control* that allows the occupant to reduce the connected lighting load in a reasonably uniform pattern by at least 50 percent. Lighting reduction shall be achieved by one of the following or other *approved* methods:

1. Controlling all lamps or luminaires;
2. Dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps;

3. Switching the middle lamp luminaires independently of the outer lamps; or
4. Switching each luminaire or each lamp.

Exception: Light reduction controls ~~need not be provided in the following areas and spaces:~~ are not required in daylight zones with *daylight responsive controls* complying with C405.3.2.

- ~~1. Areas that have only one luminaire, with rated power less than 100 watts.~~
- ~~2. Areas that are controlled by an occupant sensing device.~~
- ~~3. Corridors, equipment rooms, storerooms, restrooms, public lobbies, electrical or mechanical rooms.~~
- ~~4. Sleeping unit (see Section C405.2.3).~~
- ~~5. Spaces that use less than 0.6 watts per square foot (6.5 W/m²).~~
- ~~6. Daylight spaces complying with Section C405.2.2.3.2.~~

C405.2.2.3 Manual controls. Manual controls for lights shall meet the following requirements:

1. Shall be readily accessible to occupants; and
2. Shall be located where the controlled lights are visible; or the control shall identify the area served by the lights and indicate their status.

C405.2.2.3 C405.3 Daylight zone control. *(Portions of text not shown remains unchanged)*

C405.2.2.3.1 C405.3.1 Manual daylight controls. *(Portions of text not shown remains unchanged)*

C405.2.2.3.2 Automatic daylight controls. C405.3.2 Daylight responsive controls. *(Portions of text not shown remains unchanged)*

C405.2.2.3.3 C405.3.3 Multi-level lighting controls. *(Portions of text not shown remains unchanged)*

C405.2.3 C405.2.4 Specific application controls. *(Portions of text not shown remains unchanged)*

C405.2.4 C405.2.5 Exterior lighting controls. *(Portions of text not shown remains unchanged)*

Add new definitions as follows:

SECTION C202 GENERAL DEFINITIONS

TIME SWITCH CONTROL. An automatic control device or system that controls lighting or other loads, including switching off, based on time schedules.

OCCUPANT SENSOR CONTROL. An automatic control device or system that detects the presence or absence of people within an area and causes lighting, equipment, or appliances to be regulated accordingly.

DAYLIGHT RESPONSIVE CONTROL. A device or system that provides automatic control of electric light levels based on the amount of daylight in a space.

Reason: This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held 2 open meetings and over 15 workgroup calls which included members of the SEHPCAC as well as any interested party to discuss and debate proposed changes and public comments. Related documentation and reports are posted on the SEHPCAC website at: <http://www.iccsafe.org/cs/SEHPCAC/Pages/default.aspx>.

Reasons for this proposal are as follows:

Overview:

This proposal reorganizes, but does not delete requirements related to lighting controls in the 2012 IECC.

Section C405.2 of the 2012 IgCC is confusing. It puts information that is often irrelevant first, and surprises with essential and relevant information only after one has suffered through trying to decipher what the implications of the irrelevant information might be. Section C405.2 also contains redundant information and the relationship of various subsections of C405.2 to one another is often unclear and ambiguous. This proposal reorganizes Section C405.2 to provide the clarity that is necessary for its proper application and enforcement. This proposal is a reorganization only and does not contain technical changes or increases or decreases in stringency.

Section C405.2:

According to the IBC, all interior stairways and corridors are elements of the means of egress. The original intent of this language may have been to exempt corridors and stairways which are part of an exit as defined by the IBC, but the way the code is currently written it also exempts exit access and exit discharge components, i.e. the entire building. Exceptions 1 and 2 are moved here from deleted former Section C405.2.1.1.

Proposed Exception 3 to Section C405.2:

"Emergency egress lighting that is normally off" does not seem to be exempt from controls requirements in the current code, but it needs to be.

Section C405.2.1.1:

This proposal deletes existing Section C405.2.1.1 and replaces it with new text. The way the code is currently structured most users probably would not realize that a manual switch is always required, even with automatic-on occupant sensors. This clarifies the fact that a manual switch is always required.

Exception to Proposed Section C405.1.1:

Former Section C405.2.2 is proposed to be moved and split into two sections: Sections C405.2.1 and C405.2.1.1. The requirements under proposed new Section C405.2.1.1 have been itemized for clarity. Note that the requirement for occupant sensor controls in "other spaces 300 square feet or less" is extremely broad and will encompass all of the lighting on smaller projects. For example, this is applicable to sleeping units, dwelling units, etc. Whether or not this was the original intention, this is how the code currently reads, and this proposal is intended to provide clarity, it is not intended to make technical changes.

Exception 1 to Section C405.2.2:

Note that the current code does not offer an exception for dwelling units. Dwelling units that are not exempt from all of 405.2 are required to comply with the requirements for automatic controls and light reduction controls.

Exception 4 to Section C405.2.2:

The exception that is currently in the code is for "lighting" that is intended for continuous operation, not for "spaces". This is an important distinction, because it allows light fixtures that are intended for night lighting of unoccupied spaces to be left off the automatic control system (like retail stores for security reasons, where select lights might be left on all night long).

The current code does not offer a blanket exemption for continuously operational emergency egress "night" lighting. Under current code, all emergency egress lighting that is not located in a corridor or stairwell must have a manual control device for override, even though it does not need to be automatically controlled.

Exception 2 to Section C405.2.1 and Section C405.2.1.2:

This exception is derived from 2012 IECC Section C405.2.1.2, which this proposal deletes. Storerooms and restrooms should not be in this list because they are required to be provided with occupant sensor controls.

Sections C405.2.1.1, C405.2.2.1 and C405.2.2.3:

This new section is a combination of the requirements in existing Sections C405.2.1.1 and C405.2.2.1 that pertain to manual controls. Therefore, existing Section C405.2.1.1 is proposed to be deleted and Section C405.2.2.1 is proposed to be revised. Existing Section C405.2.2.3 is not replaced, it is renumbered, as are all affected subsequent sections.

Please note that the SEHPCAC has also submitted other proposals that are coordinated with this proposal and are intended to clarify and improve the usability of the code's prescriptive building thermal envelope provisions. This proposal, however, is intended to stand alone and is not contingent upon the success of other SEHPCAC proposals.

Cost Impact: The code change proposal will not increase the cost of construction. This proposal is a clarification and, as such, will not increase the cost of construction.

C405.2-EC-THOMPSON-SEHPCAC

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The lighting control section needed to be reorganized into a more logical format. The rearrangement will eliminate much confusion.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jack Bailey, One Lux Studio, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls as specified in Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4, and C405.2.5.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted;
2. Emergency egress lighting that is normally off; and
- ~~2. Stairways and corridors; and~~
3. Interior exit stairways, interior exit ramps, and exit passageways.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The current exception in the code makes no sense. Why should lighting in a corridor, which is an exit access component, be exempt from the controls requirements in this code while lighting in an exit passageway is not?

This proposal would conform imprecise language in the IECC with the IBC, resulting in more consistent interpretation and enforcement of the code. It would also avoid potential conflicts between lighting controls requirements in this code and lighting requirements for luminous egress path markings in exits in Section 1024 of the IBC.

Public Comment 2:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.1 Occupant sensor controls. *Occupant sensor controls* shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms,
2. Conference/meeting rooms/multi-purpose rooms,
3. Copy/print rooms,
4. Lounges,
5. Employee lunch and-break rooms,
6. Private offices,
7. Restrooms,
8. Storage rooms, and
9. Janitorial closets,
10. Locker rooms,
11. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The purpose of Proposal CE287 is to add clarity to the lighting controls requirements in the code. This comment further revises the paragraph that stipulates where occupant sensor controls must be used. The phrase "to control lights" is added to make it clear that the sensors not only have to be installed, but have to function. For clarity, the space types are presented as a list. Also for clarity, the space type names are revised to be consistent with the space type names used for determination of lighting power density. This comment also requires the use of occupancy sensors in certain additional space types where occupancy sensors can be used effectively.

CE287-13

Final Action: AS AM AMPC____ D

CE289-13
C405.2.1.1

Proposed Change as Submitted

Proponent: Jack Bailey, One Lux Studio, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

Revise as follows:

C405.2.1.1 Interior lighting controls. Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting serving that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.

Exceptions:

1. Areas designated as security or emergency areas that need to be continuously lighted.
2. Lighting in stairways or corridors that are exits or exit discharge ~~elements of the means of egress.~~

Reason: According to the IBC 2012, all interior stairways and corridors are elements of the means of egress (most are exit access components). This makes the current code language redundant and confusing.

Most users of the code interpret this exception to apply only to stairways and corridors that are part of exits, and this was probably the original intention of the language. Interior exit discharge elements are unusual, but are allowed by IBC 2012 Section 1027.1.

The proposed change will make this section of the code technically correct and consistent with other ICC family codes.

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

C405.2.1.1-EC-BAILEY.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The revision clarifies the exception. It aligns with the terms as defined in the *International Building Code*.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

J. William Degnan, President, National Association of State Fire Marshals, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.1.1 Interior lighting controls. Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting serving that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.

Exceptions:

1. Areas designated as security or emergency areas that need to be continuously lighted.

2. Lighting in stairways or corridors that are ~~exits or exit discharge~~ elements of the means of egress meeting the requirements of the *International Building Code*.

Commenter's Reason: The change that the committee approved as submitted removed other components of a Means of Egress from the exception without proper technical justification. Both Corridors and stairways may be part of a MOE but not an exit or exit discharge. The original language actually is better. Adding conformance with the IBC would add the necessary clarification.

Public Comment 2:

Brenda Thompson, CBCO, Manager Building Inspections, Clark County Development Services, ICC Sustainability, Energy and High Performance Code Action Committee (SEHPCAC) Chair requests Disapproval.

Commenter's Reason: The text of the approved CE289 will set up a conflict between the IECC and the IBC. Means of egress is the term representing the whole egress system consisting of three parts: Exit access, exits and exit discharge. The 2012 code only addresses stairways and corridors in the means of egress system. And this section of the code only addresses interior lighting. While there are some exceptions that allow exit discharge within a building, most exit discharge is exterior and not regulated by this provision of the IECC. CE287 which was also approved eliminated the text of "means of egress" and would provide the exception for all stairways. CE287 is consistent with the current code. CE289 adds the qualify that it is only stairways and corridors in exits and exit discharge. Corridors are only located in exit access. If CE289 is allowed to remain approve it actually eliminates the application of this exception to all corridors and will eliminate its use for stairways also located in the exit access portion of the system. The current code is correct as will be the code if CE287 is allowed to stand. The IECC will be inconsistent with the IBC if CE289 remains approved.

This public comment is submitted by the ICC Sustainability Energy and High Performance Code Action Committee (SEHPCAC). The SEHPCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the SEHPCAC has held numerous open meetings and workgroup calls which included members of the SEHPCAC, as well as interested parties, to discuss and debate proposed changes and public comments.

CE289-13

Final Action: AS AM AMPC_____ D

CE292-13
C405.2.2.2

Proposed Change as Submitted

Proponent: Tim Nogler, Washington State Building Code Council (tim.nogler@des.wa.gov)

Revise as follows:

C405.2.2.2 Occupancy sensors. Occupancy sensors shall be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, warehouse spaces, storage rooms and janitorial closets, and other spaces 300 square feet (28 m²) or less enclosed by floor-to-ceiling height partitions. These automatic control devices shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, and shall either be manual on or shall be controlled to automatically turn the lighting on to not more than 50 percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants

Reason: This provision adds warehouses to the list of areas requiring occupancy sensors for lighting control. Since most areas in a warehouse are unoccupied most of the time, while other spaces are in use, the savings on lighting energy are substantial. This has been an integral part of the Washington State Energy Code for many years.

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

C405.2.2.2-EC-NOGLER.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was concerned about the potential safety issues of having lights turn off automatically in a warehouse. The committee suggested working with proponent of CE293-13 to develop a coordinated public comment.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Tim Nogler, Washington State Building Code Council, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.2.2 Occupancy sensors. Occupancy sensors shall be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, ~~warehouse spaces~~, storage rooms and janitorial closets, and other spaces 300 square feet (28 m²) or less enclosed by floor-to-ceiling height partitions. ~~These~~ The automatic control devices in these spaces shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, and shall either be manual on or shall be controlled to automatically turn the lighting on to not more than 50 percent power. In aisle ways and open areas in warehouses, lighting shall be controlled with occupancy sensors that automatically reduce lighting power by at least 50 percent when the areas are unoccupied. The occupancy sensors in warehouses shall control lighting in each aisle way independently, and shall not control lighting beyond the aisle way being controlled by the sensor.

Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, warehouses, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.

Commenter's Reason: The committee asked that the proponents of this proposal CE292 and the related proposal CE293 coordinate to provide a combined Public Comment to address lighting energy conservation in warehouses. This Comment addresses the safety concerns expressed at the Dallas hearing by requiring only a 50% lighting power reduction after 30 minutes of inactivity, rather than a full-off control, and by limiting the controlled areas to aisles and open spaces only. The proposed language is adapted from the California Title 24 code.

CE292-13

Final Action: AS AM AMPC_____ D

CE293-13

C405.2.2.2, C405.2.2.2.1 (New), C405.2.2.2.2 (New)

Proposed Change as Submitted

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, (glenn@lampartners.com). James Edelson, New Buildings Institute.

Revise as follows:

C405.2.2.2 Occupancy sensors controls. Occupancy sensors shall be installed to control lights in accordance with C405.2.2.2.1 and C405.2.2.2.2. These automatic control devices shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, and shall either be manual-on or shall be controlled to automatically turn the lighting on to not more than 50 percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in:

1. Public corridors,
2. Stairways,
3. Restrooms,
4. Primary building entrance areas and lobbies,
5. Parking garages,
6. Warehouses,
7. Areas where manual-on operation would endanger the safety or security of the room or building occupants.

C405.2.2.2.1. Occupancy sensors for 100 percent load control. Occupancy sensors shall be installed to control 100 percent of the connected lighting load in:

1. Classrooms/lecture/training rooms,
2. Conference/meeting ~~rooms~~/multi-purpose rooms,
3. Copy/print rooms,
4. Lounges,
5. Employee lunch and-break rooms,
6. Private offices,
7. Restrooms,
8. Storage rooms, and
9. Janitorial closets,
10. Laboratory classrooms,
11. Locker rooms,
12. Other spaces 300 square feet (28 m²) or less enclosed by floor-to-ceiling height partitions.

C405.2.2.2.2. Occupancy sensors for 50 percent load control. Occupancy sensors shall be installed to control not less than 50 percent of the connected lighting load in:

1. Enclosed stairways,
2. Parking garages,
3. Warehouses.

Reason: Occupancy sensors are the automatic control type that leads to the most energy savings. This proposal requires the use of occupancy sensors in certain additional space types where occupancy sensors can be used effectively. The space type names are consistent with the space type names used for determination of lighting power density. The phrase "to control lights" is added to make it clear that the sensors not only have to be installed, but have to function. The section has been reformatted in list format for clarity.

Cost Impact: This code change proposal will increase the cost of construction if occupancy sensors would not already be specified for the space types not currently in the code.

C405.2.2.2-EC-HEINMILER.doc

Public Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that previous proposals addressed these issues in a better way and perhaps this proponent could work some of these ideas through those items. There was also concern that a reduction of lighting to 50% within enclosed stairways could result in something below minimum illumination required by the *International Building Code*.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.2.2 Occupancy sensor controls. Occupancy sensors shall be installed in the following areas and spaces to control lights in accordance with C405.2.2.2.1 and C405.2.2.2.2. ~~These automatic control devices shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, and shall either be manual-on or shall be controlled to automatically turn the lighting on to not more than 50 percent power.~~

~~C405.2.2.2.1. Occupancy Sensors for 100% load control.~~ ~~Occupancy sensors shall be installed to control 100 percent of the connected lighting load in:~~

1. Classrooms/lecture/training rooms,
2. Conference/meeting rooms/multi-purpose rooms,
3. Copy/print rooms,
4. Lounges,
5. Employee lunch and-break rooms,
6. Private offices,
7. Restrooms,
8. Storage rooms, and
9. Janitorial closets,
10. ~~Laboratory classrooms,~~
10. Locker rooms,
11. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.

Exception: Full automatic-on controls shall be permitted to control lighting in:

1. Public corridors,
2. Stairways,
3. Restrooms,
4. Primary building entrance areas and lobbies,
5. ~~Parking garages,~~
6. ~~Warehouses,~~
- 5 7. Areas where manual-on operation would endanger the safety or security of the room or building occupants.

~~C405.2.2.2.2. Occupancy Sensors for at least 50% load control.~~ ~~Occupancy sensors shall be installed to control at least 50 percent of the connected lighting load in:~~

1. ~~Enclosed stairways,~~
2. ~~Parking garages,~~
3. ~~Warehouses.~~

Commenter's Reason: CE293 was disapproved in Dallas for extending the mandatory use of occupancy sensors to some specific types. This Public Comment removes those space types (warehouses, parking garages, enclosed stairways, laboratory classrooms).

CE293-13

Final Action:

AS

AM

AMPC_____

D

CE294-13

C202, Figure C405.1 (NEW), Figure C405.2 (NEW), C405.2.2.3, C405.2.2.3.1 (NEW), C405.2.2.3.2 (NEW), C405.2.2.3.3 (NEW), Figure C405.3 (NEW), Figure C405.4 (NEW)

Proposed Change as Submitted

Proponent: Jack Bailey, One Lux Studio, representing International Association of Lighting Designers (jbailey@oneluxstudio.com), Jim Edelson, New Buildings Institute (jim@newbuildings.org)

Revise as follows:

~~**C405.2.2.3 Daylight zone control.** Daylight zones shall be designed such that lights in the daylight zone are controlled independently of general area lighting and are controlled in accordance with either Section C405.2.2.3.1 or Section C405.2.2.3.2. Each daylight control zone shall not exceed 2,500 square feet (232 m²). Contiguous daylight zones adjacent to vertical fenestration are allowed to be controlled by a single controlling device provided that they do not include zones facing more than two adjacent cardinal orientations (i.e., north, east, south, west). Daylight zones under skylights more than 15 feet (4572 mm) from the perimeter shall be controlled separately from daylight zones adjacent to vertical fenestration.~~

~~**Exception:** Daylight zones enclosed by walls or ceiling height partitions and containing two or fewer light fixtures are not required to have a separate switch for general area lighting.~~

~~**C405.2.2.3 Daylight responsive controls.** Daylight responsive controls complying with Section C405.2.2.3.1 shall be provided to control the electric lights within daylight zones in the following spaces:~~

- ~~1. Spaces with a total of more than 150 watts of general lighting within sidelight daylight zones complying with Section C405.2.2.3.2. General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.3.~~
- ~~2. Spaces with a total of more than 150 watts of general lighting within toplight daylight zones complying with Section C405.2.2.3.3.~~

~~**Exceptions:** Daylight responsive controls are not required for the following:~~

- ~~1. Spaces in health care facilities where patient care is directly provided.~~
- ~~2. Dwelling units and sleeping units.~~
- ~~3. Lighting that is required to have specific application control in accordance with Section C405.2.3.~~

~~**C405.2.2.3.1 Daylight responsive control function.** Where required, daylight responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:~~

- ~~1. Lights in toplight daylight zones in accordance with Section C405.2.2.3.3 shall be controlled independently of lights in sidelight daylight zones in accordance with Section C405.2.2.3.2;~~
- ~~2. Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel;~~
- ~~3. Calibration mechanisms shall be readily accessible;~~
- ~~4. When located in offices, classrooms, laboratories, and library reading rooms, daylight responsive controls shall dim lights continuously from full light output to 10 percent of full light output or lower;~~
- ~~5. Daylight responsive controls shall be capable of a complete shut off of all controlled lights; and~~
- ~~6. Lights in sidelight daylight zones in accordance with Section C405.2.2.3.2 facing different cardinal orientations (i.e. within 45 degrees of due north, east, south, west) shall be controlled independently of each other.~~

Exception: Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

C405.2.2.3.2 Sidelight daylight zone. The sidelight *daylight zone* is the floor area adjacent to vertical *fenestration* which complies with all of the following:

1. Where the *fenestration* is located in a wall, the *daylight zone* shall extend laterally to the nearest full height wall, or up to 1.0 times the height from the floor to the top of the *fenestration*, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.1;
2. Where the *fenestration* is located in a rooftop monitor, the *daylight zone* shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the *fenestration*, whichever is less, and longitudinally from the edge of the *fenestration* to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the *fenestration*, whichever is less, as indicated in Figures C405.2 and C405.3;
3. The area of the *fenestration* is at least 24 square feet;
4. The distance from the *fenestration* to any building or geological formation which would block access to daylight is greater than the height from the bottom of the *fenestration* to the top of the building or geologic formation; and
5. Where located in existing buildings, the *visible transmittance* of the *fenestration* is no less than 0.25.

C405.2.2.3.3 Toplight daylight zone. The toplight *daylight zone* is the floor area underneath a roof *fenestration* assembly which complies with all of the following:

1. The *daylight zone* shall extend laterally and longitudinally beyond the edge of the roof *fenestration* assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.4;
2. No building or geological formation blocks direct sunlight from hitting the roof *fenestration* assembly at the peak solar angle on the summer solstice; and
3. Where located in existing buildings, the product of the *visible transmittance* of the roof *fenestration* assembly and the area of the rough opening of the roof fenestration assembly, divided by the area of the daylight zone is no less than 0.008.

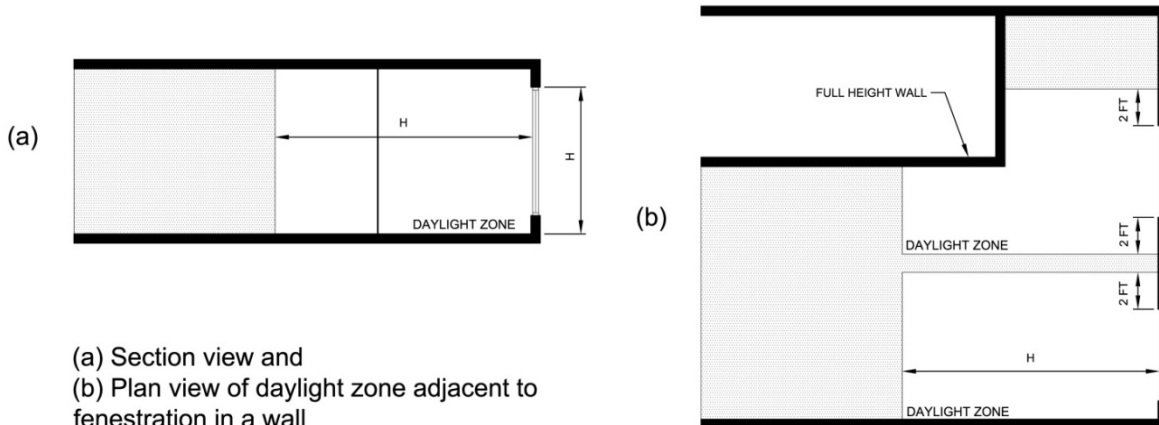
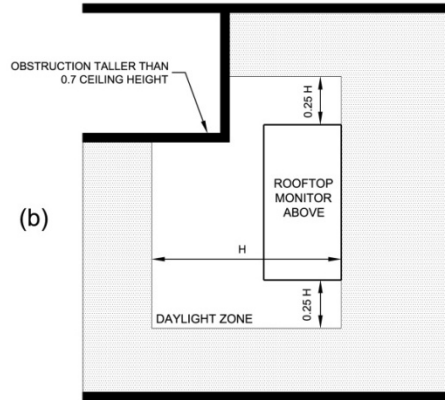
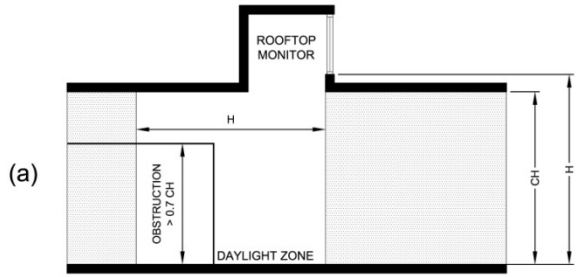
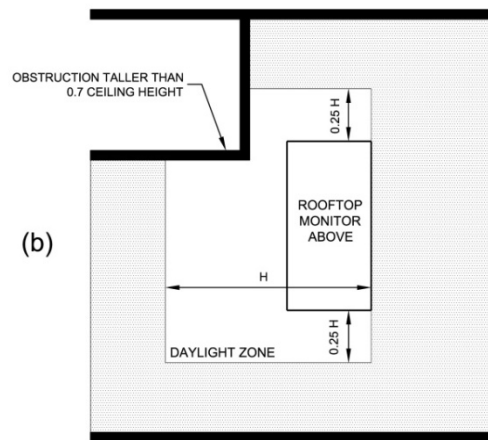
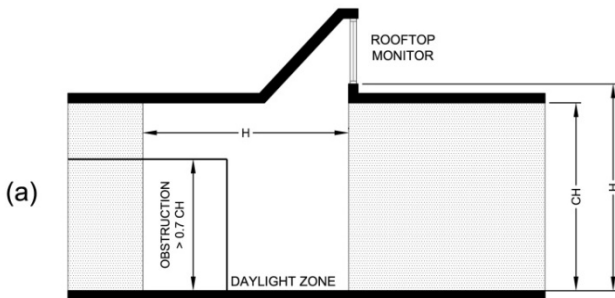


FIGURE C405.1
DAYLIGHT ZONE ADJACENT TO FENESTRATION IN A WALL



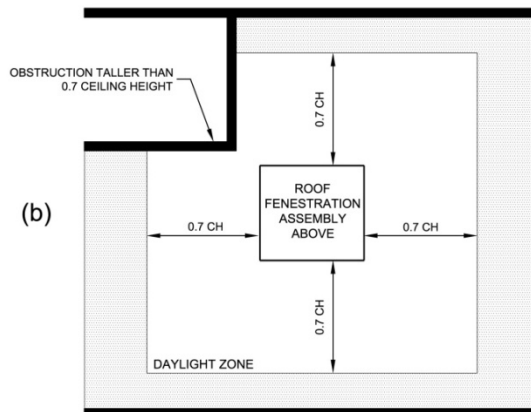
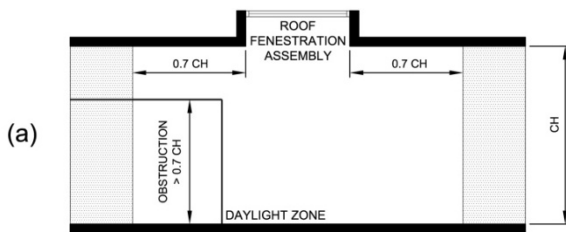
(a) Section view and
(b) Plan view of daylight zone under a rooftop monitor

FIGURE C405.2
DAYLIGHT ZONE UNDER A ROOFTOP MONITOR



(a) Section view and
(b) Plan view of daylight zone under a rooftop monitor

FIGURE C405.3
DAYLIGHT ZONE UNDER A SLOPED ROOFTOP MONITOR



(a) Section view and
(b) Plan view of daylight zone under a roof fenestration assembly

FIGURE C405.4
DAYLIGHT ZONE UNDER A ROOF FENESTRATION ASSEMBLY

Revise definitions as follows:

SECTION C202 GENERAL DEFINITIONS

DAYLIGHT RESPONSIVE CONTROL. A device or system that provides automatic control of electric light levels based on the amount of daylight in a space.

DAYLIGHT ZONE. That portion of a building's interior floor area that is illuminated by natural light.

- ~~1. **Under skylights.** The area under skylights whose horizontal dimension, in each direction, is equal to the skylight dimension in that direction plus either the floor-to-ceiling height or the dimension to a ceiling height opaque partition, or one-half the distance to adjacent skylights or vertical fenestration, whichever is least.~~
- ~~2. **Adjacent to vertical fenestration.** The area adjacent to vertical fenestration which receives daylight through the fenestration. For purposes of this definition and unless more detailed analysis is provided, the daylight zone depth is assumed to extend into the space a distance of 15 feet (4572 mm) or to the nearest ceiling height opaque partition, whichever is less. The daylight zone width is assumed to be the width of the window plus 2 feet (610 mm) on each side, or the window width plus the distance to an opaque partition, or the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least.~~

Reason: This proposal would replace the provisions in the code related to control of electric lights in daylight zones. It would not alter any of the envelope provisions in the code, nor would it set any minimum requirements for fenestration. The proposed changes are needed for two reasons:

1. The existing IECC code language is technically inadequate and confusing, and
2. There is a tremendous untapped potential for energy savings in buildings just by turning off electric lights in daylight spaces.

Inadequate and Confusing Language in 2012 IECC

1. The code describes all sidelight daylight zones as being 15 feet deep, regardless of whether the window is 5 feet high or 50 feet high. Lighting controls will not function properly if the daylight zone size is wrong, and the 15 foot depth requirement in the current code is actually an impediment to successful implementation of daylight responsive controls. New definitions that are based on the geometry of the building are proposed, and diagrams are provided to make the code easier to use. The proposed diagrams are modified slightly from the diagrams published in the 2012 IGCC, and if this proposal is approved these modifications should be proposed for the IGCC diagrams as well.
2. The code provides no clear guidance about the daylight zone associated with a rooftop monitor. This proposal clearly describes the daylight zone associated with rooftop monitors.
3. Small windows, windows with low-VT glass, and windows which are overshadowed by adjacent buildings are common in urban areas with older building stock. Daylight responsive controls should not be required in situations where they will be ineffective. The current code does not provide exceptions for these situations, but the proposed language does.
4. The code requires that separate control be provided for lights in each daylight zone. On facades where windows are spaced more than 4 feet apart, each window establishes a separate daylight zone, and hence a separate lighting control zone. This adds unnecessary cost and complexity to the lighting controls. The proposed daylight responsive control requirements in Section 405.2.2.3.1 resolve this issue and clarify which lights can be grouped together for control in a more sensible way.
5. The code allows step-switching in offices, laboratories, classrooms, and reading rooms, where we know this is objectionable to occupants. This proposal would require dimming in those areas, while still allowing less costly switching systems to be used in other areas.
6. The code is not specific enough about how daylight responsive controls should be required to function. An owner, developer, designer, or builder who looks for the lowest first-cost solution that meets the current code will likely end up with a lighting control system that doesn't work. The proposed Section 405.2.2.3.1 would establish minimum requirements for these systems to function properly. The code is not a design guideline, but it should prevent obvious shortcuts which subvert the intent of the code.

Additional Energy Savings from Daylight Responsive Controls

The IECC requires that daylight responsive controls only be provided in buildings following the prescriptive path which fail to meet certain fenestration requirements. This is obviously a very limited requirement, as most lighting installations are completed as part of alterations to existing buildings that do not include envelope alterations.

This proposal would require that daylight responsive controls be provided whenever more than 150 watts of lighting is installed in an area which receives effective daylight. Necessary exceptions are included for lighting in dwelling units, sleeping units, health care, etc. The 150 watt threshold was found to be cost effective by PNNL and HMG in research done to support the ASHRAE 90.1 Committee. If approved, this proposal would align the stringency of the lighting control requirements in the IECC with those of ASHRAE / ANSI / IESNA Standard 90.1 – 2013, but would still leave the IECC less stringent than California Title 24 – 2013.

Lighting in commercial buildings is responsible for 38% of electricity consumption in commercial buildings nationally. As a portion total energy use, lighting is the largest individual use of energy, accounting for one fifth (20%) of the combined energy total. This occurs despite the fact that many buildings have ample access to a free light source – daylight. A recent meta-analysis report on lighting controls in commercial buildings (Lighting Controls in Commercial Buildings, Williams, Atkins et al, 2012) estimated a 28% average lighting energy savings potential for buildings that incorporated daylighting strategies.

Guidelines published by NBI (<http://patternguide.advancedbuildings.net>) show that there are multiple ways to provide high quality daylight in most buildings. In addition to many energy code entities, almost every voluntary rating system has been increasing their reliance on daylighting to reduce energy consumption in commercial buildings. This proposal ensures that the IECC incorporates the energy saving priority that if sufficient daylight is available, then controls should be included to turn off the electric lights.

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

C405.2.2.3 (NEW)-EC-BAILEY-EDELSON

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Daylight zones are already required and must be shown on the construction documents. This proposal clarifies the appropriate controls for each type of daylight space.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jack Bailey, One Lux Studio, representing International Association of Lighting Designers; Jim Edelson, New Buildings Institute, Glenn Heinmiller, Lam Partners, representing self, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.2.3 Daylight Responsive Controls. *Daylight responsive controls* complying with Section C405.2.2.3.1 shall be provided to control the electric lights within *daylight zones* in the following spaces:

1. Spaces with a total of more than 150 watts of *general lighting* within sidelight *daylight zones* complying with C405.2.2.3.2. *General lighting* does not include lighting that is required to have specific application control in accordance with C405.2.3.
2. Spaces with a total of more than 150 watts of *general lighting* within toplight *daylight zones* complying with C405.2.2.3.3.

Exceptions:

1. Spaces in health care facilities where patient care is directly provided.
2. Dwelling units and sleeping units.
3. Lighting that is required to have specific application control in accordance with C405.2.3.
4. Sidelight *daylight zones* on the first floor above grade in Group A-2 and Group M occupancies.

C405.2.2.3.1 Daylight responsive control function. Where required, *daylight responsive controls* shall be provided within each space for control of lights in that space and shall comply with all of the following:

4. Where located in offices, classrooms, laboratories, and library reading rooms, *daylight responsive controls* shall dim lights continuously from full light output to ~~40~~ 15 percent of full light output or lower

C405.2.2.3.2 Sidelight Daylight Zone. The sidelight *daylight zone* is the floor area adjacent to vertical *fenestration* which satisfies the following criteria:

5. Where located in existing buildings, the *visible transmittance* of the *fenestration* is no less than ~~0.25~~ 0.20.

(Portions of proposal not shown remain unchanged)

Commenter's Reason:

Bailey/Edelson: The sponsors of CE294 have worked with a group of interested parties to offer one consolidated public comment with several proposed revisions:

1. Add an exception for restaurants, bars, and retailers who often want to leave lights on during the day in their street level storefronts to draw attention to their establishment, and to convey to passersby that they are open for business. This seems like a reasonable exception, and Seattle already has a similar provision in place in their code.
2. Relax the requirement for lights in offices, classrooms, laboratories, and library reading rooms to dim to 10%. Changing this requirement to 15% will allow a much wider variety of lighting products to be used.
3. Reduce the VT exception for fenestration in existing buildings from 0.25 to 0.20. This will make daylight responsive controls more widely applicable in existing buildings, and will also discourage the use of lower transmittance fenestration in new construction. In many cases, permits for new construction do not include interior fitout, and interior fitout is subsequently filed as an alteration to the new building. When this happens, daylight controls will not be required if low VT fenestration is used. This creates a perverse incentive for the designers of the new building to select a lower transmittance fenestration assembly to avoid the requirement for daylight responsive controls inside the building. Lowering the threshold for this exception will make it less likely that this will happen, as most designers would not select fenestration with a VT lower than 0.20 for aesthetic reasons.

Heinmiller: This public comment incorporates three separate changes to the original proposal:

1. Add an exception for restaurants, bars, and retailers who often want to leave lights on during the day in their street level storefronts to draw attention to their establishment, and to convey to passersby that they are open for business. This seems like a reasonable exception, and Seattle already has a similar provision in place in their code.
2. Relax the requirement for lights in offices, classrooms, laboratories, and library reading rooms to dim to 10%. Changing this requirement to 15% will allow a much wider variety of lighting products to be used.
3. Reduce the VT exception for fenestration in existing buildings from 0.25 to 0.20. This will make daylight responsive controls more widely applicable in existing buildings, and will also discourage the use of lower transmittance fenestration in new construction. In many cases, permits for new construction do not include interior fitout, and interior fitout is subsequently filed as an alteration to the new building. When this happens, daylight controls will not be required if low VT fenestration is used. This creates a perverse incentive for the designers of the new building to select a lower transmittance fenestration assembly to avoid the requirement for daylight responsive controls inside the building. Lowering the threshold for this exception will make it less likely that this will happen, as most designers would not select fenestration with a VT lower than 0.20 for aesthetic reasons.

Public Comment 2:

Jack Bailey, One Lux Studio, representing International Association of Lighting Designers; Jim Edelson, New Buildings Institute, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~**C405.2.2.3.1 Manual daylighting controls.** Manual controls shall be installed in daylight zones unless automatic controls are installed in accordance with Section C405.2.3.5.~~

~~**C405.2.2.3.2 Automatic daylighting controls.** Set-point and other controls for calibrating the lighting control device shall be readily accessible.~~

~~Daylighting controls device shall be capable of automatically reducing the lighting power in response to available daylight by either one of the following methods:~~

- ~~1. Continuous dimming using dimming ballasts and daylight-sensing automatic controls that are capable of reducing the power of general lighting in the daylight zone continuously to less than 35 percent of rated power at maximum light output.~~
- ~~2. Stepped dimming using multi-level switching and daylight-sensing controls that are capable of reducing lighting power automatically. The system shall provide a minimum of two control channels per zone and be installed in a manner such that at least one control step is between 50 percent and 70 percent of design lighting power and another control step is no greater than 35 percent of design power.~~

~~**C405.2.2.3.3 Multi-level lighting controls.** Where multi-level lighting controls are required by this code, the general lighting in the daylight zone shall be separately controlled by at least one multi-level lighting control that reduces the lighting power in response to daylight available in the space. Where the daylight illuminance in the space is greater than the rated illuminance of the general lighting of daylight zones, the general lighting shall be automatically controlled so that its power draw is no greater than 35 percent of its rated power. The multi-level lighting control shall be located so that calibration and set-point adjustment controls are readily accessible and separate from the light sensor.~~

~~**C402.3 Fenestration (Prescriptive).** Fenestration shall comply with Table C402.3. Automatic daylighting controls specified by this section shall comply with Section C405.2.2.3.2 C405.2.2.3.1~~

C402.3.2.1 Lighting controls in daylight zones under skylights. All lighting in the daylight zone shall be controlled by multilevel lighting controls that comply with Section ~~C405.2.2.3.3~~ C405.2.2.3.1.

Exceptions (Remain unchanged.)

Commenter's Reason: This public comment eliminates superseded code subsections that are redundant and confusing.

CE294 was intended to completely replace existing provisions in the IECC related to daylight controls in Section C405.2.2.3 **and all of its subsections**. However, due to a misunderstanding of ICC procedures by the sponsors, CE294 as approved would only delete section C405.2.2.3, but subsections C405.2.2.3.1, C405.2.2.3.2, and C405.2.2.3.3 would remain in the code. This public comment corrects that error. If the language remains in the IECC there will be two separate sets of requirements for daylight responsive controls – one for controls required by the envelope section C402, and a second for controls required by the lighting section C405.

Public Comment 3:

Duane Jonlin, City of Seattle, Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~**C405.2.2.3.1 Manual daylighting controls.** Manual controls shall be installed in daylight zones unless automatic controls are installed in accordance with Section C405.2.3.5.~~

~~**C405.2.2.3.2 Automatic daylighting controls.** Set-point and other controls for calibrating the lighting control device shall be readily accessible.~~

~~Daylighting controls device shall be capable of automatically reducing the lighting power in response to available daylight by either one of the following methods:~~

- ~~1. Continuous dimming using dimming ballasts and daylight-sensing automatic controls that are capable of reducing the power of general lighting in the daylight zone continuously to less than 35 percent of rated power at maximum light output.~~
- ~~2. Stepped dimming using multi-level switching and daylight-sensing controls that are capable of reducing lighting power automatically. The system shall provide a minimum of two control channels per zone and be installed in a manner such that at least one control step is between 50 percent and 70 percent of design lighting power and another control step is no greater than 35 percent of design power.~~

~~**C405.2.2.3.3 Multi-level lighting controls.** Where multi-level lighting controls are required by this code, the general lighting in the daylight zone shall be separately controlled by at least one multi-level lighting control that reduces the lighting power in response to daylight available in the space. Where the daylight illuminance in the space is greater than the rated illuminance of the general lighting of daylight zones, the general lighting shall be automatically controlled so that its power draw is no greater than 35 percent of its rated power. The multi-level lighting control shall be located so that calibration and set point adjustment controls are readily accessible and separate from the light sensor.~~

~~**C402.3 Fenestration (Prescriptive).** Fenestration shall comply with Table C402.3. Automatic daylighting Daylight responsive controls specified by this section shall comply with Section ~~C405.2.2.3.3~~ C405.2.2.3~~

~~**C402.3.2.1 Lighting controls in daylight zones under skylights.** All lighting in the daylight zone shall be controlled by multilevel lighting daylight responsive controls that comply with Section ~~C405.2.2.3.3~~ C405.2.2.3~~

Exceptions (Remain unchanged.)

(The remainder of the proposal is not modified.)

Commenter's Reason: This public comment deletes unnecessary language from the code. If CE294 is approved, the sections proposed for deletion above would then remain in the code, but would not be referenced by any other sections. This would be confusing for users of the code.

CE294-13

Final Action: AS AM AMPC_____ D

CE299-13
C405.2.3

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C405.2.3 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units and guest suites shall have a master control device ~~at the main room entry that controls all permanently installed luminaires and switched receptacles~~ that is capable of switching off all installed luminaires and switched receptacles within 20 minutes after all occupants leave the room.

Exception: Lighting and switched receptacles controlled by captive key systems.

4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.

Reason: For consistency with ASHRAE/IES 90.1. These revisions introduce automatic lighting control to guestroom type spaces for additional energy savings and allow captive key systems that provide similar savings control to also comply.

Cost Impact: The code change proposal will increase the cost of construction when lighting controls are required in parking garages.

C405.2.3-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Modified

Modify the proposal as follows:

3. Hotel and motel sleeping units and guest suites shall have a master control device that is capable of automatically switching off all installed luminaires and switched receptacles within 20 minutes after all occupants leave the room.

(Balance of the proposal is unchanged.)

Committee Reason: The modification was approved to correct the readability of the sentence. The turning off of power when sleeping units are occupied will save significant energy.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jack Bailey, One Lux Studio, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Further modify the proposal as follows:

C405.2.3 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units and guest suites shall have a master control device that is ~~capable of automatically switching switches~~ off all installed luminaires and switched receptacles within 20 minutes after all occupants leave the room.

Exception: Lighting and switched receptacles controlled by captive key systems.

4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.

Commenter's Reason: A manual switch is **capable** of switching lights off within 20 minutes of all occupants leaving the room if the occupants use the switch to turn the lights off when they walk out.

It is essential that the term "automatic" included in this proposal so that it achieves the intended result.

CE299-13

Final Action:

AS

AM

AMPC_____

D

CE302-13

C405.2.3

Proposed Change as Submitted

Proponent: Duane Jonlin, City of Seattle, representing City of Seattle Department of Planning and Development (duane.jonlin@seattle.gov)

Revise as follows:

C405.2.3 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units and guest suites shall have a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles.
4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
7. Each stairway shall have one or more control devices to automatically reduce lighting power by not less than 50 percent when no occupants have been detected in the stairway for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter the stairway. All portions of stairways shall remain illuminated to at least 1 footcandle (11 lux) at the walking surface when the lighting power is reduced.
8. Lighting in parking garages shall have one or more control devices to automatically reduce lighting power in any one controlled zone by not less than 50 percent when no occupants have been detected in that zone for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter or approach the zone. Each lighting zone controlled by occupancy sensors shall be no larger than 7,200 square feet. Pedestrian occupancy sensors controlling any lighting zone are permitted to be configured to detect pedestrians no more than 30 feet outside of that zone. Vehicle occupancy sensors controlling any lighting zone are permitted to be configured to detect vehicles no more than 60 feet outside of that zone.

Reason: This provision allows stairs enclosures and parking garages lighting energy use to be reduced by half when unoccupied, then come back to full brightness when occupants enter those spaces. It provides a balance between safety, security and energy use. These measures are currently in force in Seattle.

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

C405.2.3-EC-JONLIN.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee was concerned that there may be unintended consequences from the proposed language. Item 8 didn't have a minimum amount of light. The committee expressed concern about a scenario where one might happen to be sitting in a car in a parking garage while waiting for someone else to show up. The lights could go out leaving the occupant in the dark.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Duane Jonlin, City of Seattle, Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.3 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units and guest suites shall have a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles.
4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
7. Each stairway shall have one or more control devices to automatically reduce lighting power by not less than 50 percent when no occupants have been detected in the stairway for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter the stairway. All portions of stairways shall remain illuminated to the level required by Section 1006.2 of the *International Building Code* when the lighting power is reduced.
8. Lighting in parking garages shall have one or more control devices to automatically reduce lighting power in any one controlled zone by not less than 50 percent and not more than 75 percent when no occupants have been detected in that zone for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter or approach the zone. Each lighting zone controlled by occupancy sensors shall be no larger than 7,200 square feet. Pedestrian occupancy sensors controlling any lighting zone are permitted to be configured to detect pedestrians no more than 30 feet outside of that zone. Vehicle occupancy sensors controlling any lighting zone are permitted to be configured to detect vehicles no more than 60 feet outside of that zone. Lighting for covered vehicle entrances to and exits from the garage shall be separately controlled and comply with Section C405.2.4. Lighting is permitted to be turned off completely during hours when the garage not in operation.

Commenter's Reason: The original code change proposal adds items #7 for stairways and #8 for parking garages. This Public Comment responds to the Committee's concern that no minimum garage lighting level had been specified. In addition, garage entrance and exit lighting is exempted from the requirement.

Public Comment 2:

Andrei Moldoveanu, representing The National Electrical Manufacturers Association (NEMA), requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.3 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units and guest suites shall have a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles.
4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control which is independent of the controls for other lighting within the room or space.
7. Each stairway shall have one or more control devices to automatically reduce lighting power by not less than 50 percent when no occupants have been detected in the stairway for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter the stairway. All portions of stairways shall remain illuminated to at least 1 footcandle (11 lux) at the walking surface when the lighting power is reduced.
8. ~~Lighting in parking garages shall have one or more control devices to automatically reduce lighting power in any one controlled zone by not less than 50 percent when no occupants have been detected in that zone for a period not exceeding 30 minutes, and restore lighting to full power when occupants enter or approach the zone. Each lighting zone controlled by occupancy sensors shall be no larger than 7,200 square feet. Pedestrian occupancy sensors controlling any lighting zone are permitted to be configured to detect pedestrians no more than 30 feet outside of that zone. Vehicle occupancy sensors controlling any lighting zone are permitted to be configured to detect vehicles no more than 60 feet outside of that zone.~~

Commenter's Reason: The Committee rejected the original proposal because "item 8 didn't have a minimum amount of light". Also, "the lighting could go out [in parking garages] leaving occupants in the dark". The committee did not appear to have an issue with item 7. This modification eliminates item 8 thereby removing the committee's objections.

CE302-13

Final Action: AS AM AMPC_____ D

CE303-13
C405.2.4

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Delete and substitute as follows:

~~**C405.2.4 Exterior lighting controls.** Lighting not designated for dusk-to-dawn operation shall be controlled by either a combination of a photosensor and a time switch, or an astronomical time switch. Lighting designated for dusk-to-dawn operation shall be controlled by an astronomical time switch or photosensor. All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.~~

C405.2.4 Exterior lighting controls. Exterior lighting shall be controlled by either an astronomical time switch or a photo sensor and a time switch. Time switches shall be capable of retaining programming and the time setting for at least 10 hours without power.

Exception: Lighting designed for dusk to dawn operation shall be permitted to have a photo sensor without a time switch.

Reason: This proposal simplifies the provisions covering exterior lighting controls in the code, to foster the ability to implement and verify compliance with the code.

Cost Impact: The code change proposal will not increase the cost of construction.

C405.2.4 (NEW)-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: Clarifies the text of the section. There are no technical changes resulting from the revision.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~**C405.2.4 Exterior lighting controls.** All exterior lighting shall be controlled by either an astronomical time switch or a photo sensor and a time switch, provided with a control that automatically turns off the lighting when daylighting is available.~~

Where lighting the building façade or landscape, the lighting shall also be provided with controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.

Exterior lighting other than building façade or landscape lighting shall be provided with controls configured to automatically reduce the connected lighting power by at least 30 percent from 12 midnight or within one hour of the end of business operations, whichever is later until 6 a.m. or business opening whichever is earlier or during any period when no activity has been detected for a time of no longer than 15 minutes.

All time-switches controls that operate as a function of time shall be capable of retaining programming and the time setting during a loss of power of at least 10 hours.

Exceptions:

1. ~~Lighting designed for dusk to dawn operation shall be permitted to have a photo sensor without a time switch.~~
1. Emergency lighting that is intended to be automatically off during building operation.
2. Lighting specifically required to satisfy health and life safety requirements.
3. Decorative gas lighting systems
4. Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.

Commenter's Reason: At the code development hearing, both CE303-13 and CE304-13 were approved as submitted. The intent of CE303-13 was to simplify the provisions in the code covering exterior lighting controls and in so doing foster the ability to implement the code and to verify compliance with the code. The language approved pursuant to CE304-13, which is intended to foster consistency between the IECC and ANSI/ASHRAE/IESNA Standard 90.1-13, is as follows:

C405.2.4 Exterior lighting controls. *Lighting for exterior applications other than emergency lighting that is intended to be automatically off during building operation, lighting specifically required to meet health and life safety requirements or decorative gas lighting systems shall:*

1. *Be provided with a control that automatically turns off the lighting as a function of available daylight.*
2. *Where lighting the building façade or landscape the lighting shall have controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.*
3. *Where not covered in Item 2 the lighting shall have controls configured to automatically reduce the connected lighting power by at least 30 percent from no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening or during any period when no activity has been detected for a time of no longer than 15 minutes.*

All time switches shall be able to retain programming and the time setting during loss of power for a period of at least ten hours.

Exception: *Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.*

The approval of both CE303-13 and CE304-13 would provide a challenge in reconciling the text approved in both changes. In all likelihood the approved text in CE303-13 would be overshadowed and more or less eliminated by the text approved in CE304-13. As a result, the simplicity and clarification intended in CE303-13 would be lost. The intent of this public comment is to reconcile the provisions in CE303-13 and CE304-13 in a way that addresses both the simplicity and clarity intended in CE303-13, and the technical improvement and consistency with ANSI/ASHRAE/IESNA Standard 90.1-13 intended CE304-13. This public comment allows the voting members of ICC to review and vote on how these two approved changes would be reconciled and appear in the 2015 IECC.

Two comments were received on DOE's draft public comment; the first made suggestions to the code language in the public comment to reconcile CE303 and CE304, and the second recommended the deletion of the exception for decorative gas lighting.

Since CE304 excepted decorative gas lighting, which is consistent with Standard 90.1 (Section 9.1.1), and both CE303 and CE304 were recommended for approval at the first hearing, and the purpose of this public comment is to simply reconcile what was approved at the first hearing, it did not seem appropriate for DOE to remove that exception.

DOE did revise the public comment based on the suggestions made in the first comment. As such, DOE believes that this public comment reconciles both CE303 and CE304 in a manner acceptable to both proponents, and, since both were recommended for approval at the first hearing, this reconciliation of the text should be acceptable to the ICC membership in voting for approval of CE303 as modified by this public comment.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE303-13

Final Action: AS AM AMPC_____ D

CE304-13
C405.2.4

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Delete and substitute as follows:

~~**C405.2.4 Exterior lighting controls.** Lighting not designated for dusk-to-dawn operation shall be controlled by either a combination of a photosensor and a time switch, or an astronomical time switch. Lighting designated for dusk-to-dawn operation shall be controlled by an astronomical time switch or photosensor. All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least 10 hours~~

C405.2.4 Exterior lighting controls. Lighting for exterior applications other than emergency lighting that is intended to be automatically off during building operation, lighting specifically required to meet health and life safety requirements or decorative gas lighting systems shall:

1. Be provided with a control that automatically turns off the lighting as a function of available daylight.
2. Where lighting the building façade or landscape the lighting shall have controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.
3. Where not covered in Item 2 the lighting shall have controls configured to automatically reduce the connected lighting power by at least 30 percent from no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening or during any period when no activity has been detected for a time of no longer than 15 minutes.

All time switches shall be able to retain programming and the time setting during loss of power for a period of at least ten hours.

Exception: Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.

Reason: For consistency with ASHRAE/IES 90.1-2010. Section 9.4.1.7 of that document contains provisions for exterior lighting controls that differ from those in Section C405.2.4 of the IECC Commercial Provisions. As that standard is an alternative path to compliance with the IECC and there is a desire to maintain equivalency of the IECC with 90.1 this change is needed.

Cost Impact: The code change proposal will not increase the cost of construction.

C405.2.4-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal clarifies the requirements as well as providing 2 additional compliance options. This proposal does leave the lights on, versus completely shutting them off. Many exterior lights are provided for safety purposes and should remain on to a certain level.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Maureen Traxler, City of Seattle Department of Planning & Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.4 Exterior lighting controls. Lighting for exterior applications other than emergency lighting that is intended to be automatically off during building operation, lighting specifically required to meet health and life safety requirements or decorative gas lighting systems shall:

1. Be provided with a control that automatically turns off the lighting as a function of available daylight.
2. Where lighting the building façade or landscape the lighting shall have controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.
3. Where not covered in Item 2 the lighting shall have controls configured to automatically reduce the connected lighting power by at least 30 percent from no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening or during any period when no activity has been detected for a time of no longer than 15 minutes.

Exception: The following types of lighting are not required to comply with this section:

1. Emergency lighting that is intended to be automatically off during building operation.
2. Lighting specifically required to meet health and life safety requirements.
3. Decorative gas lighting systems.
4. Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.

All time switches shall be able to retain programming and the time setting during loss of power for a period of at least ten hours.

Exception: ~~Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.~~

Commenter's Reason: These modifications are intended to be an editorial reorganization of the original proposal. The "other than" phrase in the first sentence contains exceptions which are combined with the exception at the end of the section.

Public Comment 2:

Martha VanGeem, representing self, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.4 Exterior lighting controls. Lighting for exterior applications other than emergency lighting that is intended to be automatically off during building operation, lighting specifically required to meet health and life safety requirements or decorative gas lighting systems shall:

1. Be provided with a control that automatically turns off the lighting as a function of available daylight.
2. Where lighting the building façade or landscape the lighting shall have controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.
3. Where not covered in Item 2 the lighting shall have controls configured to automatically reduce the connected lighting power by at least 30 percent from no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening or during any period when no activity has been detected for a time of no longer than 15 minutes.

All time switches shall be able to retain programming and the time setting during loss of power for a period of at least ten hours.

Exceptions:

1. Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.
2. Lighting that is integral to signage and installed in the signage by the manufacturer.

Commenter's Reason: In response to industry feedback, an additional exterior lighting control exception will be incorporated into 90.1-2013 in addendum DT. This modification adds an exception for lighting integral to signage. Addendum DT to 90.1-2010 will be incorporated into 90.1-2013, so this also will make the IECC consistent with 90.1-2013.

Public Comment 3:

Craig Conner, Building Quality, representing self; Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC; request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

Public Comment 4:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Disapproval.

Commenter's Reason: The Committee approved this proposal because they believed that it "clarifies the requirements". In fact, the opposite is true. This proposal makes the provision confusing by introducing awkward and unclear language and undefined terms. The proposal adds unnecessary complexity.

The Committee approved this proposal because they believed that it is "providing 2 additional compliance options". The proposal does NOT appear to provide any options; it only seems to add new requirements to turn off lights at specific times and amounts depending on the type of lighting.

By requiring that lights be shut off according to "set opening and closing time" and "no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening" the provision is regulating building operations. According to C101.3 of this code the IECC regulates the "design and construction" of buildings. The IECC should not regulate building operations.

Before hearing this proposal, the committee approved proposal CE303. The committee correctly approved proposal CE303 because it "clarifies the text" as desired by the committee. If CE304 is approved it would counteract that clarity, and as noted above, make the provision much more confusing.

Lighting designers who have reviewed this proposal do not understand it, or what they would have to do to comply with it. Code provisions that are vague and confusing can lead to lack of compliance and arguments about interpretation.

Code officials should read this proposal carefully and ask themselves if they understand the language, and if they would be able to verify compliance if necessary.

CE304-13

Final Action: AS AM AMPC____ D

CE306-13
C405.2.5 (NEW)

Proposed Change as Submitted

Proponent: Eric Makela, Britt/Makela Group, Inc., representing Northwest Energy Codes Group (eric@brittmakela.com)

Add new text as follows:

C405.2.5 Lighting in refrigerated display cases and walk-in coolers. Lighting in refrigerated display cases, and lights on glass doors installed on walk-in coolers and freezers shall be controlled by one of the following:

1. Automatic time switch controls to turn off lights during non-business hours.
2. Motion sensor controls on each case that reduce display case lighting power by not less than 50 percent within 30 minutes after the area near the case is vacated

Reason: The proposal reduces energy waste by reducing the power level of display lights in refrigerated display cases and glass doors in walk-in coolers during non-business hours and when the nearby area is not in use. Providing automatic controls ensures that lights not in use are automatically reduced in power by at least 50%. Reducing unnecessary lighting of refrigerated areas reduces energy used both for lighting and for the additional cooling load from added heat source. The language for the proposal is adapted from California Title 24-2013.

Cost Impact: The code change proposal will increase the cost of construction but will reduce the overall operating cost of the display case offsetting the first cost of the control.

C405.2.5 (NEW)-EC-MAKELA.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The text would appear to prohibit a single control on multiple cases. The phrase 'near the case' is undefined. People working in non-business hours may need the ability to override to automatic control.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Eric Makela, Britt/Makela Group, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.5 Lighting in refrigerated display cases and walk-in coolers. Lighting in refrigerated display cases, and lights on glass doors installed on walk-in coolers and freezers shall be controlled by one of the following:

1. ~~Automatic time switch controls to turn off lights during non-business hours.~~ Automatic time switch controls to turn off lights during non-business hours. Timed overrides for display cases or walk-in coolers and freezers shall be used to turn the lights on for up to one hour and shall automatically time out to turn the lights off.
2. ~~Motion sensor controls on each case that reduce display case lighting power by not less than 50 percent within 30 minutes after the area near the case is vacated.~~ Motion sensor controls on each display case or walk-in door section that reduce lighting power by at least 50 percent within 3 minutes after the area within the sensor range is vacated.

Commenter's Reason: The IECC Code Development committee voted to disapprove this code change proposal based on three key points:

1. The text would appear to prohibit a single control on multiple cases.
2. The phrase 'near the case' is undefined.
3. People working in non-business hours may need the ability to override to automatic control.

The revised proposal addresses each point by modifying the language accordingly. The code allows either the installation of a motion sensor control on each case or an automatic time switch that could control several cases giving the designer the option to choose either. The language near the case has been deleted. Either the motion sensor is on the case or an automatic time switch can be used that can be located in a remote location. The revised language also requires a timed override for the display case lighting to allow for people working at non-business hours.

The proposal reduces energy waste by reducing the power level of display lights in refrigerated display cases and glass doors in walk-in coolers during non-business hours and when the nearby area is not in use. Providing automatic controls ensures that lights not in use are automatically reduced in power by at least 50%. Reducing unnecessary lighting of refrigerated areas reduces energy used both for lighting and for the additional cooling load from added heat source.

CE306-13

Final Action: AS AM AMPC_____ D

CE307-13
C405.2.5 (New)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C405.2.5 Lighting controls in parking garages. Parking garages shall comply with the provisions of Section C405.2.1 and C405.2.2. Lighting shall be provided with controls which are capable of automatically reducing the power supplied to each luminaire by not less than 30 percent after 30 minutes of inactivity in an area not greater than 36,000 square feet. Lighting for covered vehicle entrances to and exits from the garage shall be separately controlled and comply with of Section C405.2.4.

Luminaires within 20 feet of any perimeter wall that has a net opening to wall area ratio of at least 40 open and no exterior obstructions within 20 feet of the wall shall be provided with controls that will automatically adjust the lighting in response to available daylight.

Exceptions: Controls are not required for the following:

1. High-intensity discharge lamps not greater than 150 watts
2. Induction lamps
3. Luminaires that illuminate daylight transitions zones without parking
4. Luminaires that illuminate ramps without parking.
5. Luminaires proximate to exterior walls.

Reason: For consistency with ASHRAE/IES 90.1-2010. Section 9.4.1.3 of that document contains provisions for lighting controls in parking garages and no such provisions exist in the IECC Commercial Provisions. As that standard is an alternative path to compliance with the IECC and there is a desire to maintain equivalency of the IECC with 90.1 this change is needed.

Cost Impact: The code change proposal will increase the cost of construction when lighting controls are required in parking garages.

C405.2.5 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt the proposed text was unclear and may actually conflict with itself.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2.5 Lighting controls in parking garages. Parking garages shall comply with the provisions of Section C405.2.1 and C405.2.2 and the following:

1. Lighting shall be provided with controls which are capable of automatically reducing the power supplied to each luminaire by not less than 30 percent after 30 minutes of inactivity in an area not greater than ~~36000~~ 3600 square feet.
2. Lighting for covered vehicle entrances to and exits from the garage shall be separately controlled and comply with of Section C405.2.4.
3. Luminaires within 20 feet of any perimeter wall that has a net opening to wall area ratio of at least 40 percent open and no exterior obstructions within 20 feet of the wall shall be provided with controls that will automatically adjust the lighting in response to available daylight.

Exceptions: Controls are not required for the following as follows:

1. High-intensity discharge lamps not greater than 150 watts are exempt from Item 2 of Section C405.2.5.
2. Induction lamps are exempt from Item 2 of Section C405.2.5.
3. Luminaires that illuminate daylight transitions zones without parking are exempt from Items 2 and 4 of Section C405.2.5.
4. Luminaires that illuminate ramps without parking. are exempt from Items 2 and 4 of Section C405.2.5.
5. Luminaires proximate to exterior walls.

Commenter's Reason: During the Committee Action hearings, this was disapproved because "The committee felt the proposed text was unclear and may actually conflict with itself. "The conflicting language has been removed in this comment which also fixes a couple of small typos.

The proposal is written to only reduce lighting power, not shut off the lighting, when there is no occupancy in the space and the control automatically returns light to full power and output as soon as an occupant enters the space. The additional changes clarify the actual and realistic exemptions and make the provision more energy effective.

CE307-13

Final Action: AS AM AMPC_____ D

CE308-13

C405.3

Proposed Change as Submitted

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

Delete without substitution as follows:

~~**C405.3 Tandem wiring (Mandatory).** The following luminaires located within the same area shall be tandem-wired:~~

- ~~1. Fluorescent luminaires equipped with one, three or odd-numbered lamp configurations, that are recess-mounted within 10 feet (3048 mm) center-to-center of each other.~~
- ~~2. Fluorescent luminaires equipped with one, three or any odd-numbered lamp configuration that are pendant or surface-mounted within 1 foot (305 mm) edge-to-edge of each other.~~

Exceptions:

- ~~1. Where electronic high-frequency ballasts are used.~~
- ~~2. Luminaires on emergency circuits.~~
- ~~3. Luminaires with no available pair in the same area.~~

Reason: Simplify the code by removing an obsolete provision. This provision refers to obsolete magnetic ballast technology and no longer serves any purpose. Electronic ballasts are now used for all fluorescent luminaires, and since luminaires with electronic ballasts are exempt, then this provision would never apply and is pointless. It was removed from the 2010 version of Standard 90.1 for these reasons.

Cost Impact: The code change proposal will not increase the cost of construction.

C405.3-EC-HEINMILLER.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The provisions address obsolete technology.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.1 General (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior and exterior applications, electrical energy consumption, and minimum acceptable lighting equipment for exterior applications.

Commenter's Reason: This proposal CE308 removes the only requirement in the code covering the "connection of ballasts". The general description in C405.1 needs to be modified to reflect this

CE308-13

Final Action: AS AM AMPC____ D

CE309-13
C405.5.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C405.5.1 Total connected interior lighting power. The total connected interior lighting power (watts) shall be the sum of the watts of all interior lighting equipment as determined in accordance with Sections C405.5.1.1 through C405.5.1.4 determined in accordance with Equation 4-6.

$$\text{TCLP} = [\text{SL} + \text{LV} + \text{LTPB} + \text{Other}] \quad \text{(Equation 4-6)}$$

where:

TCLP = total connected lighting power (watts)

SL = labeled wattage of luminaires for screw in lamps

LV = wattage of the transformer supplying low-voltage lighting

LTPB = wattage of line-voltage lighting tracks and plug-in busways as the specified wattage of the luminaires but at least 30 W/lin. ft. (100 W/lin m), or the wattage limit of the system's circuit breaker, or the wattage limit of other permanent current limiting devices on the system

Other = the wattage of all other luminaires and lighting sources not covered above and associated with interior lighting verified by data supplied by the manufacturer or other approved sources.

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. *Sleeping unit* lighting in hotels, motels, boarding houses or similar buildings.
 - 1.3. Emergency lighting automatically off during normal building operation.
 - 1.4. Lighting in spaces specifically designed for use by occupants with special lighting needs including the visually impaired visual impairment and other medical and age-related issues.
 - 1.5. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
 - 1.6. Casino gaming areas.
2. Lighting equipment used for the following shall be exempt provided that it is in addition to general lighting and is controlled by an independent control device:
 - 2.1. Task lighting for medical and dental purposes.
 - 2.2. Display lighting for exhibits in galleries, museums and monuments.
3. Lighting for theatrical purposes, including performance, stage, film production and video production.
4. Lighting for photographic processes.
5. Lighting integral to equipment or instrumentation and is installed by the manufacturer.
6. Task lighting for plant growth or maintenance.
7. Advertising signage or directional signage.
8. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.
9. Lighting equipment that is for sale.

10. Lighting demonstration equipment in lighting education facilities.
11. Lighting *approved* because of safety or emergency considerations, inclusive of exit lights.
12. Lighting integral to both open and glass-enclosed refrigerator and freezer cases.
13. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.
14. Furniture mounted supplemental task lighting that is controlled by automatic shutoff.

Reason: The provisions in Section C405.5.1 deal with the determination of a value for the actual connected interior lighting power in a building that is more appropriately addressed as an equation. This proposal simplifies the provisions associated with connected interior lighting power to present as an equation what is now text that guides how the connected lighting power is calculated. The objective of this proposal is to simplify the code to foster implementation and compliance verification.

Cost Impact: The code change proposal does not increase the cost of construction.

C405.5.1 #1-EC-WILLIAMS.doc

Committee Action Hearing Results

The following errata were not posted to the ICC website. The proposal also includes deleting the following sections.

C405.5.1.1 Screw lamp holders. The wattage shall be the maximum *labeled* wattage of the luminaire.

C405.5.1.2 Low-voltage lighting. The wattage shall be the specified wattage of the transformer supplying the system.

C405.5.1.3 Other luminaires. The wattage of all other lighting equipment shall be the wattage of the lighting equipment verified through data furnished by the manufacturer or other *approved* sources.

C405.5.1.4 Line-voltage lighting track and plug-in busway. The wattage shall be:

1. The specified wattage of the luminaires included in the system with a minimum of 30 W/lin ft. (98 W/lin. m);
2. The wattage limit of the system's circuit breaker; or
3. The wattage limit of other permanent current limiting device(s) on the system.

(Portions of proposal not shown remain unchanged)

Committee Action:

Approved as Submitted

Committee Reason: The proposal takes existing text in 4 subsections and replaces them with an equation that does the same thing. The committee felt the proposal simplified the code without any resulting technical change.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.5.1 Total connected interior lighting power. The total connected interior lighting power (watts) shall be the sum of the watts of all interior lighting equipment as determined in accordance with Equation 4-6.

$\text{TCILP_TCILP} = [\text{SL} + \text{LV} + \text{LTPB} + \text{Other}]$

(Equation 4-6)

where:

TCILP_TCILP = total connected interior lighting power (watts)
SL = labeled wattage of luminaires for screw in lamps

LV = wattage of the transformer supplying low-voltage lighting
 LTPB = wattage of line-voltage lighting tracks and plug-in busways as the specified wattage of the luminaires but at least 30 W/lin. ft. (100 W/lin m), or the wattage limit of the system's circuit breaker, or the wattage limit of other permanent current limiting devices on the system
 Other = the wattage of all other luminaires and lighting sources not covered above and associated with interior lighting verified by data supplied by the manufacturer or other *approved* sources.

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. *Sleeping unit* lighting in hotels, motels, boarding houses or similar buildings.
 - 1.3. Emergency lighting automatically off during normal building operation.
 - 1.4. Lighting in spaces specifically designed for use by occupants with special lighting needs including the visually impaired visual impairment and other medical and age-related issues.
 - 1.5. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
 - 1.6. Casino gaming areas.
2. Lighting equipment used for the following shall be exempt provided that it is in addition to general lighting and is controlled by an independent control device:
 - 2.1. Task lighting for medical and dental purposes.
 - 2.2. Display lighting for exhibits in galleries, museums and monuments.
3. Lighting for theatrical purposes, including performance, stage, film production and video production.
4. Lighting for photographic processes.
5. Lighting integral to equipment or instrumentation and is installed by the manufacturer.
6. Task lighting for plant growth or maintenance.
7. Advertising signage or directional signage.
8. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.
9. Lighting equipment that is for sale.
10. Lighting demonstration equipment in lighting education facilities.
11. Lighting *approved* because of safety or emergency considerations, inclusive of exit lights.
12. Lighting integral to both open and glass-enclosed refrigerator and freezer cases.
13. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.
14. Furniture mounted supplemental task lighting that is controlled by automatic shutoff

Commenter's Reason: At the code development hearing, there was a concern raised through opposing testimony about "double-counting." The proponent indicated that there was no double-counting in the proposal, and this was re-verified when looking at the change and considering if a public comment to address any double counting was needed.

DOE reviewed how the code change placed the current provisions in Sections C405.5.1.1 through C405.5.1.4 in equation form, and verified that there is no double-counting in the code change proposal. When doing that re-evaluation, DOE did note that the term TCLP would be more accurate if it referred to interior lighting power, so as not to confuse the user of the code with exterior lighting power. The only change suggested in this public comment is to reference 'total connected interior lighting power,' or TCILP.

One comment DOE received on their draft public comment suggesting the following additional revisions to the code text that was recommended for approval at the first hearing.

SL = labeled wattage of luminaires for 120-277 Volt screw in lamps

LV = Labeled wattage of low voltage lamps plus the estimated wattage loss of the transformers supplying low-voltage lighting

As stated in the original code change, the intent was to take what is currently a series of criteria in C405.5.1.1 through C405.5.1.4 that guide how wattage is to be determined, and put the provisions in those subsections in a more understandable and usable equation format. DOE did not propose any technical changes to the provisions in those subsections in the original change that was recommended for approval.

DOE feels a further modification to this public comment, as suggested above, would change the requirement in the current code and the equation form of that requirement as approved at the first hearing. For that reason, DOE did not choose to implement the above recommendation by further revising this public comment. The purpose for using the transformer rating in the current requirements is similar to the purpose for using the circuit capacity or permanent circuit limiter capacity associated with line voltage track. Since these systems can have additional lamps easily installed after compliance is verified, the code must capture what that maximum could be for compliance. It currently does that in C405.5.1.2 and the LV component of the equation above. Similarly C405.5.1.1 does not specify a voltage range for screw in lamps so DOE did not include it in the original code change that was approved and does not feel it appropriate to include it in this public comment.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE309-13

Final Action: AS AM AMPC____ D

CE310-13

C405.5.1, C405.5.3 (NEW), Table C405.5.2(1), Table C405.5.2(2)

Proposed Change as Submitted

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

Revise as follows:

C405.5.1 Total connected interior lighting power. The total connected interior lighting power (watts) shall be the sum of the watts of all interior lighting equipment as determined in accordance with Sections C405.5.1.1 through C405.5.1.4.

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. Sleeping unit lighting in hotels, motels, boarding houses or similar buildings, provided that the lighting complies with Section R404.1.
 - 1.3. Emergency lighting automatically off during normal building operation.
 - 1.4. Lighting in spaces specifically designed for use by occupants with special lighting needs including the visually impaired visual impairment and other medical and age-related issues.
 - 1.5. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
 - 1.6. Casino gaming areas.
 - 1.7. Mirror lighting in dressing rooms.

(Portions of text not shown remains unchanged)

C405.5.3 Additional interior lighting power. Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where the specified lighting is installed and automatically controlled, separately from the general lighting, to be turned off during nonbusiness hours. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose. An increase in the interior lighting power allowance is permitted in the following cases:

1. For spaces in which lighting is specified to be installed in addition to the general lighting for the purpose of decorative appearance or for highlighting art or exhibits, provided that the additional lighting power shall not exceed 1.0 W/ft² of such spaces.

**TABLE C405.5.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD**

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.9 <u>0.80</u>
Convention center	1.2 <u>1.01</u>
Courthouse	1.2 <u>1.01</u>

BUILDING AREA TYPE	LPD (w/ft2)
Dining: bar lounge/leisure	4.3 <u>1.01</u>
Dining: cafeteria/fast food	4.4 <u>0.9</u>
Dining: family	4.6 <u>0.95</u>
Dormitory	4.0 <u>0.57</u>
Exercise center	4.0 <u>0.84</u>
Fire station	0.8 <u>0.67</u>
Gymnasium	4.1 <u>0.94</u>
Health care clinic	4.0 <u>0.90</u>
Hospital	4.2 <u>1.05</u>
Hotel/ <u>Motel</u>	4.0 <u>0.87</u>
Library	4.3 <u>1.19</u>
Manufacturing facility	4.3 <u>1.17</u>
Motel	4.0
Motion picture theater	4.2 <u>0.76</u>
Multifamily	0.7 <u>0.51</u>
Museum	4.1 <u>1.02</u>
Office	0.9 <u>0.82</u>
Parking garage	0.3 <u>0.21</u>
Penitentiary	4.0 <u>0.81</u>
Performing arts theater	4.6 <u>1.39</u>
Police station	4.0 <u>0.87</u>
Post office	4.1 <u>0.87</u>
Religious building	4.3 <u>1.0</u>
Retail	4.4 <u>1.26</u>
School/University	4.2 <u>0.87</u>
Sports arena	4.1 0.91
Town hall	4.1 <u>0.89</u>

BUILDING AREA TYPE	LPD (w/ft2)
Transportation	4.0 <u>0.70</u>
Warehouse	0.6 <u>0.66</u>
Workshop	1.4 <u>1.19</u>

TABLE C405.5.2(2)
INTERIOR LIGHTING POWER ALLOWANCES:
SPACE-BY-SPACE METHOD

COMMON SPACE-BY-SPACE TYPES	LPD (w/ft2)
Atrium - First <u>that is < 40 feet in height</u>	0.03 per ft. <u>in total height</u> ht.
Atrium - Above <u>that is > 40 feet in height</u>	<u>0.40 + 0.02 per ft. in total height</u> ht.
Audience/seating area - permanent For auditorium For performing arts theater For motion picture theater	0.9 <u>0.63</u> 2.6 <u>2.43</u> 1.2 <u>1.14</u>
Classroom/lecture/training	1.30 <u>1.24</u>
Conference/meeting/multipurpose	1.2 <u>1.23</u>
<u>Copy/Print room</u>	<u>0.72</u>
Corridor/transition	0.7 <u>0.66</u>
<u>Computer Room</u>	<u>1.71</u>
Dining area Bar/lounge/leisure dining Family dining area <u>Cafeteria/Fast Food Dining</u>	1.40 <u>1.07</u> 1.40 <u>0.89</u> <u>0.65</u>
Dressing/fitting room in performing arts theater	1.1 <u>0.61</u>
Electrical/mechanical	1.10 <u>0.42</u>
<u>Emergency Vehicle Garage</u>	<u>0.56</u>
Food preparation	1.20 <u>1.21</u>
Laboratory for classrooms	1.3 <u>1.43</u>
Laboratory for medical/industrial/research	1.8 <u>1.81</u>
<u>Laundry/Washing area</u>	<u>0.60</u>
<u>Loading Dock (interior)</u>	0.47
Lobby	1.10 <u>0.90</u>
Lobby for performing arts theater	3.3 <u>2.00</u>
Lobby for motion picture theater	1.0 <u>0.59</u>
<u>Lobby - elevator</u>	<u>0.64</u>
<u>Lobby for Hotel</u>	<u>1.06</u>
Locker room	0.80 <u>0.75</u>

Lounge/-recreation Breakroom	0.8 0.73
Office- enclosed	4.4 1.11
Office- open plan	4.0 0.98
Pharmacy Area	1.68
Restroom	1.0 0.98
Sales area	4.6 ^a 1.44
Stairway	0.70 0.69
Storage	0.8 0.63
Vehicular Maintenance Area	0.67
Workshop	4.60 1.59
BUILDING SPECIFIC SPACE-BY-SPACE TYPES	
Courthouse/police station/penitentiary	
Courtroom	4.90 1.72
Confinement cells	4.4 0.81
Judge chambers	4.3
Penitentiary audience seating	0.5 0.28
Penitentiary classroom	4.3 1.34
Penitentiary dining	4.4 0.96
Automotive service/repair	0.70
Bank/office- banking activity area	4.5 1.01
Dormitory living quarters bedrooms	4.40 0.38
Gymnasium/fitness center	
Fitness Exercise area	0.9 0.72
Gymnasium audience/seating	0.40 0.65
Playing area	4.40 1.2
Healthcare clinic/hospital	
Corridors/transition	4.00 0.99
Exam/treatment	4.7 1.66
Emergency	2.70
Public and staff lounge	0.80
Medical supplies	4.40 0.74
Nursery	0.9 0.88
Nurse station	4.00 0.71
Physical therapy	0.90 0.91
Patient room	0.70 0.62
Pharmacy	4.20
Radiology/imaging	4.3 1.51
Operating room	2.20 2.48
Recovery	4.2 1.15
Lounge/Breakroom	0.8 0.92
Laundry - washing	0.60
Hotel	
Dining area	4.30
Guest rooms	4.40
Hotel lobby	2.40
Highway lodging dining	4.20
Highway lodging guest rooms	4.40

Library		
Stacks	1.70	<u>1.71</u>
Card file and cataloguing	1.40	<u>1.40</u>
Reading area	1.20	<u>1.06</u>
Manufacturing		
Corridors/transition	0.40	<u>0.41</u>
Detailed manufacturing	1.3	<u>1.29</u>
Equipment room	1.0	<u>0.74</u>
Extra high bay (>50-foot floor-ceiling height)	1.1	<u>1.05</u>
High bay (25-- 50-foot floor-ceiling height)	1.20	<u>1.23</u>
Low bay(< 25-foot floor-ceiling height)	1.2	<u>1.19</u>
Museum		
General exhibition	1.00	<u>1.05</u>
Restoration	1.70	<u>1.02</u>
Parking garage - garage areas	0.2	<u>0.19</u>
Convention center		
Exhibit space	1.50	<u>1.45</u>
Audience/seating area	0.90	<u>0.82</u>
Fire stations		
Engine room	0.80	<u>0.80</u>
Fire Station Sleeping Quarters	0.30	<u>0.22</u>
Post office Sorting area	0.9	<u>0.94</u>
Religious building		
Fellowship hall	0.60	<u>0.64</u>
Audience seating	2.40	<u>1.53</u>
Worship pulpit/choir	2.40	<u>1.53</u>
Retail		
Dressing/fitting area	0.9	<u>0.71</u>
Mall concourse	1.6	<u>1.10</u>
Sales area	1.6	<u>1.59</u>
Sports arena		
Audience seating	0.4	<u>0.43</u>
Court sports Playing area - Class 4	0.7	<u>1.20</u>
Court sports Playing area - Class 3	1.2	<u>1.80</u>
Court sports Playing area - Class 2	1.9	<u>2.40</u>
Court sports Playing area - Class 1	3.0	<u>3.68</u>
Ring sports area	2.7	<u>2.7</u>
Transportation		
Air/train/bus baggage area	1.00	<u>0.53</u>
Airport concourse	0.60	<u>0.36</u>
Terminal - ticket counter	1.50	<u>0.80</u>
Warehouse		
Fine material storage small hand-carried items	1.40	<u>0.95</u>
Medium/bulky material, palletized items	0.60	<u>0.58</u>

(Portions of Table not shown remain unchanged)

Reason: The purpose of this change is to adjust the lighting power density allowances to the best available values. "Best" means values and methodology for determining allowances that will lead to high energy-efficiency while still allowing high-quality lighting and sufficient light levels. We believe that the best source for these values are the models maintained by Pacific Northwest National Lab (PNNL) for the DOE in support of ASHRAE/IES Standard 90.1 development. Recently the models were updated to account for some changes in recommended light levels in the new Lighting Handbook, 10th Edition from the Illuminating Engineering Society

(IES). Additionally several new space types were added and some space types renamed or removed for clarity. Also, the Building Area Method values were based on a larger data set with 56% additional representative buildings.

Additional explanation of proposed changes by section:

Exception 1.2 to C405.5.1, (Sleeping Unit exception to lighting power limits)

Sleeping Units should be subject to the same requirements as Dwelling Units and residential buildings covered by Chapter 4 [RE].

Add exception for Mirror Lighting in Dressing Rooms.

Because this exception is in Standard 90.1, we assume that the LPD for Dressing/Fitting Room space types was developed with mirror lighting excluded. Without this exception the LPD limit for Dressing Rooms would be too low.

Add "Additional Interior Lighting Power" section.

This provision is an integral part of the space-by-space method. IECC-2012 already includes the additional power for retail as a footnote to the LPD table. The proposal adds the special allowance for decorative lighting and lighting for art and exhibits. IECC-2012 is missing this allowance, which is why some of the LPD values in IECC-2012 for some space types are higher than 90.1-2010. This allowance is a "use it or lose it" addition that can only be used for certain types of lighting. This provision gives the designer more flexibility but should not result in significant increase or decrease in stringency. The proposed new space-by-space LPD values were developed with the understanding that this additional allowance is available to the designer. The LPDs would not be valid for many space types without this additional allowance.

Revise Building Area Method LPDs (Table C405.5.2(1))

As mentioned above, these proposed values are from current PNNL models. These values were published in the public review draft of Addendum "co" to ASHRAE/IES Standard 90.1.

Revise Space-by-space Method LPDs (Table C405.5.2(2))

As mentioned above, these proposed values and space types are from current PNNL models. These values were published in the public review draft of Addendum "bh" to ASHRAE/IES Standard 90.1. The formatting and the ordering of space types that is in the IECC-2012 table were changed as little as possible. In order to accommodate the new space types, and the renaming or removal of a few space types, some rearrangement was necessary.

Cost Impact: The code change proposal will not increase the cost of construction.

C405.5.1 #1-EC-HEINMILLER.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The changes proposed increase the usability of the IECC. Designers are already using these revised provisions in their designs.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

TABLE C405.5.2(2)
INTERIOR LIGHTING POWER ALLOWANCES:
SPACE-BY-SPACE METHOD

COMMON SPACE-BY-SPACE TYPES	LPD (w/ft ²)
Atrium -that is < 40 feet in height	0.03 per ft. in total height ht.
Atrium -that is > 40 feet in height	0.40 + 0.02 per ft. in total height ht.
Audience/seating area - permanent For auditorium For performing arts theater For motion picture theater	0.63 2.43 1.14
Classroom/lecture/training	1.24

Conference/meeting/multipurpose	1.23
Copy/Print room	0.72
Corridor/transition	0.66
Computer Room	1.74
Dining-area	
Bar/lounge/leisure dining	1.07
Family dining-area	0.89
Cafeteria/Fast Food Dining	0.65
Dressing/fitting room in performing arts theater	0.61
Electrical/mechanical	0.42
Emergency Vehicle Garage	0.56
Food preparation	1.21
Laboratory for classrooms	1.43
Laboratory for medical/industrial/research	1.84
Laundry/Washing area	0.60
Loading Dock (interior)	0.47
Lobby	0.90
Lobby for performing arts theater	2.00
Lobby for motion picture theater	0.59
Lobby - elevator	0.64
Lobby for Hotel	1.06
Locker room	0.75
Lounge/Breakroom	0.73
Office- enclosed	1.11
Office- open plan	0.98
Pharmacy Area	1.68
Restroom	0.98
Sales-area	1.44
Stairway	0.69
Storage	0.63
Vehicular Maintenance Area	0.67
Workshop	1.59
BUILDING SPECIFIC SPACE-BY-SPACE TYPES	
Courthouse/police station/penitentiary	
Courtroom	1.72
Confinement cells	0.81
Penitentiary audience seating	0.28
Penitentiary classroom	1.34
Penitentiary dining	0.96
Bank/office- banking activity area	1.01
Dormitory bedrooms	0.38
Gymnasium/fitness center	
Exercise area	0.72
Gymnasium audience/seating	0.65
Playing area	1.2

Healthcare-clinic/hospital	
Corridors/transition	0.99
Exam/treatment	1.66
Medical-supplies	0.74
Nursery	0.88
Nurse station	0.71
Physical therapy	0.91
Patient room	0.62
Radiology/imaging	1.51
Operating room	2.48
Recovery	1.15
Lounge/Breakroom	0.92
Library	
Stacks	1.71
Reading area	1.06
Manufacturing	
Corridors/transition	0.41
Detailed manufacturing	1.29
Equipment room	0.74
Extra-high bay (>50-foot floor-ceiling height)	1.05
High bay (25-- 50-foot floor-ceiling height)	1.23
Low bay (< 25-foot floor-ceiling height)	1.19
Museum	
General exhibition	1.05
Restoration	1.02
Parking garage - garage areas	0.19
Convention center	
Exhibit space	1.45
Audience/seating area	0.82
Fire Station Sleeping Quarters	-0.22
Post-office Sorting area	0.94
Religious building	
Fellowship hall	0.64
Audience seating	1.53
Worship pulpit/choir	1.53
Retail	
Dressing/fitting area	0.71
Mall-concourse	1.10
Sales area	1.59
Sports arena	
Audience seating	0.43
Playing area - Class 4	1.20
Playing area - Class 3	1.80
Playing area - Class 2	2.40
Playing area - Class 1	3.68
Transportation	
Air/train/bus baggage area	0.53
Airport concourse	0.36
Terminal - ticket counter	0.80
Warehouse	
small hand-carried items	0.95
Medium/bulky material, palletized items	0.58

TABLE C405.5.2(2)
 INTERIOR LIGHTING POWER ALLOWANCES:
 SPACE-BY-SPACE METHOD

Common Space Types^a	LPD (watts/s q.ft)
Atrium	
<i>... that is < 20' in height</i>	0.03 per foot in total height

<i>... that is \geq 20' and \leq 40' in height</i>	0.03 per foot in total height
<i>... that is $>$ 40' in height</i>	0.40 + 0.02 per foot in total height
Audience Seating Area	
<i>... in an auditorium</i>	0.63
<i>... in a convention center</i>	0.82
<i>... in a gymnasium</i>	0.65
<i>... in a motion picture theater</i>	1.14
<i>... in a penitentiary</i>	0.28
<i>... in a performing arts theater</i>	2.43
<i>... in a religious building</i>	1.53
<i>... in a sports arena</i>	0.43
<i>... otherwise</i>	0.43
Banking Activity Area	1.01
Breakroom (See Lounge/Breakroom)	
Classroom/Lecture Hall/Training Room	
<i>... in a penitentiary</i>	1.34
<i>... otherwise</i>	1.24
Conference/Meeting/Multipurpose Room	1.23
Confinement Cells	0.81
Copy/Print Room	0.72
Corridor^b	
<i>... in a Facility for the Visually Impaired (and not used primarily by the staff)^c</i>	0.92
<i>... in a hospital</i>	0.79
<i>... in a manufacturing facility</i>	0.41
<i>... otherwise</i>	0.66
Courtroom	1.72
Computer Room	1.71
Dining Area	
<i>... in a penitentiary</i>	0.96
<i>... in a Facility for the Visually Impaired (and not used primarily by the staff)^c</i>	1.9
<i>... in Bar/Lounge or Leisure Dining</i>	1.07
<i>... in Cafeteria or Fast Food Dining</i>	0.65
<i>... in Family Dining</i>	0.89
<i>... otherwise</i>	0.65
Electrical/Mechanical Room	0.42
Emergency Vehicle Garage	0.56
Food Preparation Area	1.21
Guest Room	0.47
Laboratory	
<i>... in or as a classroom</i>	1.43
<i>... otherwise</i>	1.81
Laundry/Washing Area	0.6
Loading Dock, Interior	0.47
Lobby	
<i>... in a Facility for the Visually Impaired (and not used primarily by the staff)^c</i>	1.8
<i>... for an elevator</i>	0.64
<i>... in a hotel</i>	1.06

<i>... in a motion picture theater</i>	0.59
<i>... in a performing arts theater</i>	<u>2</u>
<i>... otherwise</i>	0.9
Locker Room	0.75
Lounge/Breakroom	
<i>... in a healthcare facility</i>	0.92
<i>... otherwise</i>	0.73
Office	
<i>... enclosed and <= 250 sq.ft</i>	1.11
<i>... enclosed and > 250 sq.ft</i>	1.11
<i>... open plan</i>	0.98
Parking Area, Interior	0.19
Pharmacy Area	1.68
Restroom	
<i>... in a Facility for the Visually Impaired (and not used primarily by the staffs^c)</i>	1.21
<i>... otherwise</i>	0.98
Sales Area	1.59
Seating Area, General	0.54
Stairway	See space containing stairway
Stairwell	0.69
Storage Room	
<i>... < 50 sq.ft</i>	0.63
<i>... >= 50 sq.ft and <= 1,000 sq.ft</i>	0.63
<i>... otherwise</i>	0.63
Vehicular Maintenance Area	0.67
Workshop	1.59
Building Type Specific Space Types^a	LPD (watts/s q.ft)
Facility for the Visually Impaired^c	
<i>... in a chapel (and not used primarily by the staff)</i>	2.21
<i>... in a recreation room (and not used primarily by the staff)</i>	2.41
Automotive (See Vehicular Maintenance Area above)	
Convention Center - Exhibit Space	1.45
Dormitory - Living Quarters	0.38
Fire Station - Sleeping Quarters	0.22
Gymnasium/Fitness Center	
<i>... in an Exercise Area</i>	0.72
<i>... in a Playing Area</i>	1.2
Healthcare Facility	
<i>... in an Exam/Treatment Room</i>	1.66
<i>... in an Imaging Room</i>	1.51
<i>...in a Medical Supply Room</i>	0.74
<i>... in a Nursery</i>	0.88
<i>... in a Nurse's Station</i>	0.71
<i>... in an Operating Room</i>	2.48
<i>... in a Patient Room</i>	0.62
<i>... in a Physical Therapy Room</i>	0.91
<i>... in a Recovery Room</i>	1.15
Library	
<i>... in a Reading Area</i>	1.06
<i>... in the Stacks</i>	1.71

Manufacturing Facility	
... in a detailed manufacturing area	1.29
... in an Equipment Room	0.74
... in an Extra High Bay Area (> 50' floor-to-ceiling height)	1.05
... in a High Bay Area (25-50' floor-to-ceiling height)	1.23
... in a Low Bay Area (< 25' floor-to-ceiling height)	1.19
Museum	
... in a General Exhibition Area	1.05
... in a Restoration Room	1.02
Performing Arts Theater - Dressing Room	0.61
Post Office - Sorting Area	0.94
Religious Buildings	
... in a Fellowship Hall	0.64
... in a Worship/Pulpit/Choir Area	1.53
Retail Facilities	
... in a Dressing/Fitting Room	0.71
... in a Mall Concourse	1.1
Sports Arena - Playing Area	
... for a Class I facility	3.68
... for a Class II facility	2.4
... for a Class III facility	1.8
... for a Class IV facility	1.2
Transportation Facility	
... in a baggage/carousel Area	0.53
... in an Airport Concourse	0.36
... at a Terminal Ticket Counter	0.8
Warehouse - Storage Area	
...for medium to bulky, palletized items	0.58
... for smaller, hand-carried items	0.95

- In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
- In corridors, the extra LPD allowance is not based on the RCR and shall be permitted when the width of the corridor is less than 8 feet
- A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for either senior long-term care, adult daycare, senior support and/or people with special visual needs.

(Portions of the proposal not shown remain unchanged)

Commenter's Reason: The intent of the original proposal is to have the space by space lighting power densities in the IECC match the lighting power densities in 90.1. Standard 90.1-2013 will also be published to include a reformatted space by space table which is intended to have consistent formatting, and hopefully more readable and usable. For example, the current Table in the IECC has separate rows for Atriums less than 40 feet in height, and Atriums greater than 40 feet in height, then in the next row for audience/seating areas, there are three rows in the group. This comment makes it so similar types of spaces are grouped together, then if there are separate requirements for different types of spaces in a similar grouping, the requirements are broken out in a consistently formatted manner.

This proposal will make the values in the table, and the formatting of the table consistent with how they will be published in 90.1-2013.

CE310-13

Final Action: AS AM AMPC____ D

CE312-13

C405.5.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C405.5.1 Total connected interior lighting power. The total connected interior lighting power (watts) shall be the sum of the watts of all interior lighting equipment as determined in accordance with Sections C405.5.1.1 through C405.5.1.4

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. Lighting ~~units~~ lighting in hotels, motels, boarding houses or similar buildings.
 - 1.3. Emergency lighting automatically off during normal building operation.
 - 1.4. Lighting in spaces specifically designed for use by occupants with special lighting needs including the visually impaired visual impairment and other medical and age-related issues.
 - 1.5. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
 - 1.6. Casino gaming areas.
2. Lighting equipment used for the following shall be exempt provided that it is in addition to general lighting and is controlled by an independent control device:
 - 2.1. Task lighting for medical and dental purposes.
 - 2.2. Display lighting for exhibits in galleries, museums and monuments.
3. Lighting for theatrical purposes, including performance, stage, film production and video production.
4. Lighting for photographic processes.
5. Lighting integral to equipment or instrumentation and is installed by the manufacturer.
6. Task lighting for plant growth or maintenance.
7. Advertising signage or directional signage.
8. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.
9. Lighting equipment that is for sale.
10. Lighting demonstration equipment in lighting education facilities.
11. Lighting *approved* because of safety or emergency considerations, inclusive of exit lights.
12. Lighting integral to both open and glass-enclosed refrigerator and freezer cases.
13. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.
14. Furniture mounted supplemental task lighting that is controlled by automatic shutoff.

Reason: This proposal simplifies the exception to the interior lighting power in sleeping units. The definition of sleeping unit is such that there is no further need to delineate the building type in which the sleeping unit is located. In fact, the delineation suggests there are others that are not "similar" to hotels, motels, and boarding houses where the exception would not apply (e.g., dormitories).

Cost Impact: The code change proposal does not increase the cost of construction.

C405.5.1 #2-EC-WILLIAMS.doc

Committee Action Hearing Results

The following errata were not posted to the ICC website. The added text 'Lighting in ' should have been underlined.

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. Lighting in sleeping units.

Committee Action:

Disapproved

Committee Reason: The committee is concerned that reducing the text to sleeping units, that the application to guest rooms that are full dwelling units is unclear.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Submitted.

Commenter's Reason: At the code development hearing, there was no opposition to proposal CE312-13 from the floor. After it went to committee, there was a concern raised that the proposal language would open the door to exempting suites from the lighting provisions in the code. As it had gone to committee, there was no further opportunity to provide a response. The apparent confusion about sleeping units was enough to create doubt, and the code change proposal was disapproved with a vote of 5 to 4.

Proposal CE312-13 is simply a clarification to the code. The term "lighting in" is needed to provide a subject for the exception, and is consistent with other exceptions to Section C405.5.1 and general criteria in Section C405. The code currently uses a vague and undefined term "other similar buildings" that leads to interpretation issues when considering buildings other than hotels, motels, or boarding houses. Most important, regardless of the above two clarifications in the code, the end result is the current code exempts lighting in sleeping units from consideration in the LPD calculation, and the proposed code text does, as well.

The current code clearly intends that lighting in sleeping units not be included in the LPD calculations. *Sleeping unit* is defined in Chapter 2 of the code as:

A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

As defined, there appears no need to indicate what types of buildings such a unit must be located in. For instance, if a suite meets the definition of a sleeping unit, then under the current code and proposed code it would be exempt. If it is not a sleeping unit, then, by definition, it is a dwelling unit and is **not** exempt – the distinction being a dwelling unit, unlike a sleeping unit, has **both** sanitation and kitchen facilities.

The reason given for disapproval was the unclear nature of the application of lighting requirements to guest rooms that are full dwelling units. Both terms are defined in the code, and the intent of proposal CE312-13 is not to change the definitions or requirements, but simply to clarify the exception. If a room, suite, area or other living space in any building is defined as a sleeping unit, then the code exempts the lighting in that space from the LPD criterion. If not a sleeping unit, then it is a dwelling unit and therefore not exempt. CE312-13 makes no change to those requirements. If there is a concern about the unclear application of the lighting criteria, it will remain in the existing code if this change is disapproved, because the terms used are defined in the current code without respect to the type of building in which the sleeping units or dwelling units are located.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. EERE-2012-BT-BC-0030) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE312-13

Final Action:

AS

AM

AMPC_____

D

CE319-13

C405.6, C405.6.1, C405.6.2

Proposed Change as Submitted

Proponent: Glenn Heinmiller, Lam Partners, International Association of Lighting Designers
(glenn@lampartners.com)

Revise as follows:

C405.6 Exterior lighting (Mandatory). Where the power for exterior lighting is supplied through the energy service to the building, all exterior lighting, ~~other than low-voltage landscape lighting~~, shall comply with Sections ~~C405.6.1 and~~ C405.6.2.

Exception: Where *approved* because of historical, safety, signage or emergency considerations.

~~**C405.6.1 Exterior building grounds lighting.** All exterior building grounds luminaires that operate at greater than 100 watts shall contain lamps having a minimum efficacy of 60 lumens per watt unless the luminaire is controlled by a motion sensor or qualifies for one of the exceptions under Section C405.6.2.~~

C405.6.2 Exterior building lighting power. The total exterior lighting power allowance for all exterior building applications is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated and are permitted in Table C405.6.2(2) for the applicable lighting zone. Tradeoffs are allowed only among exterior lighting applications listed in Table C405.6.2(2), Tradable Surfaces section. The lighting zone for the building exterior is determined from Table C405.6.2(1) unless otherwise specified by the local jurisdiction. ~~Exterior lighting for all applications (except those included in the exceptions to Section C405.6.2) shall comply with the requirements of Section C405.6.1.~~

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional and marker lighting associated with transportation;
2. Advertising signage or directional signage;
3. Integral to equipment or instrumentation and is installed by its manufacturer;
4. Theatrical purposes, including performance, stage, film production and video production;
5. Athletic playing areas;
6. Temporary lighting;
7. Industrial production, material handling, transportation sites and associated storage areas;
8. Theme elements in theme/amusement parks; and
9. Used to highlight features of public monuments and registered historic landmark structures or buildings.

Reason: Simplify the code without reducing stringency.

C405.6 -The exemption of "low-voltage landscape lighting" makes no sense and adds unnecessary complexity. This exemption is not in Standard 90.1.

C405.6.1 This is an obsolete and redundant provision that should have been removed from IECC when the lighting power density method was introduced for exterior lighting. The provision adds no value to the code and increases complexity.

Cost Impact: The code change proposal will not increase the cost of construction.

C405.6-EC-HEINMILLER.doc

Committee Action Hearing Results

Committee Action: **Approved as Submitted**

Committee Reason: Refines the requirement to focus on the system of lighting and not individual fixtures.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.1 General (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior and exterior applications, electrical energy consumption, and ~~minimum acceptable lighting equipment for exterior applications.~~

Commenter's Reason: This proposal CE319 removes the only requirement in the code covering the "minimum acceptable lighting equipment for exterior applications". Exterior lighting is regulated by limiting lighting power. The general description in C405.1 needs to be modified to reflect this.

CE319-13

Final Action: AS AM AMPC_____ D

CE323-13

C405.7, C405.7.1 (NEW), C405.7.2 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C405.7 Electrical energy consumption (Mandatory). ~~In buildings having individual dwelling units, provisions shall be made to determine the electrical energy consumed by each tenant by separately metering individual dwelling units.~~ Meters, metering devices or other provisions shall be installed capable of determining the electrical energy consumed by and within the building in accordance with this section.

C405.7.1 Multi-family residential buildings. ~~In buildings having individual dwelling units, provisions shall be made to determine the electrical energy consumed within each dwelling unit by separately metering individual dwelling units.~~

C405.7.2 Buildings other than multi-family residential buildings. Metering devices capable of measuring electrical energy use shall be provided for the total electrical energy system, HVAC systems, interior lighting systems, exterior lighting systems and receptacle circuits in each building and, for other than shared systems, each separate tenancy within the building. The measurement devices shall have the capability to record electrical energy use at least every 15 minutes and report that use on at least an hourly, daily, monthly and annual basis and retain the recorded data at least 36 months.

Exceptions: Metering devices are not required for the following spaces and systems:

1. Buildings less than 10,000 square feet in net floor area.
2. Individual tenant spaces less than 5,000 square feet in net floor area.
3. Dwelling units
4. Residential buildings with less than 10,000 square feet of common area.
5. Critical and equipment branches covered in the Article 517 of NFPA 70

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised with respect to energy metering. The change ensures continued consistency between the IECC and standard 90.1-2010. It retains the current provisions in the IECC for multi-family residential buildings and then includes electrical metering provisions for other building types and occupancies.

Cost Impact: The code change proposal will increase the cost of construction when monitoring devices are required.

C405.7-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Consistent with the action taken on CE325-13, this similar proposal was disapproved.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.7 Electrical Energy consumption monitoring (Mandatory). Meters, metering devices or other provisions shall be installed in new buildings capable of determining the electrical energy consumed by and within the building in accordance with this section.

C405.7.1 System electrical energy monitoring. Metering devices capable of measuring electrical energy use shall be provided for each of the following: total electrical energy system, HVAC systems, interior lighting systems, exterior lighting systems and receptacle circuits in each building.

Metering devices capable of measuring electrical energy use shall be provided in each building for each of the following: total electrical energy system, HVAC systems, interior lighting systems, exterior lighting systems and receptacle circuits.

Exception: Up to 10 percent of the electrical load being metered or monitored for HVAC systems, interior lighting systems, exterior lighting systems, and receptacle circuits shall be permitted to be from other electrical loads.

C405.7.1.1 Multi-family residential buildings. In buildings having individual dwelling units, provisions shall be made to determine the electrical energy consumed within each dwelling unit by separately metering individual dwelling units.

C405.7.2 Buildings other than multi-family residential buildings Recording and reporting from monitoring. Metering devices capable of measuring electrical energy use shall be provided for the total electrical energy system, HVAC systems, interior lighting systems, exterior lighting systems and receptacle circuits in each building.

The measurement devices shall have the capability to record electrical energy use at least every 15 minutes and report that use on at least an hourly, daily, monthly and annual basis and retain the recorded data for at least 36 months.

Exceptions: Metering devices are not required for the following spaces and systems:

1. Buildings less than 40,000 25,000 square feet in net floor area.
2. Individual tenant spaces less than 5,000 10,000 square feet in net floor area.
3. Dwelling units and sleeping units
4. Group R-2 occupancy Residential buildings with less than 10,000 square feet of common area.
5. Critical and equipment branches covered in the Article 517 of NFPA 70
6. Group R-1 and A-2 occupancies.

C405.7.3 Whole building energy monitoring. Meters, metering devices or other provisions shall be installed at the building site to monitor the energy usage of each new building to monitor the building use of the following types of energy supplied by a utility, energy provider, or plant that is not within the building:

1. Natural gas
2. Fuel oil
3. Propane
4. Steam
5. Chilled water
6. Hot water

Exception: Whole building energy monitoring is not required for the following buildings, spaces, or equipment:

1. Buildings less than 25,000 square feet in net floor area.
2. Individual tenant spaces less than 10,000 square feet in net floor area.
3. Group R-2 occupancy buildings with less than 10,000 square feet of common area.
4. Equipment that uses fuel for on-site emergencies

C405.7.3.1 Recording and reporting or whole building energy use. When measurement devices are required in accordance with Section C405.7.3, the measurement devices shall have the capability to record energy use at least every 60 minutes and report that use on at least an hourly, daily, monthly and annual basis and retain the recorded data for at least 36 months.

Commenter's Reason: Submetering requirements were added to ASHRAE 90.1-2010. The proposed addendum expands the submetering requirements to cover all fuels that are used by a building. This will ensure that the building owners and operators receive information about all of the energy being used by building equipment.

This language will make the IECC consistent with the latest submetering requirements that will be published in ASHRAE 90.1-2013. This language is an improvement in that it requires that only new buildings meet the requirements, and also requires the metering of fossil fuels at buildings, which will lead to more energy savings. Several studies have shown that submetering, with the information provided to key personnel, leads to more energy savings during the operation of a building.

The requirements were changed to in addendum bn to 90.1-2013 which will be incorporated into 90.1-2013. There are cases where the submetering requirements would not be cost-justified, due to the number of submeters required, associated installation costs, and potentially low energy cost savings.

A new exception has been added so that for each of the systems being submetered, 10% of the loads can be different equipment (e.g., the meter for receptacles can also be monitoring some lighting). This is to account for electric panel and outlet connection reality (e.g., a desk lamp that is plugged into a receptacle is not really a "plug load", or if there are some receptacle loads being monitored by the "interior lighting" submeter).

These modifications focus the metering requirements on buildings and will ensure that the requirement is cost effective and will result in energy savings, especially in multi-building sites.

By requiring that all major forms of energy are metered, the proposed modifications will ensure that all opportunities for all types of energy and cost savings are addressed, rather than for just one form of energy.

By making these changes, we will prevent situations where hundreds of submeters are installed at a significant cost, especially for major renovations at existing buildings (e.g., hotels and motels with hundreds of fan coil units, PTACs, rooftop units, exhaust fans, etc), that are likely not to be cost-effective.

CE323-13

Final Action: AS AM AMPC_____ D

**CE326-13
C405.8 (New)**

Proposed Change as Submitted

Proponent: Wayne Stoppelmoor, Schneider Electric (wayne.stoppelmoor@schneider-electric.com)

Add new text as follows:

C405.8 Energy monitoring (Mandatory). Buildings with a gross conditioned floor area over 25,000 square feet shall comply with Section C405.8.1 through C405.8.5. Buildings shall be equipped to measure, monitor, record and report energy consumption data for each end-use category required by Section C405.8.2.

Exception: Individual tenant spaces are not required to comply with this section provided the space has its own utility services and meters and has less than 5,000 square feet of conditioned floor area.

C405.8.1 Electrical energy metering. For electrical energy, including all electrical energy supplied to the building and its associated site, including but limited to site lighting, parking, recreational facilities, and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.8.2.

C405.8.2 End-use metering categories. Meters or other measurement devices shall be provided to collect energy use data for each end-use category listed in Table 405.8.1. These meters shall have the capability to collect energy consumption data for the whole building or for each separately metered portion of the building. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the measured load for each of the end-use categories listed in Table 405.8.1 is permitted to be from a load not within that category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit does not require end-use metering.
2. End-use metering is not required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use metering is not required for and individual tenant space having a floor area not greater than 2,500 square feet where a dedicated source meter complying with Section C405.8.3 is provided.

**TABLE 405.8.1
ENERGY USE CATEGORIES**

<u>Load Category</u>	<u>Description of energy use</u>
Total HVAC system	Heating, cooling and ventilation including, but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120 volt equipment, or by 208/120 volt equipment that is located in a building where the main service is 480/277 volt power, is permitted to be excluded from Total HVAC system energy use.
Interior lighting	Lighting systems located within the <i>building</i> .
Exterior lighting	Lighting systems located on the <i>building site</i> but not within the <i>building</i> .
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets
Process loads	Any single load that is not included in a HVAC, lighting, or plug load category and that exceeds 5 percent of the peak connected load of the whole building including, but not limited to data centers, manufacturing equipment and commercial kitchens.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table including, but not limited to, vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas, and snow-melt systems.

C405.8.3 Meters. Meters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.8.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC, or other building systems that can monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of +/-2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections C405.8.4 and C405.8.5.

C405.8.4 Data acquisition system. A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly, and yearly logged data for each end-use category required by Section C405.8.2.

C405.8.5 Graphical energy report. A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each end-use category required by Section C405.8.2 at least every hour, day, month and year for the previous 36 months.

Reason: This proposal saves energy by providing actionable and timely energy consumption data to building owners and operators. For large buildings, this data is further broken out by the major sub-systems (HVAC, lighting, process loads, and plug loads). Estimates in available literature of the energy savings to be expected from metering and monitoring systems vary from 2% to 15%. The effectiveness of each system depends on owners and facility managers observing and acting upon the data provided. Additionally, the 2013 version of ASHRAE Std. 90.1 and several state energy codes will be requiring energy monitoring.

Cost Impact: This requirement will cause a modest increase to the cost of construction. However, such increase in cost will be recovered in a short period of time due to the decreased energy consumed in the building.

C405.8 (NEW)-EC-STOPPELMOOR.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal was similar to CE325-13 and was disapproved for the same reasons.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Duane Jonlin, City of Seattle, Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.8 Energy monitoring (Mandatory). New B-buildings with a gross conditioned floor area over 25,000 square feet shall comply with Section C405.8.1 through C405.8.5. Buildings shall be equipped to measure, monitor, record and report energy consumption data for each energy supply category required by Section C405.8.1 and each end-use category required by Section C405.8.2.

Exception: Individual tenant spaces are not required to comply with this section provided the space has its own utility services and meters and has less than 5,000 square feet of conditioned floor area.

C405.8.1 Energy supply metering. Buildings shall have a meter at each supply for electrical energy, natural gas, district steam, district chilled water and district hot water.

C405.8.1.1 Electrical energy metering. For electrical energy, including all electrical energy supplied to the building and its associated site, including but limited to site lighting, parking, recreational facilities, and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.8.2.

C405.8.2 End-use metering categories. Meters or other measurement devices shall be provided to collect electrical energy use data for each end-use category listed in Table 405.8.1. These meters shall have the capability to collect energy consumption data for the whole building or for each separately metered portion of the building. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the measured load for each of the end-use categories listed in Table 405.8.1 is permitted to be from a load not within that category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit does not require end-use metering.
2. End-use metering is not required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use metering is not required for an individual tenant space having a floor area not greater than 2,500 square feet where a dedicated source meter complying with Section C405.8.3 is provided.

**TABLE 405.8.1
ENERGY USE CATEGORIES**

Load Category	Description of energy use
Total HVAC system	Heating, cooling and ventilation including, but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120 volt equipment, or by 208/120 volt equipment that is located in a building where the main service is 480/277 volt power, is permitted to be excluded from Total HVAC system energy use.
Interior lighting	Lighting systems located within the <i>building</i> .
Exterior lighting	Lighting systems located on the <i>building site</i> but not within the <i>building</i> .
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets
Process loads	Any single load that is not included in a HVAC, lighting, or plug load category and that exceeds 5 percent of the peak connected load of the whole building including, but not limited to data centers, manufacturing equipment and commercial kitchens.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table including, but not limited to, vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas, and snow-melt systems.

C405.8.3 Meters. Meters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.8.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC, or other building systems that can monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of +/-2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections C405.8.4 and C405.8.5.

C405.8.4 Data acquisition system. A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly, and yearly logged data for each energy supply category required by Section C405.8.1 and each end-use category required by Section C405.8.2.

C405.8.5 Graphical energy report. A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each energy supply category required by Section C405.8.1 and each end-use category required by Section C405.8.2 at least every hour, day, month and year for the previous 36 months.

Commenter’s Reason: The overall energy supply entering a building provides the most important data for energy management. Such metering is a relatively inexpensive addition when using pulse meters attached to the main utility meters that serve the building and delivering data to the same monitoring system used for the sub-metering data. Cost for installing pulse meters varies by the utility, generally \$500 to \$1500 each for gas and electric.

In addition, the word “new” was added to the beginning of the proposal to clarify that it applies only to new construction.

Public Comment 2:

Andrei Moldoveanu, representing The National Electrical Manufacturers Association (NEMA), requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.8 Energy monitoring (Mandatory). ~~Buildings~~ New buildings with a gross conditioned floor area over ~~25,000~~ 50,000 square feet shall comply with Section C405.8.1 through C405.8.5. ~~The gross conditioned floor area shall exclude the area of dwelling and sleeping units.~~ Buildings shall be equipped to measure, monitor, record and report ~~energy~~ electric consumption data for each end-use category required by Section C405.8.2.

Exception: Individual tenant spaces, including dwelling and sleeping units, are not required to comply with this section provided the space has its own ~~utility electric meter services and meters~~ electric meter and has less than ~~5,000~~ 20,000 square feet of conditioned floor area.

(Balance of proposal remains unchanged)

Commenter's Reason: The Committee rejected the proposal because 1) it was unclear if it applied to existing buildings; 2) the threshold of 25,000 square feet was too low; and 3) it was not clear if residential dwelling units were exempted. The modified proposal 1) makes it clear that this requirement only applies to new buildings; 2) increases the threshold to 50,000 square feet; and 3) exempts residential dwelling units. It is believed that this revised proposal overcomes the committee's objections. Additionally, there are numerous studies that show the installation of meters and sub-meters in buildings cause a reduction in energy usage.

The committee was not accurate when it said that this proposal (CE326) is similar to CE325. CE325 requires metering of many different fuel types; however, this proposal (CE326) only requires metering of electric energy, which has been demonstrated to reduce energy usage.

CE326-13

Final Action: AS AM AMPC_____ D

CE328-13

C405.8 (NEW), C405.8.1 (NEW), C405.8.2 (NEW)

Proposed Change as Submitted

Proponent: Jim Edelson, New Buildings Institute (jedelson@comcast.net), Eric Makela, Britt/Makela Group, Inc., representing Northwest Energy Codes Group (eric@brittmakela.com)

Add new text as follows:

C405.8 Requirements for solar-ready energy systems (Mandatory). In climates zones 1 through 6, infrastructure shall be provided within the building and space shall be allocated on the roof for future installation of on-site renewable energy systems. The infrastructure and allocated roof space shall be capable of accommodating an energy system with a minimum rating of 3.7 W/ft² or 13 Btu/h·ft² (40 W/m²) multiplied by the total roof area in square feet (m²) and shall comply with Section C405.8.2. Compliance with this section shall be documented as specified in Section C405.8.1.

Exceptions:

1. The portion of the total roof area shaded during the peak sun angle on the summer solstice by natural objects, permanent features of the building or by permanent features of adjacent buildings can be excluded from the total roof area for the purposes of this section.
2. Buildings incorporating an on-site renewable energy systems with a minimum rating of 3.7 W/ft² or 13 Btu/h·ft² (40 W/m²) multiplied by the total roof area in square feet (m²) do not have to meet the requirements of this section.
3. Buildings with four or more stories do not have to meet the requirements of this section .
4. Additions, alterations and repairs to existing buildings do not have to meet the requirements of this section.

C405.8.1 Documentation. Construction documents shall show allocated space and pathways for installation of on-site solar energy systems and associated infrastructure. Documents shall indicate a pathway for one of the following:

1. A pathway for routing of conduit from the roof or alternate reserved space to the main electrical service panel.
2. A pathway for routing of plumbing from the roof or alternate reserved space to the water-heating system.

C405.8.2 Building service for renewable systems. For solar electric the main electrical service panel shall have a minimum busbar rating sufficient to accommodate the power supply from the system and shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location and shall be permanently labeled with "For Solar Electric".

Reason: This proposal provides for the option of installing a future on-site renewable energy system. Design alternatives for renewable systems are generally most plentiful and at the lowest cost at the time of new construction. As the cost of solar energy systems continues to fall, a building's value can be enhanced by providing for the future installation of on-site renewable systems if they are not installed at the time of new construction.

The technical requirements in the proposal are based on values from Title 24 and ASHRAE 189.1 - 2008. The 3-story limitation in this proposal matches the broadest height exclusion in Title 24. The climate zone limits generally follow the annual insolation level of 4 kwh per square meter (source: NREL Flat Plate PV Solar Radiation map). The minimum equipment size ratings are based on ASHRAE 189.1.

The 2011 CASE study for the Title 24 solar-ready measure states: "The proposed code change does not require equipment installation nor does it have any incremental maintenance costs. The only costs associated with the measure are design costs. Initially designers will need to familiarize themselves with the solar-ready requirement, but over time design will become streamlined and the costs will be minimal.

Cost savings from retrofits will result when photovoltaic or solar water heating equipment is easily interconnected with the building electrical or plumbing systems. Installing PV or SWH systems on solar-ready buildings (as defined in the recommended code language) could reduce the installed cost of the system by as much as 10 percent.”

Cost Impact: The code change proposal will not increase the cost of construction.

C405.8 (NEW)-EC-EDELSON-MAKELA.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal only addresses solar and not other renewable energy installations such as wind. While intended to reduce barriers, it actually requires installation of features that may never be used.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jim Edelson, New Buildings Institute; Eric Makela / Britt/Makela Group, Inc. representing Northwest Energy Codes Group, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

APPENDIX A

RENEWABLE READY ENERGY SYSTEMS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION AC101 **GENERAL**

AC101.1 General C405.8 Requirements for solar ready energy systems (Mandatory). Building projects in climate zones 1-6 shall provide for the future installation of *on-site renewable energy* systems with a minimum rating of 3.7 W/ft² or 13 Btu/h-ft² (40 W/m²) multiplied by the total roof area horizontally-projected gross roof area less the area covered by rooftop equipment, skylights, occupied roof decks and planted areas, in ft² (m²). Building projects shall comply with sections C405.8.1 through C405.8.2.

Exceptions:

1. The proportion of the total roof area shaded during the peak sun angle on the summer solstice by natural objects, permanent features of the building or by permanent features of adjacent buildings.
- 2 1. Buildings incorporating an *on-site renewable energy* system, s with a minimum rating of 3.7 W/ft² or 13 Btu/h-ft² (40 W/m²) multiplied by the total roof area in ft² (m²).
- 3 2. Buildings with four or more stories.
- 4 3. Additions, alterations and repairs to existing buildings

SECTION AC102 **DOCUMENTATION**

C405.8.1 AC102.1 Documentation. Construction documents shall show allocated space and pathways for installation of *on-site renewable energy* solar energy systems and associated infrastructure. Documents shall indicate a pathway for one of the following:

1. A pathway for routing of conduit from the roof or alternate reserved space to the main electrical service panel.
2. A pathway for routing of plumbing from the roof or alternate reserved space to the water heating system.

C405.8.2 Building service for renewable systems. For solar electric the main electrical service panel shall have a minimum busbar rating sufficient to accommodate the power supply from the system and shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location and shall be permanently labeled with “For Solar Electric”.

If accommodating future solar thermal systems, building projects shall document a pathway for routing of plumbing from the roof or alternate reserved space to the water heating system.

Commenter's Reason: The committee asked that this provision be placed in an Appendix and that it be made technology-neutral. The Comment simplifies and abbreviates the language, applies the existing definition of *on-site renewable energy* and renumbers the proposal to accomplish this. By placing the renewable-ready language in an Appendix, each jurisdiction will have the option for a technology-neutral measure that can help their state or community meet future planning goals with a low or no-cost requirement in current construction.

CE328-13

Final Action: AS AM AMPC_____ D

CE329-13

C405.8 (NEW), Table C405.8 (NEW)

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C405.8 Electrical transformers (Mandatory). Electric transformers shall meet the minimum efficiency requirements of Table C405.8 as tested and rated in accordance with the test procedure listed in DOE 10 CFR 431. The efficiency shall be verified through certification under an approved certification program or, where no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the transformer manufacturer.

Exceptions: The following transformers are exempt:

1. Transformers that meet the Energy Policy Act of 2005 exclusions based on the DOE 10 CFR 431 definition of special purpose applications.
2. Transformers that meet the Energy Policy Act of 2005 exclusions that are not to be used in general purpose applications based on information provided in DOE 10 CFR 431
3. Transformers that meet the Energy Policy Act of 2005 exclusions with multiple voltage taps where the highest tap is at least 20 percent more than the lowest tap.
4. Drive transformers
5. Rectifier transformers
6. Auto-transformers
7. Uninterruptible power system transformers
8. Impedance transformers
9. Regulating transformers
10. Sealed and nonventilating transformers
11. Machine tool transformer
12. Welding transformer
13. Grounding transformer
15. Testing transformer

TABLE C405.8
Minimum Nominal Efficiency Levels for 10 CFR 431 Low Voltage Dry-Type Distribution Transformers

Single Phase Transformers		Three Phase Transformers	
kVA^a	Efficiency (%)^b	kVA^a	Efficiency (%)^b
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

a. kiloVolt-Amp rating.

b. Nominal efficiencies shall be established in accordance with the DOE 10 CFR 431 test procedure for low voltage dry-type transformers.

Add new definitions as follows:

LOW VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMER: A transformer that is air-cooled, does not use oil as a coolant, has an input voltage less than or equal to 600 Volts, and is rated for operation at a frequency of 60 Hertz

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised with respect to electric low-voltage dry-type transformer efficiency provisions, an issue that is not currently addressed in the IECC Commercial Provisions. The change ensures continued consistency between the IECC and standard 90.1-2010/2013 and addresses an important component associated with improving building energy efficiency.

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

C405.8 (NEW)-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal is consistent with federal regulations of transformers and its placement in the code will restrict the reuse of older transformers. Some on the committee felt that this wasn't appropriate for inclusion in an energy code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality; Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE329-13

Final Action:

AS

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D

CE331-13

C405.8 (NEW), Table C405.8(1) (NEW), Table C405.8(2) (NEW), C405.8(3) (NEW), Table C405.8(4) (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C405.8 Electrical motors (Mandatory). Electric motors shall meet the minimum efficiency requirements of Tables C405.8 (1) through C405.8 (4) when tested and rated in accordance with the DOE 10 CFR 431. The efficiency shall be verified through certification under an approved certification program or, where no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the motor manufacturer.

Table C405.8 (1)
Minimum Nominal Full-Load Efficiency for 60 HZ NEMA General Purpose Electric Motors
(Subtype I) Rated 600 Volts or Less (Random Wound)^a

<u>Number of Poles</u> ⇒	<u>Open Drip-Proof Motors</u>			<u>Totally Enclosed Fan-Cooled Motors</u>		
	<u>2</u>	<u>4</u>	<u>6</u>	<u>2</u>	<u>4</u>	<u>6</u>
<u>Synchronous Speed (RPM)</u>	<u>3600</u>	<u>1800</u>	<u>1200</u>	<u>3600</u>	<u>1800</u>	<u>1200</u>
<u>Motor Horsepower</u>						
<u>1</u>	<u>77.0</u>	<u>85.5</u>	<u>82.5</u>	<u>77.0</u>	<u>85.5</u>	<u>82.5</u>
<u>1.5</u>	<u>84.0</u>	<u>86.5</u>	<u>86.5</u>	<u>84.0</u>	<u>86.5</u>	<u>87.5</u>
<u>2</u>	<u>85.5</u>	<u>86.5</u>	<u>87.5</u>	<u>85.5</u>	<u>86.5</u>	<u>88.5</u>
<u>3</u>	<u>85.5</u>	<u>89.5</u>	<u>88.5</u>	<u>86.5</u>	<u>89.5</u>	<u>89.5</u>
<u>5</u>	<u>86.5</u>	<u>89.5</u>	<u>89.5</u>	<u>88.5</u>	<u>89.5</u>	<u>89.5</u>
<u>7.5</u>	<u>88.5</u>	<u>91.0</u>	<u>90.2</u>	<u>89.5</u>	<u>91.7</u>	<u>91.0</u>
<u>10</u>	<u>89.5</u>	<u>91.7</u>	<u>91.7</u>	<u>90.2</u>	<u>91.7</u>	<u>91.0</u>
<u>15</u>	<u>90.2</u>	<u>93.0</u>	<u>91.7</u>	<u>91.0</u>	<u>92.4</u>	<u>91.7</u>
<u>20</u>	<u>91.0</u>	<u>93.0</u>	<u>92.4</u>	<u>91.0</u>	<u>93.0</u>	<u>91.7</u>
<u>25</u>	<u>91.7</u>	<u>93.6</u>	<u>93.0</u>	<u>91.7</u>	<u>93.6</u>	<u>93.0</u>
<u>30</u>	<u>91.7</u>	<u>94.1</u>	<u>93.6</u>	<u>91.7</u>	<u>93.6</u>	<u>93.0</u>
<u>40</u>	<u>92.4</u>	<u>94.1</u>	<u>94.1</u>	<u>92.4</u>	<u>94.1</u>	<u>94.1</u>
<u>50</u>	<u>93.0</u>	<u>94.5</u>	<u>94.1</u>	<u>93.0</u>	<u>94.5</u>	<u>94.1</u>
<u>60</u>	<u>93.6</u>	<u>95.0</u>	<u>94.5</u>	<u>93.6</u>	<u>95.0</u>	<u>94.5</u>
<u>75</u>	<u>93.6</u>	<u>95.0</u>	<u>94.5</u>	<u>93.6</u>	<u>95.4</u>	<u>94.5</u>
<u>100</u>	<u>93.6</u>	<u>95.4</u>	<u>95.0</u>	<u>94.1</u>	<u>95.4</u>	<u>95.0</u>
<u>125</u>	<u>94.1</u>	<u>95.4</u>	<u>95.0</u>	<u>95.0</u>	<u>95.4</u>	<u>95.0</u>
<u>150</u>	<u>94.1</u>	<u>95.8</u>	<u>95.4</u>	<u>95.0</u>	<u>95.8</u>	<u>95.8</u>
<u>200</u>	<u>95.0</u>	<u>95.8</u>	<u>95.4</u>	<u>95.4</u>	<u>96.2</u>	<u>95.8</u>
<u>250</u>	<u>95.0</u>	<u>95.8</u>	<u>95.4</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>

<u>300</u>	<u>95.4</u>	<u>95.8</u>	<u>95.4</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>
<u>350</u>	<u>95.4</u>	<u>95.8</u>	<u>95.4</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>
<u>400</u>	<u>95.8</u>	<u>95.8</u>	<u>95.8</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>
<u>450</u>	<u>95.8</u>	<u>96.2</u>	<u>96.2</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>
<u>500</u>	<u>95.8</u>	<u>96.2</u>	<u>96.2</u>	<u>95.8</u>	<u>96.2</u>	<u>95.8</u>

a Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

Table C405.8 (2)
Minimum Nominal Full-Load Efficiency of General Purpose Electric Motors (Subtype II) and all Design B motors greater than 200 horsepower^a

<u>Number of Poles</u> ==>	<u>Open Drip-Proof Motors</u>				<u>Totally Enclosed Fan Cooled Motors</u>			
	<u>2</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>8</u>
<u>Synchronous Speed (RPM)=></u>	<u>3600</u>	<u>1800</u>	<u>1200</u>	<u>900</u>	<u>3600</u>	<u>1800</u>	<u>1200</u>	<u>900</u>
<u>Motor Horsepower</u>								
<u>1</u>	<u>NR</u>	<u>82.5</u>	<u>80.0</u>	<u>74.0</u>	<u>75.5</u>	<u>82.5</u>	<u>80.0</u>	<u>74.0</u>
<u>1.5</u>	<u>82.5</u>	<u>84.0</u>	<u>84.0</u>	<u>75.5</u>	<u>82.5</u>	<u>84.0</u>	<u>85.5</u>	<u>77.0</u>
<u>2</u>	<u>84.0</u>	<u>84.0</u>	<u>85.5</u>	<u>85.5</u>	<u>84.0</u>	<u>84.0</u>	<u>86.5</u>	<u>82.5</u>
<u>3</u>	<u>84.0</u>	<u>86.5</u>	<u>86.5</u>	<u>86.5</u>	<u>85.5</u>	<u>87.5</u>	<u>87.5</u>	<u>84.0</u>
<u>5</u>	<u>85.5</u>	<u>87.5</u>	<u>87.5</u>	<u>87.5</u>	<u>87.5</u>	<u>87.5</u>	<u>87.5</u>	<u>85.5</u>
<u>7.5</u>	<u>87.5</u>	<u>88.5</u>	<u>88.5</u>	<u>88.5</u>	<u>88.5</u>	<u>89.5</u>	<u>89.5</u>	<u>85.5</u>
<u>10</u>	<u>88.5</u>	<u>89.5</u>	<u>90.2</u>	<u>89.5</u>	<u>89.5</u>	<u>89.5</u>	<u>89.5</u>	<u>88.5</u>
<u>15</u>	<u>89.5</u>	<u>91.0</u>	<u>90.2</u>	<u>89.5</u>	<u>90.2</u>	<u>91.0</u>	<u>90.2</u>	<u>88.5</u>
<u>20</u>	<u>90.2</u>	<u>91.0</u>	<u>91.0</u>	<u>90.2</u>	<u>90.2</u>	<u>91.0</u>	<u>90.2</u>	<u>89.5</u>
<u>25</u>	<u>91.0</u>	<u>91.7</u>	<u>91.7</u>	<u>90.2</u>	<u>91.0</u>	<u>92.4</u>	<u>91.7</u>	<u>89.5</u>
<u>30</u>	<u>91.0</u>	<u>92.4</u>	<u>92.4</u>	<u>91.0</u>	<u>91.0</u>	<u>92.4</u>	<u>91.7</u>	<u>91.0</u>
<u>40</u>	<u>91.7</u>	<u>93.0</u>	<u>93.0</u>	<u>91.0</u>	<u>91.7</u>	<u>93.0</u>	<u>93.0</u>	<u>91.0</u>
<u>50</u>	<u>92.4</u>	<u>93.0</u>	<u>93.0</u>	<u>91.7</u>	<u>92.4</u>	<u>93.0</u>	<u>93.0</u>	<u>91.7</u>
<u>60</u>	<u>93.0</u>	<u>93.6</u>	<u>93.6</u>	<u>92.4</u>	<u>93.0</u>	<u>93.6</u>	<u>93.6</u>	<u>91.7</u>
<u>75</u>	<u>93.0</u>	<u>94.1</u>	<u>93.6</u>	<u>93.6</u>	<u>93.0</u>	<u>94.1</u>	<u>93.6</u>	<u>93.0</u>
<u>100</u>	<u>93.0</u>	<u>94.1</u>	<u>94.1</u>	<u>93.6</u>	<u>93.6</u>	<u>94.5</u>	<u>94.1</u>	<u>93.0</u>
<u>125</u>	<u>93.6</u>	<u>94.5</u>	<u>94.1</u>	<u>93.6</u>	<u>94.5</u>	<u>94.5</u>	<u>94.1</u>	<u>93.6</u>
<u>150</u>	<u>93.6</u>	<u>95.0</u>	<u>94.5</u>	<u>93.6</u>	<u>94.5</u>	<u>95.0</u>	<u>95.0</u>	<u>93.6</u>
<u>200</u>	<u>94.5</u>	<u>95.0</u>	<u>94.5</u>	<u>93.6</u>	<u>95.0</u>	<u>95.0</u>	<u>95.0</u>	<u>94.1</u>
<u>250</u>	<u>94.5</u>	<u>95.4</u>	<u>95.4</u>	<u>94.5</u>	<u>95.4</u>	<u>95.0</u>	<u>95.0</u>	<u>94.5</u>
<u>300</u>	<u>95.0</u>	<u>95.4</u>	<u>95.4</u>	<u>NR</u>	<u>95.4</u>	<u>95.4</u>	<u>95.0</u>	<u>NR</u>
<u>350</u>	<u>95.0</u>	<u>95.4</u>	<u>95.4</u>	<u>NR</u>	<u>95.4</u>	<u>95.4</u>	<u>95.0</u>	<u>NR</u>
<u>400</u>	<u>95.4</u>	<u>95.4</u>	<u>NR</u>	<u>NR</u>	<u>95.4</u>	<u>95.4</u>	<u>NR</u>	<u>NR</u>
<u>450</u>	<u>95.8</u>	<u>95.8</u>	<u>NR</u>	<u>NR</u>	<u>95.4</u>	<u>95.4</u>	<u>NR</u>	<u>NR</u>
<u>500</u>	<u>95.8</u>	<u>95.8</u>	<u>NR</u>	<u>NR</u>	<u>95.4</u>	<u>95.8</u>	<u>NR</u>	<u>NR</u>

a Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

NR—No requirement

**Table C405.8 (3)
Minimum Average Full Load Efficiency for Polyphase *Small Electric Motors*^a**

Open Motors			
Number of Poles	2	4	6
==>			
Synchronous Speed (RPM)	3600	1800	1200
Motor Horsepower			
0.25	65.6	69.5	67.5
0.33	69.5	73.4	71.4
0.50	73.4	78.2	75.3
0.75	76.8	81.1	81.7
1	77.0	83.5	82.5
1.5	84.0	86.5	83.8
2	85.5	86.5	N/A
3	85.5	86.9	N/A

^a Average full load efficiencies shall be established in accordance with 10 CFR 431.

**Table C405.8 (4)
Minimum Average Full Load Efficiency for Capacitor-Start Capacitor-Run and Capacitor-Start Induction-Run *Small Electric Motors*^a**

Open Motors			
Number of Poles	2	4	6
==>			
Synchronous Speed (RPM)	3600	1800	1200
Motor Horsepower			
0.25	66.6	68.5	62.2
0.33	70.5	72.4	66.6
0.50	72.4	76.2	76.2
0.75	76.2	81.8	80.2
1	80.4	82.6	81.1
1.5	81.5	83.8	N/A
2	82.9	84.5	N/A
3	84.1	N/A	N/A

^a Average full load efficiencies shall be established in accordance with 10 CFR 431.

Add new definitions as follows:

GENERAL PURPOSE ELECTRIC MOTOR (SUBTYPE I): A motor which is designed in standard ratings with either:

1. Standard operating characteristics and standard mechanical construction for use under usual service conditions, such as those specified in NEMA MG1, paragraph 14.02, "Usual Service Conditions," and without restriction to a particular application or type of application; or
2. Standard operating characteristics or standard mechanical construction for use under unusual service conditions, such as those specified in NEMA MG1, paragraph 14.03, "Unusual Service

Conditions,” or for a particular type of application, and which can be used in most general purpose applications.

General purpose electric motors (subtype I) are constructed in NEMA T-frame sizes, or IEC metric equivalent, starting at 143T.

GENERAL PURPOSE ELECTRIC MOTOR (SUBTYPE II). A motor incorporating the design elements of a general purpose electric motor (subtype I) that is configured as one of the following:

1. A U-frame motor
2. A Design C motor
3. A close-coupled pump motor
4. A footless motor
5. A vertical, solid-shaft, normal-thrust motor (as tested in a horizontal configuration)
6. An 8-pole motor (900 rpm)
7. A polyphase motor with voltage of not more than 600 volts (other than 230 or 460 volts)

SMALL ELECTRIC MOTOR. A general purpose, alternating current, single speed induction motor.

Add new standard to Chapter 5 as follows:

DOE

10 CFR 431 Subpart B, App B, Uniform Test Method for Measuring Nominal Full Load Efficiency of Electric Motors.

NEMA National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

MG1-2011 Motors and Generators.

Reason: ASHRAE/IES Standard 90.1-2010, which is adopted by reference as an alternative to the IECC Commercial Provisions, has been revised with respect to electric motor efficiency provisions, an issue not currently addressed in the IECC Commercial Provisions. The change ensures continued consistency between the IECC and standard 90.1-2010 and addresses an important component associated with improving building energy efficiency.

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

C405.8-EC-FERGUSON.doc

Committee Action Hearing Results

For staff analysis of the content of DOE 10CFR 431 Subpart B, App. B, and NEMA MG1-2011 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: While the proposal integrates federal standard which need to be complied with in the manufacturer of new equipment, placing this in the code will act to limit aftermarket use of existing equipment in new buildings.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Craig Conner, Building Quality; Shaunna Mazingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE331-13

Final Action: AS AM AMPC_____ D

CE332-13
C405.8 (NEW), C405.8.1 (NEW)

Proposed Change as Submitted

Proponent: Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development (WABO TCD)

Add new text as follows:

C405.8 Variable speed escalators and moving walks. Escalators and moving walks shall be capable of reducing their operating speed to no more than 15 feet per minute when no passengers have been detected for a period of time not exceeding three times the amount of time required to transfer a passenger between landings.

Exception: A power factor controller that reduces operating voltage in response to light loading conditions is permitted to be provided in place of the variable speed function.

C405.8.1 Regenerative drive. An escalator designed either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded with passengers whose combined weight exceeds 750 pounds.

Reason: This proposal will result in reduced energy use and longer equipment life due to reduced wear and tear during the hours on standby mode or light loading conditions. These escalator controls have been standard in Canada, Europe and most of Asia for many years. The 2010 ANSI/ASME A17.1 safety standard for elevators and escalators now allows use of escalators and moving walks with “sleep mode” for reducing speed during unoccupied periods and provides for their safe operation. Sensors detect approaching passengers and bring the escalator or walk up to full speed before the passenger steps on. The 750-pound threshold for activation of the regenerative drive is derived from the 5-passenger threshold mentioned in manufacturers’ literature (5 passengers x 150# = 750).

Energy savings:

The energy consumed by a typical pair of escalators is approximately 24,000 – 36,000 kWh per year, and the predicted energy savings ranges between 25% and 60%. The higher figure applies to escalators that have bursts of usage at wide intervals, as occurs with performing arts or transportation facilities. The lower figure would apply where usage is scattered throughout the day, as in shopping malls or office buildings. Annual savings per pair of escalators would equate to an energy cost savings of \$600 - \$2,140. The installed cost of escalators would typically increase by 1% - 4%, although one major manufacturer now includes these capabilities as standard for all escalators.

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

C405.8-EC-KRANZ.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt this proposal was inferior to later items. The standard for this equipment needs to be referenced as shown in CE333-13.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

~~**C405.8 Variable speed escalators and moving walks.** Escalators and moving walks shall be capable of reducing their operating speed to no more than 15 feet per minute when no passengers have been detected for a period of time not exceeding three times the amount of time required to transfer a passenger between landings.~~

~~**Exception:** A power factor controller that reduces operating voltage in response to light loading conditions is permitted to be provided in place of the variable speed function.~~

C405.8.1 C405.8 Regenerative drive. An escalator designed either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded with passengers whose combined weight exceeds 750 pounds.

Commenter's Reason: A regenerative drive system for the "down" escalator supplies electricity back into the building's electrical system. If it becomes an IECC requirement, a regenerative drive system will be provided as a standard feature rather than a "special order" and costs will decrease. Regenerative drives are permitted by ASME A17.1 standard. As we explained in our original proposal, these systems can save as much as 60% of the energy used by an escalator.

Section C405.8 is proposed to be deleted because similar text was included in CE333-13 and was approved in Dallas. This public comment is proposed to be appended to CE333-13 if it is approved for the 2015 IECC.

CE332-13

Final Action: AS AM AMPC_____ D

CE333-13

C405 (NEW), C405.1 (NEW), C405.2 (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Add new text as follows:

C405 Vertical and horizontal transportation systems and equipment. Vertical and horizontal transportation systems and equipment shall comply with this section.

C405.1 Elevator cabs. For the luminaires in each elevator cab, not including signals and displays, the sum of the lumens divided by the sum of the watts shall be no less than 35 lumens per watt. Ventilation fans in elevators that do not have their own air conditioning system shall not consume more than 0.33 watts/cfm at the maximum rated speed of the fan. Controls shall be provided that will de-energize ventilation fans and lighting systems when the elevator is stopped, unoccupied and with its doors closed for over 15 minutes.

C405.2 Escalators and moving walks. Escalators and moving walks shall comply with ASME A17.1/CSA B44 and shall have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.

Add new standard to Chapter 5 as follows:

ASME

ASME/A17.1/CSA B44-2010 Safety Code for Elevators and Escalators

Reason: Energy is used in lighting and ventilating elevators when in operation and when not in operation. ASHRAE/IES Standard 90.1-2010, which is adopted by reference in the IECC Commercial Provisions, contains provisions to reduce the amount of energy used by elevators. This change ensures consistency between the IECC Commercial Provisions and standard 90.1 and owners/developers who choose to comply with standard 90.1 via the IECC are afforded this opportunity to save energy and reduce their operating costs.

Cost Impact: The code change proposal will increase the cost of construction if controls for ventilation on fans and systems are required.

C405 (NEW) #1-EC-FERGUSON.doc

Committee Action Hearing Results

For staff analysis of the content of ASME A17.1/CSA B44-2010 relative to CP#28, Section 3.6, please visit: http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Approved as Submitted

Committee Reason: The proposal will lead to energy savings. The industry has developed the acceptable methodologies and included them in the referenced standards. There was some concern that the threshold for application of this new provision was unclear.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Lee Kranz, City of Bellevue, WA, representing Washington Association of Building Officials Technical Code Development Committee, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C405.2 Escalators and moving walks. Escalators and moving walks shall comply with ASME A17.1/CSA B44 and shall provide one of the following systems:

1. Automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers. or
2. A power factor controller that reduces electrical consumption in response to light loading conditions.

(Balance of proposal is unchanged)

Commenter's Reason: A power factor controller system is less expensive to install than a variable-speed escalator, and saves more energy where escalators are frequently in use by only a few people at a time. This is a common condition in office buildings and shopping malls. The variable speed escalator system, by contrast, is most energy-efficient for escalators that are heavily loaded in short bursts, followed by periods of complete inactivity. This is a common usage pattern in transportation and entertainment venues.

This public comment allows owners and designers to select the most appropriate power-saving system for each condition, rather than requiring one system type for all conditions. It reduces construction costs, saves more energy, and provides options for owners.

Public Comment 2:

Craig Conner, Building Quality; Shaunna Mozingo, City of Cherry Hills Village, CO, representing Colorado Chapter of ICC, request Disapproval.

Commenter's Reason: Eleven approved ASHRAE proposals, listed below, lack a reason and substantiation. In order to evaluate proposals the I-code development process requires a reason and substantiation. Disapproval is requested on the following proposals due to a lack of reason and substantiation. The proposals are CE227, CE239, CE240, CE251, CE254, CE255, CE259, CE304, CE329, CE331, and CE333. (The first two proposals have a longer reason covering all eleven proposals.)

According to ICC's CP# 28-05 on "Code Development"

3.3.5.2 Reasons: *The proponent shall justify changing the current Code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals which add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.*

3.3.5.3 Substantiation: *The proponent shall substantiate the proposed code change based on technical information and substantiation. ...*

CE333-13

Final Action: AS AM AMPC____ D

CE337-13

C202 (New), C406.1, C406.2, Table C406.2(1), Table C406.2(2), Table C406.2(3), Table C406.2(4), Table C406.2(5), Table C406.2(6), Table C406.2(7), C406.3, C406.4, C406.5 (New), C406.6 (New), C406.8 (New), C406.8.1 (New)

Proposed Change as Submitted

Proponent: Eric Makela, Britt/Makela Group, Inc., representing Northwest Energy Codes Group (eric@brittmakela.com), Jim Edelson, New Buildings Institute

Revise as follows:

C406.1 Requirements. Buildings shall comply with at least one of the following:

1. More efficient HVAC equipment performance in accordance with Section C406.2.
2. Reduced efficient lighting power density system in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High efficiency service water heating in accordance with Section C406.8.

C406.2. More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.2.3(1) through 403.2.3(7) by 10 percent in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IES 90.1 by 10 percent. Equipment not listed in Tables C403.2.3(1) through 403.2.3(7) shall be limited to 10 percent of the total building system capacity.

TABLE C406.2(1)
UNITARY AIR CONDITIONERS AND CONDENSING UNITS, ELECTRICALLY OPERATED,
EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY ^a	
			CLIMATE ZONES 1-5	CLIMATE ZONES 6-8
Air conditioners, air cooled	< 65,000 Btu/h	Split system	15.0 SEER 12.5 EER	14 SEER 12 EER
		Single package	15.0 SEER 12.0 EER	14.0 SEER 11.6 EER
	≥ 65,000 Btu/h and < 240,000 Btu/h	Split system and single package	12.0 EER ^b 12.54 IEER ^b	11.5 EER ^b 12.0 IEER ^b
	≥ 240,000 Btu/h and < 760,000 Btu/h	Split system and single package	10.8 EER ^b 11.3 IEER ^b	10.5 EER ^b 11.0 IEER ^b
	≥ 760,000 Btu/h	—	10.2 EER ^b 10.7 IEER ^b	9.7 EER ^b 10.2 IEER ^b
Air conditioners, water and evaporatively cooled	—	Split system and single package	14.0 EER	14.0 EER

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

a. IEERs are only applicable to equipment with capacity modulation.

b. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

**TABLE C406.2(2)
UNITARY AND APPLIED HEAT PUMPS, ELECTRICALLY OPERATED, EFFICIENCY
REQUIREMENTS**

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY ^a	
			CLIMATE ZONES 1-5	CLIMATE ZONES 6-8
Air cooled (Cooling mode)	< 65,000 Btu/h	Split system	15.0 SEER _T 12.5 EER	14.0 SEER _T 12.0 EER
		Single package	15.0 SEER _T 12.0 EER	14.0 SEER 11.6 EER
	≥ 65,000 Btu/h and < 240,000 Btu/h	Split system and single package	12.0 SEER _T 12.4 EER	11.5 EER _T ^b 12.0 IEER ^b
	≥ 240,000 Btu/h	Split system and single package	12.0 SEER _T 12.4 EER	10.5 EER _T ^b 10.5 IEER ^b
Water sources (Cooling mode)	< 135,000 Btu/h	85°F entering water	14.0 EER	14.0 EER
Air cooled (Heating mode)	< 65,000 Btu/h (Cooling capacity)	Split system	9.0 HSPF	8.5 HSPF
		Single package	8.5 HSPF	8.0 HSPF
	≥ 65,000 Btu/h and < 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb -outdoor air	3.4 COP	3.4 COP
		17°F db/15°F wb -outdoor air	2.4 COP	2.4 COP
	≥ 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb -outdoor air	3.2 COP	3.2 COP
		77°F db/15°F wb -outdoor air	2.1 COP	2.1 COP
Water sources (Heating mode)	< 135,000 Btu/h (Cooling capacity)	70°F entering water	4.6 COP	4.6 COP

For SI: °C = [(°F) - 32] / 1.8, 1 British thermal unit per hour = 0.2931 W.

db = dry-bulb temperature, °F; wb = wet-bulb temperature, °F.

a. IEERs and Part load rating conditions are only applicable to equipment with capacity modulation.

b. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

**TABLE C406.2(3)
PACKAGED TERMINAL AIR CONDITIONERS AND PACKAGED TERMINAL HEAT PUMPS**

EQUIPMENT TYPE	SIZE CATEGORY	MINIMUM EFFICIENCY
Air conditioners and heat pumps (cooling mode)	< 7,000 Btu/h	11.9 EER
	7,000 Btu/h and < 10,000 Btu/h	11.3 EER
	10,000 Btu/h and ≤ 13,000 Btu/h	10.7 EER
	≥ 13,000 Btu/h	9.5 EER

TABLE C406.2(4)
WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS,
WARM AIR DUCT FURNACES AND UNIT HEATERS, EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE
Warm air furnaces, gas fired ^a	< 225,000 Btu/h	—	For Climate Zones 1 and 2 -NR	DOE 10 CFR Part 430 or ANSI Z21.47
			For Climate Zones 3 and 4 90 AFUE or 90 E_t^e	
			For Climate Zones 4—8 92 AFUE or 92 E_t^e	
	≥ 225,000 Btu/h	Maximum capacity	90% E_c^b	ANSI Z21.47
Warm air furnaces, oil fired ^a	< 225,000 Btu/h	—	For Climate Zones 1 and 2 -NR	DOE 10 CFR Part 430 or UL 727
			For Climate Zones 3—8 85 AFUE or 85 E_t^e	
		≥ 225,000 Btu/h	Maximum capacity	85% E_t^b
Warm air duct furnaces, gas fired ^a	All capacities	Maximum capacity	90% E_c	ANSI Z83.8
Warm air unit heaters, gas fired	All capacities	Maximum capacity	90% E_c	ANSI Z83.8
Warm air unit heaters, oil fired	All capacities	Maximum capacity	90% E_c	UL 734

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

E_t = Thermal efficiency. E_c = Combustion efficiency (100 percent less flue losses).

- a. Efficient furnace fan: Fossil fuel furnaces in climate zones 3 to 8 shall have a furnace electricity ratio not greater than 2 percent and shall include a manufacturer's designation of the furnace electricity ratio.
- b. Units shall also include an IID (intermittent ignition device), have jacket losses not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
- c. Where there are two ratings for units not covered by NAECA (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]), units shall be permitted to comply with either rating.

TABLE C406.2(5)
BOILER, EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	FUEL	SIZE CATEGORY	TEST PROCEEDURE	MINIMUM EFFICIENCY
Steam	Gas	< 300,000 Btu/h	DOE 10 CFR Part 430	83% AFUE
		> 300,000 Btu / h and > 2.5 m Btu/h	DOE 10 CFR Part 434	81% E_t
		> 2.5 m Btu/h		82% E_c
	Oil	< 300,000 Btu/h	DOE 10 CFR Part 430	85% AFUE
		> 300,000 Btu/h and > 2.5 m Btu/h	DOE 10 CFR Part 434	83% E_t

EQUIPMENT TYPE	FUEL	SIZE CATEGORY	TEST PROCEEDURE	MINIMUM EFFICIENCY
		≥2.5 m-Btu/h		84% E_c
Hot water	Gas	<300,000 Btu/h	DOE 10 CFR Part 430	97% AFUE
		>300,000 Btu/h and >2.5 m-Btu/h	DOE 10 CFR Part 431	97% E_t
		≥2.5 m-Btu/h		94% E_c
	Oil	<300,000 Btu/h	DOE 10 CFR Part 430	90% AFUE
		>300,000 Btu/h and >2.5 m-Btu/h	DOE 10 CFR Part 431	88% E_t
		≥2.5 m-Btu/h		87% E_c

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

E_t = Thermal efficiency. E_c = Combustion efficiency (100 percent less flue losses).

TABLE C406.2(6)
CHILLERS—EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	MINIMUM EFFICIENCY ^a (I-P)				Test Procedure ^b
			Path A		Path B ^c		
			Full Load	IPLV	Full Load	IPLV	
Air-cooled chillers with condenser, electrically operated	<150 tons	EER	10.000	12.500	NA	NA	AHRI 550/590 ^f
	≥150 tons	EER	10.000	12.750	NA	NA	
Air-cooled without condenser, electrical operated	All capacities	EER	Condenserless units shall be rated with matched condensers				AHRI 550/590 ^f
Water-cooled, electrically operated, positive displacement (reciprocating)	All capacities	kw/ton	Reciprocating units required to comply with water-cooled positive displacement requirements				AHRI 550/590 ^f
Water-cooled electrically operated, positive displacement	<75 tons	kw/ton	0.780	0.630	0.800	0.600	AHRI 550/590 ^f
	≥75 tons and <150 tons	kw/ton	0.775	0.615	0.790	0.586	
	≥150 tons and <300 tons	kw/ton	0.680	0.580	0.718	0.540	
	≥300 tons	kw/ton	0.620	0.540	0.639	0.490	
Water-cooled electrically operated, centrifugal ^d	<150 tons	kw/ton	0.634	0.596	0.639	0.450	AHRI 550/590 ^f
	≥150 tons and <300 tons	kw/ton	0.634	0.596	0.639	0.450	
	≥300 tons and <600 tons	kw/ton	0.576	0.549	0.600	0.400	
	≥600 tons	kw/ton	0.570	0.539	0.590	0.400	
Air-cooled absorption single effect ^e	All capacities	GOP	0.600	NR	NA	NA	AHRI 560

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	MINIMUM EFFICIENCY ^a (I-P)				Test Procedure ^b
			Path A		Path B ^c		
			Full Load	IPLV	Full Load	IPLV	
Water-cooled absorption single effect ^e	All capacities	COP	0.700	NR	NA	NA	
Absorption double-effect indirect-fired	All capacities	COP	1.000	1.050	NA	NA	
Absorption double-effect direct-fired	All capacities	COP	1.000	1.000	NA	NA	

For SI: 1 Ton = 3516 W.

NA = Not applicable and cannot be used for compliance. NR = No minimum requirements.

a. Compliance with this standard can be obtained by meeting the minimum requirements of Path A or Path B. However both the full load and IPLV shall be met to fulfill the requirements of Path A and Path B.

b. Chapter 6 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

c. Path B is intended for applications with significant operating time at part load. All Path B machines shall be equipped with demand-limiting capable controls.

d. The chiller equipment requirements do not apply for chillers used in low-temperature applications where the design leaving fluid temperature is greater than 40°F.

e. Only allowed to be used in heat recovery applications.

f. Packages that are not designed for operation at ARI Standard 550/590 test conditions (and, thus, cannot be tested to meet the requirements of Table C-3) of 44°F leaving chilled-water temperature and 85°F entering condenser-water temperature with 3 gpm/ton condenser-water flow shall have maximum full-load kW/ton and NPLV ratings adjusted using the following equation:

$$\text{Adjusted maximum full load kW/ton rating} = (\text{full load kW/ton from Table C-3})/K_{adj}$$

$$\text{Adjusted maximum NPLV rating} = (\text{IPLV from Table C-3})/K_{adj}$$

where:

$$K_{adj} = 6.174722 - 0.303668(X) + 0.00629466(X)^2 - 0.000045780(X)^3$$

$$X = DT_{std} + LIFT \text{ (}^\circ\text{F)}$$

$$DT_{std} = [(24 + (\text{full load kW/ton from Table C-3}) \times 6.83)]/\text{flow (}^\circ\text{F)}$$

$$\text{Flow} = \text{condenser-water flow (gpm)} / \text{cooling full-load capacity (tons)}$$

$$LIFT = CEWT - CLWT \text{ (}^\circ\text{F)}$$

$$CEWT = \text{full-load entering condenser-water temperature (}^\circ\text{F)}$$

$$CLWT = \text{full-load leaving chilled-water temperature (}^\circ\text{F)}$$

The adjusted full-load and NPLV values are only applicable over the following full-load design ranges:

Minimum leaving chilled-water temperature: 38°F

Maximum condenser entering water temperature: 102°F

Condenser-water flow: 1 to 6 gpm/ton

X ≥ 39°F and ≤ 60°F

TABLE C406.2(7)
ABSORPTION CHILLERS—EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	MINIMUM EFFICIENCY FULL LOAD COP (IPLV)
Air cooled, single-effect	0.60, allowed only in heat recovery applications
Water cooled, single effect	0.70, allowed only in heat recovery applications
Double effect—direct-fired	1.0 (1.05)
Double effect—indirect-fired	1.20

C406.3 Reduced lighting power density The total interior lighting power (watts) of the building shall be determined by using 90 percent of the lighting power values in Table C405.5.2(1)the reduced whole building interior lighting power in Table C406.3 times the floor area of the building types- or by using 90 percent of the interior lighting power allowance calculated by the Space by Space method in section C405.5.2.

C406.4 Enhanced digital lighting controls. Interior lighting in the building shall have the following enhanced lighting controls which shall be located, scheduled, and operated in accordance with Section C405.2.2.

1. Luminaires shall be capable of continuous dimming.
2. Luminaires shall be capable of being addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of no more than 4 luminaires shall be allowed.
3. No more than 8 luminaires shall be controlled together in a *daylight zone*
4. Fixtures shall be controlled through a digital control system that includes the following function:
 - 1.1. Control reconfiguration based on digital addressability
 - 1.2. Load shedding
 - 1.3. Individual user control of overhead general illumination in open offices
 - 1.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4 of Section C406.4.
6. Functional testing of lighting controls shall comply with Section 408.

C406.4-C406.5 On-site renewable energy Total minimum ratings of on-site renewable energy systems shall comply with one of the following:

1. Provide not less than 1.75 btu's, or not less than 0.50 watts, per square foot of conditioned floor area.
2. Provide not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4;

C406.6 Dedicated outdoor air system. Buildings covered by Section C403.4 shall be equipped with an independent ventilation system designed to provide no less than the minimum 100 percent outdoor air to each individual occupied space as specified by the *International Mechanical Code*, to each individual occupied space. The ventilation system shall be capable of total energy recovery. The HVAC system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperatures. The controls shall reset the supply air temperature at least 25 percent of the difference between the design supply-air temperature and the design room air temperature.

C406.7 Reduced energy use in service water heating. Buildings shall be of the following types to use this compliance method:

1. Group R-1, Boarding houses, Hotels or motels;
2. Group I-2, Hospitals, mental hospitals, and nursing homes;
3. Group A-2, Restaurants and Banquet halls or buildings containing food preparation areas;
4. Group F, Laundries;
5. Group R-2 Buildings with residential occupancies;
6. Group A-3 Health clubs and spas; or
7. Buildings showing a service hot water load of 10 percent or more of total building energy loads as shown with an energy analysis as described in Section C407.

C406.7.1 Load fraction. The building service water heating system shall have one or more of the following that are sized to provide at least 60 percent of hot water requirements, or sized to provide 100 percent of hot water requirements if the building must otherwise comply with Section C403.4.6:

1. Waste heat recovery from service hot water, heat recovery chillers, building equipment, process equipment, or a combined heat and power system.
2. Solar water heating systems.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

VARIABLE REFRIGERANT FLOW SYSTEM. An engineered direct expansion (DX) refrigerant system that incorporates a common condensing unit, at least one variable capacity compressor, a distributed refrigerant piping network to multiple indoor fan heating and cooling units each capable of individual zone temperature control, through integral zone temperature control devices and common communications network. Variable refrigerant flow utilizes three or more steps of control on common inter-connecting piping.

Reason: This proposal increases the number of optional packages in the IECC from three to six for compliance with Section C406, in addition to the modeling options available both in Section 507 of the IECC and the Energy Cost Budget method of ASHRAE 90.1. The purpose of this section is to provide flexibility for compliance, and to recognize that all buildings may not be able to meet higher levels of efficiency in today's prescriptive model codes without providing options. The specifications included in the six approximately equal energy packages were based on preliminary modeling done by New Buildings Institute.

HVAC

The equipment tables have been removed and replaced with a requirement for a 10% increase in efficiency over the base requirements. This will ensure that the HVAC equipment efficiency levels contained in this section provide the necessary energy savings over equipment efficiencies contained in Section C403. This will allow the base efficiencies to be increased in future code cycles without needing to make corresponding changes to Section C406. The proposed option limits the use of heating and cooling equipment not listed in the C403 tables to no more than 10% of the total building capacity. This would allow some systems, e.g. electric resistance heat, to be used in a limited capacity for the proposed project and still allow the code user to use this option. Under the 2012 IECC all systems must comply with the equipment efficiency requirements.

LPD

The LPD tables have been removed and replaced with a requirement for a 10% increase in efficiency over the base requirements for whole building or space-by-space. This will ensure that the LPD levels contained in this section provide the necessary energy savings over the LPDs contained in Section C405. This will allow the base efficiencies to be increased in future code cycles without needing to make corresponding changes to Section C406. The 2012 IECC Additional Package Options only allowed whole building LPDs to be used. This proposal allows the use of space-by-space LPDs to provide more flexibility to the code user thereby increasing the viability of this option. The values proposed in this section are similar to those included as part of ASHRAE Standard 189.1.

The renewable option has not been modified from the 2012 IECC and provides three straightforward compliance approaches: electricity generation, thermal collection, and a calculation method for any type or combination of energy production. A path to include purchase of renewable power or credits was carefully considered, but not included based on concerns regarding verification and permanence of the transaction after the certificate of occupancy has been issued.

The Dedicated Outdoor Air System package is based on technical specifications from the 50% Technical Support Documents of the Pacific Northwest National Lab. The measure requires that adequate quantity of outside air is delivered separately to spaces in the buildings while employing 100% energy recovery. This reduces the need for excess outdoor air or supply air, and uses less energy for terminal reheating.

The Enhanced Lighting Controls Package provides a non-LPD lighting alternative package requires a digital control system to allow continuous dimming and a significant level of controllability on individual luminaires, or groups of no more than eight luminaires.

The Service Water Heating Package language is modified from similar language in the IgCC and the 2012 North Carolina commercial code. The requirements for use of waste energy to heat service hot water are in excess of what is otherwise required in Section C403 of the IECC, when applicable. Solar thermal water heating systems may also be used. This package is independent of the package offered in Section C406.5 since only one package is required for compliance with Section 406 in total.

Cost Impact: The code change proposal will not increase the cost of construction.

C406.1-EC-EDELSON-MAKELA.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The proposal both simplifies the provisions for additional efficiency packages and increases the options open to designers of each building. The existing tables have known flaws and replacing the HVAC proposal with a simple percentage increase in savings increases flexibility.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Eric Makela, Britt/Makela Group, representing Northwest Energy Codes Group; Jim Edelson, New Buildings Institute, request Approval as Modified by this Public Comment.

Modify the proposal as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402, C403, C404 and C405. In addition, commercial buildings shall comply with either Section ~~C406.2, C406.3 or C406.4~~ Section C406, and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

~~Individual tenant spaces shall comply with either Section C406.2 or Section C406.3 unless documentation can be provided that demonstrates compliance with Section C406.4 for the entire building.~~

~~C406.1.1~~ Tenant Spaces. ~~Tenant spaces shall comply with Section C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively tenant spaces shall comply with Section C406.5 when the entire building is in compliance.~~

~~C406.3~~ Efficient Lighting System ~~Whole building lighting power density shall comply with the requirements of Section C406.3.1.~~

~~C 406.3.1~~ C406.3 Reduced lighting power density The total interior lighting power (watts) of the building shall be determined by using 90 percent of the lighting power values in Table C405.5.2(1) times the floor area of the building types or by using 90 percent of the interior lighting power allowance calculated by the Space by Space method in section C405.5.2.

**~~TABLE C406.3~~
REDUCED INTERIOR LIGHTING POWER**

Commenter's Reason: CE 337 was Approved as Submitted because it was recognized to simplify the provisions, increase flexibility by providing more options for compliance, and eliminating tables with errors.

A few technical and editorial issues were brought to the attention of the Proponents. This Comment accomplishes three objectives in addressing those issues:

1. Corrects the pointer language in C401.2
2. Clarifies and updates the Tenant Space application language in C406.1.1
3. Deletes orphaned language in 406.3 and renumbers accordingly.

Public Comment 2:

Steve Rosenstock, Edison Electric Institute, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C406.1 Requirements. Buildings shall comply with at least one of the following:

1. More efficient HVAC equipment ~~performance~~ in accordance with Section C406.2.

2. Reduced lighting power density system in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High efficiency service water heating in accordance with Section C406.8.

C406.1.1. Tenant spaces. Except where an entire building is in compliance with Section C406.5, individual tenant spaces shall comply with either Section C406.2 or Section C406.3.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.2.3(1) through C403.2.3(7) by ~~40~~ 3 percent in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by ~~40~~ 3 percent. *Variable refrigerant flow systems* shall exceed the energy efficiency provisions of ANSI/ASHRAE/IES 90.1 by ~~40~~ 3 percent. Equipment not listed in Tables C403.2.3(1) through C403.2.3(7) shall be allowed limited to meet ~~40~~ 100 percent of the total building system capacity.

C406.3 Efficient lighting system. Whole building lighting power density (Watts/sf) shall comply with the requirements of Section C406.3.1.

C406.3.1 Reduced lighting power density. The total interior lighting power (watts) of the building shall be determined by using ~~90~~ 97 percent of the lighting power values in Table C405.4.2(1) times the floor area for the building types or by using ~~90~~ 97 percent of the interior lighting power allowance calculated by the Space by Space method in Section C405.4.2.

C406.5 On-site renewable energy. Total minimum ratings of on-site renewable energy systems shall comply with one of the following:

1. Provide not less than ~~1.75~~ 1 Btu (~~1850~~ W), or not less than 0.50 watts per square foot (5.4 W/m^2) of conditioned floor area.
2. Provide not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4.

C406.7 Reduced energy use in service water heating. Buildings shall be designed to reduce service hot water usage by at least 3 percent. of the following types to use this compliance method:

- ~~1. Group R-1, Boarding houses, hotels or motels.~~
- ~~2. Group I-2, Hospitals, mental hospitals, and nursing homes.~~
- ~~3. Group A-2, Restaurants and banquet halls or buildings containing food preparation areas.~~
- ~~4. Group F, Laundries.~~
- ~~5. Group R-2 Buildings with residential occupancies.~~
- ~~6. Group A-3 Health clubs and spas.~~
- ~~7. Buildings showing a service hot water load of 10 percent or more of total building energy loads as shown with an energy analysis as described in Section C407.~~

(CE337-13 AS)

C406.7.1 Load fraction. The building service water heating system shall have one or more of the following that are sized to provide at least 60 percent of hot water requirements, or sized to provide 100 percent of hot water requirements if the building shall otherwise comply with Section C403.4.7:

- ~~1. Waste heat recovery from service hot water, heat recovery chillers, building equipment, process equipment, or a combined heat and power system.~~
- ~~2. Solar water heating systems.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The proposed modifications will improve this section in the following ways:

- Equivalence of effort. The threshold for all systems will be the same.
- The values are more realistic, especially when considering that the code development committee approved many measures that will increase the energy efficiency of all commercial buildings in the areas of lighting, envelope, heating equipment efficiency, cooling equipment efficiency, motor efficiency, transformer efficiency, exhaust system efficiency, commercial refrigeration efficiency, and controls (for lighting and mechanical equipment). All of these increases "raised the floor" of efficiency by a significant amount. In fact, it is very likely that it is not possible to improve efficiency by even 4% for many systems.
- For water heating, all buildings will be eligible to use this option, not just some buildings.

- Design and equipment flexibility. The code should not restrict the types of technologies that can be used to improve efficiency. There are options not shown in the tables (thermal energy storage, gas-fired heat pumps, zoned electric systems, etc.) that could meet the additional efficiency requirements. Restricting other or new technologies to 10% of building capacity is inflexible, arbitrary, and not consistent with the goals of this section.

Public Comment 3:

Jeremiah Williams, U.S. Department of Energy, request Approval as Modified by this Public Comment.

Modify proposal as follows:

C406.1 Requirements. Buildings shall comply with at least one of the following:

1. More efficient HVAC equipment in accordance with Section C406.2.
2. Reduced lighting power density ~~system~~ in accordance with Section C406.3.
3. Enhanced lighting controls in accordance with Section C406.4
4. On-site supply of renewable energy in accordance with Section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
6. High efficiency service water heating in accordance with Section C406.8.

C406.1.1. Tenant spaces. Except where an entire building is in compliance with Section C406.5, individual tenant spaces shall comply with either Section C406.2 or Section C406.3.

C406.2 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.2.3(1) through C403.2.3(7) by 10 percent in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. Variable refrigerant flow systems shall exceed the energy efficiency provisions of ANSI/ASHRAE/IES 90.1 by 10 percent. Equipment not listed in Tables C403.2.3(1) through C403.2.3(7) shall be limited to 10 percent of the total building system capacity.

C406.3 Efficient lighting system. ~~Whole building lighting power density (Watts/sf) shall comply with the requirements of Section C406.3.1.~~

C406.3.1 Reduced lighting power density. ~~The total interior lighting power (watts) of the building shall be determined by using not exceed 90 percent of the lighting power resulting from multiplying the values in Table C405.5.2.1 (1) times the floor area of the applicable building type(s) or by using 90 percent of the interior lighting power allowance as calculated in accordance with by the Space-by-Space method in Section C405.5.2. For the purposes of this option the determination of areas and their application to building type(s) shall be in accordance with Section C405.5.2.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: During the code development hearing, CE335-13 was heard after CE337-13 and, based on the action taken on CE337-13, DOE asked for disapproval of CE335-13. DOE is submitting this public comment to address the issue contained in CE335-13. While the current code advises how to determine the reduced lighting power density, it is not clear that the code actually requires the building to comply with the resultant LPD. This public comment ensures the changes approved in CE337-13 are retained, but corrects the issue regarding the lack of a specific requirement in Section C406.3 that the LPD determined per the code must actually be met. In addition, this public comment addresses a small editorial change needed in Section C406.1.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

Public Comment 4:

Gary MacFadden, representing The National Electrical Manufacturers Association, requests Disapproval.

Commenter's Reason: CE337 adds requirements to section 406 of the commercial provisions of the IECC. By the proponents own admission, the proposal would increase the optional paths to compliance from 3 to 6.

Alternative paths to compliance are good, but doubling the number of paths will lead to confusion for code enforcers especially when there has not been any cry out by the consuming public about the current 3 options being too inflexible.

Public Comment 5:

Chuck Foster, C.R. Foster, representing self; requests Disapproval.

Commenter's Reason: This is trying to fix a problem that doesn't exist. There are already 3 options for users in Section 406. This proposal would add three more – doubling the size of the section.

Consumers of this code have not complained that section 406 is too rigid or that they need more flexibility for that section. Where does this stop; we now have 6 optional paths, should we go for 17 paths, or 66 paths, or

Sec 406 is a relatively new section – we should give consumers time to digest it before we go making changes. Urge disapproval.

CE337-13

Final Action: AS AM AMPC____ D

CE340-13
C406.3, Table C406.3, C406.3.1

Proposed Change as Submitted

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glen@lampartners.com)

Revise as follows:

~~**C406.3 Efficient lighting system.** Whole building lighting power density (Watts/sf) shall comply with the requirements of Section C406.3.1.~~ **Reduced lighting power density.** The lighting power allowance shall be 90 percent of the lighting power allowance determined according to Section C405.5.2.

~~**C406.3.1 Reduced lighting power density.** The total interior lighting power (watts) of the building shall be determined by using the reduced whole building interior lighting power in Table C406.3 times the floor area for the building types.~~

TABLE C406.3
REDUCED INTERIOR LIGHTING POWER

Reason: Simplify and clarify the code. Allow proper design flexibility without reducing stringency. As currently written, this option only allows the use of Building Area Method lighting power densities according to the values in table C406.3, which are 10% below base code. This prevents the designer from using the space-by-space method to determine the lighting power allowance for this additional efficiency option. This proposal simply requires a 10% reduction in the lighting power from what is allowed in base code. It does not change stringency and it simplifies the code. Also it means that whenever the base code LPD values are updated, no changes to this option will need to be made. No table will need to be revised.

Cost Impact: The code change proposal will not increase the cost of construction.

C406.3-EC-HEINMILLER.doc

Committee Action Hearing Results

Committee Action: Disapproved

Committee Reason: Addressed with the approval of CE337-13. This change is not needed.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers, requests Approval as Submitted.

Commenter's Reason: The contents of this proposal are included in proposal CE337. Proposal CE337 was Approved as Submitted by the Committee. This proposal, CE340, was subsequently Disapproved because it is contained in CE337. If CE337 receives Public Comments and is heard at the Public Comment Hearings and is disapproved or significantly modified, then this proposal CE340 needs to be Approved as Submitted so its provision can be incorporated into the code, independent of CE337's fate.

CE340-13
Final Action: AS AM AMPC_____ D

CE343-13 C407.2, C407.2.1 (NEW)

Proposed Change as Submitted

Proponent: Brian Dean, ICC International, representing Energy Efficient Codes Coalition; Garrett Stone, Brickfield Burchette Ritts & Stone, PC; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy; Bill Prindle, Energy Efficient Codes Coalition; and Don Vigneau, Northeast Energy Efficiency Partnerships.

Revise as follows:

C407.2 Mandatory requirements. Compliance with this section requires that the criteria of Sections C402.4, C403.2, C404, and C405 and C407.2.1 be met.

C407.2.1 Maximum fenestration U-factor and SHGC for compliance based on total building performance (Mandatory). For buildings complying with Section C407, the area-weighted average U-factor permitted for products within each fenestration product category listed in Table C402.3 shall not exceed the applicable U-factor specified in Table C402.3 by more than 25 percent. For buildings complying with Section C407, the area-weighted average SHGC permitted for products within each fenestration product category listed Table C402.3 shall not exceed the applicable SHGC specified in Table C402.3 by more than 50 percent.

Reason: The purpose of the proposed code change is to establish new maximum trade-off limits for fenestration under the commercial performance path. This proposal imports, from the residential *IECC* provisions, an effective backstop on fenestration trade-offs that has been in the *IECC* since 2004, but with some additional modifications and improvements. This new provision will ensure that modern, highly efficient commercial buildings are required to have at least moderately efficient windows:

- New section C407.2.1 would ensure that whenever the simulated performance alternative is used, the windows on a weighted average basis will meet a reasonable level of efficiency (no worse than 25% greater U-factor and 50% greater SHGC than the prescriptive requirements).
- The main difference between this new commercial section and the existing residential trade-off backstop is that the proposed provision would cap trade-offs at a percentage of the U-factor and SHGC requirements as they change over time rather than setting specific maximum values (we are also proposing to change the residential provision to the same approach).
- This approach will allow the cap to slide up or down to match future changes to the U-factor and SHGC requirements, while still ensuring that buildings are designed and constructed with windows that fall within a reasonable range of efficiency.

The fenestration trade-off limits currently found in the residential chapter of the *IECC* are simple, mandatory measures that ensure all new buildings contain high-quality, cost-effective windows that save energy, provide reasonable comfort, resist condensation in colder climates and block unwanted solar gain in warmer climates. Without the protection of this backstop, fenestration values could be traded away to levels unacceptable in modern building practice. Given the improvements to window efficiency brought about by the 2012 *IECC* and our nation's high priority for energy efficiency, this proposal is a common-sense extension of an effective code requirement.

- **Simple compliance.** The residential fenestration maximums are effective and easy to understand. These requirements have been successfully applied for the last several years. All states that have already adopted the 2006, 2009, and 2012 *IECC* have adopted these maximums to residential construction. On the residential side, they are also already seamlessly built into compliance software such as the Department of Energy's REScheck. The same approach would work for commercial building compliance software.
- **Flexible standard.** The area-weighted average approach embodied in the fenestration maximums allows considerable flexibility for the use of decorative glass, glass block, and other fenestration products, while maintaining a baseline performance for the building's overall glazing. In short, not all products are required to individually meet the maximum values; only the area-weighted average of all products in the building are required to meet the maximum values specified in this code provision.
- **Quality windows, energy savings and peak demand savings nationwide.** The fenestration maximums encourage the use of cost-effective energy-efficient windows nationwide. Because good windows reduce energy consumption both during peak cooling times in the summer months and during peak heating hours in the winter months, such windows can help reduce the strain on the electric grid and natural gas pipeline system and delay the need to build expensive peaking facilities. By reducing the trade-off of efficient windows for other measures, the maximums will better capture the benefits

of blocking solar gain and providing reasonable insulating value such as peak reduction, reduced cooling system sizes and year-round comfort. Consumers will also enjoy the reduced costs that come with economies of scale and market transformation.

- **More comfortable buildings and less energy use.** Incremental changes in window efficiency can have a huge impact on occupant comfort because even the most efficient windows are, at best, still only the equivalent of about an R-3 wall in the winter. Moreover, unlike the opaque wall, even the best fenestration allows substantial summer solar heat gain into the conditioned space. Hot spots created by high solar gain in the summer and/or cold or drafty glass in the winter months can force an occupant to adjust the thermostat to compensate. A good window will provide reasonable insulating value, keeping occupants more comfortable during the coldest months. Similarly, windows with low SHGC will protect against hot spots and occupant discomfort, and will make it less likely that occupants will need to adjust the thermostat and use more energy.

For a more detailed discussion of the benefits of good fenestration, see the section on the benefits of efficient windows on the website of the Efficient Windows Collaborative -- <http://www.efficientwindows.org/benefits.cfm>. The fenestration maximums have served an important role in ensuring residential energy efficiency for many years. We recommend that the fenestration maximums in the residential chapter of the *IECC* be duplicated, with the appropriate modifications, in the commercial chapter of the *IECC*.

Cost Impact: The code change proposal will not increase the cost of construction.

C407.2-EC-DEAN-HARRIS-MISURIELLO-PRINDLE-STONE-VIGNEAU.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposal would put an artificial restriction on the performance path methodology. Such runs counter to the intent of the performance path option and restricts the flexibility of the design professional.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jeff Inks, Window & Door Manufacturers Association, requests Approval as Submitted.

Commenter's Reason: We are urging approval as submitted for the reasons stated by the proponents in the proposal. WDMA supports establishing reasonable trade-off caps under the performance path to ensure an unlimited reduction in fenestration efficiency is not permitted. We do not believe the 25% variance allowed for U-factors and 50% for SHGC is either an artificial restriction or presents unreasonable design restrictions. In addition, we believe establishing the caps as a percentage of the respective prescriptive requirements is also a much more sensible approach than prescribing specific values because it alleviates the need for additional revisions to the cap values when prescriptive requirements are amended.

We believe this proposal will result in a significant improvement in the IECC and we therefore urge approval as submitted.

CE343-13

Final Action:

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CE344-13
C407.3.1 (NEW), Chapter 5

Proposed Change as Submitted

Proponent: Mark Nowak, M. Nowak Consulting, LLC, representing Steel Framing Alliance

Add new text as follows:

C407.3.1 Alternative to proposed design. A representative building as described in NREL/TP-5500-46861 or other representative buildings approved by the code official shall be permitted to be used in lieu of the actual building design.

Add new standard to Chapter 5 as follows:

DOE

NREL/TP-5500-46861-11 Commercial Reference Building Models of the National Building Stock

Reason: This proposal will simplify the implementation of the code by allowing a representative building to be used for compliance rather than the actual building. Designers will only need to build a model for the representative building for a given climate zone. Likewise, simulation tool developers would be able to provide the buildings in library files for users. However, it will still leave the designer the option to comply with the actual propose building.

This represents a significant deviation from past and current practice but it is a logical step for the IECC to take. Given that the representative buildings are the basis for the current prescriptive requirements, they should be permitted to be used repeatedly for building design and compliance. This approach would allow the development of multiple prescriptive solutions equivalent to those in the code without cluttering up the code with pages of additional text.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: A review of the standard proposed for inclusion in the code, DOE-NREL/TP-5500-46861-2011 Commercial Reference Building Models of the National Building Stock, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2013.

C407.3.1 (NEW)-EC-NOWAK.doc

Committee Action Hearing Results

For staff analysis of the content of DOE NREL/TP-5500-46861-11 relative to CP#28, Section 3.6, please visit:
http://www.iccsafe.org:8888/cs/codes/Documents/2012-13cycle/Proposed-A/00a_updates.pdf

Committee Action:

Disapproved

Committee Reason: The proponent requested disapproval because the current proposal doesn't reflect his original intent..

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Mark Nowak, M. Nowak Consulting, LLC, representing Steel Framing Alliance, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C407.3.1 Alternative to proposed design. A representative building with the size, shape, floor plan, fenestration area, and opaque envelope area as described in NREL/TP-5500-46861 or other representative buildings approved by the code official shall be permitted to be used in lieu of the actual building design. All other specifications for the proposed and standard reference designs shall comply with the requirements of this code.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This proposal will simplify the implementation of the code by allowing a representative building to be used for compliance rather than the actual building. Designers will only need to build a model once for the representative building for a given climate zone. Likewise, simulation tool developers would be able to provide the buildings in library files for users. However, it will still leave the designer the option to comply using the actual proposed building. This will make the use of the performance option more flexible by offering a less complex option for compliance.

This represents a significant deviation from past and current practice but it is a logical step for the IECC to take. Given that the representative buildings are the basis for the current prescriptive requirements, they should be permitted to be used repeatedly for building design and compliance. This approach would allow the development of multiple prescriptive solutions equivalent to those in the code without cluttering up the code with pages of additional text.

As the proponent of the original proposal, we asked for disapproval after a ruling by the committee chair that a modification was out of order. The modification shown here brings the proposal in line with our original intent by specifying that the proposed building's geometry, fenestration area, and opaque areas must match the representative building. All other requirements of the code will still be required to be met.

CE344-13

Final Action: AS AM AMPC_____ D

CE350-13

C408

Proposed Change as Submitted

Proponent: Richard Grace, Fairfax County Government, representing The Virginia Plumbing and Mechanical Inspectors Association, The Virginia Building Code Officials Association (Richard.Grace@fairfaxcounty.gov)

Revise as follows:

Section C408 APPENDIX A SYSTEM COMMISSIONING

~~C408.1~~ **AC 101.1 General.** This ~~section~~ appendix covers the commissioning of the building mechanical systems in Section C403 and electrical power and lighting systems in Section C405.

~~C408.2~~ **AC 101.2 Mechanical systems commissioning and completion requirements.** Prior to passing the final mechanical inspection, the *registered design professional* shall provide evidence of mechanical systems *commissioning* and completion in accordance the provisions of this ~~section~~. appendix. Construction document notes shall clearly indicate provisions for *commissioning* and completion requirements in accordance with this ~~section~~ appendix and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner and made available to the *code official* upon request in accordance with Sections ~~C408.2.4 and C408.2.5~~ AC101.2.4 and AC101.2.5

Exception: The following systems are exempt from the commissioning requirements:

1. Mechanical systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140 690 W) cooling capacity and 600,000 Btu/h (175 860 W) heating capacity.
2. Systems included in Section C403.3 that serve dwelling units and sleeping units in hotels, motels, boarding houses or similar units.

~~C408.2.1~~ **AC 101.2.1 Commissioning plan.** A *commissioning plan* shall be developed by a *registered design professional* or approved *agency* and shall include the following items:

1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
2. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
3. Functions to be tested, including, but not limited to calibrations and economizer controls.
4. Conditions under which the test will be performed. At a minimum, testing shall affirm winter and summer design conditions and full outside air conditions.
5. Measurable criteria for performance.

~~C408.2.2~~ **AC 101.2.2 Systems adjusting and balancing.** HVAC systems shall be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within the tolerances provided in the product specifications. Test and balance activities shall include air system and hydronic system balancing.

~~C408.2.2.1~~ **AC 101.2.2.1 Air systems balancing.** Each supply air outlet and *zone* terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the

International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 10 hp (18.6 kW) and larger. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp (0.74 kW), fan speed shall be adjusted to meet design flow conditions.

Exception: Fans with fan motors of 1 hp (0.74 kW) or less.

C408.2.2.2 AC 101.2.2.2 Hydronic systems balancing. Individual hydronic heating and cooling coils shall be equipped with means for balancing and measuring flow. Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the capability to measure pressure across the pump, or test ports at each side of each pump.

Exceptions:

1. Pumps with pump motors of 5 hp (3.7 kW) or less.
2. Where throttling results in no greater than five percent of the nameplate horsepower draw above that required if the impeller were trimmed.

C408.2.3 AC 101.2.3 Functional performance testing. Functional performance testing specified in Sections ~~C408.2.3.1 through C408.2.3.3~~ AC101.2.3.1 through AC101.2.3.3 shall be conducted.

C408.2.3.1 AC 101.2.3.1 Equipment. Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and *sequence of operation*, including under full-load, part-load and the following emergency conditions:

1. All modes as described in the *sequence of operation*;
2. Redundant or *automatic* back-up mode;
3. Performance of alarms; and
4. Mode of operation upon a loss of power and restoration of power.

Exception: Unitary or packaged HVAC equipment listed in Tables C403.2.3(1) through C403.2.3(3) that do not require supply air economizers.

C408.2.3.2 AC101.2.3.2 Controls. HVAC control systems shall be tested to document that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to document they operate in accordance with *approved* plans and specifications.

C408.2.3.3 AC 101.2.3.3 Economizers. Air economizers shall undergo a functional test to determine that they operate in accordance with manufacturer's specifications.

C408.2.4 AC 101.2.4 Preliminary commissioning report. A preliminary report of commissioning test procedures and results shall be completed and certified by the *registered design professional* or *approved agency* and provided to the building owner. The report shall be identified as "Preliminary Commissioning Report" and shall identify:

1. Itemization of deficiencies found during testing required by this ~~section~~ appendix that have not been corrected at the time of report preparation.
2. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.
3. Climatic conditions required for performance of the deferred tests.

C408.2.4.1 AC 101.2.4.1 Acceptance of report. *Buildings*, or portions thereof, shall not pass the final mechanical inspection until such time as the *code official* has received a letter of transmittal from the

building owner acknowledging that the *building* owner has received the Preliminary Commissioning Report.

C408.2.4.2 AC 101.2.4.2 Copy of report. The *code official* shall be permitted to require that a copy of the Preliminary

C408.2.5 AC 101.2.5 Documentation requirements. The *construction documents* shall specify that the *documents* described in this section be provided to the *building* owner within 90 days of the date of receipt of the *certificate of occupancy*.

C408.2.5.1 AC 101.2.5.1 Drawings. Construction documents shall include the location and performance data on each piece of equipment.

C408.2.5.2 AC 101.2.5.2 Manuals. An operating and maintenance manual shall be provided and include all of the following:

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Name and address of at least one service agency.
4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in system programming instructions.
5. A narrative of how each system is intended to operate, including recommended setpoints.

C408.2.5.3 AC 101.2.5.3 System balancing report. A written report describing the activities and measurements completed in accordance with Section ~~C408.2.2~~ AC 101.2.2.

C408.2.5.4 AC 101.2.5.4 Final commissioning report. A report of test procedures and results identified as "Final Commissioning Report" shall be delivered to the building owner and shall include:

1. Results of functional performance tests.
2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

Exception: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

C408.3 AC 101.3 Lighting system functional testing. Controls for automatic lighting systems shall comply with Section ~~C408.3~~ AC101.3.

C408.3.1 AC 101.3.1 Functional testing. Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. The construction documents shall state the party who will conduct the required functional testing. Where required by the code official, an approved party independent from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the code official certifying that the installed lighting controls meet the provisions of Section C405.

Where occupant sensors, time switches, programmable schedule controls, photosensors or daylighting controls are installed, the following procedures shall be performed:

1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
3. Confirm that the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.

Reason: We are not opposed to commissioning, in fact we fully support the concept. What we are opposed to is including language into a code that is not enforceable, inconsistent, or is written in such a way that enforcement will place a burden on building owners when occupancy permits are held up based on incomplete commissioning reports. There are many examples of this contained within this code change.

(1) C408.2 – “**Prior to passing the final mechanical inspection, the registered design professional shall provide evidence of mechanical systems commissioning and completion according to the provisions of this section.**” First off, this language suggests that only a registered design professional is permitted to provide such evidence, even if a licensed, Class A contractor designed the project. Second,

(2) 503.2.9.1 - “**Copies of all documentation shall be given to the owner.**” We do not agree with language included in the code that requires a code official to verify contractual issues between an owner and their agents, designers, or contractors.

(3) 503.2.9.1.2 – “**All HVAC systems shall be balanced in accordance with generally accepted engineering standards.**” “Shall be” is positive, enforceable language, however “generally accepted” is so open ended that consistency between any two individuals will be virtually impossible.

(4) 503.2.9.2 – “**shall not be issued a final certificate of occupancy**”. This section states that a certificate of occupancy shall not be issued without receiving a letter from the owner stating that they have received the Preliminary Commissioning Report. Why should the owner of a building be penalized in such a harsh manner for a procedure that can obviously be conducted after occupancy.

(5) 503.2.9.3 – “**shall require that within 90 days after the date of final certificate of occupancy**”. This section requires the code official to go back to the building owner after issuing the certificate of occupancy and verify that the building owner was provided with drawings, manuals, system balancing report, and the final commissioning report. Wow! After the certificate of occupancy is issued, the International Energy Conservation Code is no longer applicable to the building or building owner. I truly do not understand how this is going to work. What gives the code official the authority to verify and comply with this code section? What recourse does a code official have if the documentation is not provided to the building owner? Is the certificate of occupancy voided and the building occupants forced to vacate? After the certificate of occupancy is issued, the IECC is no longer applicable. The applicable code after the certificate of occupancy is issued is the Property Maintenance Code.

Cost Impact: This code change proposal will not increase the cost of construction.

C408-EC-GRACE.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: Commissioning is an important part of the code and should not be moved to an optional appendix. Building owners want a level of confidence that the complex systems work, commissioning provides a methodology to assure the systems functionality.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Richard Grace, Fairfax County Government, representing Virginia Plumbing and Mechanical Inspectors Association (VPMIA) and Virginia Building and Code Officials Association (VBCOA), requests Approval as Submitted.

Commenter’s Reason: The committee’s reason for disapproval for this proposed change was as follows:

“Commissioning is an important part of the code and should not be moved to an optional appendix. Building owners want a level of confidence that the complex systems work, commissioning provides a methodology to assure the systems functionality.”

We agree in part with this statement. Commissioning is an important part of the design and construction process, however proper commissioning should be completed at a time after an owner takes possession of the structure. These requirements prevents this from happening (see 1 below), and encourages improper commissioning procedures.

We are not opposed to commissioning, in fact we fully support the concept. What we are opposed to is including language into a code that is not enforceable, inconsistent, or is written in such a way that enforcement will place a burden on building owners when occupancy permits are held up based on incomplete commissioning reports. There are many examples of this contained within this code change.

(1) C408.2 – **“Prior to passing the final mechanical inspection, the registered design professional shall provide evidence of mechanical systems commissioning and completion according to the provisions of this section.”** First off, this language suggests that only a registered design professional is permitted to provide such evidence, even if a licensed, Class A contractor designed the project. Second, this section requires commissioning to be completed prior to the owner taking possession of the structure, and moving in.

(2) 503.2.9.1 - **“Copies of all documentation shall be given to the owner.”** We do not agree with language included in the code that requires a code official to verify contractual issues between an owner and their agents, designers, or contractors.

(3) 503.2.9.1.2 – **“All HVAC systems shall be balanced in accordance with generally accepted engineering standards.”** “Shall be” is positive, enforceable language, however “generally accepted” is so open ended that consistency between any two individuals will be virtually impossible.

(4) 503.2.9.2 – **“shall not be issued a final certificate of occupancy”**. This section states that a certificate of occupancy shall not be issued without receiving a letter from the owner stating that they have received the Preliminary Commissioning Report. Why should the owner of a building be penalized in such a harsh manner for a procedure that can obviously be conducted after occupancy.

(5) 503.2.9.3 – **“shall require that within 90 days after the date of final certificate of occupancy”**. This section requires the code official to go back to the building owner after issuing the certificate of occupancy and verify that the building owner was provided with drawings, manuals, system balancing report, and the final commissioning report. Wow! After the certificate of occupancy is issued, the International Energy Conservation Code is no longer applicable to the building or building owner. I truly do not understand how this is going to work. What gives the code official the authority to verify and comply with this code section? What recourse does a code official have if the documentation is not provided to the building owner? Is the certificate of occupancy voided and the building occupants forced to vacate? After the certificate of occupancy is issued, the IECC is no longer applicable. The applicable code after the certificate of occupancy is issued is the Property Maintenance Code.

CE350-13

Final Action:

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CE355-13
C408.2.4.1

Proposed Change as Submitted

Proponent: Jeremiah Williams, U.S. Department of Energy (jeremiah.williams@ee.doe.gov)

Revise as follows:

C408.2.4.1 Acceptance of report. *Buildings*, or portions thereof, shall not be considered acceptable for a final inspection pursuant to Section C104.3 ~~pass the final mechanical inspection until such time as the code official has received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report.~~

Reason: This proposal revises the commissioning provision so that buildings cannot be considered for a final inspection (e.g., do not pass the mechanical inspection) until the owner indicates in writing they have the required commissioning report. This clarifies the code through the reference section for final inspections and eliminates unneeded language "such time as".

Cost Impact: The code change proposal will not increase the cost of construction.

C408.2.4.1-EC-WILLIAMS.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The process should not be delayed waiting for the formality of the submitted report.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment 1:

Ellen Eggerton, Fairfax County, representing Virginia Building Coe Officials Association; requests Approval as Submitted.

Commenter's Reason: The existing code language puts the mechanical contractor on the hook for items that could be the responsibility of an electrical contractor or the general contractor. The code change holds up the final inspection regardless of which contractor is holding up the work.

Public Comment 2:

Jeremiah Williams, U.S. Department of Energy, requests Approval as Submitted.

Commenter's Reason: The current code is clear, but not complete. It essentially says that the mechanical inspection is not passed until the code official has the required letter of transmittal. Without a letter of transmittal confirming the commissioning has been completed, the mechanical inspection would not be passed. Without passing the mechanical inspection, it is presumed any final inspection could not proceed, and any resultant occupancy permit could not be issued. At the code development hearing, there was opposition to this change based on the opinion that the revision would tend to hold up the conduct of inspections and, as a result, would hold up the issuance of the final occupancy permit. In disapproving the code change, the committee indicated that the process should not be delayed waiting for the formality of a submitted report. DOE does not believe the code change has a negative impact regarding overall project approvals and in some cases could eliminate re-inspections and speed the issuance of an occupancy permit.

The current and proposed code text only provides for the submission of a letter of transmittal related to receipt of the commissioning report by the building owner. Currently, the code says the building does not pass final mechanical inspection until the

letter is received (i.e., even if all the other items covered by the mechanical inspection pass, no passage occurs until the letter is received). Proposal CE355-13 requires the receipt of the letter before the final inspection occurs. This should not delay the process, because it ensures that when the final mechanical inspection is done, the commissioning has been completed per code; as a result, the building is more likely to pass the final mechanical inspection. So the proposal does not delay the approval process for the building owner and in some cases could accelerate the process.

The code change proposal, as covered in more detail below, will not hold up the issuance of an occupancy permit and actually could speed its issuance. Under the current code, if the letter is not sent, then the mechanical inspection is not passed and subsequent inspections and issuance of an occupancy permit cannot occur.

The commissioning provisions in the code apply to mechanical systems as well as electrical power and lighting systems. It would seem then the code should also add electrical inspection passage as a criterion, but that is not currently addressed in the code, nor proposed herein. That said, the key issue is final inspection, which unlike mechanical or electrical inspections, is an item specifically covered in the code. Instead of addressing the passage of the mechanical or electrical inspections, which in turn trigger a final inspection and issuance of a certificate of occupancy, based on the receipt of a letter, it seems more appropriate to address that as a condition for a final inspection. This ensures conformance to all the system commissioning requirements, and provides a singular point of reference in the process. Either way, there is a possible hold up on issuing the occupancy permit (i.e., under the current code or proposed code language) based on receipt of the letter from the owner.

The remaining issue then is if the AHJ wants to conduct the inspection before or after receipt of the letter. It would seem more reasonable, given the intent of commissioning, that an inspector would be more likely to find fewer issues in inspecting a commissioned versus an un-commissioned building. Also, a requirement that the letter be posted prior to the final inspection provides some incentive for the building owner to ensure the commissioning is completed. Since the intent of commissioning is to ensure the building electrical, lighting and mechanical systems are properly and working, it is more appropriate to ensure commissioning is conducted prior to final inspection as opposed to logging the receipt of a letter from the owner after all the inspections have been completed. In either case, the issuance of a certificate of occupancy rests on receipt of the letter, and the inspections have to be conducted. If the above reasons are not sufficient, this requirement provides some incentive for the building owner to focus on getting this done, allowing the inspector to actually see the result in the building, which benefits both the builder and the AHJ.

DOE posted its draft proposals and public comments for the IECC on its Building Energy Codes website prior to submitting to the ICC. Interested parties were provided a 30 day public review in June 2013, for which notice was published in the *Federal Register* (Docket No. [EERE-2012-BT-BC-0030](#)) and announced via the DOE Building Energy Codes news email list. In response to stakeholder input, DOE revised its proposals and public comments, as appropriate, and submitted to the ICC.

For more information on DOE proposals and public comments, including how DOE participates in the ICC code development process, please visit: <http://www.energycodes.gov/development>.

CE355-13

Final Action: AS AM AMPC____ D

CE356-13
C408.2.5.2

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C408.2.5.2 Manuals. An operating and maintenance manual shall be provided and include all of the following:

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Name and address of at least one service agency.
4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in system programming instructions.
5. Submittal data indicating all selected options for each piece of lighting equipment and lighting controls.
6. Operation and maintenance manuals for each piece of lighting equipment. Required routine maintenance actions, cleaning and recommended relamping shall be clearly identified.
7. A schedule for inspecting and recalibrating all lighting controls.
8. A narrative of how each system is intended to operate, including recommended setpoints.

Reason: The current requirements for manuals seems specific to HVAC documentation. This proposal adds additional language for the documentation, maintenance, and inspection of lighting equipment and controls. These requirements are consistent with ANSI/ASHRAE/IES Standard 90.1

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

C408.2.5.2-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: The committee approved the proposal because the information on the lighting controls is just as important as those on the HVAC systems. The listing of manual items is simply information for the building owner, it requires no action. Some felt that some or all of this would be better placed in commentary. Some felt that details on each luminaire is excessive detail.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ron Nickson, National Multi Housing Council, requests Disapproval.

Commenter's Reason: As noted by the proponent this change will increase the cost of construction. However, the proposal did not include any cost information or provide any cost effective analysis to justify the increase. The approved change will have a significant cost impact in that it requires:

1. Information and data on each piece of lighting equipment. The opened ended requirement can be interpreted in many ways and could ultimately require information on every light bulb, ceiling and wall fixture, lighting control (switches, automatic switches, etc.), electrical wiring, electrical boxes, breaker boxes and other electrical equipment used in the circuit to the light fixture. Providing the information has no cost benefit and it does not provide and cost savings.
2. Operation and maintenance manuals for "each" piece of lighting equipment along with maintenance actions, cleaning and recommended relamping. This requirement is unnecessary and costly in that it would require operation and maintenance manuals for items such as fixtures, bulbs, switches, etc. that in all reality have no maintenance in that when they fail they need to be replaced. In addition the requirement requires a list of all estimated relamping requirements which is unnecessary for operation of the building lighting. The estimated life of a bulb has little to do with replacement in that bulbs provide and very definite clue that they are no longer working and thus need to be replace.

CE356-13

Final Action: AS AM AMPC _____ D

CE357-13
C408.3.1

Proposed Change as Submitted

Proponent: Steve Ferguson, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) (sferguson@ashrae.org)

Revise as follows:

C408.3.1 Functional testing. Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. ~~The construction documents shall state the party who will conduct the required functional testing.~~ Where required by the code official, an approved party individual independent from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the code official certifying that the installed lighting controls meet the provisions of Section C405.

Where occupant sensors, time switches, programmable schedule controls, photosensors or daylighting controls are installed, the following procedures shall be performed:

1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
 - 1.1. For projects with up to seven occupancy sensors, all occupancy sensors shall be tested
 - 1.2. For projects with more than seven the following shall be verified:
 - 1.2.1. Status indicator (as applicable) operates correctly
 - 1.2.2. The controlled lights turn off or down to the permitted level within the required time,
 - 1.2.3. For auto-on occupant sensors, the lights do turn on to the permitted level when someone enters the space.
 - 1.2.4. For manual on sensors, the lights turn on only when manually activated
 - 1.2.5. The lights are not incorrectly turned on by movement in nearby areas or by HVAC operation
2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
3. Confirm that all control devices for daylight controls have been properly located, field-calibrated, and set for design set points and threshold light levels. All daylight control devices shall only be readily accessible to authorized personnel. ~~the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.~~

Reason: For consistency with ASHRAE/IES 90.1. These revisions add more specific requirements to the functional testing of lighting controls for the common controls required by the standard and adds some clarification to the description of entities allowed to perform the testing and verification.

Cost Impact: The code change proposal will increase the cost of construction when lighting controls are required in parking garages.

C408.3.1-EC-FERGUSON.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The proponent requested disapproval in order to address needed revisions.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Steve Ferguson, ASHRAE, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

C408.3.1 Functional testing. Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. Where required by the code official, an approved individual independent from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the code official certifying that the installed lighting controls meet the provisions of Section C405.

Where occupant sensors, time switches, programmable schedule controls, photosensors or daylighting controls are installed, the following procedures shall be performed:

1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
 - 1.1 For projects with up to seven occupancy sensors, all occupancy sensors shall be tested. For projects with more than seven, at least one of each sensor type and the sensors in one of each distinct room or space type shall be tested
 - 1.2 For all sensors required to be tested by item 1.1, projects with more than seven the following shall be verified:
 - 1.2.1 Status indicators operate correctly
 - 1.2.2 The controlled lights turn off or down to the permitted level within the required time,
 - 1.2.3 For auto-on occupant sensors, the lights do turn on to the permitted level when someone enters the space,
 - 1.2.4 For manual on sensors, the lights turn on only when manually activated
 - 1.2.5 The lights are not incorrectly turned on by movement in nearby areas or by HVAC operation
2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
3. Confirm that all control devices for daylight controls have been properly located, field-calibrated, and set for design set points and threshold light levels. All daylight control devices shall only be readily accessible to authorized personnel.

Commenter's Reason: The original proposal was written was not laid out correctly. The intent is for the all of the tests to be performed when required. If a project has 7 or fewer sensors, then all sensors must be tested. If a project has more than 7 sensors, then one set of sensors needs to be tested for distinct room or space types. If you have 7 hallways and 19 offices, you would only be required to test all of the sensors in one of the hallways and one of the offices.

The current layout proposes to fix that and clarifies when the verification needs to occur.

Public Comment 2:

Eric Makela, Birtt/Makela Group, representing Northwest Energy Codes Group, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

Add to Section C202 General Definitions

REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

Revise as follows:

~~C408.3.1 Functional testing.~~ Testing shall ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. ~~The construction documents shall state the party who will conduct the required functional testing. Where required by the code official, an approved party individual independent from the design or construction of the project shall be responsible for the functional testing and shall provide documentation to the code official certifying that the installed lighting controls meet the provisions of Section C405.~~

C408.3.1 Functional testing. Prior to passing final inspection, the registered design professional shall provide evidence that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions-Functional testing shall comply with Section C408.3.1.1 to C408.3.1.2 for the applicable control type.

C408.3.1.1 Occupancy sensors Where occupancy sensors are provided, the following procedures shall be performed:

1. Certify that the occupancy sensor has been located and aimed in accordance with manufacturer recommendations
2. For projects with seven or fewer occupancy sensors each sensor shall be tested.
3. For projects with more than seven occupancy sensors, testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided no fewer than the greater of one, or 10 percent of each combination, shall be tested unless the code official or design professional require a higher percentage to be tested. Where 30 percent or more of the tested controls fail, all remaining identical combinations shall be tested.

For each occupancy sensor to be tested, verify the following:

- 3.1 Where occupancy sensors include status indicators, verify correct operation.
- 3.2 The controlled lights turn off or down to the permitted level within the required time.
- 3.3 For auto-on occupancy sensors, the lights turn on to the permitted level when an occupant enters the space.
- 3.4 For manual on sensors, the lights turn on only when manually activated.
- 3.5 The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

C408.3.1.2 Automatic time switches. Where automatic time switches are provided, the following procedures shall be performed:

1. Confirm that the automatic time switch control is programmed with accurate weekday, weekend, and holiday schedules.
2. Provide documentation to the owner of automatic time switch programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
3. Verify the correct time and date in the time switch.
4. Verify that any battery back-up is installed and energized.
5. Verify that the override time limit is set to no more than 2 hours.
6. Simulate occupied condition. Verify and document the following:
 - 6.1 All lights can be turned on and off by their respective area control switch.
 - 6.2 The switch only operates lighting in the enclosed space in which the switch is located.
7. Simulate unoccupied condition. Verify and document the following:
 - 7.1 All non-exempt lighting turns off.
 - 7.2 Manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shut off occurs.
8. Additional testing as specified by the registered design professional.

C408.3.1.3 Daylight Controls Where daylighting controls are provided, the following procedures shall be performed:

1. All control devices have been properly located, field-calibrated and set for accurate set points and threshold light levels.
2. Daylight controlled lighting loads adjust to light level set points in response to available daylight.
3. The locations of calibration adjustment equipments are readily accessible only to authorized personnel.

C408.3.2 Documentation Requirements. The construction documents shall specify that documents certifying that the installed lighting controls meet documented performance criteria of Section C405 be provided to the building owner within 90 days from the date of receipt of the certificate of occupancy.

Where occupant sensors, time switches, programmable schedule controls, photosensors or daylighting controls are installed, the following procedures shall be performed:

1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
 - 1.1. For projects with up to seven occupancy sensors, all occupancy sensors shall be tested
 - 1.2. For projects with more than seven the following shall be verified:
 - 1.2.1. Status indicator (as applicable) operates correctly
 - 1.2.2. The controlled lights turn off or down to the permitted level within the required time,
 - 1.2.3. For auto-on occupant sensors, the lights do turn on to the permitted level when someone enters the space,
 - 1.2.4. For manual on sensors, the lights turn on only when manually activated
 - 1.2.5. The lights are not incorrectly turned on by movement in nearby areas or by HVAC operation
2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
3. Confirm that all control devices for daylight controls have been properly located, field-calibrated, and set for design set points and threshold light levels. All daylight control devices shall only be readily accessible to authorized personnel. the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.

Commenter's Reason: This Public Comment provides specific functional testing requirements for the specific types of lighting controls that are addressed in Section C405 of the IECC. The current language in Section C408.3 is not specific to lighting control type, providing general requirements with the intent that a system can be adequately "commissioned" if the section is followed. The Public Comment provides specific, step-by-step instructions testing occupancy sensors, daylighting controls and automatic time switches to ensure that they are operating correctly before system acceptance. The requirements will appear in the Southern

Nevada Energy Code and were proposed by the lighting design industry. The functional testing requirements are consistent with the timing and format of Section C408.2. Also the modification requires that the Registered Design Professional perform to testing requirement to be consistent with the Section C408 Commissioning requirements.

CE357-13

Final Action:

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CE361-13

C202 (New), C410 (New)

Proposed Change as Submitted

Proponent: Duane Jonlin, City of Seattle, representing City of Seattle Department of Planning and Development (duane.jonlin@seattle.gov)

Add new text as follows:

C410.1 General. A solar zone shall be provided for buildings which are five stories or less in height above grade plane, and shall be located on the roof of the building or elsewhere on the site. The solar zone shall comply with Sections C410.2 through C410.8 and the International Fire Code.

Exceptions:

1. A solar zone is not required where the solar exposure of the building's roof area is less than 75 percent of that of an unobstructed area in the same location, as measured by one of the following:
 - 1.1. Incident solar radiation expressed in kWh/ft²-yr using typical meteorological year (TMY) data
 - 1.2. Annual sunlight exposure expressed in cumulative hours per year using TMY data
 - 1.3. Shadow studies indicating that the area is more than 25 percent in shadow, on September 21 at 10am, 11am, 12pm, 1pm, and 2pm solar
2. Subject to the approval of the code official, buildings with extensive rooftop equipment that would make full compliance with this section impractical shall be permitted to provide a smaller solar zone than that required by Section C410.3.

C410.2 Minimum area. The minimum area of the solar zone shall be determined in accordance with Section C410.2.1 or C410.2.2, whichever results in the smaller area.

C410.2.1 Percentage of roof area. An area equal to 40 percent of the roof area calculated as the horizontally-projected gross roof area less the area covered by skylights, occupied roof decks and planted areas.

C410.2.2 Percentage of electrical service size. The electrical service size shall be the rated capacity of the total of all electrical services to the building, and the required solar zone size shall be based upon 10 peak watts of PV per square foot for 20 percent of the size of the electrical service.

C410.3 Obstructions. The solar zone shall be free of pipes, vents, ducts, HVAC equipment, skylights and other obstructions, except those serving PV or SWH systems within the solar zone. PV and SHW systems are permitted to be installed within the solar zone.

C410.4 Shading. Any existing or new object on the building or site that is located south, east, or west of the solar zone shall be set back from the solar zone a distance at least two times its height above the roof surface. Such objects include but are not limited to taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings. The solar zone shall not be located on a roof slope greater than 2:12 that faces within 45° of true north.

C410.5 Non-contiguous area. The solar zone is permitted to be comprised of smaller separated sub-zones. Each subzone shall be at least 5 feet wide in the narrowest dimension.

C410.6 Access. Areas contiguous to the *solar zone* shall provide access pathways and provisions for emergency smoke ventilation as required by the *International Fire Code*.

C410.7 Structural integrity. Where the *solar zone* is on the roof of the building or another structure on the site, the as-designed dead load and live load for the *solar zone* shall be clearly marked on the construction documents, and shall accommodate future PV or SHW arrays at an assumed dead load of 5 pounds per square foot in addition to other required live and dead loads. For PV systems, a location for inverters shall be designated either within or adjacent to the solar zone, with a minimum area of 2 square feet for each 1000 square feet of solar zone area, and shall accommodate an assumed dead load of 175 pounds per square foot.

C410.8 PV or SWH interconnection provisions. Buildings shall provide for the future interconnection of either a PV system in accordance with Section C410.2.8.1 or an SWH system in accordance with Section C410.2.8.2.

C410.2.8.1 PV interconnection. A capped roof penetration sleeve shall be provided in the vicinity of the future inverter, sized to accommodate the future PV system conduit. Interconnection of the future PV system shall be provided for at the main service panel, either ahead of the service disconnecting means or at the end of the bus opposite the service disconnecting means, in one of the following forms:

1. A space for the mounting of a future overcurrent device, sized to accommodate the largest standard rated overcurrent device that is less than 20 percent of the bus rating; or
2. Lugs sized to accommodate conductors with an ampacity of at least 20 percent of the bus rating, to enable the mounting of an external overcurrent device for interconnection.

The electrical construction documents shall indicate the following:

1. Solar zone boundaries and access pathways;
2. Location for future inverters and metering equipment; and
3. Route for future wiring between the PV panels and the inverter, and between the inverter and the main service panel.

C410.2.8.2 SWH interconnection. Two capped pipe tees shall be provided upstream of the domestic water heating equipment to provide plumbing interconnections between a future SWH system and the domestic water heating system. Two roof penetration sleeves shall be provided in the vicinity of the solar zone, capable of accommodating supply and return piping for a future SWH system.

The plumbing construction documents shall indicate the following:

1. Solar zone boundaries and access pathways;
2. Location for future hot water storage tanks; and
3. Route for future piping between the solar zone and the plumbing interconnection point, following the shortest feasible pathway.

Add new definition as follows:

SECTION C202 GENERAL DEFINITIONS

SOLAR ZONE. A clear area or areas reserved solely for current and future installation of photovoltaic or solar hot water systems.

Reason: The cost of photovoltaic and solar water heating systems has declined markedly in recent years, but at this point they are still only marginally cost-effective. However, their cost continues to decline, and this rule will prepare our new building stock to easily install such systems at an appropriate time. As energy costs rise and solar generation costs decline, a point will be reached where large solar energy systems are a viable investment. This rule brings that date closer in time by clearing away any physical impediments to future installation.

The rule requires an unobstructed "solar zone" for most non-residential buildings of five stories or less, either 40 percent of the building's roof area, or an area large enough to generate 20% of the building's electricity.

Example: A building with a 10,000 SF total roof area, 1,000 SF skylight area, and a 400 Amp, 240 volt single phase electrical service is required to provide a solar zone area of the smaller of the following:

1. $[40\% \times (10,000 \text{ SF roof area} - 1,000 \text{ SF skylights})] = 3,600 \text{ SF}$, or
2. $[400 \text{ Amp} \times 240 \text{ Volts} \times 20\% / 10 \text{ watts per SF}] = 1,920 \text{ SF}$

Therefore, a solar zone of 1,920 square feet is required

The solar zone requires a dedicated pathway for future connection to the electrical or water heating system, and may also be located above carports, canopies, or elsewhere on the building or site. Exemptions are provided for roofs that are extensively shaded or congested with equipment.

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

C410 (NEW)-EC-JONLIN.doc

Committee Action Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee felt that the code should allow this as an owner option and not a requirement. They felt that the 'reserved area' concept is not workable over time. Residential use buildings should be exempted. Even if it is in an appendix, it needed to be acceptable code language.

Assembly Action:

Approved as Modified

The modification included in the Assembly Action is to change the proposal to be located in an Appendix chapter in the Commercial IECC without any change to the text of the proposal.

Individual Consideration Agenda

This code change proposal is on the agenda for individual consideration because the proposal received a successful assembly action of Approved as Modified and a Public Comment was received.

Public Comment:

Duane Jonlin, City of Seattle, Department of Planning & Development, requests Approval as Modified by this Public Comment.

Modify the proposal as follows:

APPENDIX A

SOLAR ZONES

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION AC101

GENERAL

C410.1 AC101.1 General. A solar zone shall be provided for buildings which are five stories or less in height above grade plane, and shall be located on the roof of the building or elsewhere on the site. The solar zone shall comply with Sections C410.2 AC102 through C410.8 AC108 and the International Fire Code.

Exceptions:

1. A solar zone is not required where the solar exposure of the building's roof area is less than 75 percent of that of an unobstructed area in the same location, as measured by one of the following:
 - 1.1. Incident solar radiation expressed in kWh/ft²-yr using typical meteorological year (TMY) data
 - 1.2. Annual sunlight exposure expressed in cumulative hours per year using TMY data

- 1.3. Shadow studies indicating that the area is more than 25 percent in shadow on September 21 at 10am, 11am, 12pm, 1pm, and 2pm solar
2. Subject to the approval of the code official, buildings with extensive rooftop equipment that would make full compliance with this section impractical shall be permitted to provide a smaller *solar zone* than that required by Section C410.3: AC102.

SECTION AC102 **AREA**

C410.2 AC102.1 Minimum area. The minimum area of the *solar zone* shall be determined in accordance with Section AC102.1.1 C410.2.1 or C410.2.2 or AC102.1.2, whichever results in the smaller area.

C410.2.1 AC 102.1.1 Percentage of roof area. An area equal to 40 percent of the roof area calculated as the horizontally-projected gross roof area less the area covered by skylights, occupied roof decks and planted areas.

C410.2.2 AC102.1.2 Percentage of electrical service size. The electrical service size shall be the rated capacity of the total of all electrical services to the building, and the required *solar zone* size shall be based upon 10 peak watts of PV photovoltaic system per square foot for 20 percent of the size of the electrical service.

SECTION AC103 **OBSTRUCTIONS**

C410.3 AC103.1 Obstructions. The *solar zone* shall be free of pipes, vents, ducts, HVAC equipment, skylights and other obstructions, except those serving PV or SWH photovoltaic (PV) or solar hot water (SWH) systems within the solar zone. PV and SHW systems are permitted to be installed within the solar zone.

SECTION AC104 **SHADING**

C410.4 AC104.1 Shading. Any existing or new object on the building or site that is located south, east, or west of the solar zone shall be set back from the solar zone a distance at least two times its height above the roof surface. Such objects include but are not limited to taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings. The *solar zone* shall not be located on a roof slope greater than 2:12 that faces within 45° of true north.

SECTION AC105 **NON-CONTIGUOUS AREA**

C410.5 AC105.1 Non-contiguous area. The *solar zone* is permitted to be comprised of smaller separated sub-zones. Each subzone shall be at least 5 feet wide in the narrowest dimension.

SECTION AC106 **ACCESS**

C410.6 AC106.1 Access. Areas contiguous to the *solar zone* shall provide access pathways and provisions for emergency smoke ventilation as required by the *International Fire Code*.

SECTION AC107 **STRUCTURAL INTEGRITY**

C410.7 AC107.1 Structural integrity. Where the *solar zone* is on the roof of the building or another structure on the site, the as-designed dead load and live load for the *solar zone* shall be clearly marked on the construction documents, and shall accommodate future PV or SHW arrays at an assumed dead load of 5 pounds per square foot in addition to other required live and dead loads. For PV systems, a location for inverters shall be designated either within or adjacent to the solar zone, with a minimum area of 2 square feet for each 1000 square feet of solar zone area, and shall accommodate an assumed dead load of 175 pounds per square foot.

SECTION AC108 **INTERCONNECTIONS**

C410.8 AC108.1 PV or SWH interconnection provisions. Buildings shall provide for the future interconnection of either a PV system in accordance with Section C410.2.8.1 AC108.1.1 or an SWH system in accordance with Section C410.2.8.2 AC108.1.2

C410.1 AC108.1.1 PV interconnection. A capped roof penetration sleeve shall be provided in the vicinity of the future inverter, sized to accommodate the future PV system conduit. Interconnection of the future PV system shall be provided for at the main service panel, either ahead of the service disconnecting means or at the end of the bus opposite the service disconnecting means, in one of the following forms:

1. A space for the mounting of a future overcurrent device, sized to accommodate the largest standard rated overcurrent device that is less than 20 percent of the bus rating; or
2. Lugs sized to accommodate conductors with an ampacity of at least 20 percent of the bus rating, to enable the mounting of an external overcurrent device for interconnection.

The electrical construction documents shall indicate the following:

1. Solar zone boundaries and access pathways;
2. Location for future inverters and metering equipment; and
3. Route for future wiring between the PV panels and the inverter, and between the inverter and the main service panel.

C410.8.2 AC108.1.2 SWH interconnection. Two capped pipe tees shall be provided upstream of the domestic water heating equipment to provide plumbing interconnections between a future SWH system and the domestic water heating system. Two roof penetration sleeves shall be provided in the vicinity of the solar zone, capable of accommodating supply and return piping for a future SWH system.

The plumbing construction documents shall indicate the following:

1. Solar zone boundaries and access pathways;
2. Location for future hot water storage tanks; and
3. Route for future piping between the solar zone and the plumbing interconnection point, following the shortest feasible pathway.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This proposal, as approved by Assembly Action in the Dallas meetings, places the "solar-ready" requirements in an Appendix, so that individual jurisdictions can choose to incorporate it or not, depending on local conditions. This will provide uniformity among those jurisdictions.

Note that this proposal does not place any restrictions on how the "solar zone" is used in the future. Also note that the solar zone size is reduced where skylights, roof plantings or occupied decks utilize portions of the roof.

CE361-13

Final Action: AS AM AMPC_____ D
