Total Mods for Energy in Pending Review: 124

Total Mods for report: 124

Proposed Code Modifications

This document created by the Florida Department of Business and Professional Regulation - 850-487-1824

TAC: Energy

Total Mods for **Energy** in **Pending Review: 124**

Total Mods for report: 124

Sub Code: Energy Conservation

EN7332

7 - Forms

1

Date Submitted 11/19/2018
Chapter Appendix CB
Section CB
Affects HVHZ No
Proponent Bryan Holland
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes**   **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification adds Appendix CB for "Solar-Ready Zone - Commercial" provisions.

Rationale

This proposed modification adds an appendix for Solar-Ready Zone - Commercial provisions similar to those already provided in Appendix RB of the FBC-Energy Residential.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7332-G1

Proponent Stevie Freeman-Monte **Submitted** 1/29/2019 **Attachments** No

Comment:

I support this proposed code modification.

APPENDIX CB

SOLAR-READY ZONE—COMMERCIAL

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User note:

About this appendix: Appendix CB is intended to encourage the installation of renewable energy systems by preparing buildings for the future installation of solar energy equipment, piping and wiring.

SECTION CB101

SCOPE

CB101.1 General. These provisions shall be applicable for new construction where solar-ready provisions are required.

SECTION CB102

GENERAL DEFINITION

SOLAR-READY ZONE. A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

SECTION CB103

SOLAR-READY ZONE

CB103.1 General. A solar-ready zone shall be located on the roof of buildings that are five stories or less in height above grade plane, and are oriented between 110 degrees and 270 degrees of true north or have low-slope roofs. Solar-ready zones shall comply with Sections CB103.2 through CB103.8.

Exceptions:

1. A building with a permanently installed, on-site renewable energy system.

2. A building with a solar-ready zone that is shaded for more than 70 percent of daylight hours annually.

3. A building where the licensed design professional certifies that the incident solar radiation available to the building is not suitable for a solar-ready zone.

4. A building where the licensed design professional certifies that the solar zone area required by Section CB103.3 cannot be met because of extensive rooftop equipment, skylights, vegetative roof areas or other obstructions.

CB103.2 Construction document requirements for a solar-ready zone. Construction documents shall indicate the solar-ready zone.

CB103.3 Solar-ready zone area. The total solar-ready zone area shall be not less than 40 percent of the roof area calculated as the horizontally projected gross roof area less the area covered by skylights, occupied roof decks, vegetative roof areas and mandatory access or set back areas as required by the Florida Fire Prevention Code. The solar-ready zone shall be a single area or smaller, separated sub-zone areas. Each subzone shall be not less than 5 feet (1524 mm) in width in the narrowest dimension.

CB103.4 Obstructions. Solar ready zones shall be free from obstructions, including pipes, vents, ducts, HVAC equipment, skylights and roof-mounted equipment.

CB103.5 Roof loads and documentation. A collateral dead load of not less than 5 pounds per square foot (5 psf) (24.41 kg/m2) shall be included in the gravity and lateral design calculations for the solar-ready zone. The structural design loads for roof dead load and roof live load shall be indicated on the construction documents.

CB103.6 Interconnection pathway. Construction documents shall indicate pathways for routing of conduit or piping from the solar-ready zone to the electrical service panel or service hot water system.

CB103.7 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a dual-pole circuit breaker for future solar electric installation and shall be labeled “For Future Solar Electric.” The reserved space shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

CB103.8 Construction documentation certificate. A permanent certificate, indicating the solar-ready zone and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.

Date Submitted	12/15/2018	**Section**	CA	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix CA	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

8074

Summary of Modification

Provide a Commercial Energy Conservation Code Documentation Checklist in Appendix CA.

Rationale

Adding a compliance checklist to Appendix CA will help clarify commercial code compliance reporting requirements and facilitate code compliance verification.

A need for this checklist was identified through FBC sponsored research conducted by the Florida Solar Energy Center (see Commercial Enforcement Recommendations section on page 26):
http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-CR-1922-12.pdf

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or help facilitate code enforcement.

Impact to building and property owners relative to cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Impact to industry relative to the cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Impact to small business relative to the cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by facilitating code compliance verification.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating code compliance verification.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; facilitates code compliance verification.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by facilitating code compliance verification.

[Checklist is also attached as PDF.]

Florida Building Code, Seventh Edition (2020) – Energy Conservation

[Approved Software Title and Version], Effective Date: Dec 31, 2020
[Compliance Method]

Commercial Compliance Check List

Applications for compliance with the Florida Building Code, Energy Conservation shall include:

- ☐ This Checklist
- ☐ The full compliance report generated by the software that contains the project summary, compliance summary, certifications and detailed component compliance reports.
- ☐ The compliance report must include the full input report generated by the software as contiguous part of the compliance report.
- ☐ Boxes appropriately checked in the Mandatory Section of the compliance report.

[Approved Software Title and Version] TAM 2020-1.0 Compliant Software. Effective Date: Dec 31, 2020
Florida Building Code, Seventh Edition (2020) - [Compliance method]

MM/DD/YY HH:MM [AM/PM] Page 1 of [#]

Date Submitted	12/10/2018	**Section**	RD	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix RD	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Replace existing Form R402 (prescriptive R-value computation compliance report) with new Form R402.

Rationale

The proposed new Form R402 eliminates existing Form R402 redundancy and provides fenestration and insulation requirements in same format as Florida Energy Conservation Code Table R402.1.2. Proposed new Form R402 also clarifies the meaning of the values shown better than on the old form.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Should facilitate code enforcement.

Impact to building and property owners relative to cost of compliance with code

None; only intended to improve Form R402.

Impact to industry relative to the cost of compliance with code

None; only intended to improve Form R402.

Impact to small business relative to the cost of compliance with code

None; only intended to improve Form R402.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by providing improved prescriptive compliance form which should facilitate code compliance verification.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing improved prescriptive compliance form which should facilitate code compliance verification.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; provides improved prescriptive code form.

Does not degrade the effectiveness of the code

Increases code effectiveness by providing improved prescriptive compliance form which should facilitate code compliance verification.

Alternate Language

1st Comment Period History

7652-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** Yes

Rationale

Medium hot water draw pattern is typical so most appropriate to provide here.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None for alt language mod A-1.

Impact to building and property owners relative to cost of compliance with code

None for alt language mod A-1.

Impact to industry relative to the cost of compliance with code

None for alt language mod A-1.

Impact to Small Business relative to the cost of compliance with code

None; only intended to improve Form R402.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Same as original mod.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Same as original mod.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Same as original mod.

Does not degrade the effectiveness of the code

Same as original mod.

Mod 7652

[Replace existing Appendix RD Form R402 with new version of Form R402 below (and also [provided as attached PDF.]

Florida Building Code, Energy Conservation

Residential Building Thermal Envelope Approach

FORM R402-2020 R-Value Computation Method Florida Climate Zone

PROJECT NAME AND ADDRESS:		**BUILDER:**
		PERMITTING OFFICE:
		JURISDICTION NUMBER:
OWNER:		**PERMIT NUMBER:**
PERMIT TYPE:		**NUMBER OF UNITS:**
WORST CASE?		**CONDITIONED FLOOR AREA:**

Scope: Compliance with Section R402.1.2 of the *Florida Building Code, Energy Conservation*, shall be demonstrated by the use of Form R402 for single- and multiple-family residences of three stories or less in height, additions to existing residential buildings, alterations, renovations, and building systems in existing buildings, as applicable. To comply, a building must meet or exceed all of the energy efficiency requirements and applicable mandatory requirements summarized on this form. If a building does not comply with this method, or by the UA Alternative method, it may still comply under Section R405 or R406 of the *Florida Building Code, Energy Conservation*.

General Instructions:

1. Fill in all the applicable spaces of the "INSTALLED" row in the INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT table with the information requested. All "INSTALLED" values must be equal to or more efficient than the required levels. "AVG" indicates an area weighted average is allowed; "LOWEST" indicates the lowest R-value to be installed must be entered.
2. Complete the tables for air infiltration and installed equipment.
3. Read the MANDATORY REQUIREMENTS table and check each box to indicate your intent to comply with all applicable items.
4. Read, sign and date the "Prepared By" certification statement at the bottom of this form. The owner or owner's agent must also sign and date the form.

INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[1]

REQUIRE-MENT	**FENESTRATION U-FACTOR[2, 3, 4]**	**SKYLIGHT[2] U-FACTOR**	**GLAZED FENESTRATION**	**CEILING R-VALUE**	**WOOD FRAME WALL R-**	**MASS WALL R-**	**FLOOR R-VALUE**	**BASEMENT WALL R-**	**SLAB[7] R-VALUE &**	**CRAWL SPACE WALL R-**
CLIMATE ZONE 1	NR	0.75	0.25	30	13	3/4	13	0	0	0
CLIMATE ZONE 2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
VALUE	AVG	AVG	AVG	LOWEST	LOWEST	LOWEST	LOWEST	LOWEST	LOWEST	LOWEST
INSTALLED:										

R-Value Calculation Method - [PASS / FAIL]

For SI: 1 foot = 304.8 mm; NR = No requirement.

(1) R-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.

(2) The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in climate zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.

(3) For impact rated fenestration complying with Section R301.2.1.2 of the *Florida Building Code, Residential* or Section 1609.1.2 of the *Florida Building Code, Building*, the maximum *U*-factor shall be 0.65 in Climate Zone 2. An area-weighted average of *U*-factor and SHGC shall be accepted to meet the requirements, and up to 15 square feet of glazed fenestration area are exempted from the *U*-factor and SHGC requirement based on Section R402.3.1, R402.3.2 and R402.3.3.

(4) One side-hinged opaque door assembly up to 24 square feet is exempted from this *U*-factor requirement based on Section R402.3.4.

(5) R-values are for insulation material only as applied in accordance with manufacturer's installation instructions.

(6) The second R-value applies when more than half the insulation is on the interior of the mass wall.

(7) R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.

FORM R402-2020

Air infiltration:	Blower door test is required on the building envelope to verify leakage <= 7 ACH50; test report must be provided to code official before CO is issued. *Florida Building Code, Energy Conservation* Section R402.4.1.2 testing exception may apply for additions, alterations, or renovations.

EQUIPMENT REQUIREMENTS AND INSTALLED VALUES

Fill in the "INSTALLED EFFICIENCY LEVEL" column with the information requested. For multiple systems of the same type, indicate the minimum efficient system. All "INSTALLED" values must be equal to or more efficient than the required level. If a listed "SYSTEM TYPE" is not to be installed, write in "N/A" for not applicable.

SYSTEM TYPE	MINIMUM EFFICIENCY LEVEL REQUIRED	INSTALLED EFFICIENCY LEVEL
Air distribution system[1]	Not allowed in attic	Location:
Air handling unit	Factory Sealed	Factory Sealed? Y/N
Duct R-Value	= R-8 (Ducts in unconditioned attics, Diameter => 3 in.) = R-6 (Ducts in unconditioned non attics, Diam. => 3 in.) = R-6 (Ducts in unconditioned attics, Diameter < 3 in.) = R-4.2 (Ducts in uncond not attics, Diam. < 3 in.) All ducts are in conditioned space (No minimum)	R-Value (In unc. attic) = R-Value (In unc. non attics) = R-value (Small ducts in attic) = R-Value (Small ducts in unc) = All in conditioned space? Y/N
Air Leakage/Duct test	Air handler installed: Total leakage = 4 cfm/100 s.f. Air handler not installed: Total leakage = 3 cfm/100 s.f.	Total leakage (cfm/100 s.f.) = Air handler installed? Y/N
Duct testing	Test not required if all ducts and AHU are within the building thermal envelope and for additions or alterations where ducts extended from existing heating and cooling system through unconditioned space are < 40 linear ft.	Test report required? Y/N
Air conditioning systems:	Minimum federal standard required by NAECA[2]	
Central system <= 65,000 Btu/h	SEER=14.0	SEER (Min)=
PTAC	EER [from Table C403.2.3(3)]	EER (Min) =
Other:	See Tables C403.2.3(1)-(11)	Type = Effic.(Min) =
Heating systems:	Minimum federal standard required by NAECA[2]	
Heat Pump <= 65,000 Btu/h	HSPF >= 8.2	HSPF (Min) =
Gas Furnace, non-weatherized	AFUE >= 80%	AFUE (Min) =
Oil Furnace, non-weatherized	AFUE >= 83%	AFUE (Min) =
Other:		Type = Effic.(Min)=
Water heating system (storage type):	Minimum federal standard required by NAECA[2]	Capacity =
Electric[3, 6]	UEF: 40 gal.: 0.931, 50 gal.: 0.930, 60 gal.: 2.176	UEF (Min) =
Gas fired[4, 6]	UEF: 40 gal.: 0.64, 50 gal.: 0.627, 60 gal.: 0.789	UEF (Min) =
Other (describe)[5, 6]:		Type= Effic.(Min)=

Equipment Efficiency - [PASS / FAIL]

(1) Ducts & AHU installed "substantially leak free" per Section R403.3.2. Test required by either individuals as defined in Section 553.993(5) or (7),*Florida Statutes*, or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i), *Florida Statutes*. The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope, and for additions where ducts from an existing heating and cooling system extended to the addition through unconditioned space are less than 40 linear ft.

(2) Minimum efficiencies are those set by the *National Appliance Energy Conservation Act* of 1987 for typical residential equipment and are subject to NAECA rules and regulations. For other types of equipment, see Tables C403.2.3 (1-11) of the Commercial Provisions of the *Florida Building Code, Energy Conservation.*

(3) For electric storage volumes <= 55 gallons, minimum UEF = 0.9349 – (0.0001 * volume). For electric storage volumes > 55 gallons, minimum UEF = 2.2418 – (0.0011 * volume).

(4) For natural gas storage volumes <= 55 gallons, minimum UEF = 0.692 – (0.0013 * volume). For natural gas storage volumes > 55 gallons, minimum UEF = 0.8072 – (0.0003 * volume).

(5) For electric tankless, min. UEF = 0.92. For natural gas tankless, min. UEF = 0.81.

(6) Referenced UEFs shown are for high draw pattern value provided by manufacturer.

MANDATORY REQUIREMENTS			
Component	**Section**	**Summary of Requirement(s)**	**Check**
Air leakage	R402.4	To be caulked, gasketed, weatherstripped or otherwise sealed per Table R402.4.1.1. Recessed lighting IC-rated as having <= 2.0 cfm tested to ASTM E 283.Windows and doors: 0.3 cfm/sq.ft. (swinging doors: 0.5 cfm/sf) when tested to NFRC 400 or AAMA/WDMA/CSA 101/I.S. 2/A440. Fireplaces: Tight-fitting flue dampers & outdoor combustion air.	
Programmable thermostat	R403.1.2	A programmable thermostat is required for the primary heating or cooling system.	
Air distribution system	R403.3.2 R403.3.4	Ducts shall be tested as per Section R403.3.2 by either individuals as defined in Section553.993(5) or (7), *Florida Statutes*, or individuals licensed as set forth in Section 489.105(3) (f), (g) or (i), *Florida Statutes*. Air handling units are not allowed in attics.	
Water heaters	R403.5	Comply with efficiencies in Table C404.2. Hot water pipes insulated to >= R-3 to kitchen outlets, other cases. Circulating systems to have an automatic or accessible manual OFF switch. Heat trap required for vertical pipe risers.	
Cooling/heating equipment	R403.7	Sizing calculation performed & attached. Special occasion cooling or heating capacity requires separate system or variable capacity system.	
Swimming pools & spas	R403.10	Spas and heated pools must have vapor-retardant covers or a liquid cover or other means proven to reduce heat loss except if 70% of heat from site-recovered energy. Off/timer switch required. Gas heaters minimum thermal efficiency is 82%. Heat pump pool heaters minimum COP is 4.0.	
Lighting equipment	R404.1	At least 75% of permanently installed lighting fixtures shall be high-efficacy lamps.	

I hereby certify that the plans and specifications covered by this form are in compliance with the *Florida Building Code, Energy Conservation.* PREPARED BY: Date I hereby certify that this building is in compliance with the *Florida Building Code, Energy Conservation.* OWNER/AGENT: Date	Review of plans and specifications covered by this form indicate compliance with the *Florida Building Code, Energy Conservation* Before construction is complete, this building will be inspected for compliance in accordance with Section 553.908, F.S. CODE OFFICIAL: _ Date: _

~~**FLORIDA BUILDING CODE, ENERGY CONSERVATION**~~

~~**Residential Building Thermal Envelope Approach**~~

~~FORM R402-2017~~ ~~Climate Zone ☐~~

~~Scope: Compliance with Section R401.2(1) of the Florida Building Code, Energy Conservation, shall be demonstrated by the use of Form R402 for single- and multiple-family residences of three stories or less in height, additions to existing residential buildings, alterations, renovations and building systems in existing buildings, as applicable. To comply, a building must meet or exceed all of the energy efficiency requirements on Table R402A and all applicable mandatory requirements summarized in Table R402B of this form. If a building does not comply with this method, or by the UA Alternative method, it may still comply under Section R405 of the Florida Building Code, Energy Conservation.~~

~~**PROJECT NAME AND ADDRESS:**~~ ~~**BUILDER:**~~

~~OWNER:~~ ~~PERMITTING OFFICE:~~

~~JURISDICTION NUMBER:~~

~~PERMIT NUMBER:~~

~~General Instructions:~~

1. ~~1.Fill in all the applicable spaces of the "To Be Installed" column on Table R402A with the information requested. All "To Be Installed" values must be equal to or more efficient than the required levels.~~
2. ~~2.Complete page 1 based on the "To Be Installed" column information.~~
3. ~~3.Read the requirements of Table R402B and check each box to indicate your intent to comply with all applicable items.~~
4. ~~4.Read, sign and date the "Prepared By" certification statement at the bottom of page 1. The owner or owner's agent must also sign and date the form.~~

1. ~~New construction, addition, or existing building~~ ~~1.~~ ______ ______
2. ~~Single-family detached or multiple-family attached~~ ~~2.~~ ______ ______
3. ~~If multiple-family, number of units covered by this submission~~ ~~3.~~ ______ ______
4. ~~Is this a worst case? (yes/no)~~ ~~4.~~ ______ ______
5. ~~Conditioned floor area (sq. ft.)~~ ~~5.~~ ______ ______
6. ~~Windows, type and area~~

	~~a) U-factor:~~		~~6a.~~		
	~~b) Solar Heat Gain Coefficient (SHGC)~~		~~6b.~~		
	~~c) Area~~		~~6c.~~		
~~7.~~	~~Skylights~~				
	~~a) U-factor:~~		~~7a.~~		
	~~b) Solar Heat Gain Coefficient (SHGC)~~		~~7b.~~		
~~8.~~	~~Floor type, area or perimeter, and insulation:~~				
	~~a) Slab-on-grade (R-value)~~		~~8a.~~		
	~~b) Wood, raised (R-value)~~		~~8b.~~		
	~~c) Wood, common (R-value)~~		~~8c.~~		
	~~d) Concrete, raised (R-value)~~		~~8d.~~		
	~~e) Concrete, common (R-value)~~		~~8e.~~		
~~9.~~	~~Wall type and insulation:~~				
	~~a) Exterior:~~	~~1. Wood frame (Insulation R-value)~~	~~9a1-~~		
		~~2. Masonry (Insulation R-value)~~	~~9a2-~~		
	~~b) Adjacent:~~	~~1. Wood frame (Insulation R-value)~~	~~9b1-~~		
		~~2. Masonry (Insulation R-value)~~	~~9b2-~~		
~~10.~~	~~Ceiling type and insulation~~				
	~~a) Attic (Insulation R-value)~~		~~10a-~~		

	~~b) Single assembly (Insulation R-value)~~		~~10b~~	
~~11.~~	~~Air distribution system:~~			
	~~a) Duct location, insulation~~		~~11a~~	
	~~b) AHU location~~		~~11b~~	
	~~c) Total duct leakage. Test report attached.~~		~~11c~~ ~~cfm/100 s.f.~~	~~Yes ☐ No ☐~~
~~12.~~	~~Cooling system:~~	~~a) type~~	~~12a~~	
		~~b) efficiency~~	~~12b~~	
~~13.~~	~~Heating system:~~	~~a) type~~	~~13a~~	
		~~b) efficiency~~	~~13b~~	
~~14.~~	~~HVAC sizing calculation: attached~~		~~14.~~	~~Yes ☐ No ☐~~
~~15.~~	~~Water heating system:~~	~~a) type~~	~~15a~~	
		~~b) efficiency~~	~~15b~~	

~~I hereby certify that the plans and specifications covered by this form are in compliance with the Florida Building Code, Energy Conservation.~~

~~PREPARED BY:~~ ______________________

~~Date~~ __________

~~Review of plans and specifications covered by this form indicate compliance with the Florida Building Code, Energy Conservation. Before construction is complete, this building will be inspected for compliance in accordance with Section 553.908, F.S.~~

~~I hereby certify that this building is in compliance with the Florida Building Code, Energy Conservation.~~

~~OWNER/AGENT:~~ ______________________ ~~Date:~~ __________

~~CODE OFFICIAL:~~ ______________________

~~Date:~~ __________

~~TABLE R402A~~

~~BUILDING COMPONENT~~	~~PRESCRIPTIVE REQUIREMENTS~~[1]		~~INSTALLED VALUES~~
	~~Climate Zone 1~~	~~Climate Zone 2~~	

~~Windows~~	~~U Factor = NR~~ ~~SHGC = 0.25~~	~~U Factor = 0.40[2]~~ ~~SHGC = 0.25~~	~~U Factor =~~ ~~SHGC =~~
~~Skylights~~	~~U factor = 0.75~~ ~~SHGC = 0.30~~	~~U factor = 0.65~~ ~~SHGC = 0.30~~	~~U factor =~~ ~~SHGC =~~
~~Doors: Exterior door~~	~~U factor = NR~~	~~U factor = 0.40[3]~~	~~U factor=~~
~~Floors:~~			
~~Slab-on-Grade~~	~~NR~~	~~NR~~	
~~Over unconditioned spaces[4]~~	~~R-13~~	~~R-13~~	~~R-Value =~~
~~Walls[4]: Ext. and Adj.~~			
~~Frame~~	~~R-13~~	~~R-13~~	~~R-Value =~~
~~Mass~~			
~~Insulation on wall interior~~	~~R-4~~	~~R-6~~	~~R-Value =~~
~~Insulation on wall exterior~~	~~R-3~~	~~R-4~~	~~R-Value =~~
~~Ceilings[5]~~	~~R=30~~	~~R=38~~	~~R-Value =~~
~~Air infiltration~~	~~Blower door test is required on the building envelope to verify leakage ≤ 7 ACH;~~ ~~test report provided to code official.~~		~~Total leakage = ACH~~ ~~Test report attached?~~ ~~Yes ☐ No ☐~~
~~Air distribution system[5]:~~			
~~Air handling unit~~	~~Not allowed in attic~~		
~~Duct R-value~~	~~R-value ≥ R-8 (supply in attics) or ≥ R-6 (all other duct locations)~~		~~Location: R-Value =~~
~~Air leakage[5]:~~			
~~Duct test~~	~~Postconstruction test~~	~~Total leakage ≤ 4 cfm/100 s.f.~~	~~Total leakage =_______ cfm/100s.f.~~
	~~Rough-in test~~	~~Total leakage ≤ 4 cfm/100 s.f. (air handler installed)~~ ~~Total leakage ≤ 3 cfm/100 s.f. (air handler not installed)~~	~~Test report Attached?~~ ~~Yes ☐ No ☐~~ ~~Location:~~
~~Ducts in conditioned space~~	~~Test not required if all ducts and AHU are in conditioned space~~		
~~Air conditioning system:~~	~~Minimum federal standard required by NAECA[6]:~~		
~~Central system ≤ 65,000 Btu/h~~	~~SEER 14.0~~		~~SEER =~~
~~Room unit or PTAC~~	~~EER [from Table C403.2.3(3)]~~		~~EER =~~

~~8. (8)For other natural gas storage volumes, minimum EF = 0.67 – (0.0019 * volume).~~

~~TABLE R402B MANDATORY REQUIREMENTS~~

~~Component~~	~~Section~~	~~Summary of Requirement(s)~~	~~Check~~
~~Air leakage~~	~~R402.4~~	~~To be caulked, gasketed, weatherstripped or otherwise sealed per Table R402.4.1.1. Recessed lighting: IC-rated as having ≤ 2.0 cfm tested to ASTM E 283.~~	
		~~Windows and doors: 0.3 cfm/sq. ft. (swinging doors: 0.5 cfm/sf) when tested to NFRC 400 or AAMA/WDMA/CSA 101/I.S. 2/A440.~~	
		~~Fireplaces: Tight-fitting flue dampers & outdoor combustion air.~~	
~~Programmable thermostat~~	~~R403.1.2~~	~~A programmable thermostat is required for the primary heating or cooling system.~~	
~~Air distribution system~~	~~R403.3.2~~ ~~R403.3.4~~	~~Ducts shall be tested as per Section R403.3.2 by either individuals as defined in Section 553.993(5) or (7), Florida Statutes, or individuals licensed as set forth in Section 489.105(3) (f), (g) or (i), Florida Statutes. Air handling units are not allowed in attics.~~	
~~Water heaters~~	~~R403.5~~	~~Comply with efficiencies in Table C404.2. Hot water pipes insulated to ≥ R-3 to kitchen outlets, other cases.~~	
		~~Circulating systems to have an automatic or accessible manual OFF switch. Heat trap required for vertical pipe risers.~~	
~~Swimming pools & spas~~	~~R403.10~~	~~Spas and heated pools must have vapor-retardant covers or a liquid cover or other means proven to reduce heat loss except if 70% of heat from site recovered energy. Off/timer switch required. Gas heaters minimum thermal efficiency is 82%. Heat pump pool heaters minimum COP is 4.0.~~	
~~Cooling/heating equipment~~	~~R403.7~~	~~Sizing calculation performed & attached. Special occasion cooling or heating capacity requires separate system or variable capacity system.~~	
~~Lighting equipment~~	~~R404.1~~	~~At least 75% of permanently installed lighting fixtures shall be high-efficacy lamps.~~	

Mod 7652-A1

[Make the following changes to the Water heating system section and corresponding note 6 of the new Form R402 mod (only page 2 of the new form is shown here; no changes to other pages or sections of form):]

EQUIPMENT REQUIREMENTS AND INSTALLED VALUES

Fill in the “INSTALLED EFFICIENCY LEVEL" column with the information requested. For multiple systems of the same type, indicate the minimum efficient system. All "INSTALLED" values must be equal to or more efficient than the required level. If a listed “SYSTEM TYPE” is not to be installed, write in “N/A” for not applicable.

SYSTEM TYPE	MINIMUM EFFICIENCY LEVEL REQUIRED	INSTALLED EFFICIENCY LEVEL
Air distribution system[1]	Not allowed in attic	Location:
Air handling unit	Factory Sealed	Factory Sealed? Y/N
Duct R-Value	= R-8 (Ducts in unconditioned attics, Diameter => 3 in.) = R-6 (Ducts in unconditioned non attics, Diam. => 3 in.) = R-6 (Ducts in unconditioned attics, Diameter < 3 in.) = R-4.2 (Ducts in uncond not attics, Diam. < 3 in.) All ducts are in conditioned space (No minimum)	R-Value (In unc. attic) = R-Value (In unc. non attics) = R-value (Small ducts in attic) = R-Value (Small ducts in unc) = All in conditioned space? Y/N
Air Leakage/Duct test	Air handler installed: Total leakage = 4 cfm/100 s.f. Air handler not installed: Total leakage = 3 cfm/100 s.f.	Total leakage (cfm/100 s.f.) = Air handler installed? Y/N
Duct testing	Test not required if all ducts and AHU are within the building thermal envelope and for additions or alterations where ducts extended from existing heating and cooling system through unconditioned space are < 40 linear ft.	Test report required? Y/N
Air conditioning systems:	Minimum federal standard required by NAECA[2]	
Central system <= 65,000 Btu/h	SEER=14.0	SEER (Min)=
PTAC	EER [from Table C403.2.3(3)]	EER (Min) =
Other:	See Tables C403.2.3(1)-(11)	Type = Effic.(Min) =
Heating systems:	Minimum federal standard required by NAECA[2]	
Heat Pump <= 65,000 Btu/h	HSPF >=8.2	HSPF (Min) =
Gas Furnace, non-weatherized	AFUE >= 80%	AFUE (Min) =
Oil Furnace, non-weatherized	AFUE >= 83%	AFUE (Min) =
Other:		Type = Effic.(Min)=
Water heating system (storage type):	Minimum federal standard required by NAECA[2]	Capacity =
Electric[3, 6]	UEF: 40 gal.: ~~0.931~~0.923, 50 gal.: ~~0.930~~0.921, 60 gal.: ~~2.176~~2.051	UEF (Min) =
Gas fired[4, 6]	UEF: 40 gal.: ~~0.64~~0.580, 50 gal.: ~~0.627~~0.563, 60 gal.: ~~0.789~~0.766	UEF (Min) =
Other (describe)[5, 6]:		Type= Effic.(Min)=

Equipment Efficiency - [PASS / FAIL]

(1)
Ducts&AHUinstalled“substantiallyleakfree”perSectionR403.3.2.Testrequiredbyeitherindividualsasdefinedin Section553.993(5)or(7),*FloridaStatutes*,orindividualslicensedassetforthinSection489.105(3)(f),(g),or(i),*FloridaStatutes*.Thetotalleakagetestisnot requiredforductsandairhandlerslocatedentirelywithinthebuildingthermalenvelope, and for additions where ducts from an existing heating and cooling system extended to the addition through unconditioned space are less than 40 linear ft.

(2)
Minimumefficienciesarethosesetbythe*NationalApplianceEnergyConservationAct*of1987fortypicalresidentialequipmentandare subjecttoNAECArulesandregulations.Forothertypesofequipment,seeTablesC403.2.3(1-11)oftheCommercialProvisionsofthe *Florida Building Code, EnergyConservation.*

(3) Forelectricstoragevolumes<=55 gallons,minimum UEF=0.9349–(0.0001*volume).Forelectricstoragevolumes>55 gallons,minimum UEF=2.2418–(0.0011*volume).

(4) Fornaturalgasstoragevolumes<=55 gallons,minimum UEF=0.692–(0.0013*volume).Fornaturalgasstoragevolumes>55 gallons,minimum UEF=0.8072–(0.0003*volume).

(5) Forelectrictankless,min. UEF=0.92.Fornaturalgastankless,min. UEF=0.81.

(6) Referenced

EN7675

Date Submitted	12/12/2018	**Section**	RD	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix RD	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

7677

Summary of Modification

Add Envelope Leakage Test Report to Appendix RD.

Rationale

The 2017 version of this report form is currently available through FBC approved residential Florida Energy Conservation Code software. Providing it in the Code will help facilitate consistent building air leakage compliance verification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or help facilitate code enforcement.

Impact to building and property owners relative to cost of compliance with code

Lower to no cost; blower door tester would only need to maintain one form for the entire state.

Impact to industry relative to the cost of compliance with code

Lower to no cost; blower door tester would only need to maintain one form for the entire state.

Impact to small business relative to the cost of compliance with code

Lower to no cost; blower door tester would only need to maintain one form for the entire state.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by facilitating building air leakage testing verification consistency.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating building air leakage testing verification consistency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; facilitates building air leakage testing verification consistency.

Does not degrade the effectiveness of the code

Increases code effectiveness by facilitating building air leakage testing verification consistency.

[Add attached test report in its entirety.]

Envelope Leakage Test Report (Blower Door Test)

Residential Prescriptive, Performance or ERI Method Compliance
2020 Florida Building Code, Energy Conservation, 7th Edition

Jurisdiction:	Permit #:

Job Information

Builder: Community: Lot:

Address:

City: State: FL Zip:

Air Leakage Test Results *Passing results must meet either the Performance, Prescriptive, or ERI Method*

○ **PRESCRIPTIVE METHOD-**The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 7 air changes per hour at a pressure of 0.2 inch w.g. (50 Pascals) in Climate Zones 1 and 2.

○ **PERFORMANCE or ERI METHOD-**The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding the selected ACH(50) value, as shown on Form R405-2020 (Performance) or R406-2020 (ERI), section labeled as infiltration, sub-section ACH50.
ACH(50) specified on Form R405-2020-Energy Calc (Performance) or R406-2020 (ERI): ☐

_________ x 60 ÷ _____________ = ____________
CFM(50) Building Volume ACH(50)

☐ **PASS**

☐ When ACH(50) is less than 3, mechanical ventilation installation must be verified by building department.

Method for calculating building volume:

○ Retrieved from architectural plans
○ Code software calculated
○ Field measured and calculated

R402.4.1.2 Testing. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), *Florida Statues.*or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i) or an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the*code official.* Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope.*

During testing:
1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, back draft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

Testing Company

Company Name: ______________________________________ Phone: ________________________

I hereby verify that the above Air Leakage results are in accordance with the 2020 7th Edition Florida Building Code Energy Conservation requirements according to the compliance method selected above.

Signature of Tester: ____________________________________ Date of Test: ______________________

Printed Name of Tester: ____________________________________

License/Certification #: ______________________________ Issuing Authority: __________________________

EN7677

Date Submitted	12/10/2018	**Section**	RD	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix RD	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

7675

Summary of Modification

Add Duct Leakage Test Report to Appendix RD.

Rationale

The 2017 version of this report form is currently available through FBC approved residential Florida Energy Conservation Code software. Providing it in the Code will help facilitate consistent duct air leakage compliance verification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or help facilitate code enforcement.

Impact to building and property owners relative to cost of compliance with code

Lower to no cost; duct tester would only need to maintain one form for the entire state.

Impact to industry relative to the cost of compliance with code

Lower to no cost; duct tester would only need to maintain one form for the entire state.

Impact to small business relative to the cost of compliance with code

Lower to no cost; duct tester would only need to maintain one form for the entire state.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by facilitating duct air leakage testing verification consistency.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating duct air leakage testing verification consistency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; facilitates duct air leakage testing verification consistency.

Does not degrade the effectiveness of the code

Increases code effectiveness by facilitating duct air leakage testing verification consistency.

[Add attached test report in its entirety.]

Duct Leakage Test Report

Residential Prescriptive, Performance or ERI Method Compliance
2020 Florida Building Code, Energy Conservation, 7th Edition

Jurisdiction:	Permit #:

Job Information

Builder:	Community:	Lot:
Address:		
City:	State: FL	Zip:

Duct Leakage Test Result s ○ **Prescriptive Method** ○ **Performance/ERI Method**

System 1	_________	cfm25
System 2	_________	cfm25
System 3	_________	cfm25
Sum of any	_________	cfm25
Total of all	_________	cfm25

________ ÷ ___________ = ________Qn
Total of all systems ÷ Total Conditioned Square Footage

☐ **PASS** ☐ **FAIL**

○ **Prescriptive Method** cfm25 (Total)
To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed, Qn Total must be less than or equal to 0.03. This testing method meets the requirements in accordance with Section R403.3.3.
Is the air handler unit installed during testing? ☐ YES ($=\frac{.04}{Qn}$) ☐ NO ($=\frac{.03}{Qn}$)

○ **Performance/ERI Method** cfm25 (Out or Total)
To qualify using this method, Qn must not be greater than the proposed duct leakage Qn specified on Form R405-2020 or R406-2020.

Leakage Type selected on Form R405-2020 (EnergyCalc) or R406-2020	*Qn specified on Form R405-2020 (EnergyCalc) or R406-2020*

Duct tightness shall be verified by testing in accordance with ANSI/RESNET/ICC380 by either individuals as defined in Section 553.993(5) or (7), Florida Statutes, or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i), Florida Statutes.

Testing Company

Company Name: ______________________________ Phone: ____________________

I hereby verify that the above duct leakage testing results are in accordance with the Florida Building Code requirements with the selected compliance path as stated above, either the Prescriptive Method or Performance Method.

Signature of Tester: ______________________________ Date of Test: ____________________

Printed Name of Tester: ______________________________

License/Certification #: ______________________________ Issuing Authority: ____________________

EN7678

Date Submitted	12/10/2018	**Section**	RD	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix RD	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No**

Alternate Language **No**

Related Modifications

Summary of Modification

Modify Energy Performance Level (EPL) Display Card.

Rationale

The proposed new EPL Display Card provides additional project component and equipment information compared to the current EPL Card, including breaking out windows by SHGC and U-factor (instead of averaging), and allowing additional floor, wall, ceiling and HVAC system types to be shown as needed. This additional detail is especially helpful for efficiency verification of larger projects and has been requested by some building departments.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Should assist code officials by providing more detailed EPL Card.

Impact to building and property owners relative to cost of compliance with code

None; only facilitates verification.

Impact to industry relative to the cost of compliance with code

None; only facilitates verification.

Impact to small business relative to the cost of compliance with code

None; only facilitates verification.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by facilitating code compliance verification.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating code compliance verification.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; facilitates code compliance verification.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by facilitating code compliance verification.

Mod 7678

[Replace existing EPL Display Card in its entirety with the EPL Display Card below (also attached as PDF).]

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = [value]

The lower the Energy Performance Index, the more efficient the home.

[Address]

1. New home or, addition
2. Single family or multiple family ______-family
3. Number of units (if multiple family) ______[#]
4. Number of Bedrooms ______[#]
5. Is this a worst case? (yes/no)
6. Conditioned floor area (sq. ft.)
7. Windows** | Description | Area
   a. U-Factor: SHGC: | U-Factor: SHGC: | ft²
   b. U-Factor: SHGC: | [Type or N/A], U = | ft²
   c. U-Factor: SHCG: | [Type or N/A], U = | ft²
   d. U-Factor: SHGC: | [Type or N/A], U = | ft²

   Area Weighted Average Overhang Depth: ft²
   Area Weighted Average SHGC: ft.
8. Skylights | Description | Area
   a. U-Factor: SHGC: | U-Factor: SHGC: | ft²
9. Floor type, insulation level | Insulation | Area
   a. [Type] | R = | ft²
   b. [Type or N/A] | R = | ft²
   c. [Type or N/A] | R = | ft²
10. Wall type and insulation | Insulation | Area
    a. [Type] | R = | ft²
    b. [Type or N/A] | R = | ft²
    c. [Type or N/A] | R = | ft²
    d. [Type or N/A] | R = | ft²
11. Ceiling type and insulation level | Insulation | Area
    a. [Type] | R = | ft²
    b. [Type or N/A] | R = | ft²
    c. [Type or N/A] | R = | ft²
12. Ducts, location and insulation level
    a. Sup: [loc.], Ret: [loc], AH: [loc] | R ft²
    b. Sup: , Ret: , AH: [or N/A]
13. Cooling systems | kBtu/hr | Efficiency
    a. [Type]
    b. [Type or N/A]
    c. [Type or N/A]
14. Heating systems | kBtu/hr | Efficiency
    a. [Type]
    b. [Type or N/A]
    c. [Type or N/A]*
15. Water heating system
    a. [Type] | Cap: [#] gallons
    b. Conservation features | UEF:

    Use medium draw pattern UEF provided by manufacturer.

Credits (Performance method)

I certify that this home has complied with the *Florida Building Code, Energy Conservation*, through the above energy saving features which will be installed (or exceeded) in this home before final inspection. Otherwise, a new EPL Display Card will be completed based on installed Code compliant features.

Builder Signature: ______________________ Date: ______________

Address of Home: ______________________ City/FL Zip: ______________

*Note: This is not a Building Energy Rating. If your Index is below 70, your home may qualify for energy efficient mortgage (EEM) incentives if you obtain a Florida EnergyGauge Rating. For information about the *Florida Building Code, Energy Conservation*, contact the Florida Building Commission's support staff.

**Label required by Section R303.1.3 of the *Florida Building Code, Energy Conservation*, if not DEFAULT.

~~ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD~~

~~ESTIMATED ENERGY PERFORMANCE INDEX* = ____~~

~~The lower the Energy Performance Index, the more efficient the home.~~

~~1.~~	~~New home or, addition~~	~~1.~~_________
~~2.~~	~~Single family or multiple family~~	~~2.~~_________
~~3.~~	~~No. of units (if multiple family)~~	~~3.~~_________
~~4.~~	~~Number of bedrooms~~	~~4.~~_________
~~5.~~	~~Is this a worst case? (yes/no)~~	~~5.~~_________
~~6.~~	~~Conditioned floor area (sq. ft.)~~	~~6.~~_________
~~7.~~	~~Windows, type and area~~	
	~~a) U factor:~~	~~7a.~~_________
	~~b) Solar Heat Gain Coefficient (SHGC)~~	~~7b.~~_________
	~~c) Area~~	~~7c.~~_________
~~8.~~	~~Skylights~~	
	~~a) U factor~~	~~8a.~~_________
	~~b) Solar Heat Gain Coefficient (SHGC)~~	~~8b.~~_________
~~9.~~	~~Floor type, insulation level:~~	
	~~a) Slab-on-grade (R-value)~~	~~9a.~~_________
	~~b) Wood, raised (R-value)~~	~~9b.~~_________
	~~c) Concrete, raised (R-value)~~	~~9c.~~_________
~~10.~~	~~Wall type and insulation:~~	
	~~A. Exterior:~~	
	~~1. Wood frame (Insulation R-value)~~	~~10A1.~~_________
	~~2. Masonry (Insulation R-value)~~	~~10A2.~~_________
	~~B. Adjacent:~~	
	~~1. Wood frame (Insulation R-value)~~	~~10B1.~~_________
	~~2. Masonry (Insulation R-value)~~	~~10B2.~~_________
~~11.~~	~~Ceiling type and insulation level~~	
	~~a) Under attic~~	~~11a.~~_________
	~~b) Single assembly~~	~~11b.~~_________
	~~c) Knee walls/skylight walls~~	~~11c.~~_________
	~~d) Radiant barrier installed~~	~~11d.~~_________
~~12.~~	~~Ducts, location & insulation level~~	
	~~a) Supply ducts~~	~~R=~~_________
	~~b) Return ducts~~	~~R=~~_________
	~~c) AHU location~~	

~~13.~~	~~Cooling system:~~	~~Capacity:~~ ________
	~~a) Split system~~	~~SEER~~ ________
	~~b) Single package~~	~~SEER~~ ________
	~~c) Ground/water source~~	~~COP~~ ________
	~~d) Room unit/PTAC~~	~~EER~~ ________
	~~e) Other~~ ________	________
~~14.~~	~~Heating system:~~	
	~~a) Split system heat pump~~	~~HSPF~~ ________
	~~b) Single package heat pump~~	~~HSPF~~ ________
	~~c) Electric resistance~~	~~COP~~ ________
	~~d) Gas furnace, natural gas~~	~~AFUE~~ ________
	~~e) Gas furnace, LPG~~	~~AFUE~~ ________
	~~f) Other~~ ________	________
~~15.~~	~~Water heating system~~	
	~~a) Electric resistance~~	~~EF~~ ________
	~~b) Gas fired, natural gas~~	~~EF~~ ________
	~~c) Gas fired, LPG~~	~~EF~~ ________
	~~d) Solar system with tank~~	~~EF~~ ________
	~~e) Dedicated heat pump with tank~~	~~EF~~ ________
	~~f) Heat recovery unit~~	~~HeatRec%~~ ________
	~~g) Other~~ ________	________
~~16.~~	~~HVAC credits claimed (Performance Method)~~	________
	~~a) Ceiling fans~~	________
	~~b) Cross ventilation~~	________
	~~c) Whole house fan~~	________
	~~d) Multizone cooling credit~~	________
	~~e) Multizone heating credit~~	________
	~~f) Programmable thermostat~~	________

~~*Label required by Section R303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.~~

~~I certify that this home has complied with the Florida Building Code, Energy Conservation, through the above energy saving features which will be installed (or exceeded) in this home before final inspection. Otherwise, a new EPL display card will be completed based on installed code compliant features.~~

~~Builder Signature:~~ ________________________ ~~Date:~~ ________________________

~~Address of New Home:~~ ________________________ ~~City/FL Zip:~~ ________________

EN8074

Date Submitted	12/15/2018	**Section**	RD	**Proponent**	Jeff Sonne for FSEC
Chapter	Appendix RD	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Provide a Residential Energy Conservation Code Documentation Checklist in Appendix RD.

Rationale

Adding a compliance checklist to Appendix RD will help clarify code compliance reporting requirements and facilitate code compliance verification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or help facilitate code enforcement.

Impact to building and property owners relative to cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Impact to industry relative to the cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Impact to small business relative to the cost of compliance with code

None; the checklist only helps clarify code compliance reporting requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by facilitating code compliance verification.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating code compliance verification.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; facilitates code compliance verification.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by facilitating code compliance verification.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
[Compliance Method]

Applications for compliance with the 2020 Florida Building Code, Energy Conservation via the [compliance method] shall include:

- ☐ *This checklist*
- ☐ *Form [R402, TOTAL UA, R405, or R406] report*
- ☐ *Input summary checklist that can be used for field verification (usually four pages/may be greater)*
- ☐ *Energy Performance Level (EPL) Display Card (one page)*
- ☐ *HVAC system sizing and selection based on ACCA Manual S or per exceptions provided in Section R403.7*
- ☐ *Mandatory Requirements (five pages)*

Required prior to CO:

- ☐ *Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 - one page)*
- ☐ *A completed Envelope Leakage Test Report (usually one page)*
- ☐ *If Form R405 or R406 duct leakage type indicates anything other than "default leakage", then a completed Duct Leakage Test Report (usually one page)*

Date Submitted	11/12/2018	**Section** 202		**Proponent**	Bryan Holland
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the definition of "nameplate horsepower" to correlate with the 2018 IECC and related industry standards.

Rationale

Many small motors that are covered in Tables C405.8(3) and C405.8(4) provide information on the input and output power. This can be confusing for SI units where the input and output power are both stated in kW. The revision to the definition will clarify the power rating that is intended to be used (e.g. output) for efficiency requirements of small (and large) electric motors. Approval of this code change proposal will ensure consistency with ASHRAE Standard 90.1-2016, which will be adopted by reference as an alternative path to the 2020 FBC-Energy.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not have a fiscal impact on the local entity but will assist in the enforcement of energy rules related to motor and equipment horsepower ratings.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by defining terms in the FBC-Energy in accordance with industry standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing the FBC-Energy with industry standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

NAMEPLATE HORSEPOWER. The nominal motor ~~horsepower~~ output power rating stamped on the motor nameplate.

EN7237

Date Submitted	11/12/2018	**Section**	202	**Proponent**	Bryan Holland
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification deletes the term "screw lamp holders" as it is not used in the FBC-Energy nor the IECC or ASHRAE Standard 90.1.

Rationale

This term is not used anywhere in the FBC-Energy nor can it be found in the 2018 IECC or ASHARE Standard 90.1-2016. The code should not have the definition of terms it does not use.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by removing defined terms not used in the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by deleting unused terms in the definitions.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

~~**SCREW LAMP HOLDERS.** A lamp base that requires a screw-in-type lamp, such as a compact- fluorescent, incandescent or tungsten-halogen bulb.~~

EN7240

10

Date Submitted 11/12/2018	**Section** 202	**Proponent** Bryan Holland
Chapter 2	**Affects HVHZ** No	**Attachments** No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification adds, revises, and deletes several electrically-related definitions from the FBC-Energy to harmonize the code the 2018 IECC and other industry standards.

Rationale

The terms "ACCESS (TO)" and "READY ACCESS (TO)" reflect the language used in the code in lieu of "readily accessible" which is to be deleted. The terms "captive key override", "luminaire-level lighting controls", and "networked guestroom control system" are used throughout the code and related to current industry practices. The definition of "computer room" is revised current industry demand thresholds in computer rooms as related to energy consumption. "Low-voltage lighting" is deleted as it is no longer used in the code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by adding, deleting, or revising terms for correct use.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by adding, deleting, or revising code-used terms to match industry standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

ACCESS (TO). That which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel, or similar obstruction.

CAPTIVE KEY OVERRIDE. A lighting control that will not release the key that activates the override when the lighting is on.

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~~of less than 20 watts per square foot of conditioned floor area or a connected design electronic data equipment load of less than 10 kW.

~~LOW-VOLTAGE LIGHTING. Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.~~

LUMINAIRE-LEVEL LIGHTING CONTROLS. A lighting system consisting of one or more luminaires with embedded lighting control logic, occupancy and ambient light sensors, wireless networking capabilities and local override switching capability, where required.

NETWORKED GUESTROOM CONTROL SYSTEM. A control system, accessible from the front desk or other central location associated with a Group R -1 building, that is capable of identifying the occupancy status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

~~READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see "Accessible"). In public facilities, accessibility may be limited to certified personnel through locking covers or by placing equipment in locked rooms.~~

READY ACCESS (TO). That which enables a device, appliance or equipment to be directly reached, without requiring the removal or movement of any panel or similar obstruction.

EN7884

Date Submitted	12/14/2018	**Section**	1	**Proponent**	Amanda Hickman
Chapter	2	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

#7885 - removal of reference standard AMCA 205-12
#7886 - delete language in section C403.2.12.3

Summary of Modification

This modification deletes the definition of fan efficiency grade.

Rationale

AMCA International and a consensus of its member companies have decided that the Fan Energy Index (FEI) metric is to replace the Fan Efficiency Grade (FEG) metric for efficiency codes, standards and regulations.

FEI emerged as the metric of choice from public stakeholder negotiations as a recommendation to the Department of Energy toward its rulemaking initiative for commercial fans and blowers. Although that rulemaking has been postponed, it has not been canceled.

ASHRAE Technical Committee TC 5.1 for fans voted to remove FEG from ASHRAE 90.1. The 90.1 Mechanical Subcommittee vetted FEI and decided to replace FEG with FEI, which was upheld by the full committee.

FEI is replacing FEG in ASHRAE 90.1 in the 2019 edition.

FEI has been added to EnergyPlus modeling software and the DOE Fan System Assessment Tool.

FEI also has been vetted by ISO and is being added to the ISO Standard 12759 Fans - Energy Efficiency classification of fans.

Globally, the direction for regulation of motor driven units (fans, pumps, and compressors) focuses on metrics that include motors, drives and controllers. FEG is the only metric that is not in sync with this direction.

AMCA International has expanded its fan certification program to include FEI ratings.

Therefore, in concert with the proposal to replace FEG with FEI, AMCA is proposing that The FEG provision be deleted from Florida Energy Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification removes an antiquated, no longer supported metric for fan efficiency. Deleting this provision will decrease any confusion that code enforcement may have regarding these requirements for FEG.

Impact to building and property owners relative to cost of compliance with code

This modification could likely result in a decrease in cost because it is eliminating a requirement.

Impact to industry relative to the cost of compliance with code

This modification could likely result in a decrease in cost because it is eliminating a requirement.

Impact to small business relative to the cost of compliance with code

This modification could likely result in a decrease in cost because it is eliminating a requirement.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification deletes a metric that is no longer in use, thereby allowing the general public to make better decisions regarding energy efficiency fan products that will promote health, safety and welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification deletes an unused metric that is no longer supported, thereby strengthening the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification deletes an unused metric, therefore it does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This modification deletes an unused metric, therefore improving the effectiveness of the code.

~~FAN EFFICIENCY GRADE (FEG). A numerical rating identifying the fan's aerodynamic ability to convert shaft power, or impeller power in the case of a direct-driven fain, to air power.~~

EN7892

Date Submitted 12/14/2018
Chapter 2
Section 1
Affects HVHZ No
Proponent Amanda Hickman
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No
Alternate Language Yes

Related Modifications

#8122 Fan energy index
#7913 - reference standard AMCA 208

Summary of Modification

Adds definitions related to fan energy index to CE Chapter 2.

Rationale

This modification adds definitions for a new fan efficiency metric as well as definitions that are provided in the language in the requirements for fan energy index that is proposed in a related modification. This modification reflects recent changes made to ASHRAE 90.1.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification brings in updated definitions related to fan energy index language and a related modification. This will assist in the enforcement of fans that comply with this metric.

Impact to building and property owners relative to cost of compliance with code

This modification will not have a cost impact, because it only adds and deletes definitions.

Impact to industry relative to the cost of compliance with code

This modification will not have a cost impact, because it only adds and deletes definitions.

Impact to small business relative to the cost of compliance with code

This modification will not have a cost impact, because it only adds and deletes definitions.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification brings in new definitions related to another modification, which updates the fan efficiency requirements and will promote the health, safety and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification updates definitions that are associated in a related modification for fan energy index, which is the currently supported metric for fan efficiency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No. This modification only adds and deletes definitions.

Does not degrade the effectiveness of the code

No. This modification only updates definitions to be consistent with ASHRAE 90.1.

1st Comment Period History

7892-A1

Proponent Melissa Howard **Submitted** 2/18/2019 **Attachments** Yes

Rationale

This updates the term to be consistent with the language that is being proposed in the requirements in modification #8122 by adding the word "input".

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None. This comment is only editorial.

Impact to building and property owners relative to cost of compliance with code

None. This comment is only editorial.

Impact to industry relative to the cost of compliance with code

None. This comment is only editorial.

Impact to Small Business relative to the cost of compliance with code

This modification will not have a cost impact, because it only adds and deletes definitions.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None. This comment is only editorial.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

None. This comment is only editorial.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

None. This comment is only editorial.

Does not degrade the effectiveness of the code

None. This comment is only editorial.

Add definitions as follows:

Fan, Embedded. A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

Fan Array. Multiple fans in parallel between two plenum sections in an air distribution system.

Fan Energy Index (FEI). The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.

Fan Nameplate Electrical Input Power. The nominal electrical input power rating stamped on a fan assembly nameplate.

Fan System Electrical Power. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

Fan System Electrical Input Power. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

EN7915

Date Submitted 12/11/2018	**Section** 202	**Proponent** Joseph Hetzel
Chapter 2	**Affects HVHZ** No	**Attachments** No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Clarification to the definitions of Entrance Door and Fenestration.

Rationale

The definition of Entrance Door needs grammatical improvements as shown in the proposal. The key change is adding the word 'occupant' before the purposes of the door. This is to distinguish entrance doors from doors which are used for trucks or other cargo or material movement.
The edit to the definition of Fenestration is for consistency with Table C402.4 as well as some editorial clarity.
The proposal was submitted to the ICC as CE11-16 Part 1 (Commercial) and was approved as submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety and welfare by clarifying the definitions of Entrance Door and Fenestration.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying the definitions of Entrance Door and Fenestration.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination since it simply involves clarifying the definitions of Entrance Door and Fenestration.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying the definitions of Entrance Door and Fenestration.

1st Comment Period History

7915-A1

Proponent Dick Wilhelm **Submitted** 2/9/2019 **Attachments** Yes

Rationale

AAMA prefers the definition of vertical fenestration in the 2018 IBC in lieu of proponent's definition. The 2020 IBC definition clarifies that fenestration installed in a wall measured at 15 degrees from the vertical rather than the horizontal.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No cost impact

Impact to building and property owners relative to cost of compliance with code

No cost impact

Impact to industry relative to the cost of compliance with code

No cost impact

Impact to Small Business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides general public a well dsesigned definition.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Provides an internationally accepted definition.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade effectiveness.

ENTRANCE DOOR. ~~Fenestration products~~A vertical fenestration product used for occupant ingress, egress and access in nonresidential buildings, including, but not limited to, exterior entrances ~~that utilize~~utilizing latching hardware and automatic closers and ~~contain~~containing over 50-percent ~~glass~~glazing specifically designed to withstand heavy ~~use and possibly abuse~~duty usage.

FENESTRATION. Products classified as either skylights or vertical fenestration ~~or skylights~~.

Skylights. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal. Glazing materials in skylights, including unit skylights, tubular daylighting devices, solariums, sunrooms, roofs and sloped walls are included in this definition.

Vertical fenestration. Windows ~~(~~that are fixed or ~~moveable~~operable~~)~~, opaque doors, glazed doors, glazed block and combination opaque~~/~~ and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of ~~at least~~not less than 60 degrees (1.05 rad) from horizontal.

6th Edition, 2017 FBC

~~**FENESTRATION.** Skylights, roof windows, vertical windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors. Fenestration includes products with glass and nonglass glazing materials.~~

<u>**FBCB SECTION 202**</u>

<u>**FENESTRATION, VERTICAL.** Windows that are fixed or movable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors installed in a wall at less than 15 degrees from the vertical</u>

EN8175

Date Submitted	12/14/2018	**Section**	202	**Proponent**	Armin Hauer
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No

Alternate Language No

Related Modifications

C403.2.12.2 Motor nameplate horsepower

Summary of Modification

added definition

Rationale

Definition is needed for an update to C403.2.12.2.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

no impact

Impact to building and property owners relative to cost of compliance with code

no impact

Impact to industry relative to the cost of compliance with code

no impact

Impact to small business relative to the cost of compliance with code

no impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The associated proposal C403.2.12.2 corrects an IP / SI conversion error related to shaft power: 6 bhp equals 4476 W mechanical power.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The associated proposal C403.2.12.2 moves the clause about fan system motor nameplate into the exceptions section for better clarity.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The associated proposal C403.2.12.2 increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Does not degrade the effectiveness of the code

The associated proposal C403.2.12.2 moves the clause about fan system motor nameplate into the exceptions section for better clarity.

Fan Nameplate Electrical Input Power. The nominal electrical input power rating stamped on a fan assembly nameplate.

EN8256

Date Submitted	12/14/2018	**Section**	202	**Proponent**	John Woestman
Chapter	2	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Propose definition of cavity insulation.

Rationale

This proposal adds a definition for cavity insulation to complement the existing definition for continuous insulation. Cavity and continuous insulation relate to the location of insulation materials in or on an assembly, not specific types of insulation materials that may be used in these locations. Adding this definition will help clarify the code in regards to terms used to explain where insulation is located.

Cost Impact: Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Clearly defines cavity insulation - should make code understanding better and enforcement easier.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clearly defines cavity insulation - should make code understanding better and enforcement easier regarding use of insulation products.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code with better understanding of materials used in construction.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Add new definition as follows:

SECTION C202 DEFINITIONS

CAVITY INSULATION. Insulating material located between framing members.

EN7203

2 [RE] Definitions

16

Date Submitted 11/6/2018
Chapter 2
Section 202
Affects HVHZ No
Proponent Bryan Holland
Attachments No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **No**

Related Modifications

7204

Summary of Modification

This proposed modification deletes the definition of "high-efficacy lamps" from the code in coordination with a proposed modification to R404.1

Rationale

This proposed modification eliminates confusion caused by the term and definition for “high-efficacy lamps”. Many residential luminaires now have the lamp integrated into the fixture itself as a single unit instead of two separate components. By putting the efficacy level requirements of both lamps and luminaires in section R404.1, the improper “high-efficacy lamps” definition is no longer applicable or needed.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will have no impact to the local entity relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will have no impact on building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

This proposed modification will have no impact on small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification does not impact the health, safety, or welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by deleting a definition that is not applicable or needed.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification does not degrade the effectiveness of the code.

~~HIGH-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:~~

1. ~~1.60 lumens per watt for lamps over 40 watts;~~
2. ~~2.50 lumens per watt for lamps over 15 watts to 40 watts; and~~
3. ~~3.40 lumens per watt for lamps 15 watts or less.~~

EN7241

17

Date Submitted 11/12/2018	**Section** 202	**Proponent** Bryan Holland
Chapter 2	**Affects HVHZ** No	**Attachments** No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the terms "approved agency" and "labeled" to reflect industry practices and proper use in the code.

Rationale

This proposed modification revises the terms "approved agency" and "labeled" to reflect industry practices and proper use in the code. This also harmonizes the FBC-Energy with the 2018 IECC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by providing correctly defined terms for use in the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by revising two important terms for correct use in the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests, ~~or~~ furnishing inspection services, or finishing product certification, when such agency has been approved by the code official.

LABELED. Equipment, materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, ~~inspection~~ approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and where labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

EN7796

Date Submitted	12/9/2018	**Section**	202	**Proponent**	Joseph Belcher for FHBA
Chapter	2	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

C202 The same change is being requested for the Commercial and Residential sections of the code.

Summary of Modification

The change clarifies the definition of Building Thermal Envelope

Rationale

The Rationale is the unmodified Reason given by the ICC proponent of the change.

The Thermal envelope completely surrounds the house and the ceiling portion of the envelope was excluded from the previous definition. In addition, the envelope is not one element of the building but rather an assembly of materials that create it in each location that is described in the definition. We feel it is important to ensure a common understanding that the entirety of the assembly in each location must be understood in order to create the thermal envelope that functions as intended by the code. (CE4-16 Part I and CE4-16 Part II)

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact on enforcement of code. Clarifies intent.

Impact to building and property owners relative to cost of compliance with code

No impact on property owners. Clarifies intent.

Impact to industry relative to the cost of compliance with code

No impact on industry. Clarifies intent.

Impact to small business relative to the cost of compliance with code

No impact on small business. Clarifies intent.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change is connected to the health and welfare of the public by clarifying the application of the term. The clarification will assist enforcement personnel, property owners, industry, and small businesses in understanding the application of the term resulting in better code enforcement.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The clarification will strengthen the code by assisting enforcement personnel, property owners, industry, and small businesses in understanding the application of the building thermal envelope.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

C202 BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, ~~floor~~ floors, ~~roof~~ ceilings, roofs and any other building ~~elements~~ element assemblies that enclose ~~*conditioned space*~~ conditioned space or provide a boundary between ~~*conditioned space*~~ conditioned space and exempt or unconditioned space.

R202 (N1101.6) BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, ~~floor~~ floors, ~~roof~~ ceilings, roofs and any other building ~~elements~~ element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

EN7823

Date Submitted	12/10/2018	**Section**	202	**Proponent**	Roger LeBrun
Chapter	2	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Update definition of Skylight for consistency with other codes that were modified in the 2018 IECC.

Rationale

Definition appropriately duplicates the definition approved by the ICC for inclusion in Section C202 of the 2018 IECC, and coordinates with updated related definitions in the 2018 IBC and 2018 IRC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Removes possible source of confusion between the two parts of the Energy Conservation Code

Impact to building and property owners relative to cost of compliance with code

No impact

Impact to industry relative to the cost of compliance with code

No impact

Impact to small business relative to the cost of compliance with code

No impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Makes no substantial changes affecting the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Coordinates existing definitions

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Not applicable

Does not degrade the effectiveness of the code

Yes

SECTIONR202
GENERAL DEFINITIONS

...

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal~~. Glazing materials in skylights~~, including unit skylights, tubular daylighting devices, solariums, sunrooms, roofs and sloped walls~~, are included in this definition~~.

EN8257

Date Submitted	12/14/2018	**Section**	202	**Proponent**	John Woestman
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

8256

Summary of Modification

Propose definition of cavity insulation.

Rationale

This proposal adds a definition for cavity insulation to complement the existing definition for continuous insulation. Cavity and continuous insulation relate to the location of insulation materials in or on an assembly, not specific types of insulation materials that may be used in these locations. Adding this definition will help clarify the code in regards to terms used to explain where insulation is located.

Cost Impact: Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Clearly defines cavity insulation - should make code understanding better and enforcement easier.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction. The proposal only provides a new definition without any material impact to the code or cost.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clearly defines cavity insulation - should make code understanding better and enforcement easier regarding use of insulation products.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code with better understanding of materials used in construction.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Add new definition as follows:

SECTION R202 DEFINITIONS

CAVITY INSULATION. Insulating material located between framing members.

Date Submitted 12/11/2018
Chapter 3
Section 303.1.3
Affects HVHZ No
Proponent Joseph Hetzel
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No

Alternate Language No

Related Modifications

Summary of Modification

Inclusion of rolling doors in U-factor ratings determination language, and reformatting the fenestration product rating language.

Rationale

The scope of ANSI/DASMA 105 includes both garage doors and rolling doors, which are within the scope of the IECC content. The reformatting of Section C403.1.3 is an acknowledgement that there are two
categories of criteria. The current format wrongly places the door criteria as an Exception. The proposal was submitted to the IECC as CE29-16 Part 1 (Commercial) and was approved as modified by public comment, where the final approved language is reflected in this Florida code modification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety, and welfare by clarifying fenestration product rating language.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying fenestration product rating language.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal is material/product/method/system neutral.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying fenestration product rating language.

C303.1.3 Fenestration product rating.

U-factors of fenestration products ~~(windows, doors and skylights)~~ shall be determined ~~in accordance with NFRC 100~~as follows.

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.

~~Exception:~~ 2. Where required~~,~~ for garage door and rolling doors, *U*-factors ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and *labeled* and certified by the manufacturer.

Products lacking such a *labeled* *U*-factor shall be assigned a default *U*-factor from Table C303.1.3(1) or C303.1.3(2). The solar heat gain coefficient (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Products lacking such a *labeled* SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3).

EN7930

Date Submitted	12/11/2018	**Section**	303.1.3	**Proponent**	Joseph Hetzel
Chapter	3	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifying the Default Door U-factor table as applying to opaque doors, and including a value for insulated rolling doors.

Rationale

The default U-factor tables should distinguish opaque doors from glazed windows, doors and skylights. The headings in the Tables should be revised accordingly. The proposed rolling door insulated metal value is approximately 10% higher than a DASMA research tested value of 0.82. The proposal was submitted to ICC as CE30-16 Part 1 (Commercial) and was approved as submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety, and welfare by clarifying default door value tables and adding an insulated rolling door value.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying default door value tables and adding an insulated rolling door value.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying default door value tables and adding an insulated rolling door value.

TABLE C303.1.3(2)

DEFAULT OPAQUE DOOR *U*-FACTORS

DOOR TYPE	*U*-FACTOR
Uninsulated Metal	1.20
Insulated Metal (Rolling)	0.90
Insulated Metal (Other)	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing,any glazing double pane	

TABLE C303.1.3(3)

DEFAULT ~~GLAZED FENESTRATION~~WINDOW, GLASS DOOR AND SKYLIGHT SHGC AND VT

[Table values unchanged]

Date Submitted	12/11/2018	**Section**	303.1.3	**Proponent**	Joseph Hetzel
Chapter	3	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No | **Alternate Language** No

Related Modifications

Summary of Modification

Reformat the fenestration product rating language.

Rationale

The reformatting of Section R303.1.3 is an acknowledgement that there are two categories of criteria. The current format wrongly places the door criteria as an exception. Changes to R303.1.3 are to make the format identical to the proposed Commercial language, with the exception that rolling doors are not found in residential buildings. See Code Modification 7924 for coordinated language.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety, and welfare due to the reformatted fenestration product rating language.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code through the reformatted fenestration product rating language.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code through the reformatted fenestration product rating language.

R303.1.3 Fenestration product rating.

U-factors of fenestration products ~~(windows, doors and skylights)~~ shall be determined ~~in accordance with NFRC 100~~as follows.

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.

~~**Exception:**~~ 2. Where required, garage door *U*-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

[remainder unchanged]

EN7940

Date Submitted 12/11/2018
Chapter 3
Section 303.1.3
Affects HVHZ No
Proponent Joseph Hetzel
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments
General Comments **Yes**
Alternate Language **No**

Related Modifications

Summary of Modification

Title the default door U-factor table as applying to opaque doors, and distinguish that table from the "glazed fenestration" table retitled to apply to windows, glass doors and skylights.

Rationale

The default U-factor tables should distinguish opaque doors from glazed windows, doors and skylights. The headings in the tables should be revised accordingly. The proposal was submitted as CE30-16 Part 2 (Residential) and was approved as submitted. See Code Modification 7930 for coordinated language.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety, and welfare by distinguishing default opaque door U-factor values from default glazed product U-factor values.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by distinguishing default opaque door U-factor values from default glazed product U-factor values.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by distinguishing default opaque door U-factor values from default glazed product U-factor values.

1st Comment Period History

EN7940-G1

Proponent John Woestman **Submitted** 2/11/2019 **Attachments** No

Comment:

Inserting "Opaque" in the column heading "Opaque U-Factor" in TABLE R303.1.3(2) may lead to confusion. Suggest insert "Opaque Door" to read "Opaque Door U-Factor".
OR
Leave the column heading as is because revising the title of TABLE R303.1.3(2) accomplishes the desired result.

TABLE R303.1.3(2)

DEFAULT OPAQUE DOOR *U*-FACTORS

DOOR TYPE	*OPAQUE U*-FA
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing,any glazing double pane	0.35

TABLE R303.1.3(3)

DEFAULT ~~GLAZED FENESTRATION~~WINDOW, GLASS DOOR AND SKYLIGHT SHGC AND VT

[table unchanged]

Date Submitted	11/7/2018	**Section**	404.4	**Proponent**	Gary Kozan
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments Yes | **Alternate Language** No

Related Modifications

Summary of Modification

Revises service water heating piping insulation to conform to the requirements of ASHRAE 90.1-2016.

Rationale

ASHRAE Standard 90.1–2016 is the basis for much of the 2018 IECC. Federal law requires that Florida's commercial building energy-efficiency codes be at least as stringent as the most recent ASHRAE 90.1 standard. In recent years, the IEEC requirements for service water heating pipe insulation have drifted from the standard. The current IECC requires that all commercial hot water piping be insulated up to the fixture supply. This is expensive, impractical, and utterly pointless in non-circulating systems.

An individual hot water fixture branch cools down rather quickly to ambient between events, regardless of insulation or not. It is difficult if not impossible to insulate every foot of hot water piping within wall cavities. Hot water piping with 1" thick insulation takes up most of the space in a frame wall. Water pipes are frequently located on single- or double-furred block walls. Every wall that contains a hot water pipe would need to be at least 3-1/2 ".There is no way to comply with the code.

It is more practical to simply restore the actual requirements listed in the current ASHRAE 90.1 standard. Circulating hot water piping (supply and return lines) must be insulated. So must the first 8 feet of branch piping emanating from the circulating loop. So must the first 8 feet of outlet piping from the heated water source. This level of hot water insulation is actually more comprehensive than previous editions of the standard. By providing hot water pipe insulation where it is most effective, we can save energy without unduly complicating the construction process and incurring unnecessary costs.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to code enforcement

Impact to building and property owners relative to cost of compliance with code

Reduces the cost of hot water piping insulation to previous reasonable levels

Impact to industry relative to the cost of compliance with code

Simplifies the insulation of hot water piping within wall cavities and on block walls. Minimizes the need for larger wall sizes to accommodate unnecessary insulation.

Impact to small business relative to the cost of compliance with code

NO impact to small business

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides specific requirements for hot water piping insulation as found in the most recent ASHRAE standard

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by eliminating hot water insulation in uncirculated branches where it has little effect

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against any materials or methods

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by mandating hot water piping insulation where it matters, and eliminating it where it doesn't

1st Comment Period History

EN7195-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

Zone 1 should be exempted from this proposed mod.

C404.4 Insulation of piping. ~~Piping from a water heater to the termination of the heated water fixture supply pipe shall be insulated in accordance with Table C403.2.10. 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 C403.2.10 or the heat trace manufacturer's instructions. 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.~~

~~**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.~~
2. ~~Valves, pumps, strainers and threaded unions in piping that is 1 inch (25 mm) or less in nominal diameter.~~
3. ~~Piping from user-controlled shower and bath mixing valves to the cold 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.~~

The following piping shall be insulated to levels shown in Table C403.2.10:

a. Recirculating system piping, including the supply and return piping of a circulating tank type water heater.

b. The first 8 feet of outlet piping for a constant-temperature non-recirculating storage system.

c. The first 8 feet of branch piping connecting to recirculated, heat-traced, or impedance heated piping.

d. The inlet piping between the storage tank and a *heat trap* in a non-recirculating storage system.

e. Piping that is externally heated (such as heat trace or impedance heating).

7.3 Simplified/Small Building Option (Not Used)

7.4 Mandatory Provisions

7.4.1 Load Calculations

Service water-heating system design loads for the purpose of sizing *systems* and *equipment* shall be determined in accordance with *manufacturers*' published sizing guidelines or *generally accepted engineering standards* and handbooks acceptable to the *adopting authority* (e.g., *ASHRAE Handbook—HVAC Applications*).

7.4.2 Equipment Efficiency

All water-heating *equipment*, *hot-water supply boilers* used solely for heating potable water, *pool* heaters, and hot-water storage tanks shall meet the criteria listed in Table 7.8. Where multiple criteria are listed, all criteria shall be met. Omission of minimum performance requirements for certain classes of *equipment* does not preclude use of such *equipment* where appropriate. *Equipment* not listed in Table 7.8 has no minimum performance requirements.

Exceptions to 7.4.2

All *water heaters* and *hot-water supply boilers* having more than 140 gal of storage capacity are not required to meet the standby loss (SL) requirements of Table 7.8 when

1. the tank surface is thermally insulated to R-12.5,
2. a standing pilot light is not installed, and
3. gas- or oil-fired storage *water heaters* have a *flue damper* or fan-assisted combustion.

7.4.3 Service Hot-Water Piping Insulation

The following *piping* shall be insulated to levels shown in Section 6, Table 6.8.3-1:

a. *Recirculating system piping*, including the supply and return *piping* of a circulating tank type *water heater*.
b. The first 8 ft of outlet *piping* for a constant-temperature nonrecirculating storage *system*.
c. The first 8 ft of branch *piping* connecting to recirculated, heat-traced, or impedance heated *piping*.
d. The inlet *piping* between the storage tank and a heat trap in a nonrecirculating storage *system*.
e. *Piping* that is externally heated (such as *heat trace* or impedance heating).

7.4.4 Service Water-Heating System Controls

7.4.4.1 Temperature Controls

Temperature *controls* shall be provided that allow for storage temperature adjustment from 120°F or lower to a maximum temperature compatible with the intended use.

Exception to 7.4.4.1

When the *manufacturers*' installation instructions specify a higher minimum *thermostat* setting to minimize condensation and resulting corrosion.

7.4.4.2 Temperature Maintenance Controls

Systems designed to maintain usage temperatures in hot-water pipes, such as recirculating hot-water *systems* or *heat trace*, shall be equipped with *automatic* time switches or other *controls* that can be set to switch off the usage temperature maintenance *system* during extended periods when hot water is not required.

7.4.4.3 Outlet Temperature Controls

Temperature controlling means shall be provided to limit the maximum temperature of water delivered from lavatory faucets in *public facility restrooms* to 110°F.

Date Submitted 11/6/2018
Chapter 4
Section 405.6.3
Affects HVHZ No
Proponent Bryan Holland
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the voltage drop requirement to include "customer-owned service conductors" in addition to feeder conductors and branch circuit conductors.

Rationale

The current requirement for voltage drop does not include customer-owned service conductors which in long runs can result in significant voltage drop. The term “conductors” has been added to feeder and branch circuit to add clarity. A definition of "voltage drop" is being added to harmonize the Florida Energy Code with the IECC and ASHRAE 90.1 Standard.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will have no impact to the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will ensure customer-owned service conductors are included in the voltage drop calculation to prevent unnecessary losses in the complete premises wiring systems.

Impact to industry relative to the cost of compliance with code

This proposed modification could result in an increased cost of compliance if the designer chooses to increase the customer-owner service conductors in response to excess voltage drop.

Impact to small business relative to the cost of compliance with code

This proposed modification should not have an impact on small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected with the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by adding a needed definition and revising the prescriptive language of the section to include all conductors on the premises-wiring side of the electrical installation.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7205-G1

Proponent Vincent Della Croce **Submitted** 1/8/2019 **Attachments** No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

C405.6.3 Voltage drop. ~~The conductors for feeders and branch circuits combined shall be sized for a maximum of 5 percent voltage drop total.~~ The total voltage drop across the combination of customer-owned service conductors, feeder conductors, and branch circuit conductors shall not exceed 5 percent.

Add to Section C202 Definition:

VOLTAGE DROP. A decrease in voltage caused by losses in the wiring systems that connect the power source to the load.

EN7206

Date Submitted	11/6/2018	**Section**	405.6.1	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the section to clarify that compliance with Section 8 Power of the ASHRAE Standard 90.1 is required by Section 405.6.1

Rationale

The purpose of this proposed modification is to align the code with DS 2016-033 and further clarify that Section 8 Power of the ASHRAE Standard 90.1 is the part being referenced by C405.6 Electric power. The revised language will assist those designing, installing, or enforcing the requirements of the Florida Energy Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will assist the local entity when enforcing the requirement of the Florida Energy Code by clarifying exactly what requirements in the ASHRAE Standard 90.1 are applicable to C405.6.1 compliance.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will ensure building and property owners have electric distribution systems installed in compliance with both C405.6 of the FBC-EC and Section 8 of ASHRAE Standard 90.1.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

This proposed modification will have no impact to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by ensuring electrical power distribution in buildings meet the requirements of the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by clarifying the section and giving a pointer to the specific section of ASHARE Standard 90.1 that is applicable.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code by clarifying the rule.

1st Comment Period History

EN7206-G1

Proponent Vincent Della Croce **Submitted** 1/8/2019 **Attachments** No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

C405.6 Electrical power (Mandatory).

C405.6.1 Applicability.

This section applies to all building power distribution systems. The provisions for electrical distribution for all sections of this code are subject to ~~the design conditions~~ the requirements of Section 8 Power in ASHRAE Standard 90.1.

Date Submitted	11/12/2018	**Section**	403.4.2.4	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification harmonizes requirements for part-load controls for hydronic system of the FBC-Energy with the 2018 IECC.

Rationale

This proposal reduces the threshold where variable flow and variable speed drives (VSD) are required for pumping systems. Requirements for heating pump VSDs are added. Variable flow systems use less pumping energy than constant flow systems. Variable pumping systems also produce larger system temperature differences that can enhance chiller efficiency and condensing boiler efficiency (although these effects are not included in the savings calculations). Variable flow systems can reduce flow either by throttling flow and then having the pump "ride the pump curve" to reduce flow and energy at higher pressure or by using a VSD. Using a variable speed drive provides similar flow control at a lower energy cost, as pressure differential is reduced. Restates the minimum flow exception as a condition requirement, removing the exception with the result of the same code requirement. An exception for pump flow controls on coils requiring freeze protection is added. The first and third exceptions had the words "is not required" added to them, Exception 2 was deleted after having the intent added to the provisions above, then a new exception for freeze protection was added as exception 2 and exception 4 is new. Operation of variable flow systems is less expensive than constant flow systems and variable speed drives increase the savings compared to throttling control. An analysis of energy impact shows that annual savings from expanding the use of motor speed control in the proposal ranges from $1,303 to $401 for 10 to 3 horsepower heating pumps and from $1821 to $386 for 10 to 2 horsepower cooling pumps in typical HVAC systems. Savings for larger pumps are proportional. More details are found in the cost-effectiveness analysis referenced in the cost impact section.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will impact building and property owners where the increased cost of compliance is passed-on to them from the builder/contractor.

Impact to industry relative to the cost of compliance with code

The cost for VSD and associated controls is approximately $3,920 for 2 horsepower pumps. Costs for larger pumps are proportional. There is no cost for reducing the threshold where variable flow systems are required.

Impact to small business relative to the cost of compliance with code

This proposed modification will impact small business owners where the increased cost of compliance is passed-on to them from the builder/contractor.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by reducing the threshold horsepower and flow configuration of pump systems.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by increasing the efficacy of pump systems used in hydronic heating/cooling applications.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

Mod 7238

C403.4.2.4 Part-load controls.

Hydronic systems greater than or equal to ~~500,000 Btu/h (146.5 kW)~~ 300,000 Btu/h (146.5 kW) in design output capacity supplying heated or chilled water to comfort conditioning systems shall include controls that ~~have the capability~~ are configured to do all of the following:

1. Automatically reset the supply-water temperatures in response to varying building heating and cooling demand using coil valve position, zone return water temperature, building-return water temperature or outside air temperature. The temperature shall be capable of being reset by not less than 25 percent of the design supply-to-return water temperature difference.

2. Automatically vary fluid flow for hydronic systems with a combined motor capacity of ~~10 hp (7.5 kW)~~ 2 hp (1.5 kW) or larger with three or more control valves or other devices by reducing the system design flow rate by not less than 50 percent or the maximum reduction allowed by the equipment manufacturer for proper operation of equipment by ~~designed~~ valves that modulate or step open and close, or pumps that modulate or turn on and off as a function of load.

3. Automatically vary pump flow on heating-water systems, chilled-water systems and heat rejection loops serving water-cooled unitary air conditioners as follows: ~~with a combined motor capacity of 10 hp (7.5 kW) or larger by reducing pump design flow by not less than 50 percent, utilizing adjustable speed drives on pumps, or multiple-staged pumps where not less than one-half of the total pump horsepower is capable of being automatically turned off. Pump flow shall be controlled to maintain one control valve nearly wide open or to satisfy the minimum differential pressure.~~

3.1 Where pumps operate continuously or operate based on a time schedule, pumps with nominal output motor power of 2 hp or more shall have a variable speed drive.

3.2. Where pumps have automatic direct digital control configured to operate pumps only when zone heating or cooling is required, a variable speed drive shall be provided for pumps with motors having the same or greater nominal output power indicated in Table C403.4.4 based on the climate zone and system served.

4. Where a variable speed drive is required by Item 3 of this Section, pump motor power input shall be not more than 30 percent of design wattage at 50 percent of the design water flow. Pump flow shall be controlled to maintain one control valve nearly wide open or to satisfy the minimum differential pressure.

Exceptions:

1. Supply-water temperature reset is not required for chilled-water systems supplied by off-site district chilled water or chilled water from ice storage systems.

2. ~~Minimum flow rates other than 50 percent as required by the equipment manufacturer for proper operation of equipment where using flow bypass or end-of-line 3-way valves~~ Variable pump flow is not required on dedicated coil circulation pumps where needed for freeze protection.

3. Variable pump flow is not required on dedicated equipment circulation pumps where configured in primary/secondary design to provide the minimum flow requirements of the equipment manufacturer for proper operation of equipment.

4. Variable speed drives are not required on heating water pumps where more than 50 percent of annual heat is generated by an electric boiler.

ADD THE FOLLOWING TABLE:

TABLE C403.4.4
VARIABLE SPEED DRIVE (VSD) REQUIREMENTS FOR DEMAND-CONTROLLED PUMPS

CHILLED WATER AND HEAT REJECTION LOOP PUMPS IN THESE CLIMATE ZONES	HEATING WATER PUMPS IN THESE CLIMATE ZONES	VSD REQUIRED FOR MOTORS WITH RATED OUTPUT OF:
1A, 1B, 2B	—	≥ 2 hp
2A, 3B	—	≥ 3 hp
3A, 3C, 4A, 4B	7, 8	≥ 5 hp
4C, 5A, 5B, 5C, 6A, 6B	3C, 5A, 5C, 6A, 6B	≥ 7.5 hp
—	4A, 4C, 5B	≥ 10 hp
7, 8	4B	≥ 15 hp
—	2A, 2B, 3A, 3B	≥ 25 hp
—	1B	≥ 100 hp
—	1A	≥ 200 hp

EN7239

Date Submitted	11/12/2018	**Section**	405.1	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification is mostly editorial to add clarity to the rules for lighting in dwelling units and coolers/freezers.

Rationale

This proposed modification simply clarifies the requirements for lighting in dwelling units, walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. These changes will harmonize the FBC-Energy with the 2018 IECC and related federal standards for this equipment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the code and harmonizing the rules with the 2018 IECC.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by clarifying the rule with minor editorial changes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.1 General (Mandatory).

This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption.

~~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.~~

~~Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.2.15 or C403.2.16.~~

<u>Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.2.15 or C403.2.16.</u>

EN7244

Date Submitted	11/12/2018	**Section**	402.4	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification makes minor editorial revision to the terms used for daylight zones, provides a pointer to requirements for daylight responsive controls, and increases the skylight area an additional 1% where DRC is provided.

Rationale

This proposed modification is a minor editorial change to the sections covering daylight zone requirements to harmonize the FBC-Energy with the 2018 IECC and ASHRAE Standard 90.1. These changes reflect current industry practices and will assist users of the code to achieve the desired daylight areas when employing daylight responsive controls. See CE97-16, CE98-16, and CE102-16 for further substantiation.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the rules of the code for better understanding and use.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing the code with industry practices and current industry standards for daylight zones.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C402.4.1.2 Increased skylight area with daylight responsive controls.

The skylight area shall be permitted to be not more than ~~5~~ 6 percent of the roof area provided that daylight responsive controls complying with Section C405.2.3.1 are installed ~~in daylight zones under skylights~~ in toplit zones.

C402.4.2 Minimum skylight fenestration area.

In an enclosed space greater than 2,500 square feet (232 m2) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height 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, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop, the total toplit daylight zone ~~under skylights~~ shall be not less than half the floor area and shall provide one of the following:

1. A minimum skylight area to toplit daylight zone ~~under skylights~~ of not less than 3 percent where all skylights have a VT of at least 0.40 as determined in accordance with Section C303.1.3.

2. A minimum skylight effective aperture of at least 1 percent, determined in accordance with Equation 4-4.

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 a.m. and 4 p.m.

4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.

5. Spaces where the total area minus the area of sidelight daylight zones ~~adjacent to vertical fenestration~~ is less than 2,500 square feet (232 m2), and where the lighting is controlled according to Section C405.2.3.

C402.4.2.1 Lighting controls in toplit daylight zones ~~under skylights~~.

Daylight responsive controls complying with Section C405.2.3.1 shall be provided to control all electric lights within ~~daylight~~ toplit zones ~~under skylights~~.

C402.4.4 Daylight zones.

Daylight zones referenced in Sections C402.4.1.1 through C402.4.3.2 shall comply with Sections C405.2.3.2 and C405.2.3.3, as applicable. Daylight zones shall include toplit zones and sidelit zones.

~~C402.4.4 Doors.~~ C402.4.5 Doors.

Opaque doors shall comply with the applicable requirements for doors as specified in Tables C402.1.3 and C402.1.4 and be considered part of the gross area of above-grade walls that are part of the building thermal envelope. Other doors shall comply with the provisions of Section C402.4.3 for vertical fenestration.

EN7245

Date Submitted	11/12/2018	**Section**	405.2	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No   **Alternate Language** No

Related Modifications

Summary of Modification

This proposed modification brings in rules for "luminaire level lighting controls" as an option for meeting the requirements of the code.

Rationale

The purpose of this code change proposal is to acknowledge current lighting control technology. Luminaire level lighting control (LLLC) refers to a controls solution where each luminaire in a space has independence from every other and can therefore maximize incremental control within very small areas. For example, a LLLC luminaire serves 80-120 square feet (sf) of open office space versus the standard approach of 'zoned' lighting controls with luminaires grouped to serve much larger interior areas. Each LLLC is not only 'wirelessly addressable', it can locally process information from integrated sensors to implement lighting control logic as well as can be programmed, overseen and modified through a computer user interface. An LLLC system will meet the intent of the lighting control requirements as specified in Section C405.2.1, C405.2.2, C405.2.3.

The LLLC technology, as specified in this proposal, will save approximately 50% over the current lighting control requirements in open office areas. Plan review verification time will be less than that for plan review for compliance with the current lighting control requirements. Plan reviewers only need to determine of the LLLC is specified for all of the lights in the building instead of reviewing lighting control specifications for each space. Building inspection can spot check to verify that the technology is installed verses looking at each room.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by providing additional options for the consumer when deciding how to control lighting.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by including rules for lighting controls technology available on the market today.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following. ~~as specified in Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4 and C405.2.5.~~

1. Lighting controls as specified in Sections C405.2.1 through C405.2.6.

2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:

2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.

2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.

2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

EN7246

Date Submitted	11/12/2018	**Section**	405.2.1	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification updates all the requirements related to occupant sensor controls to harmonize the FBC-Energy with the 2018 IECC and ASHRAE Standard 90.1.

Rationale

This proposed modification updates all the rules related to occupant sensor controls to harmonize the code with current industry practices and to match the language used in the 2018 IECC. While this proposal includes changes already approved by the Commission under CE185 and CE187, the Energy TAC failed to recommend approval of CE184 and CE186. All four of these changes work together and are needed for clarity and for proper enforcement. With these changes, the entire section will match the 2018 IECC rules for occupant sensor controls.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by ensuring all the updated requirements for occupant sensor controls are included in the 2020 FBC-Energy.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by including all the changes to these sections and not just two of the four proposals to the 2018 IECC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

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/multipurpose rooms.

3. Copy/print rooms.

4. Lounges/breakrooms.

5. ~~Employee lunch and break rooms~~ Enclosed offices.

~~6. Private offices.~~

~~7~~ 6. Open plan office areas.

~~8~~ 7. Restrooms.

~~9~~ 8. Storage rooms.

~~10. Janitorial closets.~~

~~11~~ 9. Locker rooms.

~~12~~ 10. Other spaces 300 square feet (28 m2) or less that are enclosed by floor-to-ceiling height partitions.

~~13~~ 11. Warehouse~~s~~ storage areas.

C405.2.1.1 Occupant sensor control function. Occupant sensor controls in ~~spaces other than~~ warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in ~~and~~ open plan office areas shall comply with Section C405.2.1.3. ~~,~~ Occupant sensor controls for all other space ~~as~~ specified in Section C405.2.1 shall comply with the following:

1. They shall ~~A~~automatically turn off lights within ~~30~~ 20 minutes of all occupants leaving the space.

2. They shall ~~B~~be manual on or 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.

3. They ~~S~~shall incorporate a manual control to allow occupants to turn lights off.

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than ~~250~~ 300 square feet (~~23~~ 28 m2) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that general lighting can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m2) within the open plan office space.

2. The controls shall automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space.

3. The controls shall be configured so that general lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes

of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.

4. The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.

EN7313

Date Submitted	11/19/2018	**Section**	405.2.2	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification makes minor editorial revisions to the rules related to time-switch controls.

Rationale

This proposed modification makes minor editorial revisions to the rules related to time-switch controls to added clarity to the code and to harmonize the FBC-Energy with the 2018 IECC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by adding clarity to code for rules related to time-switch controls.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by adding clarity and consistency with the 2018 IECC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.2.2 Time-switch controls. 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.

Exception: Where a manual control provides light reduction in accordance with Section C405.2.2.2, ~~automatic~~ time-switch controls shall not be required for the following:

~~1. Sleeping units.~~

~~2.~~ 1. Spaces where patient care is directly provided.

~~3.~~ 2. Spaces where an automatic shutoff would endanger occupant safety or security.

~~4.~~ 3. Lighting intended for continuous operation.

~~5.~~ 4. Shop and laboratory classrooms.

C405.2.2.1 Time-switch control function. 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:

1. Have a minimum 7-day clock.

2. Be capable of being set for seven different day types per week.

3. Incorporate an automatic holiday "shutoff" feature, which turns off all controlled lighting loads for at least 24 hours and then resumes normally scheduled operations.

4. Have program backup capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

5. Include an override switch that complies with the following:

5.1. The override switch shall be a manual control.

5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.

5.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m2).

Exceptions:

1. Within mall~~s~~ concourses, ~~arcades,~~ auditoriums, ~~single tenant retail spaces~~ sales areas, ~~industrial~~ manufacturing facilities and sport arenas:

1.1. The time limit shall be permitted to be greater than 2 hours, provided that the ~~override~~ switch is a captive key device.

1.2. The area controlled by the override switch ~~is permitted to be greater than~~ shall not be limited to 5,000 square feet (465 m2)~~, but shall not be greater~~ provided that such area is less than 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).

2.3. Corridors, ~~equipment rooms, public~~ lobbies, electrical rooms and or mechanical rooms.

EN7315

Date Submitted	11/19/2018	**Section**	405.2.2.3	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification moves the rules for manual controls to C405.2.5 and makes other minor editorial revisions.

Rationale

This proposed modification moves the rules for manual controls to C405.2.5 from C405.2.2.3 to be applicable to all of Section C405.2 and not just time-switch controls. The rest of the changes are minor edits to add clarity to the section.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the rules for manual lighting controls.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by placing in the rules for manual lighting controls in the correct location within the code so that it applies to all lighting controls and not just time-switch controls as current placed in the FBC-Energy.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.2.5 ~~C405.2.2.3~~ Manual controls. ~~Manual~~ Where required by this code, manual controls for lights shall comply with the following:

1. ~~Shall be readily accessible~~ They shall be in a location with ready access to occupants.

2. ~~Shall~~ They shall be located where the controlled lights are visible, or shall identify the area served by the lights and indicate their status.

~~C405.2.5~~ C405.2.6 Exterior lighting controls. (Approved under CE196016)

EN7317

Date Submitted	11/19/2018	**Section**	405.2.3	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification is mostly an editorial update to match the FBC-Energy to the 2018 IECC for the rules related to daylight-responsive controls.

Rationale

This proposed modification is an editorial revision to correlate C405.2.3 with proposed changes to C402.4 and combining parts of ICC modifications CE98, CE102, CE128, CE137, CE179, CE192, and CE193. This will bring the rules for daylight-responsive controls in the FBC-Energy in-line with those of the 2018 IECC. The terms "toplight daylight" has been change to just "toplit" and the terms "sidelight daylight" have been changed to "sidelit". The only substantial change is the addition of a new Exception #4 to C405.2.3 which provides a means to calculate your way out of DRC requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by adding clarity and consistency throughout the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by updating the terms used in the rule to those currently used by the lighting industry and as found in the 2018 IECC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

Mod 7317

C405.2.3 Daylight-responsive controls. Daylight-responsive controls complying with Section C405.2.3.1 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~~ sidelit zones complying with Section C405.2.3.2. General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4.

2. Spaces with a total of more than 150 watts of general lighting within ~~toplight daylight~~ toplit zones complying with Section C405.2.3.3.

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.~~ 2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
~~4. Sidelight daylight~~ 3. Sidleit zones on the first floor above grade in Group A-2 and Group M occupancies.

4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPAadj) calculated in accordance with Equation 4-9:

$LPAadj = [LPAnorm \times (1.0 - 0.4 \times UDZFA / TBFA)]$
(Equation 4-9)

where:

LPAadj = Adjusted building interior lighting power allowance in watts.

LPAnorm = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

UDZFA = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

TBFA = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

C405.2.3.1 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~~ toplit zones in accordance with Section C405.2.3.3 shall be controlled independently of lights in ~~sidelight daylight~~ sidelit zones in accordance with Section C405.2.3.2.

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~~ in a location with ready access.

4. Where located in offices, classrooms, laboratories and library reading rooms, daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.

5. Daylight responsive controls shall be capable of a complete shutoff of all controlled lights.

6. Lights in ~~sidelight daylight~~ sidelit zones in accordance with Section C405.2.3.2 facing different cardinal orientations [i.e., within 45 degrees (0.79 rad) 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.

C405.2.3.2 ~~Sidelight daylight~~ Sidelit zone. The ~~sidelight daylight~~ sidelit 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~~ sidelit 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 C405.2.3.2~~(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 C405.2.3.2(2) and C405.2.3.2(3).~~

~~3.~~ 2. The area of the fenestration is not less than 24 square feet (2.23 m2).

~~4.~~ 3. 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.

~~5. Where located in existing buildings, the~~ 4. The visible transmittance of the fenestration is not less than 0.20.

~~FIGURE C405.2.3.2(1)~~

~~DAYLIGHT ZONE ADJACENT TO FENESTRATION IN A WALL~~

~~FIGURE C405.2.3.2(2)~~

~~DAYLIGHT ZONE UNDER A ROOFTOP MONITOR~~

~~FIGURE C405.2.3.2(3)~~

~~DAYLIGHT ZONE UNDER A SLOPED ROOFTOP MONITOR~~

C405.2.3.3 ~~Toplight daylight~~ Toplit zone. The ~~toplight daylight~~ toplit zone is the floor area underneath a roof fenestration assembly which complies with all of the following:

1. The ~~daylight~~ toplit 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 C405.2.3.3(1).

2. Where the fenestration is located in a rooftop monitor, the toplit 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 C405.2.3.2(2) and C405.2.3.2(3).

~~2.~~ 3. ~~No building or geological formation blocks direct sunlight~~ Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.

~~3. Where located in existing buildings, the~~ 4. 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~~ toplit zone is not less than 0.008.

~~FIGURE C405.2.3.3~~
~~DAYLIGHT ZONE UNDER A ROOF FENESTRATION ASSEMBLY~~

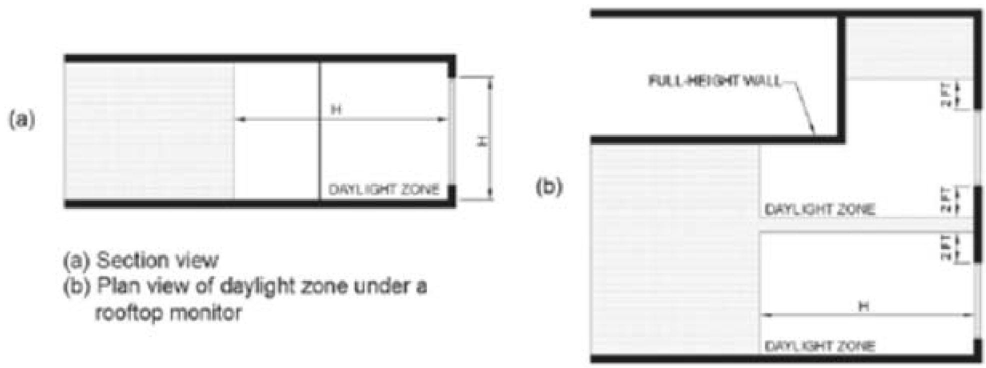


FIGURE C405.2.3.2
SIDELIT ZONE

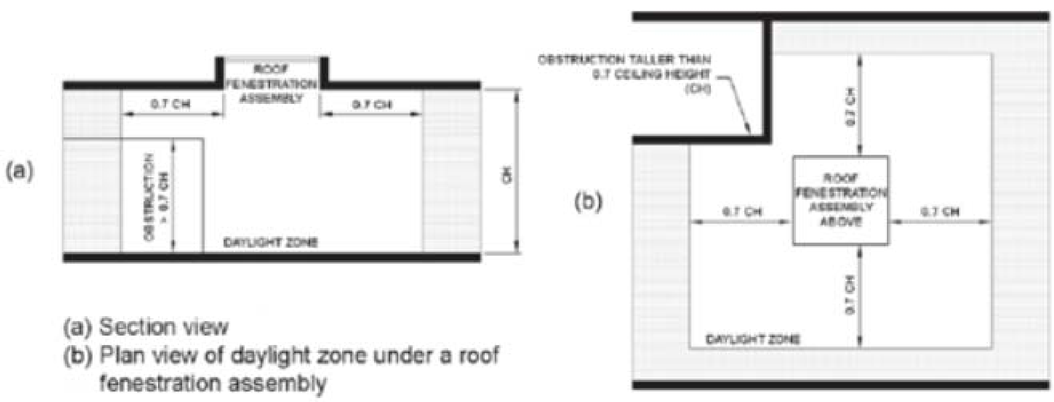
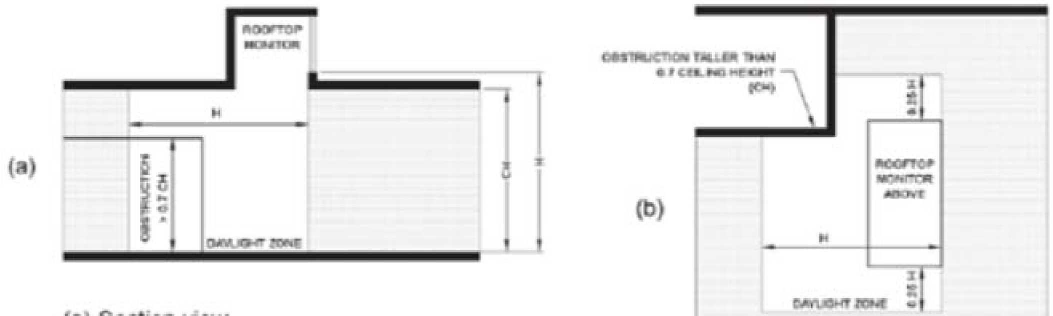
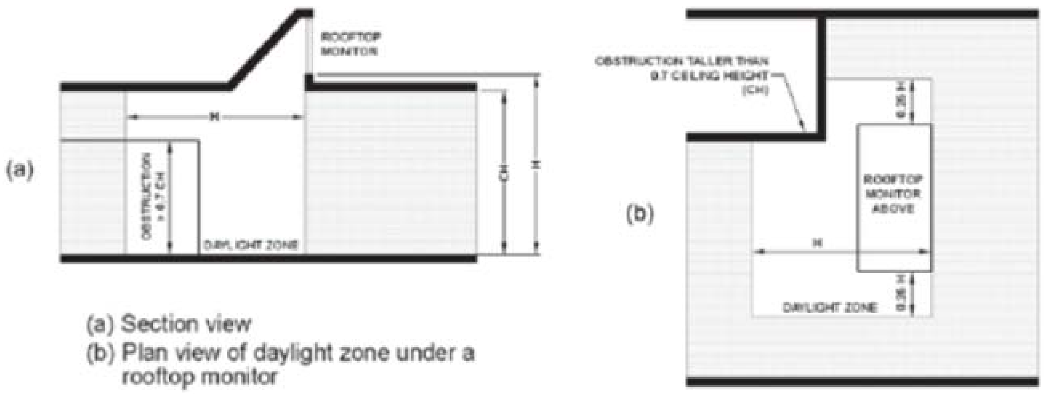


FIGURE C405.2.3.3(1)
TOPLIT ZONE



(a) Section view
(b) Plan view of daylight zone under a rooftop monitor

FIGURE C405.2.3.3(2)
DAYLIGHT ZONE UNDER A ROOFTOP MONITOR



(a) Section view
(b) Plan view of daylight zone under a rooftop monitor

FIGURE C405.2.3.3(3)
DAYLIGHT ZONE UNDER A SLOPED ROOFTOP MONITOR

EN7318

Date Submitted	11/19/2018	**Section**	405.2.4	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No **Alternate Language** No

Related Modifications

Summary of Modification

This proposed modification is an editorial revision to the rules related to specific application controls.

Rationale

This proposed modification is an editorial revision and renumbering of the rules related to specific application controls. This change will harmonize the FBC-Energy with the 2018 IECC and brings in the parts of the updated language used in CE128, CE137, CE179, CE182, and CE195.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by updating the rules related to specific application controls for clarity and consistency with the 2018 IECC.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by reformatting the section on specific application controls for clarity and proper enforcement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.2.4 Specific application controls. Specific application controls shall be provided for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the general lighting in the space:

1.1. Display and accent ~~light shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space~~.

1.2. Lighting in display cases ~~used for display case purposes shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space~~.

1.3. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.

1.4. Lighting equipment that is for sale or demonstration in lighting education.

2. Sleeping units shall have control devices or systems that are configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.

Exceptions:

1. Lighting and switched receptacles controlled by card key controls.

2. Spaces where patient care is directly provided.

3. Permanently installed luminaires within dwelling units shall be provided with controls complying with Section C405.2.1.1 or C405.2.2.2.

4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch control complying with Section C405.2.2.1 that 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 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 that 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 that 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 that is independent of the controls for other lighting within the room or space.~~

EN7325

Date Submitted	11/19/2018	**Section**	405.4	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the several of the rules and tables for interior lighting power requirements.

Rationale

This proposed modification updates the rules and tables related to interior lighting power requirements. The changes are reflected in CE192, CE201, CE202, CE203, CE204, CE205, and CE207 and correlate with the Commission approved CE206, CE209, and CE210. The total connected interior lighting power equation is updated to reflect current lighting technologies. The list of lighting equipment and applications not included in the calculation has been revised for clarity and consistency with the 2018 IECC. Finally, three new notes have been added to the Building Area Method Table and six new notes have been added to the Space-By-Space Method Table.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by harmonizing the FBC-Energy with the 2018 IECC rules for interior lighting power requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by updating the rules and tables to reflect current lighting technologies and industry practices.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.4 Interior lighting power requirements (Prescriptive). A building complies with this section where its total connected interior lighting power calculated under Section C405.4.1 is not greater than the interior lighting power calculated under Section C405.4.2.

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-9.

~~TCLP = [SL + LV + LTPB + Other]~~ TCLP = [LVL + BLL + LED + TRK + Other] (Equation 4-9)

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 plugin 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.~~

LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated wattage of the lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light-emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.

TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of luminaires without rewiring, the wattage shall be one of the following:

1. The specified wattage of the luminaires, but not less than 8 W per linear foot (25 W/lin m).

2. The wattage limit of the permanent current limiting devices protecting the system.

3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously 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 and applications is not included in calculating total connected lighting power.

~~1.~~1. ~~Professional sports arena playing field lighting~~ Television broadcast lighting for playing areas in sport arenas.

~~1.2. Lighting in sleeping units, provided that the lighting complies with Section R404.1.~~

~~1.3.~~ 2. Emergency lighting automatically off during normal building operation.

~~1.4.~~ 3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with 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.~~ 4. Casino gaming areas.

~~1.7.~~ 5. Mirror lighting in dressing rooms.

~~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.~~ 6. Task lighting for medical and dental purposes that is in addition to general lighting and controlled by an independent control device.

~~2.2.~~ 7. Display lighting for exhibits in galleries, museums and monuments that is is addition to general lighting and controlled by an independent control device.

~~3.~~ 8. Lighting for theatrical purposes, including performance, stage, film production and video production.

~~4.~~ 9. Lighting for photographic processes.

~~5.~~ 10. Lighting integral to equipment or instrumentation and installed by the manufacturer.

~~6.~~ 11. Task lighting for plant growth or maintenance.

~~7.~~ 12. Advertising signage or directional signage.

~~8. In restaurant buildings and areas,~~ l 13. Lighting for food warming ~~or integral to food preparation equipment~~.

~~9.~~ 14. Lighting equipment that is for sale.

~~10.~~ 15. Lighting demonstration equipment in lighting education facilities.

~~11.~~ 16. 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.~~ 17. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.

~~14.~~ 18. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.

~~15.~~ 19. Exit signs.

C405.4.2 Interior lighting power allowance. The total interior lighting power allowance (watts) is determined according to Table C405.4.2(1) using the Building Area Method, or Table C405.4.2(2) using the Space-by-Space Method, for all areas of the building covered in this permit.

TABLE C405.4.2(1) INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

a. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

b. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

c. Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

TABLE C405.4.2(2) INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD

a. 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.

b. A 'Facility for the Visually Impaired' is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.

c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.

f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.

g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.

h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

Date Submitted	11/19/2018	**Section**	405.5	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification revises the rules and tables for exterior lighting power requirements.

Rationale

This proposed modification updates all the rules and tables related to exterior lighting power requirements to match those in the 2018 IECC. This includes changes under CE211, CE212, and CE215. The entire section has been reformatted to match the rules for interior lighting power requirements. Five new exemptions have been added under C405.5.1 (1, 2, 3, 13, and 14). Section C405.5.2.1 is added to permit additional exterior lighting power in lieu of the old "tradable" and "nontradable" allowances of the previous code cycle. The lighting power allowances in the updated tables reflect current trends in lighting efficacy.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by updating the rules for exterior lighting power in the FBC-Energy to those found in the 2018 IECC.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing the rules for both interior and exterior lighting power requirements and updating the power allowances to reflect current trends in lighting efficacy.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.5 Exterior lighting power requirements (Mandatory). ~~Where the power for exterior lighting is supplied through the energy service to the building, all exterior lighting shall comply with Section C405.5.1.~~ The total connected exterior lighting power calculated in accordance with Section C405.5.1 shall be not greater than the exterior lighting power allowance calculated in accordance with Section C405.5.2.

~~Exception: Where approved because of historical, safety, signage or emergency considerations.~~

~~C405.5.1 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 C405.5.1(2) for the applicable lighting zone. Trade-offs are allowed only among exterior lighting applications listed in Table C405.5.1(2), in the Tradable Surfaces section. The lighting zone for the building exterior is determined from Table C405.5.1(1) unless otherwise specified by the local jurisdiction.~~

C405.4.1 Total connected exterior building exterior lighting power. The total exterior connected lighting power shall be the total maximum rated wattage of all lighting that is powered through the energy service for the building.

Exception: Lighting used for the following ~~exterior~~ applications ~~is exempt where equipped with a control device independent of the control of the nonexempt lighting:~~ shall not be included.

1. Lighting approved because of safety considerations.

2. Emergency lighting automatically off during normal business operation.
3. Exit signs.

~~1.~~ 4. Specialized signal, directional and marker lighting associated with transportation.

~~2.~~ 5. Advertising signage or directional signage.

~~3.~~ 6. Integral to equipment or instrumentation and is installed by its manufacturer.

~~4.~~ 7. Theatrical purposes, including performance, stage, film production and video production.

~~5.~~ 8. Athletic playing areas.

~~6.~~ 9. Temporary lighting.

~~7.~~ 10. Industrial production, material handling, transportation sites and associated storage areas.

~~8.~~ 11. Theme elements in theme/amusement parks.

~~9.~~ 12. Used to highlight features of art, public monuments and ~~registered historic landmark structures or buildings~~ and the national flag.

13. Lighting for water features and swimming pools.

14. Lighting controlled from within dwelling units, where the lighting complies with Section R404.1.

C405.5.2 Exterior lighting power allowance. The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting that is powered through the energy service for the building. Lighting power allowances are as specified in Table C405.5.2(2).

The lighting zone for the building exterior is determined in accordance with Table C405.5.2(1) unless otherwise specified by the code official.

TABLE C405.5.2(1)
EXTERIOR LIGHTING ZONES

LIGHTING ZONE	DESCRIPTION
1	Developed areas of national parks, state parks, forest land, and rural areas
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed-use areas
3	All other areas not classified as lighting zone 1, 2 or 4
4	High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority

C405.5.2.1 Additional exterior lighting power. Any increase in the exterior lighting power allowance is limited to the specific lighting applications indicated in Table C405.5.2(3). The additional power shall be used only for the luminaires that are serving these applications and shall not be used for any other purpose.

TABLE C405.5.2(2)
LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

	LIGHTING ZONES			
	Zone 1	Zone 2	Zone 3	Zone 4
Base Site Allowance	350 W	400 W	500 W	900 W
Uncovered Parking Areas				
Parking areas and drives	0.03W/ft^2	0.04 W/ft^2	0.06 W/ft^2	0.08 W/ft^2
Building Grounds				
Walkways and ramps less than 10 feet wide	0.5 W/linear foot	0.5 W/linear foot	0.6 W/linear foot	0.7 W/linear foot
Walkways and ramps 10 feet wide or greater, plaza areas, special feature areas	0.10 W/ft^2	0.10 W/ft^2	0.11 W/ft^2	0.14 W/ft^2
Dining areas	0.65 W/ft^2	0.65 W/ft^2	0.75 W/ft^2	0.95 W/ft^2
Stairways	0.6 W/ft^2	0.7 W/ft^2	0.7 W/ft^2	0.7 W/ft^2
Pedestrian tunnels	0.12 W/ft^2	0.12 W/ft^2	0.14 W/ft^2	0.21 W/ft^2
Landscaping	0.03 W/ft^2	0.04 W/ft^2	0.04 W/ft^2	0.04 W/ft^2
Building Entrances and Exits				
Pedestrian and vehicular entrances and exits	14 W/linear foot of opening	14 W/linear foot of opening	21 W/linear foot of opening	21 W/linear foot of opening
Entry canopies	0.02 W/ft^2	0.25 W/ft^2	0.4 W/ft^2	0.4 W/ft^2
Loading docks	0.35 W/ft^2	0.35 W/ft^2	0.35 W/ft^2	0.35 W/ft^2
Sales Canopies				
Free-standing and attached	0.04 W/ft^2	0.04 W/ft^2	0.6 W/ft^2	0.7 W/ft^2
Outdoor Sales				
Open areas (including vehicle sales lots)	0.02 W/ft^2	0.02 W/ft^2	0.35 W/ft^2	0.05 W/ft^2
Street frontage for vehicle sales lots in addition to "open area" allowance	No allowance	7 W/linear foot	7 W/linear foot	21 W/linear foot

For SI: 1 foot = 304.8 mm, 1 watt per square foot = W/0.0929 m^2.
W = watts.

TABLE C405.5.2(3)

INDIVIDUAL LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

	LIGHTING ZONES			
	Zone 1	Zone 2	Zone 3	Zone 4
Building facades	No allowance	0.075 W/ft² of gross above-grade wall area	0.113 W/ft² of gross above-grade wall area	0.15 W/ft² of gross above-grade wall area
Automated teller machines (ATM) and night depositories	135 W per location plus 45 W per additional ATM per location			
Uncovered entrances and gatehouse inspection stations at guarded facilities	0.5 W/ft² of area			
Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.35 W/ft² of area			
Drive-up windows and doors	200 W per drive through			
Parking near 24-hour retail entrances.	400 W per main entry			

For SI: 1 watt per square foot = W/0.0929 m².

W = watts.

EN7327

Date Submitted	11/19/2018	**Section**	405.5.2	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification adds mandatory requirements for gas-fired lighting appliances.

Rationale

This provision will make the lighting section of commercial code consistent with the lighting section of the residential code section R404.1.1. It will also be consistent with other provisions of the code, such as Section C404.9.1 for commercial pool heaters ("Gas-fired heaters shall not be equipped with continuously burning pilot lights"), Table 403.2.3(4) for warm air furnaces, footnotes f and g, ("Units shall also include an IID" - IID is an intermittent ignition device), federal energy efficiency requirements for residential gas ovens, federal energy efficiency requirements for residential gas hot water boilers, and federal efficiency requirements for residential gas steam boilers.

The energy usage of gas lighting with continuously burning pilot lights is very significant. A gas light using 2,500 Btu/hour will give off about the same amount of light as a 60-Watt (205 Btu) incandescent light bulb (about 800-850 lumens). In other words, a gas light will use over 12 times more energy than an incandescent light bulb. When compared to a 10-Watt LED light bulb, the gas light uses over 72 times more energy.

With a continuously burning pilot light, the 2,500 Btu/hour gas light will use 21.9 Million Btu's (or about 215 therms or 215 ccf) of gas per year. In other words, one light will use more than a typical residential gas water heater.

The savings will be significant. Usage will be reduced by at least 50%, and for a 2,500 Btu/hour gas lamp, that translate to a savings of 109.5 Million Btu's per year (or about 107.5 therms per year). At a commercial rate of $0.90 per therm, the savings are $96.75 per year. This will mean that the simple payback will be less than 1-2 years.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners unless the associated cost is passed onto them by the builder or appliance supplier.

Impact to industry relative to the cost of compliance with code

This proposed modification will increase the cost of compliance with the code. The cost to install a gas light without continuously burning pilot lights is slightly higher (approximately $50-100), depending on the installation and wiring needs.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business unless the associated cost is passed onto them by the builder or appliance supplier.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by prohibiting the use of an energy wasteful gas-fired lighting ignition system.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing requirements in the Commercial Energy Code with those found in the Residential Energy Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.5.2 Lighting equipment (Mandatory) Gas-fired lighting appliances shall not be equipped with continuously burning pilot ignition systems.

EN7328

Date Submitted	11/19/2018	**Section**	405.7	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification is an editorial revision to the Section on transformers to match the terms used in the associated Table.

Rationale

This proposal is a simple editorial connection between Section C405.7 and Table C405.7. The transformers regulated by the section are only those listed in the table. The table is titled Low-voltage dry-type distribution transformers. The section's text implies coverage of all electric transformers. They should be consistent. The Table update was approved by the Commission under CE221.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by ensuring the code is clear and consistent in the use of related terms.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by matching the terms used in the Table with the terms used in the Section.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.7 Electrical transformers (Mandatory). ~~Electric~~ Low-voltage dry-type distribution electric transformers shall meet the minimum efficiency requirements of Table C405.7 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 a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the transformer manufacturer.

EN7329

Date Submitted	11/19/2018	**Section**	405.9.2	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification adds an exception to the speed control rules for escalators and moving walks.

Rationale

The requirement for escalators to reduce their speed when unoccupied is most effective for installations that experience intermittent bursts of activity followed by longer periods of inactivity, such as at rail stations and performance venues. Escalators that experience more frequent light loading during the course of the day, such as office buildings or shopping malls, can benefit more from a variable voltage drive. As described in the report published by the Airport Cooperative Research Program in 2014, ACRP Report 117, sponsored by the Federal Aviation Administration, entitled Airport Escalators and Moving Walkways—Cost-Savings and Energy Reduction Technologies, "A variable voltage drive (VVD) increases and decreases the voltage delivered to the motor, directly affecting the energy consumption of the motor."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry. The new exception provides an alternative method which may or may not change the cost of installation.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by providing the installer and consumer additional methods for reducing energy consumption used by electrical equipment.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by adding an exception to give the installer and consumer more choices for conserving energy use.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

C405.9.2 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.

Exception: A variable voltage drive system that reduces operating voltage in response to light loading conditions is an alternative to the reduced speed function.

EN7499

Date Submitted 11/28/2018
Chapter 4
Section 402.4.1.2
Affects HVHZ No
Proponent Bereket Nigusse
Attachments Yes
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No
Alternate Language No

Related Modifications

Summary of Modification

Increases the Skylights area percentage allowed with daylight response control from 5% to 6%.

Rationale

This proposal changes the maximum skylight area when daylighting controls are used from 5% to 6% of the roof area. Research study has demonstrated energy savings for skylight areas greater than 6% in all climate zones. See the changes are reflected in CE97-16 and an excerpt is attached.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

The proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by harmonizing the FBC-Energy with the 2018 IECC rules for the maximum skylight area allowed with daylight responsive controls.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification reduces building energy use and provides design flexibility.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the code.

C402.4.1.2 Increased skylight area with daylight responsive controls.
The skylight area shall be ~~permitted to be~~ not more than ~~5~~6 percent of the roof area provided that *daylight responsive controls* complying with Section C405.2.3.1 are installed in ~~*daylight*~~ *toplit zones*~~under skylights~~.

Code Change No: CE97-16

Original Proposal

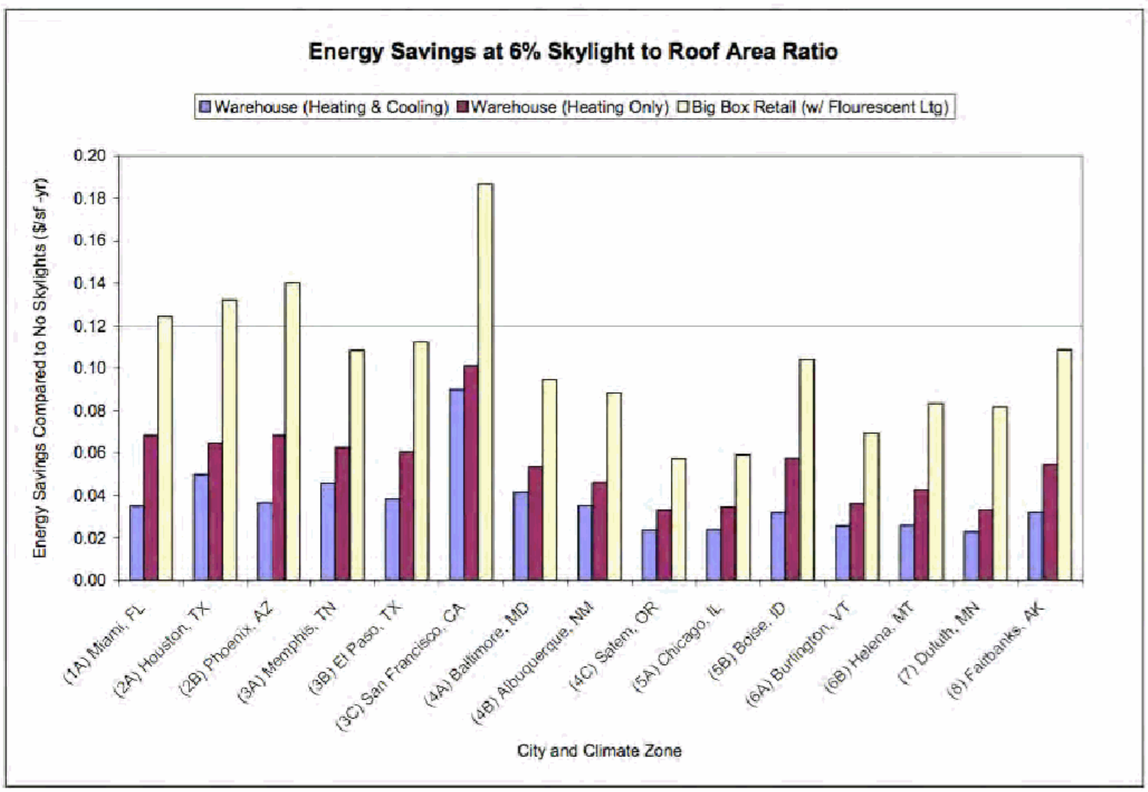
Section: C402.4.1.2

Proponent: Thomas Culp, Birch Point Consulting LLC, representing the Glazing Industry Code Committee and Aluminum Extruders Council (culp@birchpointconsulting.com)

Revise as follows:

C402.4.1.2 Increased skylight area with daylight responsive controls. The skylight area shall be permitted to be not more than ~~5~~ 6 percent of the roof area provided that *daylight responsive controls* complying with Section C405.2.3.1 are installed in *daylight zones* under skylights.

Reason: This proposal changes the maximum skylight area when daylighting controls are used from 5% to 6% of the roof area. When the toplighting requirements were first added to ASHRAE 90.1-2010 and the 2012 IECC, the research studies they were based on showed positive energy savings for skylight areas > 6% in all climate zones (for example, see figure below). ASHRAE 90.1 has the same cap on skylight area as the IECC of 3% when no daylight controls are provided, but allows 6% with proper toplighting instead of 5%. This proposal updates the percentage allowed with daylight controls to the same 6%. This will also help reduce potential conflicts where the minimum toplighting requirement of C402.3.2 would require more skylight area than allowed by this section.



Heschong Mahone Group / AAMA, page 20.

Bibliography: "90.1 Skylighting Requirements Code Change Proposal" Heschong Mahone Group, Pacific Northwest National Laboratory, Project No: 0726 PNNL ASHRAE 90.1, 2008.

"Updates to Treatment of Skylighting in the IECC", Heschong Mahone Group for AAMA Skylight Council, 2005.

"Energy Study in Support of the Proposed Revision of the International Energy Conservation Code (IECC), Skylight Portion of Table 502.3", Carli Inc. for AAMA Skylight Council, 2006.

Cost Impact: Will not increase the cost of construction
This proposal will not increase the cost of construction, as it simply changes the amount of skylight area allowed, but does not require skylights.

Report of Committee Action Hearings

Committee Action: **Approved as Submitted**

Committee Reason: Approval is based on the proponent's published reason statements.

Assembly Action **None**

Final Action Results

CE97-16	**AS**

EN7503

Date Submitted	11/28/2018	**Section**	405.2.5.3	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments Yes

Alternate Language No

Related Modifications

Increase exterior lighting automatic reduction threshold from 30 to 50 percent by selectively switching off or dimming luminaires.

Summary of Modification

Exterior lighting control device shall automatically reduce the connected lighting power by at least 50% when there is no activity. While this proposal is a new code section already approved by the the Energy TAC, this modification is required to make it equivalent to ASHRAE 90.1-2016.

Rationale

This exterior lighting control code modification makes the seventh edition FBC rule equivalent to ASHRAE 90.1-2016 requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by reducing the threshold of total connected exterior lighting power when there is no activity or off building operation hours.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by applying enhanced exterior lighting setback.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7503-G1

Proponent	pete quintela	**Submitted**	1/14/2019	**Attachments**	No

Comment:

We have not adopted the ASHRAE 90.1 2016

C405.2.5.3 Lighting setback. Lighting that is not controlled in accordance with Section C405.2.5.2 shall be controlled so that the total wattage of such lighting is automatically reduced by not less than ~~30~~50 percent by selectively switching off or dimming luminaires at one of the following times:

1. From not later than midnight to not earlier than 6a.m.
2. From not later than one hour after business closing to not earlier than one hour before business opening.
3. During any time where activity has not been detected for 15 minutes or more

2. Lighting in display cases.
3. Nonvisual lighting, such as for plant growth or food warming.
4. Lighting *equipment* that is for sale or used for demonstrations in lighting education.

b. Guestrooms

1. All lighting and all switched receptacles in guestrooms and suites in hotels, motels, boarding houses, or similar *buildings* shall be automatically controlled such that the power to the lighting and switched receptacles in each *enclosed space* will be turned off within 20 minutes after all occupants leave that *space*.

Exception to 9.4.1.3(b)(1)

Enclosed spaces where the lighting and switched receptacles are controlled by captive key *systems* and bathrooms are exempt.

2. Bathrooms shall have a separate *control device* installed to automatically turn off the bathroom lighting within 30 minutes after all occupants have left the bathroom.

Exception to 9.4.1.3(b)(2)

Night lighting of up to 5 W per bathroom is exempt.

c. All supplemental *task lighting*, including *permanently installed* undershelf or undercabinet lighting, shall be controlled from either (1) a *control device* integral to the *luminaires* or (2) by a *wall*-mounted *control device* that is *readily accessible* and located so that the occupant can see the controlled lighting.

9.4.1.4 Exterior Lighting Control

Lighting for exterior applications not exempted in Section 9.1 shall meet the following requirements:

a. Lighting shall be controlled by a device that automatically turns off the lighting when sufficient daylight is available.

b. All *building* façade and landscape lighting shall be automatically shut off between midnight or business closing, whichever is later, and 6 a.m. or business opening, whichever comes first, or between times established by the *authority having jurisdiction*.

c. Lighting not specified in Section 9.4.1.4(b) and lighting for signage shall be controlled by a device that automatically reduces the connected lighting power by at least 50% for at least one of the following conditions:

1. 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.
2. During any period when no activity has been detected for a time of no longer than 15 minutes.

d. *Luminaires* serving outdoor parking areas and having a rated input wattage of greater than 78 W and a mounting height of 24 ft or less above the ground shall be controlled to automatically reduce the power of each *luminaire* by a minimum of 50% when no activity has been detected in the area illuminated by the controlled *luminaires* for a time of no longer than 15 minutes. No more than 1500 W of lighting power shall be controlled together.

All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least ten hours.

Exception to 9.4.1.4

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*.

EN7515

Date Submitted	11/28/2018	**Section**	402.5.6	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifies cargo doors and loading dock doors infiltration restriction requirement

Rationale

This proposed modification clarifies requirements for loading dock weatherseales. This change will make the FBC-Energy consistent with the 2018 IECC based on updates in CE116.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification may impact building and property owners where the increased cost of compliance is passed-on to them from the builder/contractor.

Impact to industry relative to the cost of compliance with code

The proposed modification will not change the cost of compliance to building and property owners.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the rules related to Loading Dock Weatherseals infiltration restriction requirement and consistency with the 2018 IECC.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by clarifying the section on enforcement of loading dock infiltration restriction requirement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the code enforcement.

C402.5.6 Loading dock weatherseals. Cargo doors ~~s~~ openings and loading ~~dock~~ doors ~~s~~ openings shall be equipped with weatherseals ~~to~~ that restrict infiltration and provide direct contact along the top and sides of ~~when~~ vehicles that are parked in the doorway.

Date Submitted 11/28/2018
Chapter 4
Section 403.2.4.1.4
Affects HVHZ No
Proponent Bereket Nigusse
Attachments Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No
Alternate Language No

Related Modifications

Summary of Modification

Heated or cooled vestibules require controls based on a thermostat located in the vestibule

Rationale

This proposed modification adds a new rules how heating and cooling source of vestibules and air curtains are controlled using a thermostat installed in vestibule and makes the 2020 FBC in harmony with the 2018 IECC and ASHRAE 90.1-2016. This new code addition is based on CE136 and is expected reduce the heating and cooling energy use in vestibules.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed new section will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed new section may incur none or up to $75 increase in the cost of compliance to building and property owners depending on the thermostat type.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

The proposed new section will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed new section is directly connected to the health, safety, and welfare of the general public by updating the rules for heated or cooled vestibules in the 2020 FBC-Energy to those found in the 2018 IECC and ASHRAE 90.1-2016.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing the control rules in heated or cooled vestibules by adding thermostat limits based on outside air temperature to minimize energy use in vestibules.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed new section does not discriminate against materials, products, methods, or systems of construction

Does not degrade the effectiveness of the code

The proposed new section enhances the effectiveness of the code.

C403.2.4.1.4 Heated or cooled vestibules

The heating system for heated vestibules and air curtains with integral heating shall be provided with controls configured to shut off the source of heating when the outdoor air temperature is greater than 45°F (7°C). Vestibule heating and cooling systems shall be controlled by a thermostat located in the vestibule configured to limit heating to a temperature not greater than 60°F (16°C) and cooling to a temperature not less than 85°F (29°C).

Exception: Control of heating or cooling provided by site-recovered energy or transfer air that would otherwise be exhausted.

Code Change No: CE136-16

Original Proposal

Section: C403.2.4.1.4 (New)

Proponent: Steven Ferguson, representing American Society of Heating, Refrigerating and Air-Conditioning Engineers (sferguson@ashrae.org)

Add new text as follows:

403.2.4.1.4 Heated or cooled vestibules The heating system for heated vestibules and air curtains with integral heating shall be provided with controls configured to shut off the source of heating when the outdoor air temperature is greater than 45°F (7°C). Vestibule heating and cooling systems shall be controlled by a thermostat located in the vestibule configured to limit heating to a temperature not greater than 60°F (16°C) and cooling to a temperature not less than 85°F (29°C).

> **Exception:** Control of heating or cooling provided by site-recovered energy or transfer air that would otherwise be exhausted.

Reason: Vestibules or air curtains are required to be installed per C402.5.7 to reduce infiltration into the building. The benefit of a vestibule is negated if the vestibule is heated or cooled to the setpoint of the adjacent space. The proposed change limits heating and cooling energy use associated with vestibules. An exception for temperature limits is allowed when the vestibule is tempered with transfer air or heated with recovered energy. Transfer air tempering is beneficial because that conditioned air is destined to be exhausted anyway, and pressurizing the vestibule can reduce infiltration further.

Approval of this code change proposal will ensure consistency with ASHRAE Standard 90.1-16, which will be adopted by reference as an alternative path to the 2018 IECC Commercial Provisions. This change was made via addendum ca to to ASHRAE Standard 90.1-2010 and addendum ag to ASHRAE Standard 90.1-2013.

Cost Impact: Will increase the cost of construction
If there is a heating or cooling system serving a vestibule, it will already have a thermostat based on requirements in section C403.2.4.1. The upgrade to a thermostat with setpoint limits or a locking cover is a modest cost ($20 to $45). In a DDC system, there would be no additional cost for the outside air lockout, and in an electromechanical control system the cost for an outside air lockout thermostat is modest ($40 to $70). These modest costs will be more than offset by reduced loss of heated or cooled air. If a transfer air fan into the vestibule were selected to condition the vestibule as allowed in the exception, that cost is likely to be less than the cost of providing a separate heating or cooling system for the vestibule.

Report of Committee Action Hearings

Committee Action: **Approved as Submitted**

Committee Reason: Approval is based on the proponent's published reason statements.

Assembly Action **None**

Final Action Results

CE136-16	**AS**

EN7533

Date Submitted	11/29/2018	**Section**	403.2.4.2.3	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Add optimum start capability to individual HVAC off-hours control

Rationale

This proposed modification adds optimum start control requirement and rules related to automatic start control capability. This modification has energy savings potential and matches the 2020 FBC to those in ASHRAE 90.1-2016 requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will not change the cost of compliance to building and property owners unless the associated cost is passed onto them by the builder or appliance supplier.

Impact to industry relative to the cost of compliance with code

The proposed modification will increase the cost of compliance with the code. The cost to install optimum start capability is addition to existing automatic start device.

Impact to small business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance or impact small business unless the associated cost is passed onto them by the builder or appliance supplier.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by allowing optimum start HVAC control capability that saves heating and cooling energy end use.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the 2020 FBC by making it equivalent to ASHRAE 90.1-2016 requirement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the HVAC optimum start capabilities code.

C403.2.4.2.3 Automatic and Optimum start capabilities (Mandatory). Automatic start controls shall be provided for each HVAC system. The controls shall be ~~capable of~~ configured to automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.

Individual heating and cooling *systems* with *setback controls* and direct digital control shall have *optimum start controls*. The *control* algorithm shall, as a minimum, be a function of the difference between *space* temperature and occupied *set point*, the outdoor temperature, and the amount of time prior to scheduled occupancy. Mass radiant *floor* slab *systems* shall incorporate *floor* temperature into the optimum start algorithm.

tems, software programming) shall be provided to prevent the heating *set point* from exceeding the cooling *set point*, minus any applicable proportional band.

6.4.3.3 Off-Hour Controls

HVAC systems shall have the off-hour *controls* required by Sections 6.4.3.3.1 through 6.4.3.3.5.

Exceptions to 6.4.3.3

1. *HVAC systems* intended to operate continuously.
2. *HVAC systems* having a design heating capacity and cooling capacity less than 15,000 Btu/h that are equipped with *readily accessible manual* on/off *controls*.

6.4.3.3.1 Automatic Shutdown

HVAC systems shall be equipped with at least one of the following:

a. *Controls* that can start and stop the *system* under different time schedules for seven different day types per week, are capable of retaining programming and time setting during loss of power for a period of at least ten hours, and include an accessible *manual* override or equivalent function that allows temporary operation of the *system* for up to two hours.
b. An *occupant sensor* that is capable of shutting the *system* off when no occupant is sensed for a period of up to 30 minutes.
c. A manually operated timer capable of being adjusted to operate the *system* for up to two hours.
d. An interlock to a security *system* that shuts the *system* off when the security *system* is activated.

Exception to 6.4.3.3.1

Residential occupancies may use *controls* that can start and stop the *system* under two different time schedules per week.

6.4.3.3.2 Setback Controls

Heating *systems* shall be equipped with *controls* capable of and configured to automatically restart and temporarily operate the *system* as required to maintain zone temperatures above an adjustable heating *set point* at least 10°F below the occupied heating *set point*. Cooling *systems* shall be equipped with *controls* capable of and configured to automatically restart and temporarily operate the *mechanical cooling system* as required to maintain zone temperatures below an adjustable cooling *set point* at least 5°F above the occupied cooling *set point* or to prevent high *space* humidity levels.

Exception to 6.4.3.3.2

Radiant heating systems capable of and configured with a *setback* heating *set point* at least 4°F below the occupied heating *set point*.

6.4.3.3.3 Optimum Start Controls

Individual heating and cooling *systems* with *setback controls* and *DDC* shall have *optimum start controls*. The *control* algorithm shall, as a minimum, be a function of the difference between *space* temperature and occupied *set point*, the outdoor temperature, and the amount of time prior to scheduled occupancy. Mass radiant *floor* slab *systems* shall incorporate *floor* temperature into the optimum start algorithm.

6.4.3.3.4 Zone Isolation

HVAC systems serving zones that are intended to operate or be occupied nonsimultaneously shall be divided into isolation areas. Zones may be grouped into a single isolation area pro-

EN7536

Date Submitted	11/29/2018	**Section**	403.2.4.2.5	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Automatic control of HVAC systems serving guest rooms

Rationale

The proposed code allows the 2020 FBC to reduce hotels and motels guest rooms HVAC energy use through enhanced thermostat setups and setbacks and ventilation control in unrented and unoccupied guestrooms without affecting occupant comfort. The proposed code is applicable to hotel and motel buildings containing more than 50 guest rooms. This code addition will bring the 2020 FBC in parity with the 2018 IECC and ASHRAE 90.1-2016. While this proposed code addition increases construction cost, it is cost effective and is based on CE136.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will impact building and property owners where the increased cost of compliance is passed-on to them from the builder/contractor.

Impact to industry relative to the cost of compliance with code

For a 77 rooms hotel will have estimated construction cost increase of $21,000 to $38,000 depending on control type with energy cost savings of $3,263 to $12,432 depending on climate zone.

Impact to small business relative to the cost of compliance with code

The proposed modification will impact small business owners where the increased cost of compliance is passed-on to them from the builder/contractor.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by reducing the energy use of hotels/motels during un-occupied hours using efficient HVAC operation controls.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by allowing enhanced HVAC operation control strategies for hotels/motels guest rooms during un-occupied and un-rented hours.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances effectiveness of the code for automatic control of HVAC systems serving guest rooms.

Add new definition as follows:

ISOLATION DEVICES Devices that isolate HVAC zones so that they can be operated independently of one another. *Isolation devices* include separate systems, isolation dampers, and controls providing shutoff at terminal boxes.

-

NETWORKED GUEST ROOM CONTROL SYSTEM A control system, accessible from the front desk or other central location associated with a *Group R*-1 building, that is capable of identifying the occupancy status of each guest room according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guest room separately.

Add new text as follows:

C403.2.4.2.5 Automatic control of HVAC systems serving guest rooms. In Group R-1 buildings containing over 50 guest rooms, each guest room shall be provided with controls complying with the provisions of Sections C403.2.4.2.5.1 and C403.2.4.2.5.2. Card key conrols comply with these requirements.

-

C403.2.4.2.5.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant set-point within 30 minutes after the occupants have left the guest room. The controls shall also be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented or has not been continuously occupied for over 16 hours or a networked guest room control system indicates that the guest room is unrented and the guest room is unoccupied for more than 30 minutes. A networked guest room control system that is capable of returning the thermostat set-points to default occupied set-points 60 minutes prior to the time a guest room is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent Relative Humidity during unoccupied periods is not precluded by this section.

-

C403.2.4.2.5.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within 30 minutes of the occupants leaving the guest room or isolation devices shall be provided to each guest room that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guest room.

-

Exception: Guest room ventilation systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.

vided it does not exceed 25,000 ft^2 of *conditioned floor area* nor include more than one *floor*. Each isolation area shall be equipped with *isolation devices* capable of and configured to automatically shut off the supply of conditioned air and *outdoor air* to and exhaust air from the area. Each isolation area shall be controlled independently by a device meeting the requirements of Section 6.4.3.3.1. For central *systems* and plants, *controls* and devices shall be provided to allow stable *system* and *equipment* operation for any length of time while serving only the smallest isolation area served by the *system* or plant.

Exceptions to 6.4.3.3.4

Isolation devices and *controls* are not required for

1. exhaust air and *outdoor air* connections to isolation zones when the fan *system* to which they connect is 5000 cfm and smaller;
2. exhaust airflow from a single isolation zone of less than 10% of the design airflow of the exhaust *system* to which it connects; or
3. zones intended to operate continuously or intended to be inoperative only when all other zones are inoperative.

6.4.3.3.5 Automatic Control of HVAC in Hotel/Motel Guest Rooms

Hotels and motels with greater than 50 guest rooms shall be provided with *automatic controls* for the HVAC *equipment* serving each guest room capable of and configured according to the requirements in the following subsection.

6.4.3.3.5.1 Guest Room HVAC Set-Point Control

Within 30 minutes of all occupants leaving the guest room, HVAC *set points* shall be automatically raised by at least 4°F from the occupant *set point* in the cooling mode and automatically lowered by at least 4°F from the occupant *set point* in the heating mode. When the guest room is unrented and unoccupied, HVAC *set points* shall be automatically *reset* to 80°F or higher in the cooling mode and to 60°F or lower in the heating mode. Unrented and unoccupied guest rooms shall be determined by either of the following:

a. The guest room has been continuously unoccupied for up to 16 hours.
b. A *networked guest room control system* indicates the guest room is unrented and the guest room is unoccupied for no more than 30 minutes.

Exceptions to 6.4.3.3.5.1

1. A *networked guest room control system* shall be permitted to return the *thermostat set points* to their default occupied *set points* 60 minutes prior to the time the room is scheduled to be occupied.
2. Cooling for humidity *control* shall be permitted during unoccupied periods.

6.4.3.3.5.2 Guest Room Ventilation Control

Within 30 minutes of all occupants leaving the guest room, *ventilation* and exhaust fans shall automatically be turned off, or *isolation devices* serving each guest room shall automatically shut off the supply of *outdoor air* to the guest room and shut off exhaust air from the guest room.

Exception to 6.4.3.3.5.2

Guest room *ventilation systems* shall be permitted to have an *automatic* daily preoccupancy purge cycle that provides daily *outdoor air ventilation* during unrented periods at the design *ventilation* rate for 60 minutes or at a rate and duration equivalent to one air change.

6.4.3.3.5.3 Automatic Control

Captive key card *systems* shall be permitted to be used to comply with Section 6.4.3.3.5.

Code Change No: CE138-16

Original Proposal

Section(s): C202 (New), C403.2.4.3 (New), C403.2.4.3.1 (New), C403.2.4.3.2 (New)

Proponent: Steven Ferguson, representing American Society of Heating, Refrigerating and Air-Conditioning Engineers (sferguson@ashrae.org)

Add new definition as follows:

ISOLATION DEVICES Devices that isolate HVAC zones so that they can be operated independently of one another. Isolation devices include separate systems, isolation dampers, and controls providing shutoff at terminal boxes.

NETWORKED GUEST ROOM CONTROL SYSTEM A control system, accessible from the front desk or other central location associated with a Group R-1 building, that is capable of identifying the occupancy status of each guest room according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guest room separately.

Add new text as follows:

C403.2.4.3 Automatic control of HVAC systems serving guest rooms. In Group R-1 buildings containing over 50 guest rooms, each guest room shall be provided with controls complying with the provisions of Sections C403.2.4.3.1 and C403.2.4.3.2. Captive key card systems comply with these requirements.

C403.2.4.3.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant set-point within 30 minutes after the occupants have left the guest room. The controls shall also be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented or has not been continuously unoccupied for over 16 hours or a networked guest room control system indicates that the guest room is unrented and the guest room is unoccupied for more than 30 minutes. A networked guest room control system that is capable of returning the thermostat set-points to default occupied set-points 60 minutes prior to the time a guest room is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent Relative Humidity during unoccupied periods is not precluded by this section.

C403.2.4.3.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within 30 minutes of the occupants leaving the guest room or isolation devices shall be provided to each guest room that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guest room.

> **Exception**: Guest room ventilation systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.

Reason: The proposed additional criteria to the IECC provides the ability to reduce building energy use through deeper thermostat setups and setbacks and ventilation control in unrented guestrooms without affecting occupant comfort or creating a conflict with the International Mechanical Code. The technology exists from multiple manufacturers to support the implementation of these provisions. For standalone controls, guest rooms are considered unrented if they are unoccupied for longer than 16 hours. For systems connected to a networked guest room control, the control can be configured to indicate whether the room is scheduled to be occupied and thus setbacks and ventilation can be turned off earlier when the guest room is scheduled to be unoccupied and the networked control can return setpoints to their default levels 60 minutes in advance of scheduled check-in.

This proposal also requires that ventilation air to the guest room be shut off during unoccupied periods. This proposal includes an exception for a "purge cycle" that would provide ventilation air to the guest room one hour before scheduled check-in as indicated by a networked guest room control or through a timed outdoor air ventilation "purge cycle" one hour per day. The purge cycle exception allowed by this proposal allows for enhanced indoor air quality beyond the requirements of the International Mechanical Code, while still capturing the majority of the energy savings of the ventilation shut-off for the rest of the day. The controls would operate from an occupancy sensor, so that cleaning crews in unrented rooms would receive ventilation necessary during cleaning.

Cost Impact: Will increase the cost of construction
An analysis of the small hotel prototypes associated with the ASHRAE SSPC 90.1 activities indicates this change (which will be included in ASHRAE 90.1-2016 because this change was made via addendum j to ASHRAE 90.1-2013) results in savings and paybacks that meet ASHRAE SSPC 90.1 scalar thresholds for cost effectiveness for all climate zones for systems where the ventilation fan is simply switched off such as PTACs. For central ventilation and exhaust systems typically provided with fan coil units there is some additional cost for ventilation and exhaust dampers and pressure regulation devices. Even with these added costs the proposed measure meets the SSPC 90.1 cost effectiveness criteria. The situation where an energy recovery ventilation device is required was investigated, and it was also found that the measure meets the cost effective criteria even with reduced savings accounting for this measure. In the cost effectiveness analysis, added costs for a 77 room hotel or motel were estimated at $21,000 (single unit control) to $38,000 (central exhaust fan system control) with energy cost savings net of maintenance ranging from $3263 to $12,432, depending on climate zone and to average $5,887 annually across all U.S. climate zones

Report of Committee Action Hearings

Committee Action: **As Modified**

Modify as follows:

C403.2.4.3.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant set-point within 30 minutes after the occupants have left the guest room. The controls shall also be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented or has not been continuously ~~unoccupied~~ occupied for over 16 hours or a networked guest room control system indicates that the guest room is unrented and the guest room is unoccupied for more than 30 minutes. A networked guest room control system that is capable of returning the thermostat set-points to default occupied set-points 60 minutes prior to the time a guest room is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent Relative Humidity during unoccupied periods is not precluded by this section.

C403.2.4.3 Automatic control of HVAC systems serving guest rooms. In Group R-1 buildings containing over 50 guest rooms, each guest room shall be provided with controls complying with the provisions of Sections C403.2.4.3.1 and C403.2.4.3.2. ~~Captive~~ Card key ~~card systems~~ controls comply with these requirements.

Committee Reason: Approval is based on the proponent's published reason statements. The Modifications revise the text to use the correct terminology and fix an error in intent.

Assembly Action: **None**

Public Comments

Public Comment 1:

Steven Ferguson, representing American Society of Heating, Refrigerating, and Air-Conditioning Engineers (sferguson@ashrae.org) requests Approve as Modified by this Public Comment.

Modify as follows:

C403.2.4.3.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant set-point within 30 minutes after the occupants have left the guest room. The controls shall also be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented or has ~~not~~ been continuously ~~occupied~~ unoccupied for over 16 hours or a networked guest room control system indicates that the guest room is unrented and the guest room is unoccupied for more than 30 minutes. A networked guest room control system that is capable of returning the thermostat set-points to default occupied set-points 60 minutes prior to the time a guest room is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent Relative Humidity during unoccupied periods is not precluded by this section.

Commenter's Reason: All this public comment is doing is changing has not been continuously for over 16 hours to has been continuously unoccupied for over 16 hours

This matches the original intent of the proposal. Rarely is a hotel room continuously occupied for 16 straight hours. The point is for the controls to change the set points if no one has been in the room for a long time (16 hours).

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Final Action Results

CE138-16	AMPC1

EN7558

Date Submitted 11/29/2018	**Section** 403.2.4.3	**Proponent** Bereket Nigusse
Chapter 4	**Affects HVHZ** No	**Attachments** Yes
TAC Recommendation Pending Review		
Commission Action Pending Review		

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Updated exception that restricts gravity dampers use for exhaust and relief system only

Rationale

Restricts gravity (non-motorized) dampers to be used for exhaust and relief systems only and brings the 2020 FBC in harmony with the 2018 IECC per CE196. This proposed change restricts to use motorized dampers in outside air system and there by decreases HVAC energy use by reducing unintended outside air leakage into the outside air intake system during warm-up and setback operation.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will not change the cost of compliance to building and property owners unless the incremental cost is passed onto them by the builder or appliance supplier.

Impact to industry relative to the cost of compliance with code

The proposed modification will increase the cost of compliance with code. Based on a typical 10" x 10" motorized vent damper with actuator, the install cost will incremental $67 compared to a gravity (non-motorized) damper.

Impact to small business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance or impact small business unless the incremental cost is passed onto them by the builder or appliance supplier.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by harmonizing the 2020 FBC-Energy with the 2018 IECC and prohibited gravity (non-motorized) dampers use in outside air intake system.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by prohibiting the use of gravity (non-motorized) dampers in outside air intake system.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the gravity dampers use code.

C403.2.4.3 Shutoff dampers. Outdoor air intake and exhaust openings and stairway and shaft vents shall be provided with Class I motorized dampers. The dampers shall have an air leakage rate not greater than 4 cfm/ft^2(20.3 L/s·m^2) of damper surface area at 1.0 inch water gauge (249 Pa) and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

Outdoor air intake and exhaust dampers shall be installed with automatic controls configured to close when the systems or spaces served are not in use or during unoccupied period warm-up and setback operation, unless the systems served require outdoor or exhaust air in accordance with the *Florida Building Code, Mechanical* or the dampers are opened to provide intentional economizer cooling.

Stairway and shaft vent dampers shall be installed with automatic controls configured to open upon the activation of any fire alarm initiating device of the building's fire alarm system or the interruption of power to the damper.

Exception: Gravity (nonmotorized) dampers shall be permitted to be used for exhaust and relief as follows:

1. In buildings less than three stories in height above grade plane.

2. In buildings of any height located in *Climate Zones* 1, 2 or 3.

3. Where the design exhaust capacity is not greater than 300 cfm (142 L/s).

Gravity (nonmotorized) dampers shall have an air leakage rate not greater than 20 cfm/ft^2 (101.6 L/s·m^2) where not less than 24 inches (610 mm) in either dimension and 40 cfm/ft$_2$ (203.2 L/s·m^2) where less than 24 inches (610 mm) in either dimension. The rate of air leakage shall be determined at 1.0 inch water gauge (249 Pa) when tested in accordance with AMCA 500D for such purpose. The dampers shall be labeled by an approved agency.

Code Change No: CE139-16

Original Proposal

Section: C403.2.4.3

Proponent: Steven Ferguson, representing American Society of Heating, Refrigerating and Air-Conditioning Engineers (sferguson@ashrae.org)

Revise as follows:

C403.2.4.3 Shutoff dampers. Outdoor air intake and exhaust openings and stairway and shaft vents shall be provided with Class I motorized dampers. The dampers shall have an air leakage rate not greater than 4 cfm/ft^2 (20.3 L/s • m^2) of damper surface area at 1.0 inch water gauge (249 Pa) and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

Outdoor air intake and exhaust dampers shall be installed with automatic controls configured to close when the systems or spaces served are not in use or during unoccupied period warm-up and setback operation, unless the systems served require outdoor or exhaust air in accordance with the *International Mechanical Code* or the dampers are opened to provide intentional economizer cooling.

Stairway and shaft vent dampers shall be installed with automatic controls configured to open upon the activation of any fire alarm initiating device of the building's fire alarm system or the interruption of power to the damper.

Exception: Gravity (nonmotorized) dampers shall be permitted to be used <u>for exhaust and relief</u> as follows:

1. In buildings less than three stories in height above grade plane.
2. In buildings of any height located in *Climate Zones* 1, 2 or 3.
3. Where the design exhaust capacity is not greater than 300 cfm (142 L/s).

Gravity (nonmotorized) dampers shall have an air leakage rate not greater than 20 cfm/ft^2 (101.6 L/s • m^2) where not less than 24 inches (610 mm) in either dimension and 40 cfm/ft^2 (203.2 L/s • m^2) where less than 24 inches (610 mm) in either dimension. The rate of air leakage shall be determined at 1.0 inch water gauge (249 Pa) when tested in accordance with AMCA 500D for such purpose. The dampers shall be labeled by an approved agency.

Reason: This proposal restricts the exception allowing gravity dampers to exhaust and relief air streams, and consequently requires a positive shutoff damper for outside air intakes. Outside air intakes are under negative pressure when the system is operating and as a result will draw in the full outside air amount when a system operates during unoccupied periods to maintain setback heating temperatures. This additional outdoor requires additional heating and increases energy use

Cost Impact: Will increase the cost of construction
Based on an estimating, a typical 10" x 10" motorized vent damper with actuator costs around $111, installed. A gravity damper cost is expected to be around $44. The incremental cost is expected to be $67 for units affected by this code change proposal

Report of Committee Action Hearings

Committee Action: **Approved as Submitted**

Committee Reason: Approval is based on the proponent's published reason statements.

Assembly Action **None**

EN7608

Date Submitted	11/30/2018	**Section**	405.4.1	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Total connected interior lighting power calculation

Rationale

Updated total connected interior lighting power calculation equation and definition with current trend and harmonizes the 2020 FBC with 2018 IECC per code change CE202 and CE204. This code modification if adopted reduces the total connected interior lighting power requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by reducing the total connected interior lighting power.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by applying enhanced and current lighting technology.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the interior lighting power calculation code.

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-9.

TCLP = [~~*SL* + *LV* + *LTPB*~~ *LVL* + *BLL* + *LED* + *TRK* + Other] **(Equation 4-9)**

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 plugin busways as the specified wattage of the luminaires, but at least 308 W/lin. ft. (10025 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.~~

LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps , the rated wattage of the transformer supplying low-voltage lighting lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light emitting diode luminaires with either integral or remote drivers, the rated

wattage of the luminaire.

TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of line-voltage lighting tracks and plugin busway as luminaires without rewiring, the wattage shall be one of the following:

1. The specified wattage of the luminaires, but at least not less than 8 W per linear foot (25 W/lin m).

2. The wattage limit of the permanent current-limiting devices protecting the system.

3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously 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 and applications is not included in calculating total connected lighting power.

~~1.1. Professional sports arena playing field lighting.~~

~~1.2. Lighting in sleeping units, 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 those with 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.~~

~~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 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.~~

~~15. Exit signs~~.

1. Television broadcast lighting for playing areas in sports arena.
2. Emergency lighting automatically off during normal building operation.
3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.
4. Casino gaming areas.
5. Mirror lighting in dressing rooms.
6. Task lighting for medical and dental purposes that is in addition to general lightig and controlled by an independent control device.
7. Display lighting for exhibits in galleries, museums and monuments that is in addition to general lighting and controlled by an independent control device.
8. Lighting for theatrical purposes, including performance, stage, film production and video production.
9. Lighting for photographic processes.
10. Lighting integral to equipment or instrumentation and installed by the manufacturer.
11. Task lighting for plant growth or maintenance
12. Advertising signage or directional signage.

13. Lighting for food warming
14. Lighting equipment that is for sale.
15. Lighting demonstration equipment in lighting education facilities.
16. Lighting approved because of safety consideration
17. Lighting in retail display windows, provided that the display area is enclosed by ceiling-height partitions.
18. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.
19. Exit signs.

Code Change No: CE202-16

Original Proposal

Section: C202, C405.4.1

Proponent: Jack Bailey, representing International Association of Lighting Designers (jbailey@oneluxstudio.com)

Delete without substitution:

~~**LOW-VOLTAGE LIGHTING.** Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.~~

Revise as follows:

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-9.

TCLP = [~~*SL*~~*LVL* ~~+ *LV* + *LTPB*~~ **+ BLL + LED + TRK** + Other] **(Equation 4-9)**

where:

TCLP = Total connected lighting power (watts).

~~*SL* = Labeled wattage of luminaires for screw-in lamps.~~

~~*LV*~~ *LVL* = ~~Wattage~~ For luminaires with lamps connected directly to building power, such as line voltage lamps , the rated wattage of the ~~transformer supplying low-voltage lighting~~ lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.

~~*LTPB*~~ *TRK* = ~~Wattage~~ For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of ~~line-voltage lighting tracks and plugin busways as~~ luminaires without rewiring, the wattage shall be one of the following:
1. The specified wattage of the luminaires, but ~~at least~~ not less than 30 W/lin. ft. (100 W/lin m)~~, or the.~~
2. The wattage limit of the ~~system's circuit breaker, or~~ permanent current-limiting devices protecting the system.
3. The wattage limit of ~~other permanent current-limiting devices on~~ the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously 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. Lighting in sleeping units, 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 those with 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.

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 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.
15. Exit signs.

Reason: Equation 4-9 was added in the 2015 IECC. While this was a worthwhile addition to the code, when it was added it re-used language from previous versions of the code which have not kept pace with technological developments in the lighting industry. This outdated language creates several problems:

First, "screw base lamps" are not synonymous with incandescent lamps. Incandescent lamps are available in over a dozen different base types, of which only three or four could be described as "screw base". At the same time, many metal halide and high pressure sodium lamps, which operate from ballasts, also have screw bases. This proposal eliminates the term "screw base lamps" and refers instead to "lamps connected directly to building power".

Second, it is not clear what voltages are considered to be "low". When this definition was first added to the code, if was probably assumed to refer to 12V and 24V applications, but UL Class 2 would allow up to 60 volts DC (and LED luminaires with remote drivers in this voltage range are becoming much more common). Furthermore, this code tells us that a "low voltage transformer" has an input voltage of less than 600 volts. So presumably a 277V circuit would be considered "low voltage" to a power engineer, and lights that operates at 277V would also be considered "low voltage". This proposal eliminates the term entirely. The code really doesn't care about voltage - it should only be concerned with wattage. The term "low voltage lighting" was previously used in three different locations within the code, but the other two locations were eliminated in the 2015 version, so this is the only remaining reference in the commercial section of the code.

Third, there is no reference in the code to lighting emitting diode (LED) technology. LED luminaires have neither lamps nor ballasts. This proposal would simply require that the watts going into LED luminaires be counted.

And finally, the introduction of microprocessors into ballasts has resulted in a dramatic reduction in ballast SKU's, as ballasts can now sense what lamp is connected to them and adjust their output accordingly. This proposal requires that the wattage consumed by the ballast when operating the actual installed lamp is all that matters.

Overall this proposal will modernize terminology in the code to much more closely match lighting terminology which is currently in use.

Cost Impact: Will not increase the cost of construction
The intent of this proposal is to clarify the language to result in a more consistent interpretation of the code. However, there may be a minor cost savings. When specifying a luminaire utilizing screw-base lamps in a commercial building, it has become common to require that a "wattage reduction label" be provided on the fixture. This label states that the maximum lamp wattage that can be installed is limited to some smaller amount - typically 12W or 15W per socket - based on the LED retrofit lamp that is actually going to be used in the fixture, rather than the 60W - 150W that the incandescent socket is rated for. This has no impact on the lamps that are used (no commercial building owner will accept incandescent lamps anymore - they all want LED), but it does add a minor fee of typically \$5-\$15 per fixture for the label. The updated language above would end this practice, and result in some minor savings on the re-labelling fee.

Report of Committee Action Hearings

Committee Action: **Approved as Submitted**

Committee Reason: Approval was based on the proponent's published reason statements.

Assembly Action **None**

Final Action Results

CE202-16	**AS**

Code Change No: CE204-16

Original Proposal

Section: C405.4.1

Proponent: Glenn Heinmiller, Lam Partners, representing International Association of Lighting Designers (glenn@lampartners.com)

Revise as follows:

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-9.

TCLP = [*SL* + *LV* + *LTPB* + Other] **(Equation 4-9)**

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 plugin busways as the specified wattage of the luminaires, but at least ~~30~~ 8 W/lin. ft. (~~100~~ 25 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 previously 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. Lighting in sleeping units, 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 those with 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.
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 installed by the manufacturer.
6. Task lighting for plant growth or maintenance.

EN7752

Date Submitted	12/10/2018	**Section**	402.4	**Proponent**	Roger LeBrun
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **Yes**

Related Modifications

Summary of Modification

Clarification of allowable skylight area when daylight responsive controls and minimum skylight area provisions simultaneously apply.

Rationale

When Item 1 of C402.4.2 is the pertinent compliance option, it is possible that the minimum skylight area needed to achieve the one percent effective aperture required will exceed the higher prescriptive maximum allowed in C402.4.1.2. Since it is not possible for a minimum area to be higher than the maximum area, the clarifications added remove this conflict.
(Source: CE96-16, as revised during the 2017 ICC public comment hearings.)

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Simplifies enforcement by eliminating an existing requirement conflict.

Impact to building and property owners relative to cost of compliance with code

No impact

Impact to industry relative to the cost of compliance with code

No impact

Impact to small business relative to the cost of compliance with code

No impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Retains current relevance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Removes a compliance conflict.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No changes to these elements.

Does not degrade the effectiveness of the code

No negative change to code effectiveness - only improvement.

1st Comment Period History

7752-A1

Proponent Kelli Fleming **Submitted** 1/31/2019 **Attachments** Yes

Rationale

The original version of this mod was based on an early draft of an AAMA Proposal to the IECC which has since been expanded to cover TDD's more specifically. This mod change will keep FBC consistent with the IECC proposal that was actually submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact

Impact to building and property owners relative to cost of compliance with code

No Impact

Impact to industry relative to the cost of compliance with code

No Impact

Impact to Small Business relative to the cost of compliance with code

No impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

Is the proposed code modification part of a prior code version? No

C402.4.1 Maximum area.
The vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not be greater than 30 percent of the gross above-grade wall area. The skylight area shall not be greater than 3 percent of the gross roof area.
…

C402.4.1.2 Increased skylight area with daylight responsive controls.
Where daylight responsive controls ~~The skylight area shall be permitted to be not more than 5 percent of the roof area provided daylight responsive controls~~ complying with Section C405.2.3.1 are ~~installed~~ provided in *daylight zones* under skylights, the allowed skylight area shall not be greater than 5 percent of the gross roof area. or that required for compliance with Section C402.4.2, item 1, whichever is greater.

C402.4.2 Minimum skylight fenestration area.

Skylights shall be provided in ~~In an~~ enclosed spaces greater than 2,500 square feet (232 m2) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height 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, nonrefrigerated warehouse, retail store, distribution/sorting area, transportation depot or workshop~~,~~. The ~~the~~ total *daylight zone* under skylights shall be not less than half the floor area and shall ~~provide~~ comply with one of the following:

1. A minimum skylight area to daylight zone under skylights of not less than 3 percent whereall skylights have a VT of at least 0.40 as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture of at least 1 percent, determined in accordance with Equation 4-4.

(Equation 4-4)

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 a.m. and 4 p.m.
4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of daylight zones adjacent to vertical fenestration is less than 2,500 square feet (232 m2), and where the lighting is controlled according to Section C405.2.3.

Note to staff: text of comment to Modification EN7752 follows, in three groupings:

- -

The following change in C202 is necessary to accommodate changes to the original modification in C402.4.2:

SECTION C202 GENERAL DEFINITIONS

Add new definition as follows:

VISIBLE TRANSMITTANCE (ANNUAL) [VT_{annual}] The ratio of visible light entering the space through the fenestration product assembly to the incident visible light during the course of a year, which includes the effects of glazing material, frame, and light well or tubular conduit, and is expressed as a number between 0 and 1.

- -

Revise original modification as shown:

C402.4.2 Minimum skylight fenestration area.

Skylights shall be provided in enclosed spaces greater than 2,500 square feet (232 m2) in floor area, directly under a roof with not less than 75 percent of the ceiling area with a ceiling height 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 comply with one of the following:

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, or VT_{annual} of not less than 0.26 as determined in accordance with Section C303.1.3.
2. A minimum skylight effective aperture ~~of at least 1 percent,~~ determined in accordance with Equation 4-4~~.~~ of:
    a. Not less than 1 percent, using a skylight's VT rating; or
    b. Not less than 0.66 percent using a Tubular Daylighting Device's VT_{annual} rating.

(Equation 4-4)

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, or 1.0 for Tubular Daylighting Devices with $VT_{\mathbf{annual}}$ ratings.

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 a.m. and 4 p.m.
4. Spaces where the daylight zone under rooftop monitors is greater than 50 percent of the enclosed space floor area.
5. Spaces where the total area minus the area of daylight zones adjacent to vertical fenestration is less than 2,500 square feet (232 m2), and where the lighting is controlled according to Section C405.2.3

- -

Changes above also require additional revisions as follows:

C402.4.2.2 Haze factor.

Skylights in office, storage, automotive service, manufacturing, nonrefrigerated warehouse, retail store and distribution/sorting area spaces shall have a glazing material or diffuser with a haze factor greater than 90 percent when tested in accordance with ASTM D1003.

Exception: Skylights and/or tubular daylighting devices designed and installed to exclude direct sunlight entering the occupied space by the use of fixed or automated baffles ~~or~~, the geometry of skylight and light well, or the use of optical diffuser components.

EN7882

Date Submitted	12/14/2018	**Section**	407.5.1	**Proponent**	Amanda Hickman
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

#7883 - add ASHRAE Standard 55-2013

Summary of Modification

This modification adds an exception to Table C407.5.1(1)

Rationale

This modification provides direction regarding set point and schedule requirements for modeling systems that provide occupant thermal comfort via means other than directly controlling the air dry-bulb and wet-bulb temperature (i.e., radiant cooling / heating, elevated air speed, etc.). This proposal (CE256-16) was approved into the 2018 edition of the IECC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification adds an exception to the performance path, which gives credit for radiant cooling/heating, elevated air speed, etc.

Impact to building and property owners relative to cost of compliance with code

There is no cost impact because this modification only adds an exception to the performance path.

Impact to industry relative to the cost of compliance with code

There is no cost impact because this modification only adds an exception to the performance path.

Impact to small business relative to the cost of compliance with code

There is no cost impact because this modification only adds an exception to the performance path.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification updates the performance path to give credit for radiant cooling/heating, elevated air speed, etc.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification updates the performance path to give credit for additional technologies, such as radiant cooling/heating, elevated air speed, etc.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification only adds an exception to the performance path and does not take away from any other technology.

Does not degrade the effectiveness of the code

This modification only adds an exception to the performance path and therefore, increases the effectiveness of the code.

TABLE C407.5.1(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

All other cells of the table remain the same

Building Component Characteristics	Standard Reference Design	Proposed Design
Schedules	Same as proposed Exception: Thermostat settings and schedules for HVAC systems that utilize radiant heating, radiant cooling, and elevated air speed, provided that equivalent levels of occupant thermal comfort are demonstrated by means of equal Standard Effective Temperature as calculated in Normative Appendix B of ASHRAE 55-2013.	Operating schedules shall include hourly profiles for daily operation and shall account for variations between weekdays, weekends, holidays and any season operation. Schedules shall model the time-dependent variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service hot water usage and any process loads. The schedules shall be typical of the proposed building type as determined by the designer and approved by the jurisdiction.

EN7886

Date Submitted	12/14/2018	**Section**	403.2.12.3	**Proponent**	Amanda Hickman
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No   **Alternate Language** No

Related Modifications

#7884 - delete fan efficiency grade definition
#7885 - remove reference standard AMCA 205-12

Summary of Modification

This modification deletes section C403.2.12.3 Fan Efficiency.

Rationale

AMCA International and a consensus of its member companies have decided that the Fan Energy Index (FEI) metric is to replace the Fan Efficiency Grade (FEG) metric for efficiency codes, standards and regulations.

FEI emerged as the metric of choice from public stakeholder negotiations as a recommendation to the Department of Energy toward its rulemaking initiative for commercial fans and blowers. Although that rulemaking has been postponed, it has not been canceled.

ASHRAE Technical Committee TC 5.1 for fans voted to remove FEG from ASHRAE 90.1. The 90.1 Mechanical Subcommittee vetted FEI and decided to replace FEG with FEI, which was upheld by the full committee.

FEI is replacing FEG in ASHRAE 90.1 in the 2019 edition.

FEI has been added to EnergyPlus modeling software and the DOE Fan System Assessment Tool.

FEI also has been vetted by ISO and is being added to the ISO Standard 12759 Fans - Energy Efficiency classification of fans.

Globally, the direction for regulation of motor driven units (fans, pumps, and compressors) focuses on metrics that include motors, drives and controllers. FEG is the only metric that is not in synch with this direction.

AMCA International has expanded its fan certification program to include FEI ratings.

Therefore, in concert with the proposal to replace FEG with FEI, AMCA is proposing that The FEG provision be deleted from the Florida Energy Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade. Deleting this language will decrease confusion and increase enforceability.

Impact to building and property owners relative to cost of compliance with code

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, which has the potential to decrease cost.

Impact to industry relative to the cost of compliance with code

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, which has the potential to decrease cost.

Impact to small business relative to the cost of compliance with code

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, which has the potential to decrease cost.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, which will allow the general public the ability to choose more efficient products.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, thereby strengthening the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification only deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, which does not discriminate against any materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This modification deletes unused and unsupported language found in section C403.2.12.3 for fan efficiency grade, thereby increasing the effectiveness of the code.

Delete as follows:

~~C403.2.12.3 Fan efficiency.~~

~~Fans shall have a fan efficiency grade (FEG) of not less than 67 when determined in accordance with AMCA 205 by an *approved*, independent testing laboratory. The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.~~

~~**Exception:** The following fans are not required to have a fan efficiency grade:~~

1. ~~1.Fans of 5 hp (3.7 kW) or less as follows:~~
   1. ~~1.1.Single fan with a motor nameplate horse power of 5 hp (3.7 kW) or less, unless Exception 1.2 applies.~~
   2. ~~1.2.Multiple fans in series or parallel that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a single fan.~~
2. ~~2.Fans that are part of equipment covered under Section C403.2.3.~~
3. ~~3.Fans included in an equipment package certified by an *approved agency* for air or energy performance.~~
4. ~~4.Powered wall/roof ventilators.~~
5. ~~5.Fans outside the scope of AMCA 205.~~
6. ~~6.Fans that are intended to operate only during emergency conditions.~~

EN7898

Date Submitted	12/11/2018	**Section**	402.5.6	**Proponent**	Joseph Hetzel
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No

Alternate Language No

Related Modifications

Summary of Modification

Clarifies loading dock weatherseal provisions.

Rationale

The revision clarifies the purpose of a door opening weatherseal for cargo doors and loading dock doors. The proposal was submitted to the ICC as CE116-16 and was approved as submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Upholds health, safety, and welfare by clarifying the purpose of a door opening weatherseal.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying the purpose of a door opening weatherseal.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying the purpose of a door opening weatherseal.

C402.5.6Loading dock weatherseals.

Cargo doors and loading dock ~~doors~~ door openings shall be equipped with weatherseals ~~to~~that restrict infiltration ~~when~~and provide direct

contact along the top and sides of vehicles ~~are~~ parked in the doorway.

EN7904

Date Submitted	12/11/2018	**Section**	402.1.4	**Proponent**	Joseph Hetzel
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Include garage door maximum U-factors.

Rationale

This proposal is intended to establish maximum U-factors for garage doors, as opposed to minimum R-values, since garage door thermal performance is assembly-based and not component-based. The 14% threshold allows for doors to have vision lites. Garage doors with a single row of fenestration are typically between 14% and 25% of the total door area. Glazing does not constitute between 25% and 50% of door area. The proposal on the U-factor values was submitted to the ICC as CE60-16 Part 1 (Commercial) and was approved as submitted. The U-factor values as shown are also in ASHRAE 90.1-2016. The footnote concept was incorporated into ASHRAE 90.1-2016, where the footnote proposed here involves the Climate Zones applicable in Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Provisions reflect garage doors common in the Florida marketplace, where such doors are installed in walls enclosing conditioned spaces.

Impact to building and property owners relative to cost of compliance with code

No impact. Provisions reflect garage doors common in the Florida marketplace, where such doors are installed in walls enclosing conditioned spaces.

Impact to industry relative to the cost of compliance with code

No impact. Provisions reflect garage doors common in the Florida marketplace, where such doors are installed in walls enclosing conditioned spaces.

Impact to small business relative to the cost of compliance with code

No impact. Provisions reflect garage doors common in the Florida marketplace, where such doors are installed in walls enclosing conditioned spaces.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse impact on health, safety, and welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by requiring assembly-based garage door thermal performance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal is material/product/method/system neutral.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by requiring assembly-based garage door thermal performance.

Opaque doors														
Swinging door	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
Garage door <14% glazing[g]	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

[Notes unchanged]

[Footnotes a-f unchanged]

g. Garage doors having a single row of *fenestration* shall have an assembly U-factor less than or equal to 0.44, provided that the *fenestration* area is not less than 14 percent and not more than 25 percent of the total door area.

EN7934

Date Submitted	12/11/2018	**Section**	402.5.2	**Proponent**	Joseph Hetzel
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Adds an air leakage requirement for power-operated sliding doors and power-operated folding doors.

Rationale

Per the current Table, it can be interpreted that the value for "sliding doors" encompasses both manual sliding doors, used primarily in residential dwelling applications, and power-operated sliding doors, used primarily in non-residential applications. The maximum air leakage rate for power-operated sliding doors, and for power-operated folding doors, should be differentiated from "sliding doors" similar to how commercial glazed swinging entrance doors are differentiated from "swinging doors".

* Power-operated sliding and power-operated folding door designs must accommodate a high number of repeated openings and closings similar to such accommodation for commercial glazed swinging entrance doors.
* For emergency egress situations, power-operated sliding and power-operated folding doors must be capable of "breakout" to allow emergency egress when the power is out.
* Sealing any power-operated door at the floor is very difficult to achieve for commercial service durability because such doors must meet ADA / accessibility requirements.

Additionally, the IBC currently requires power-operated sliding doors and power-operated folding doors to comply with BHMA A156.10. Approved revisions to the 2018 IBC will require low-energy power-operated doors of these configurations to comply with BHMA A156.38. Extensive technical requirements for breakout and other safety-related requirements are included in both of these standards.

This proposal was submitted to the ICC as CE113-16, and was approved as submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No adverse effect on health, safety, and welfare by clarifying air leakage requirements for power-operated sliding doors and power-operated folding doors.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying air leakage requirements for power-operated sliding doors and power-operated folding doors.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying air leakage requirements for power-operated sliding doors and power-operated folding doors.

TABLE C402.5.2

MAXIMUM AIR LEAKAGE RATE FOR FENESTRATION ASSEMBLIES

FENESTRATIONASSEMBLY	MAXIMUMRATE (CFM/FT2)	TESTPROCEDURE
Windows	0.20 a	AAMA/WDMA/CSA101/I.S.2/A440or NFRC 400orASTM E283 at 1.57 p
Sliding doors	0.20 a	
Swinging doors	0.20 a	
Skylights – with condensationweepage openings	0.30	
Skylights – all other	0.20 a	
Curtain walls	0.06	
Storefront glazing	0.06	
Power-operated sliding doors and power-operated folding doors, Commercial glazedswinging entrance doors	1.00	
Revolving doors	1.00	
Garage doors	0.40	ANSI/DASMA 105,NFRC 400, orAST 1.57 psf(75 Pa)
Rolling doors	1.00	
High-speed doors	1.30	

For SI: 1 cubic foot per minute = 0.47 L/s, 1 square foot = 0.093 m^2.

1. 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).

EN7984

Date Submitted	12/12/2018	**Section**	404.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Updates Table C404.2 Minimum Performance of Water Heating Equipment to current federal standard.

Rationale

Standards have changed and most water heating systems are now required to meet federal regulations based on uniform energy factor instead of energy factor.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Improves consistency between federal regulation and state building code. Helps building officials as update includes terminology used with new water heaters.

Impact to building and property owners relative to cost of compliance with code

No increase in cost since already federal regulation.

Impact to industry relative to the cost of compliance with code

No increase in cost since already federal regulation.

Impact to small business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by having code be related to specifications provided by water heater manufacturers.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by bringing it inline with federal standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; brings code inline with federal standards.

Does not degrade the effectiveness of the code

Improves code effectiveness by bringing it inline with federal standards.

Alternate Language

1st Comment Period History

7984-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** Yes

Rationale

Alt 1 mod combines the two tables that were submitted as the original mod into one table, and makes several additional changes.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Same as original mod.

Impact to building and property owners relative to cost of compliance with code

Same as original mod.

Impact to industry relative to the cost of compliance with code

Same as original mod.

Impact to Small Business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Same as original mod.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Same as original mod.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Same as original mod.

Does not degrade the effectiveness of the code

Same as original mod.

[See attached document.]

[See attached file.]

[Modify Table C404.2 and associated notes as follows (starting from Supplement to the 6th Edition (2017) Florida Building Code, Energy Conservation Changes to the 2020 IECC, CE171-16 Modified by Public Comment 1):]

TABLE C404.2
MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (input)	SUBCATEGORY OR RATING CONDITION	DRAW PATTERN	PERFORMANCE REQUIRED[a, b, g]	~~TEST PROCEDURE~~ REFERENCE STANDARD
Water heaters, electric	≤ 12 kW[d]	Tabletop[e], >= 20 gallons and <= 120 gallons	Very small Low Medium High	~~0.93 - 0.00132*V*, EF~~ 0.6323 − (0.0058 × V), UEF 0.9188 − (0.0031 × V), UEF 0.9577 − (0.0023 × V), UEF 0.9884 − (0.0016 × V), UEF	DOE 10 CFR Part 430
		~~Resistance~~ >= 20 gallons and <= 55 gallons	Very small Low Medium High	~~0.960 - 0.0003*V*, EF~~ 0.8808 − (0.0008 × V), UEF 0.9254 − (0.0003 × V), UEF 0.9307 − (0.0002 × V), UEF 0.9349 − (0.0001 × V), UEF	
		> 55 gallons and < 120 gallons	Very small Low Medium High	~~2.057 - 0.00113*V*, EF~~ 1.9236 − (0.0011 × V), UEF 2.0440 − (0.0011 × V), UEF 2.1171 − (0.0011 × V), UEF 2.2418 − (0.0011 × V), UEF	
		Grid-enabled[f] > 75 ~~20~~ gallons ~~and < 120 gallons~~	Very small Low Medium High	~~1.061 - 0.00168*V*, EF~~ 1.0136 − (0.0028 × V), UEF 0.9984 − (0.0014 × V), UEF 0.9853 − (0.0010 × V), UEF 0.9720 − (0.0007 × V), UEF	
	> 12 kW	~~Resistance~~ All		$(0.3 + 27/V_m)$ SL, %/h	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
	~~≤ 24 amps and ≤ 250 volts~~	~~Heat pump > 55 gallons and < 120 gallons~~		~~2.057 - 0.00113*V*, EF~~	~~DOE 10 CFR Part 430~~
Storage water heaters, gas	≤ 75,000 Btu/h	>= 20 gallons and <= 55 gallons	Very small Low Medium High	~~0.675 - 0.0015*V*, EF~~ 0.3456 − (0.0020 × V), UEF 0.5982 − (0.0019 × V), UEF 0.6483 − (0.0017 × V), UEF 0.6920 − (0.0013 × V), UEF	DOE 10 CFR Part 430
		> 55 gallons and <= 100 gallons	Very small Low Medium High	~~0.8012 - 0.00078*V*, EF~~ 0.6470 − (0.0006 × V), UEF 0.7689 − (0.0005 × V), UEF 0.7897 − (0.0004 × V), UEF 0.8072 − (0.0003 × V), UEF	
	> 75,000 Btu/h ~~and ≤ 155,000 Btu/h~~			80% E_t (Q/800 + 110 √V)SL, Btu/h	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
	~~> 155,000 Btu/h~~			~~80% E_t~~ ~~(Q/800 + 110 √V)SL, Btu/h~~	
	>75 kBtu/hr and ≤105 kBtu/hr	Residential-duty commercial ≤120 gal	Very small Low Medium High	0.2674 − (0.0009 × V), UEF 0.5362 − (0.0012 × V), UEF 0.6002 − (0.0011 × V), UEF 0.6597 − (0.0009 × V), UEF	DOE 10 CFR Part 431
Instantaneous water heaters, electric		< 2 gal	Very small Low Medium High	0.91, UEF 0.91, UEF 0.91, UEF 0.92, UEF	DOE 10 CFR Part 430

	>12 kW and ≤58.6 kW	Residential-duty commercial ≤2 gal	Very small Low Medium High	0.80, UEF 0.80, UEF 0.80, UEF 0.80, UEF	DOE 10 CFR Part 431
Instantaneous water heaters, gas	< 2 gallons and > 50,000 Btu/h ~~and c~~	≥ 4,000 (Btu/h)/gal and	Very small Low Medium High	~~0.82 – 0.0019V, EF~~ 0.80, UEF 0.81, UEF 0.81, UEF 0.81, UEF	DOE 10 CFR Part 430
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal		80% E_t	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal		80% E_t (Q/800 + 110 V)$^{1/2}$ SL, Btu/h	
Storage water heaters, oil	≤ 105,000 Btu/h	≥ 20 gal and < 50 gallons	Very small Low Medium High	~~0.68 - 0.0019V, EF~~ 0.2509 − (0.0012 × V), UEF 0.5330 − (0.0016 × V), UEF 0.6078 − (0.0016 × V), UEF 0.6815 − (0.0014 × V), UEF	DOE 10 CFR Part 430
	≥ 105,000 Btu/h			80% E_t (Q/800 + 110 V)$^{1/2}$ SL, Btu/h	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
	>105 kBtu/hr and ≤140 kBtu/hr	Residential-duty commercial ≤120 gal	Very small Low Medium High	0.2932 − (0.0015 × V), UEF 0.5596 − (0.0018 × V), UEF 0.6194 − (0.0016 × V), UEF 0.6740 − (0.0013 × V), UEF	DOE 10 CFR Part 431
Instantaneous water heaters, oil	≤ 210,000 Btu/h	≥ 4,000 Btu/h/gal and		0.59 - 0.0019V, EF	DOE 10 CFR Part 430
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and		80% E_t	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal		78% E_t (Q/800 + 110 V)$^{1/2}$ SL, Btu/h	
Hot water supply boilers, gas and oil	≥ 300,000 Btu/h and	≥ 4,000 Btu/h/gal and		80% E_t	~~ANSI Z21.10.3~~ DOE 10 CFR Part 431
Hot water supply boilers, gas	≥ 300,000 Btu/h and	≥ 4,000 Btu/h/gal and ≥ 10 gal		80% E_t (Q/800 + 110 V)$^{1/2}$ SL, Btu/h	
Hot water supply boilers, oil	> 300,000 Btu/h and	> 4,000 Btu/h/gal and > 10 gal		78% E_t (Q/800 + 110 V)$^{1/2}$ SL, Btu/h	
Pool heaters, gas and oil	All	—		82% E_t	ASHRAE 146
Heat pump pool heaters	All	—		4.0 COP	AHRI 1160
Unfired storage tanks	All	—		Minimum insulation requirement R-12.5 $(h \cdot ft^2 \cdot °F)$/Btu	~~(none)~~ DOE 10 CFR Part 431

For SI: °C = [(°F) - 32]/1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

a. Energy factor (EF), uniform energy factor (UEF) and thermal efficiency (Et) are minimum requirements. In the EF and UEF equations, V is the rated volume in gallons.

b. Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, Q is the nameplate input rate in Btu/h. In the equations for electric water heaters, V is the rated volume in gallons and Vm is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

c. Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements where the water heater is designed to heat water to temperatures 180°F or higher.

d. Electric water heaters with an input rating of 12 kW (40,950 Btu/hr) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h).

e. A tabletop water heater is a water heater that is enclosed in a rectangular cabinet with a flat top surface not more than 3 feet (0.91 m) in height.

f. A grid-enabled water heater is an electric resistance water heater that meets all of the following:

(1) Has a rated storage tank volume of more than 75 gallons.

(2) Is manufactured on or after April 16, 2015.

(3) Is equipped at the point of manufacture with an activation lock.

(4) Bears a permanent label applied by the manufacturer that complies with all of the following: (4.1) Is made of material not adversely affected by water.

(4.2) Is attached by means of non-water-soluble adhesive.

(4.3) Advises purchasers and end-users of the intended and appropriate use of the product with the following notice printed in 16.5 point Arial Narrow Bold font: "IMPORTANT INFORMATION: This water heater is intended only for use as part of an electric thermal storage or demand response program. It will not provide adequate hot water unless enrolled in such a program and activated by your utility company or another program operator.

Confirm the availability of a program in your local area before purchasing or installing this product."
g. Water heaters and hot water supply boilers having more than 140 gallons of storage capacity need not meet the standby loss requirement if: (1) The tank surface area is thermally insulated to R-12.5 or more; (2) a standing pilot light is not used; and (3) for gas or oil-fired storage water heaters, they have a fire damper or fan-assisted combustion.

CE171-16 Modified by Public Comment 1:

[Replace crossed-out text below with values in image below that reflect current federal standards.]

TABLE C404.2
MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (input)	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[a, b]	TEST PROCEDURE
~~Water heaters, electric~~	~~≤ 12 kW[d]~~	~~Tabletop[e], > 20 gallons and < 120 gallons~~	~~0.93 - 0.00132*V*, EF~~	~~DOE 10 CFR Part 430~~
		~~Resistance > 20 gallons and < 55 gallons~~	~~0.960 - 0.0003*V*, EF~~	
		~~Grid-enabled[f] > 75 20 gallons and < 120 gallons~~	~~1.061 - 0.00168*V*, EF~~	
	~~> 12 kW~~	~~Resistance~~	~~(0.3 + 27/V_m), %/h~~	~~ANSI Z21.10.3~~
	~~≤ 24 amps and ≤ 250 volts~~	~~Heat pump > 55 gallons and < 120 gallons~~	~~2.057 - 0.00113*V*, EF~~	~~DOE 10 CFR Part 430~~
~~Storage water heaters, gas~~	~~≤ 75,000 Btu/h~~	~~> 20 gallons and < 55 gallons~~	~~0.675 - 0.0015*V*, EF~~	~~DOE 10 CFR Part 430~~
		~~> 55 gallons and < 100 gallons~~	~~0.8012 - 0.00078*V*, EF~~	
	~~> 75,000 Btu/h and ≤ 155,000 Btu/h~~		~~80% E_t~~ ~~(Q/800 + 110 V)SL, Btu/h~~	~~ANSI Z21.10.3~~
	~~> 155,000 Btu/h~~		~~80% E_t~~ ~~(Q/800 + 110 V)SL, Btu/h~~	
~~Instantaneous water heaters, gas~~	~~> 50,000 Btu/h and c~~	~~≥ 4,000 (Btu/h)/gal and~~	~~0.82 - 0.0019*V*, EF~~	~~DOE 10 CFR Part 430~~
	~~≥ 200,000 Btu/h~~	~~≥ 4,000 Btu/h/gal and~~	~~80% E_t~~	~~ANSI Z21.10.3~~
	~~≥ 200,000 Btu/h~~	~~≥ 4,000 Btu/h/gal and ≥ 10 gal~~	~~80% E_t~~ ~~(Q/800 + 110 V)SL, Btu/h~~	
~~Storage water heaters, oil~~	~~≤ 105,000 Btu/h~~	~~≥ 20 gal and < 50 gallons~~	~~0.68 - 0.0019*V*, EF~~	~~DOE 10 CFR Part 430~~
	~~≥ 105,000 Btu/h~~		~~80% E_t~~ ~~(Q/800 + 110 V)SL, Btu/h~~	~~ANSI Z21.10.3~~
~~Instantaneous water heaters, oil~~	~~≤ 210,000 Btu/h~~	~~≥ 4,000 Btu/h/gal and~~	~~0.59 - 0.0019*V*, EF~~	~~DOE 10 CFR Part 430~~
	~~> 210,000 Btu/h~~	~~≥ 4,000 Btu/h/gal and~~	~~80% E_t~~	~~ANSI Z21.10.3~~
	~~> 210,000 Btu/h~~	~~≥ 4,000 Btu/h/gal and ≥ 10 gal~~	~~78% E_t~~ ~~(Q/800 + 110 V)SL, Btu/h~~	
Hot water supply boilers, gas and oil	≥ 300,000 Btu/h and	≥ 4,000 Btu/h/gal and	80% E_t	ANSI Z21.10.3
Hot water supply boilers, gas	≥ 300,000 Btu/h and	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E_t (Q/800 + 110 V)SL, Btu/h	
Hot water supply boilers,	> 300,000 Btu/h and	> 4,000 Btu/h/gal and > 10 gal	78% E_t (Q/800 + 110 V)SL, Btu/h	

oil				
Pool heaters, gas and oil	All	—	82% E_t	ASHRAE 146
Heat pump pool heaters	All	—	4.0 COP	AHRI 1160
Unfired storage tanks	All	—	Minimum insulation requirement R-12.5 (h · ft² · °F)/Btu	(none)

For SI: °C = [(°F) - 32]/1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

a. Energy factor (EF) and thermal efficiency (Et) are minimum requirements. In the EF equation, V is the rated volume in gallons.

b. Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, Q is the nameplate input rate in Btu/h. In the equations for electric water heaters, V is the rated volume in gallons and Vm is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

c. Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements where the water heater is designed to heat water to temperatures 180°F or higher.

d. Electric water heaters with an input rating of 12 kW (40,950 Btu/hr) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h).

e. A tabletop water heater is a water heater that is enclosed in a rectangular cabinet with a flat top surface not more than 3 feet (0.91 m) in height.

f. A grid-enabled water heater is an electric resistance water heater that meets all of the following:
(1) Has a rated storage tank volume of more than 75 gallons.
(2) Is manufactured on or after April 16, 2015.
(3) Is equipped at the point of manufacture with an activation lock.
(4) Bears a permanent label applied by the manufacturer that complies with all of the following: (4.1) Is made of material not adversely affected by water.
(4.2) Is attached by means of non-water-soluble adhesive.
(4.3) Advises purchasers and end-users of the intended and appropriate use of the product with the following notice printed in 16.5 point Arial Narrow Bold font: "IMPORTANT INFORMATION: This water heater is intended only for use as part of an electric thermal storage or demand response program. It will not provide adequate hot water unless enrolled in such a program and activated by your utility company or another program operator. Confirm the availability of a program in your local area before purchasing or installing this product."

(CE171-16 AMPC1)

Product class	Rated storage volume and input rating (if applicable)	Draw pattern	Uniform energy factor
Gas-fired Storage Water Heater	≥20 gal and ≤55 gal	Very Small	$0.3456 - (0.0020 \times V_r)$
		Low	$0.5982 - (0.0019 \times V_r)$
		Medium	$0.6483 - (0.0017 \times V_r)$
		High	$0.6920 - (0.0013 \times V_r)$
	>55 gal and ≤100 gal	Very Small	$0.6470 - (0.0006 \times V_r)$
		Low	$0.7689 - (0.0005 \times V_r)$
		Medium	$0.7897 - (0.0004 \times V_r)$
		High	$0.8072 - (0.0003 \times V_r)$
Oil-fired Storage Water Heater	≤50 gal	Very Small	$0.2509 - (0.0012 \times V_r)$
		Low	$0.5330 - (0.0016 \times V_r)$
		Medium	$0.6078 - (0.0016 \times V_r)$
		High	$0.6815 - (0.0014 \times V_r)$
Electric Storage Water Heaters	≥20 gal and ≤55 gal	Very Small	$0.8808 - (0.0008 \times V_r)$
		Low	$0.9254 - (0.0003 \times V_r)$
		Medium	$0.9307 - (0.0002 \times V_r)$
		High	$0.9349 - (0.0001 \times V_r)$
	>55 gal and ≤120 gal	Very Small	$1.9236 - (0.0011 \times V_r)$
		Low	$2.0440 - (0.0011 \times V_r)$
		Medium	$2.1171 - (0.0011 \times V_r)$
		High	$2.2418 - (0.0011 \times V_r)$
Tabletop Water Heater	≥20 gal and ≤120 gal	Very Small	$0.6323 - (0.0058 \times V_r)$
		Low	$0.9188 - (0.0031 \times V_r)$
		Medium	$0.9577 - (0.0023 \times V_r)$
		High	$0.9884 - (0.0016 \times V_r)$
Instantaneous Gas-fired Water Heater	<2 gal and >50,000 Btu/h	Very Small Low	0.80 0.81
		Medium	0.81
		High	0.81
Instantaneous Electric Water Heater	<2 gal	Very Small	0.91
		Low	0.91
		Medium	0.91
		High	0.92
Grid-Enabled Water Heater	>75 gal	Very Small	$1.0136 - (0.0028 \times V_r)$
		Low	$0.9984 - (0.0014 \times V_r)$
		Medium	$0.9853 - (0.0010 \times V_r)$
		High	$0.9720 - (0.0007 \times V_r)$

*V_r is the Rated Storage Volume (in gallons), as determined pursuant to 10 CFR 429.17.

EN7990

Date Submitted 12/12/2018
Chapter 4
Section 403.2.3
Affects HVHZ No
Proponent Jeff Sonne for FSEC
Attachments Yes
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **No**

Related Modifications

Summary of Modification

Updated Table C403.2.3(3) 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 to latest federal standards.

Rationale

Change is needed for consistency with federal regulations.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No increase in cost since already federal regulation.

Impact to building and property owners relative to cost of compliance with code

No increase in cost since already federal regulation.

Impact to industry relative to the cost of compliance with code

No increase in cost since already federal regulation.

Impact to small business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by having code be consistent with federal standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by having code be consistent with federal standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code be consistent with federal standards.

Does not degrade the effectiveness of the code

Improves effectiveness of code by having code be consistent with federal standards.

See attached document.

TABLE C403.2.3(3)
MINIMUM EFFECIENCY REQUIREMENTS:
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS,
ACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS,
AND ROOM AIR-CONDITIONER HEAT SINGLE PUMPS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE[a]
PTAC (cooling mode) new construction	All Capacities	95°F db outdoor air	14.0 – (0.300 × Cap/1000) EER[c]	AHRI 310/380
PTAC (cooling mode) replacements[b]	All Capacities	95°F db outdoor air	10.9 - (0.213 × Cap/1000) EER	
PTHP (cooling mode) new construction	All Capacities	95°F db outdoor air	14.0 - (0.300 × Cap/1000) EER	
PTHP (cooling mode) replacements[b]	All Capacities	95°F db outdoor air	10.8 - (0.213 × Cap/1000) EER	
PTHP (heating mode) new construction	All Capacities	—	~~3.2 - (0.026 × Cap/1000) COP~~ 3.7 - (0.052 × Cap/1000) COP	
PTHP (heating mode) replacements[b]	All Capacities	—	2.9 - (0.026 × Cap/1000) COP	
SPVAC (cooling mode)		95°F db/ 75°F wb outdoor air	~~9.0 EER~~ 11.0 EER	AHRI 390
	≥ 65,000 Btu/h and	95°F db/ 75°F wb outdoor air	~~8.9 EER~~ 10.0 EER	
	≥ 135,000 Btu/h and	95°F db/ 75°F wb outdoor air	~~8.6 EER~~ 10.0 EER	
SPVHP (cooling mode)		95°F db/ 75°F wb outdoor air	~~9.0 EER~~ 11.0 EER	
	≥ 65,000 Btu/h and	95°F db/ 75°F wb outdoor air	~~8.9 EER~~ 10.0 EER	
	≥ 135,000 Btu/h and	95°F db/ 75°F wb outdoor air	~~8.6 EER~~ 10.0 EER	
SPVHP (heating mode)		47°F db/ 43°F wb outdoor air	~~3.0 COP~~ 3.3 COP	AHRI 390
	≥ 65,000 Btu/h and	47°F db/ 43°F wb outdoor air	3.0 COP	
	≥ 135,000 Btu/h and	47°F db/ 75°F wb outdoor air	~~2.0 COP~~ 3.0 COP	
Room air conditioners, with louvered sides	< 6,000 Btu/h	—	~~9.7 SEER~~11.0 CEER	ANSI/ AHAM RAC-1
	≥ 6,000 Btu/h and	—	~~9.7 EER~~11.0 CEER	
	≥ 8,000 Btu/h and	—	~~9.8 EER~~10.9 CEER	
	≥ 14,000 Btu/h and	—	~~9.7 EER~~10.7 CEER	

	≥ 20,000 Btu/h and < 25,000 Btu/h > 25,000 Btu/h	—	~~8.5 EER~~9.4 CEER 9.0 CEER	
Room air conditioners, without louvered sides	< 6,000 Btu/h > 6,000 Btu/h and < 8,000 Btu/h	—	10.0 CEER ~~9.0 EER~~10.0 CEER	
	≥ 8,000 Btu/h and < 11,000 Btu/h > 11,000 Btu/h and < 14,000 Btu/h > 14,000 Btu/h and < 20,000 Btu/h	—	~~8.5 EER~~9.6 CEER 9.5 CEER 9.3 CEER	
	≥ 20,000 Btu/h	—	~~8.5 EER~~9.4 CEER	
Room air-conditioner heat pumps with louvered sides	< 20,000 Btu/h	—	~~9.0 EER~~9.8 CEER	
	≥ 20,000 Btu/h	—	~~8.5 EER~~9.3 CEER	
Room air-conditioner heat pumps without louvered sides	< 14,000 Btu/h	—	~~8.5 EER~~9.3 CEER	
	≥ 14,000 Btu/h	—	~~8.0 EER~~8.7 CEER	
Room air conditioner casement only	All capacities	—	~~8.7 EER~~9.5 CEER	ANSI/ AHAM RAC-1
Room air conditioner casement-slider	All capacities	—	~~9.5 EER~~10.4 CEER	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8, wb = wet bulb, db = wet bulb.
"Cap" = The rated cooling capacity of the project in Btu/h. Where the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. Where the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations.

a. Chapter 6 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.
c. ~~Before January 1, 2015 the minimum efficiency shall be 13.8 - (0.300 x Cap/1000) EER.~~

(CE132-16)

EN7995

Date Submitted	12/12/2018	**Section**	403.2.3	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Update Table C403.2.3(5) Gas and Oil-fired Boilers to latest federal standards.

Rationale

Change is needed for consistency with federal regulations.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No increase in cost since already federal regulation.

Impact to building and property owners relative to cost of compliance with code

No increase in cost since already federal regulation.

Impact to industry relative to the cost of compliance with code

No increase in cost since already federal regulation.

Impact to small business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by having code be consistent with federal standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by having code be consistent with federal standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code be consistent with federal standards.

Does not degrade the effectiveness of the code

Improves effectiveness of code by having code be consistent with federal standards.

See attached document.

TABLE ~~C403.2.3(5)~~ C403.2.3(5)
MINIMUM EFFICIENCY REQUIREMENTS: GAS- AND OIL-FIRED BOILERS

EQUIPMENT TYPE[a]	SUBCATEGORY OR RATING CONDITION	SIZE CATEGORY (INPUT)	MINIMUM EFFICIENCY[d, e]	TEST PROCEDURE
Boilers, hot water	Gas-fired	< 300,000 Btu/h[f,g]	~~80%~~ 84% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	80% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	82% E_c	
	Oil-fired[c]	< 300,000 Btu/h[g]	~~80%~~ 86% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	82% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	84% E_c	
Boilers, steam	Gas-fired	< 300,000 Btu/h[f]	~~75%~~ 82% AFUE	10 CFR Part 430
	Gas-fired- all, except natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	79% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	79% E_t	
	Gas-fired-natural draft	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	77% E_t 79% E_t effective March 2, 2022	
		> 2,500,000 Btu/h[a]	77% E_t 79% E_t effective March 2, 2022	
	Oil-fired[c]	< 300,000 Btu/h	~~80%~~ 85% AFUE	10 CFR Part 430
		≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h[b]	81% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	81% E_t	

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

a. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

b. Maximum capacity – minimum and maximum ratings as provided for and allowed by the unit's controls.

c. Includes oil-fired (residual).

d. E_c = Combustion efficiency (100 percent less flue losses).

e. E_t = Thermal efficiency. See referenced standard for detailed information.

f. Boilers shall not be equipped with a constant burning ignition pilot.

g. A boiler not equipped with a tankless domestic water heating coil shall be equipped with an automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

(CE154-16)

EN8000

Date Submitted	12/12/2018	**Section**	403.2.3	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No | **Alternate Language** No

Related Modifications

Summary of Modification

Update Table C403.2.3(1) Unitary Air Conditioners and Condensing Units to latest federal standards.

Rationale

Change is needed for consistency with federal regulations.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No increase in cost since already federal regulation.

Impact to building and property owners relative to cost of compliance with code

No increase in cost since already federal regulation.

Impact to industry relative to the cost of compliance with code

No increase in cost since already federal regulation.

Impact to small business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by having code be consistent with federal standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by having code be consistent with federal standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code be consistent with federal standards.

Does not degrade the effectiveness of the code

Improves effectiveness of code by having code be consistent with federal standards.

See attached document.

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 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~~ 14.0 SEER	AHRI 210/240
			Single Package	~~13.0 SEER~~	14.0 SEER[c]	
Through-the-wall (air cooled)	≤ 30,000 Btu/h[b]	All	Split system	~~12.0 SEER~~	12.0 SEER	
			Single Package	~~12.0 SEER~~	12.0 SEER	
Small-duct high-velocity (air cooled)	< 65,000 Btu/h[b]	All	Split System	~~11.0 SEER~~	~~11.0 SEER~~ 12.0 SEER	
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 ~~12.8 IEER~~ 12.9 IEER	AHRI 340/360
		All other	Split System and Single Package	~~11.0 EER~~ ~~11.2 IEER~~	11.0 EER ~~12.6 IEER~~ 12.7 IEER	
	≥ 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 12.4 IEER	
		All other	Split System and Single Package	~~10.8 EER~~ ~~11.0 IEER~~	10.8 EER 12.2 IEER	
	≥ 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 11.6 IEER	
		All other	Split System and Single Package	~~9.8 EER~~ ~~9.9 IEER~~	9.8 EER 11.4 IEER	
	≥ 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~9.7 EER~~ ~~9.8 IEER~~	9.7 EER 11.2 IEER	
		All other	Split System and Single Package	~~9.5 EER~~ ~~9.6 IEER~~	9.5 EER 11.0 IEER	

(continued)

TABLE C403.2.3(1)—continued
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING SECTION TYPE	SUB-CATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY		TEST PROCEDURE[a]
				~~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	AHRI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~12.1 EER~~ ~~12.3 IEER~~	12.1 EER 13.9 IEER	AHRI 340/360
		All other	Split System and Single Package	~~11.9 EER~~ ~~12.1 IEER~~	11.9 EER 13.7 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~12.5 EER~~ ~~12.5 IEER~~	12.5 EER 13.9 IEER	
		All other	Split System and Single Package	~~12.3 EER~~ ~~12.5 IEER~~	12.3 EER 13.7 IEER	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~12.4 EER~~ ~~12.6 IEER~~	12.4 EER 13.6 IEER	
		All other	Split System and Single Package	~~12.2 EER~~ ~~12.4 IEER~~	12.2 EER 13.4 IEER	
		Electric Resistance (or None)	Split System and Single Package	~~12.2 EER~~ ~~12.4 IEER~~	12.2 EER 13.5 IEER	

	≥ 760,000 Btu/h	All other	Split System and Single Package	~~12.0 EER~~ ~~12.2 IEER~~	12.0 EER 13.3 IEER	
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	AHRI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~12.1 EER~~ ~~12.3 IEER~~	12.1 EER 12.3 IEER	AHRI 340/360
		All other	Split System and Single Package	~~11.9 EER~~ ~~12.1 IEER~~	11.9 EER 12.1 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~12.0 EER~~ ~~12.2 IEER~~	12.0 EER 12.2 IEER	
		All other	Split System and Single Package	~~11.8 EER~~ ~~12.0 IEER~~	11.8 EER 12.0 IEER	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~11.9 EER~~ ~~12.1 IEER~~	11.9 EER 12.1 IEER	
		All other	Split System and Single Package	~~11.7 EER~~ ~~11.9 IEER~~	11.7 EER 11.9 IEER	
	≥ 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~11.7 EER~~ ~~11.9 IEER~~	11.7 EER 11.9 IEER	
		All other	Split System and Single Package	~~11.5 EER~~ ~~11.7 IEER~~	11.5 EER 11.7 IEER	
Condensing units, air cooled	≥ 135,000 Btu/h			~~10.5 EER~~ ~~11.8 IEER~~	10.5 EER 11.8 IEER	AHRI 365
Condensing units, water cooled	≥ 135,000 Btu/h			~~13.5 EER~~ ~~14.0 IEER~~	13.5 EER 14.0 IEER	
Condensing units, evaporatively cooled	≥ 135,000 Btu/h			~~13.5 EER~~ ~~14.0 IEER~~	13.5 EER 14.0 IEER	

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

a. Chapter 6 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.

c. Minimum efficiency as of January 1, 2015.

EN8025

Date Submitted	12/12/2018	**Section**	403.2.3	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Updates Table C403.2.3(9) Air Conditioners and Condensing Units Serving Computer Rooms

Rationale

The proposed modification clarifies and updates efficiency requirements for computer room air conditions and condensing units based on application classification and model standard type. This change will make the FBC-Energy 2020 consistent with ASHARE 90.1-2018.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will not impact the building and property owners cost.

Impact to industry relative to the cost of compliance with code

The proposed modification will not change the cost of compliance.

Impact to small business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the rules related to computer AC application class and model standard.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by clarifying the section on enforcement of computer AC application class and model standard requirement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the code enforcement.

1st Comment Period History

8025-A2

Proponent Bereket Nigusse **Submitted** 1/11/2019 **Attachments** Yes

Rationale

The proposed modification clarifies and updates efficiency requirements for computer room air conditions and condensing units based on application classification and model standard type. This change will make the FBC-Energy 2020 consistent with ASHARE 90.1-2016. This is better strike/underline of the code modification submitted earlier.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact on the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

No impact on the building and property owners cost.

Impact to industry relative to the cost of compliance with code

No change to the cost of compliance.

Impact to Small Business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by clarifying the rules related to computer AC application class and model standard.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by clarifying the section on enforcement of computer AC application class and model standard requirement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

See attached documents.

~~**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~~	
	~~≥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~~	~~ANSI/ASHRAE 127~~

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

~~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).~~

~~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 reheaters 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 fansystem.~~

TABLE C403.2.3 (9)

MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity[a]	Standard Model	Minimum Net Sensible COP[b] (NSCOP) Return Air Dry-Bulb Temperature / Dew-Point Temperature			Test Procedure
			Class 1	Class 2	Class 3	
Air cooled	<65,000 Btu/h	Downflow unit	–	2.30	–	AHRI 1360
		Upflow unit—ducted	–	2.10	–	
		Upflow unit—nonducted	2.09	–	–	
		Horizontal-flow unit	–	–	2.45	
	=65,000 and <240,000 Btu/h	Downflow unit	–	2.20	–	
		Upflow unit—ducted	–	2.05	–	
		Upflow unit—nonducted	1.99	–	–	
		Horizontal-flow unit	–	–	2.35	
	=240,000 Btu/h	Downflow unit	–	2.00	–	
		Upflow unit—ducted	–	1.85	–	
		Upflow unit—nonducted	1.79	–	–	
		Horizontal-flow unit	–	–	2.15	
Water cooled	<65,000 Btu/h	Downflow unit	–	2.50	–	AHRI 1360
		Upflow unit—ducted	–	2.30	–	
		Upflow unit—nonducted	2.25	–	–	
		Horizontal-flow unit	–	–	2.70	
	=65,000 and <240,000 Btu/h	Downflow unit	–	2.40	–	
		Upflow unit—ducted	–	2.20	–	
		Upflow unit—nonducted	2.15	–	–	
		Horizontal-flow unit	–	–	2.60	
	=240,000 Btu/h	Downflow unit	–	2.25	–	
		Upflow unit—ducted	–	2.10	–	
		Upflow unit—nonducted	2.05	–	–	
		Horizontal-flow unit	–	–	2.45	
Water cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit	–	2.45	–	AHRI 1360
		Upflow unit—ducted	–	2.25	–	
		Upflow unit—nonducted	2.20	–	–	
		Horizontal-flow unit	–	–	2.60	
	=65,000 and <240,000 Btu/h	Downflow unit	–	2.35	–	
		Upflow unit—ducted	–	2.15	–	
		Upflow unit—nonducted	2.10	–	–	
		Horizontal-flow unit	–	–	2.55	
	=240,000 Btu/h	Downflow unit	–	2.20	–	
		Upflow unit—ducted	–	2.05	–	
		Upflow unit—nonducted	2.00	–	–	
		Horizontal-flow unit	–	–	2.40	

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TABLE C403.2.3 (9) - Continued

MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity[a]	Standard Model	Minimum Net Sensible COP[b] (NSCOP) Return Air Dry-Bulb Temperature / Dew-Point Temperature			Test Procedure
			Class 1	Class 2	Class 3	
Glycol cooled	<65,000 Btu/h	Downflow unit	_	2.30	_	AHRI 1360
		Upflow unit—ducted	_	2.10	_	
		Upflow unit—nonducted	2.00	_	_	
		Horizontal-flow unit	_	_	2.40	
	=65,000 and <240,000 Btu/h	Downflow unit	_	2.05	_	
		Upflow unit—ducted	_	1.85	_	
		Upflow unit—nonducted	1.85	_	_	
		Horizontal-flow unit	_	_	2.15	
	=240,000 Btu/h	Downflow unit	_	1.95	_	

		Upflow unit—ducted	–	1.80	–	
		Upflow unit—nonducted	1.75	–	–	
		Horizontal-flow unit	–	–	2.10	
Glycol cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit	–	2.25	–	AHRI 1360
		Upflow unit—ducted	–	2.10	–	
		Upflow unit—nonducted	2.00	–	–	
		Horizontal-flow unit	–	–	2.35	
	=65,000 and <240,000 Btu/h	Downflow unit	–	1.95	–	
		Upflow unit—ducted	–	1.80	–	
		Upflow unit—nonducted	1.75	–	–	
		Horizontal-flow unit	–	–	2.10	
	=240,000 Btu/h	Downflow unit	–	1.90	–	
		Upflow unit—ducted	–	1.80	–	
		Upflow unit—nonducted	1.70	–	–	
		Horizontal-flow unit	–	–	2.10	

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

a. Net Sensible Cooling Capacity. The rate, expressed in Btu/h and/or kW, at which the equipment removes sensible heat from the air passing through it under specified conditions of operation, including the fan energy dissipated into the conditioned space.

Net Sensible Coefficient of Performance (NSCOP). A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions defined in AHRI Standard 1360.

~~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~~	

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

~~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 reheaters 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.~~

TABLE C403.2.3 (9)
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity[a]	Standard Model	Minimum Net Sensible COP[b] (NSCOP) Return Air Dry-Bulb Temperature / Dew-Point Temperature			Test Procedure
			Class 1	Class 2	Class 3	
Air cooled	<65,000 Btu/h	Downflow unit		2.30		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.09			
		Horizontal-flow unit			2.45	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.20		
		Upflow unit—ducted		2.05		
		Upflow unit—nonducted	1.99			
		Horizontal-flow unit			2.35	
	≥240,000 Btu/h	Downflow unit		2.00		
		Upflow unit—ducted		1.85		
		Upflow unit—nonducted	1.79			
		Horizontal-flow unit			2.15	
Water cooled	<65,000 Btu/h	Downflow unit		2.50		AHRI 1360
		Upflow unit—ducted		2.30		
		Upflow unit—nonducted	2.25			
		Horizontal-flow unit			2.70	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.40		
		Upflow unit—ducted		2.20		
		Upflow unit—nonducted	2.15			
		Horizontal-flow unit			2.60	
	≥240,000 Btu/h	Downflow unit		2.25		
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.05			
		Horizontal-flow unit			2.45	
Water cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit		2.45		AHRI 1360
		Upflow unit—ducted		2.25		
		Upflow unit—nonducted	2.20			
		Horizontal-flow unit			2.60	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.35		
		Upflow unit—ducted		2.15		
		Upflow unit—nonducted	2.10			
		Horizontal-flow unit			2.55	
	≥240,000 Btu/h	Downflow unit		2.20		
		Upflow unit—ducted		2.05		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.40	

TABLE C403.2.3 (9) - Continued
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity[a]	Standard Model	Minimum Net Sensible COP[b] (NSCOP) Return Air Dry-Bulb Temperature / Dew-Point Temperature			Test Procedure
			Class 1	Class 2	Class 3	
Glycol cooled	<65,000 Btu/h	Downflow unit		2.30		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.40	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.05		
		Upflow unit—ducted		1.85		
		Upflow unit—nonducted	1.85			
		Horizontal-flow unit			2.15	
	≥240,000 Btu/h	Downflow unit		1.95		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.75			
		Horizontal-flow unit			2.10	
Glycol cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit		2.25		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.35	
	≥65,000 and <240,000 Btu/h	Downflow unit		1.95		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.75			
		Horizontal-flow unit			2.10	
	≥240,000 Btu/h	Downflow unit		1.90		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.70			
		Horizontal-flow unit			2.10	

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

a. Net Sensible Cooling Capacity. The rate, expressed in Btu/h and/or kW, at which the equipment removes sensible heat from the air passing through it under specified conditions of operation, including the fan energy dissipated into the conditioned space.

b. Net Sensible Coefficient of Performance (NSCOP). A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions defined in AHRI Standard 1360.

Table 6.8.1-11 Air Conditioners and *Condensing Units* Serving *Computer Rooms*—Minimum *Efficiency* Requirements

Equipment Type	Net Sensible Cooling Capacity	Standard Model	Minimum Net Sensible COP_C Return Air Dry-Bulb Temperature/Dew-Point Temperature Class 1 75°F/52°F	Class 2 85°F/52°F	Class 3 95°F/52°F	Test Procedure
Air cooled	<65,000 Btu/h	Downflow unit		2.30		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.09			
		Horizontal-flow unit			2.45	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.20		
		Upflow unit—ducted		2.05		
		Upflow unit—nonducted	1.99			
		Horizontal-flow unit			2.35	
	≥240,000 Btu/h	Downflow unit		2.00		
		Upflow unit—ducted		1.85		
		Upflow unit—nonducted	1.79			
		Horizontal-flow unit			2.15	
Water cooled	<65,000 Btu/h	Downflow unit		2.50		AHRI 1360
		Upflow unit—ducted		2.30		
		Upflow unit—nonducted	2.25			
		Horizontal-flow unit			2.70	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.40		
		Upflow unit—ducted		2.20		
		Upflow unit—nonducted	2.15			
		Horizontal-flow unit			2.60	
	≥240,000 Btu/h	Downflow unit		2.25		
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.05			
		Horizontal-flow unit			2.45	
Water cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit		2.45		AHRI 1360
		Upflow unit—ducted		2.25		
		Upflow unit—nonducted	2.20			
		Horizontal-flow unit			2.60	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.35		
		Upflow unit—ducted		2.15		
		Upflow unit—nonducted	2.10			
		Horizontal-flow unit			2.55	
	≥240,000 Btu/h	Downflow unit		2.20		
		Upflow unit—ducted		2.05		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.40	

Table 6.8.1-11 Air Conditioners and *Condensing Units* Serving *Computer Rooms*— Minimum *Efficiency* Requirements *(Continued)*

Equipment Type	Net Sensible Cooling Capacity	Standard Model	Minimum Net Sensible COP_C — Return Air Dry-Bulb Temperature/ Dew-Point Temperature — Class 1 75°F/52°F	Class 2 85°F/52°F	Class 3 95°F/52°F	Test Procedure
Glycol cooled	<65,000 Btu/h	Downflow unit		2.30		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.40	
	≥65,000 and <240,000 Btu/h	Downflow unit		2.05		
		Upflow unit—ducted		1.85		
		Upflow unit—nonducted	1.85			
		Horizontal-flow unit			2.15	
	≥240,000 Btu/h	Downflow unit		1.95		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.75			
		Horizontal-flow unit			2.10	
Glycol cooled with *fluid economizer*	<65,000 Btu/h	Downflow unit		2.25		AHRI 1360
		Upflow unit—ducted		2.10		
		Upflow unit—nonducted	2.00			
		Horizontal-flow unit			2.35	
	≥65,000 and <240,000 Btu/h	Downflow unit		1.95		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.75			
		Horizontal-flow unit			2.10	
	≥240,000 Btu/h	Downflow unit		1.90		
		Upflow unit—ducted		1.80		
		Upflow unit—nonducted	1.70			
		Horizontal-flow unit			2.10	

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	

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

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 reheaters 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.

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Date Submitted	12/12/2018	**Section**	403.2.3	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Update Table C403.2.3(2) ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS to latest federal standards.

Rationale

Change is needed for consistency with federal regulations.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No increase in cost since already federal regulation.

Impact to building and property owners relative to cost of compliance with code

No increase in cost since already federal regulation.

Impact to industry relative to the cost of compliance with code

No increase in cost since already federal regulation.

Impact to small business relative to the cost of compliance with code

No increase in cost since already federal regulation.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by having code be consistent with federal standards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by having code be consistent with federal standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code consistent with federal standards.

Does not degrade the effectiveness of the code

Improves effectiveness of code by having code be consistent with federal standards.

See attached file.

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 SEER[e]~~	14.0 SEER[c]	AHRI 210/240
			Single Package	~~13.0 SEER[e]~~	14.0 SEER[c]	
Through-the-wall, air cooled	≤ 30,000 Btu/h[b]	All	Split System	~~12.0 SEER~~	12.0 SEER	
			Single Package	~~12.0 SEER~~	12.0 SEER	
Single-duct high-velocity air cooled	< 65,000 Btu/h[b]	All	Split System	~~11.0 SEER~~	~~11.0 SEER~~ 12.0 SEER	
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~~	11.0 EER 12.0 IEER	AHRI 340/360
		All other	Split System and Single Package	~~10.8 EER~~ ~~11.0 IEER~~	10.8 EER 11.8 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~10.6 EER~~ ~~10.7 IEER~~	10.6 EER 11.6 IEER	
		All other	Split System and Single Package	~~10.4 EER~~ ~~10.5 IEER~~	10.4 EER 11.4 IEER	
	≥ 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	~~9.5 EER~~ ~~9.6 IEER~~	9.5 EER 10.6 IEER	
		All other	Split System and Single Package	~~9.3 EER~~ ~~9.4 IEER~~	9.3 EER 9.4 IEER	
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
	≥ 17,000 Btu/h and < 65,000 Btu/h	All	86°F entering water	~~13.0 EER~~	13.0 EER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	All	86°F entering water	~~13.0 EER~~	13.0 EER	
Water to Air: Ground Water (cooling mode)	< 135,000 Btu/h	All	59°F entering water	~~18.0 EER~~	18.0 EER	ISO 13256-1
Brine to Air: Ground Loop (cooling mode)	< 135,000 Btu/h	All	77°F entering water	~~14.1 EER~~	14.1 EER	ISO 13256-1
Water to Water: Water Loop (cooling mode)	< 135,000 Btu/h	All	86°F entering water	~~10.6 EER~~	10.6 EER	ISO 13256-2
Water to Water: Ground Water (cooling mode)	< 135,000 Btu/h	All	59°F entering water	~~16.3 EER~~	16.3 EER	
Brine to Water: Ground Loop (cooling mode)	< 135,000 Btu/h	All	77°F entering fluid	~~12.1 EER~~	12.1 EER	

(continued)

TABLE C403.2.3(2)—continued
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 (heating mode)	< 65,000 Btu/h[b]	—	Split System	~~7.7 HSPF[c]~~	8.2 HSPF[c]	AHRI 210/240
		—	Single Package	~~7.7 HSPF[c]~~	8.0 HSPF[c]	
Through-the-wall, (air cooled, heating mode)	≤ 30,000 Btu/h[b] (cooling capacity)	—	Split System	~~7.4 HSPF~~	7.4 HSPF	
		—	Single Package	~~7.4 HSPF~~	7.4 HSPF	
Small-duct high velocity (air cooled, heating mode)	< 65,000 Btu/h[b]	—	Split System	~~6.8 HSPF~~	~~6.8 HSPF~~ 7.2 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~~	3.3 COP	AHRI 340/360
			17°F db/15°F wb outdoor air	~~2.25 COP~~	2.25 COP	
	≥ 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	
Water to Air: Water Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	~~4.3 COP~~	4.3 COP	ISO 13256-1
Water to Air: Ground Water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	~~3.7 COP~~	3.7 COP	
Brine to Air: Ground Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	32°F entering fluid	~~3.2 COP~~	3.2 COP	
Water to Water: Water Loop (heating mode)	< 135,000 Btu/h (cooling capacity)	—	68°F entering water	~~3.7 COP~~	3.7 COP	ISO 13256-2
Water to Water: Ground Water (heating mode)	< 135,000 Btu/h (cooling capacity)	—	50°F entering water	~~3.1 COP~~	3.1 COP	
Brine to Water: Ground Loop (heating mode)	< 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 6 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.

c. Minimum efficiency as of January 1, 2015.

EN8031

Date Submitted	12/12/2018	**Section**	403.2.3	**Proponent**	Bereket Nigusse
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Updates Table C403.2.3(11) VRF Multi-Split Air Conditions and Heat Pumps

Rationale

The proposed modification updates efficiency requirements for VRF systems and adds missing ground water source and ground source VRF system types. This change will make the FBC-Energy 2020 code equivalent to ASHARE 90.1-2016.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

The proposed modification will not impact the building and property owners cost.

Impact to industry relative to the cost of compliance with code

The proposed modification will not change the cost of compliance.

Impact to small business relative to the cost of compliance with code

The proposed modification will not change the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposed modification is directly connected to the health, safety, and welfare of the general public by adding missing VRF system types and upgrading the VRF Heat Pump COP value requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification improves and strengthens the code by adding missing VRF system types and upgrading the VRF Heat Pump COP value requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

The proposed modification enhances the effectiveness of the code enforcement by allowing missing VRF system types.

See attached documents.

VRF efficiency code modification needed to match to ASHRAE 90.1-2016 requirement are:

(1) Adds missing cooling mode IEER values for all VRF system types

(2) Adds missing efficiency requirement for VRF ground water and ground source system types

(3) Updates minimum COP for VRF heat pumps

(4) Updates a typo in Air Cooled VRF Heat Pumps for capacity greater than 240 kBtuh

TABLE C403.2.3(11)
MINIMUM EFFICIENCY REQUIREMENTS
VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY	HEATING TYPE[a]	MINIMUM EFFICIENCY	TEST PROCEDURE[b]
VRF Multi-split Air Conditioners (Air-cooled)	< 65,000 Btu/h	All	13.0 SEER	AHRI 1230 (omit Sections 5.1.2 and 6.6)
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	11.2 EER	
		All other	11.0 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	11.0 EER	
		All other	10.8 EER	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric resistance (or none)	10.0 EER	
		All other	9.8 EER	
VRF Multi-split Heat Pumps (Air-cooled)	< 65,000 Btu/h	All	13.0 SEER 7.7 HSPF	
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	11.0 EER 3.3 COP	
		All other	10.8 EER 3.3 COP	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	10.6 EER 3.2 COP	
		All other	10.4 EER 3.2 COP	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric resistance (or none)	9.5 EER 3.2 COP	
		All other	~~9.8 EER~~ 9.3 EER 3.2 COP	
VRF Multi-split Air Conditioners (Water-source)	< 17,000 Btu/h	Without heat recovery	12.0 EER ~~4.2 COP~~ 4.3 COP	
		With heat recovery	11.8 EER ~~4.2 COP~~ 4.3 COP	
	≥ 17,000 Btu/h and < 65,000 Btu/h	All	12.0 EER ~~4.2 COP~~ 4.3 COP	
	≥ 65,000 Btu/h and < 135,000 Btu/h	All	12.0 EER ~~4.2 COP~~ 4.3 COP	
	≥ 135,000 Btu/h and < 760,000 Btu/h	Without heat recovery	10.0 EER ~~3.9 COP~~ 4.0 COP	
		With heat recovery	9.8 EER ~~3.9 COP~~ 4.0 COP	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8

a. VRAF Multi-split Heat Pumps (air-cooled) with heat recovery fall under the category of "All Other Types of Heating" unless they also have electric resistance heating, in which case it falls under the category for "No Heating or Electric Resistance Heating."

b. Chapter 6, Referenced Standards, contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.

Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum *Efficiency* Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum *Efficiency*	Test Procedure
VRF air conditioners, air cooled	<65,000 Btu/h	All	*VRF* multisplit *system*	13.0 *SEER*	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h	*Electric resistance* (or none)	*VRF* multisplit *system*	11.2 *EER* 13.1 *IEER* (before 1/1/2017) 15.5 *IEER* (as of 1/1/2017)	
	≥135,000 Btu/h and <240,000 Btu/h	*Electric resistance* (or none)	*VRF* multisplit *system*	11.0 *EER* 12.9 *IEER* (before 1/1/2017) 14.9 *IEER* (as of 1/1/2017)	
	≥240,000 Btu/h	*Electric resistance* (or none)	*VRF* multisplit *system*	10.0 *EER* 11.6 *IEER* (before 1/1/2017) 13.9 *IEER* (as of 1/1/2017)	

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum *Efficiency*	Test Procedure
VRF air cooled (cooling mode)	<65,000 Btu/h	All	*VRF* multisplit *system*	13.0 *SEER*	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h	*Electric resistance* (or none)	*VRF* multisplit *system*	11.0 *EER* 12.9 *IEER* (before 1/1/2017) 14.6 *IEER* (as of 1/1/2017)	
			VRF multisplit *system* with heat recovery	10.8 *EER* 12.7 *IEER* (before 1/1/2017) 14.4 *IEER* (as of 1/1/2017)	
	≥135,000 Btu/h and <240,000 Btu/h		*VRF* multisplit *system*	10.6 *EER* 12.3 *IEER* (before 1/1/2017) 13.9 *IEER* (as of 1/1/2017)	
			VRF multisplit *system* with heat recovery	10.4 *EER* 12.1 *IEER* (before 1/1/2017) 13.7 *IEER* (as of 1/1/2017)	
	≥240,000 Btu/h		*VRF* multisplit *system*	9.5 *EER* 11.0 *IEER* (before 1/1/2017) 12.7 *IEER* (as of 1/1/2017)	
			VRF multisplit *system* with heat recovery	9.3 *EER* 10.8 *IEER* (before 1/1/2017) 12.5 *IEER* (as of 1/1/2017)	

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements *(Continued)*

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum *Efficiency*	Test Procedure
VRF water source (cooling mode)	<65,000 Btu/h	All	*VRF* multisplit *systems* 86°F entering water	12.0 *EER* 16.0 *IEER* (as of 1/1/2018)	AHRI 1230
			VRF multisplit *systems* with heat recovery 86°F entering water	11.8 *EER* 15.8 *IEER* (as of 1/1/2018)	
	≥65,000 Btu/h and <135,000 Btu/h		*VRF* multisplit *system* 86°F entering water	12.0 *EER* 16.0 *IEER* (as of 1/1/2018)	
			VRF multisplit *system* with heat recovery 86°F entering water	11.8 *EER* 15.8 *IEER* (as of 1/1/2018)	
	≥135,000 Btu/h and <240,000 Btu/h		*VRF* multisplit *system* 86°F entering water	10.0 *EER* 14.0 *IEER* (as of 1/1/2018)	
			VRF multisplit *system* with heat recovery 86°F entering water	9.8 *EER* 13.8 *IEER* (as of 1/1/2018)	
	≥240,000 Btu/h		*VRF* multisplit *system* 86°F entering water	10.0 *EER* (before 1/1/2018) 12.0 *IEER* (as of 1/1/2018)	
			VRF multisplit *system* with heat recovery 86°F entering water	9.8 *EER* (before 1/1/2018) 11.8 *IEER* (as of 1/1/2018)	
VRF groundwater source (cooling mode)	<135,000 Btu/h	All	*VRF* multisplit *system* with heat recovery 59°F entering water	16.2 *EER*	AHRI 1230
			VRF multisplit *system* with heat recovery 59°F entering water	16.0 *EER*	
	≥135,000 Btu/h		*VRF* multisplit *system* with heat recovery 59°F entering water	13.8 *EER*	
			VRF multisplit *system* with heat recovery 59°F entering water	13.6 *EER*	
VRF ground source (cooling mode)	<135,000 Btu/h	All	*VRF* multisplit *system* 77°F entering water	13.4 *EER*	AHRI 1230
			VRF multisplit *system* with heat recovery 77°F entering water	13.2 *EER*	
	≥135,000 Btu/h		*VRF* multisplit *system* 77°F entering water	11.0 *EER*	
			VRF multisplit *system* with heat recovery 77°F entering water	10.8 *EER*	

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements *(Continued)*

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum *Efficiency*	Test Procedure
VRF air cooled (heating mode)	<65,000 Btu/h (cooling capacity)		*VRF* multisplit *system*	7.7 *HSPF*	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 47°F db/43°F wb *outdoor air*	3.3 COP_H	
			17°F db/15°F wb *outdoor air*	2.25 COP_H	
	≥135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 47°F db/43°F wb *outdoor air*	3.2 COP_H	
			17°F db/15°F wb *outdoor air*	2.05 COP_H	
VRF water source (heating mode)	<65,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 68°F entering water	4.2 COP_H (before 1/1/2018) 4.3 COP_H (as of 1/1/2018)	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 68°F entering water	4.2 COP_H (before 1/1/2018) 4.3 COP_H (as of 1/1/2018)	
	≥135,000 Btu/h and <240,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 68°F entering water	3.9 COP_H (before 1/1/2018) 4.0 COP_H (as of 1/1/2018)	
	≥240,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 68°F entering water	3.9 COP_H	
VRF groundwater source (heating mode)	<135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 50°F entering water	3.6 COP_H	AHRI 1230
	≥135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 50°F entering water	3.3 COP_H	
VRF ground source (heating mode)	<135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 32°F entering water	3.1 COP_H	AHRI 1230
	≥135,000 Btu/h (cooling capacity)		*VRF* multisplit *system* 32°F entering water	2.8 COP_H	

Date Submitted 12/12/2018	**Section** 408	**Proponent** Joseph Belcher for FHBA
Chapter 4	**Affects HVHZ** Yes	**Attachments** No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

C303.3

Summary of Modification

Consolidates maintenance requirements with commissioning provisions.

Rationale

(Note: Reason is ICC original proponent's reason.)

The operations and documentation requirements in Section C303 were written prior to the IECC having section C408. Section C408 covers commissioning requirements, but in several places it also addresses what type of operations and maintenance documents must be included in the information given to building owners and operators. As C408 is the new section that embraces those activities that occur as the building is "turned over" to the occupants, it is the proper place to locate this measure.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact on industry since this is a relocation of the provisions.

Impact to small business relative to the cost of compliance with code

No impact on small business since this is a relocation of the provisions.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by consolidating related provisions into a logical location making the missing of provisions less likely.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by consolidating related provisions into a logical location making the missing of provisions less likely.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code by consolidating related provisions into a logical location.

Delete without substitution:

~~**C303.3 Maintenance information.** Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.~~

Revise as follows:

SECTION C408

MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

C408.1 General. This section covers the provison of maintenance information and the commissioning of the building mechanical systems in Section C403 and electrical power and lighting systems in Section C405.

Add new text as follows:

C408.1.1 Building operations and maintenance information. The buildings operations and maintenance documents shall be provided to the owner and shall consist of manufacturer's information, specifications, and recommendations, programming procedures and data points, narratives, and other means of illustrating to the owner how the building equipment and systems are intended to be installed, maintained and operated. Required regular maintenance actions for equipment and systems shall be clearly stated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

EN8045

Date Submitted	12/12/2018	**Section**	401.2	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Eliminated mandatory automatic controlled receptacles.

Rationale

ASHRAE 90.1 requires at least 50% of electric receptacles (125 volt, 15-and 20-amp) be on a control that cuts power off after some period of time or when areas are unoccupied. The provisions apply to receptacles in private offices, conference rooms, copy or printer rooms, break rooms, classrooms and individual workstations.

Numerous Florida electrical contractors report that there are significant associated costs to compliance. There is concern that in actual practice there is very little energy saved. The reasons for potentially diminished savings depend upon occupants choosing to use the controlled receptacles and upon the actual power saved when chosen devices are automatically switched off.

Persons working in the spaces tend to not use the controlled outlets. Reasons cited are they do not want to risk the receptacle turning off while they are using computers, telephone chargers, radios and other devices. Many workers intentionally leave personal computers on to allow access from outside the work location. Break rooms typically have microwaves, refrigerators, other appliances with clocks, coffee pots with warmer plates and controlled receptacles based on occupancy can create a myriad of problems. The controlling devices are considerably more expensive than a typical uncontrolled outlet with little chance of return through energy savings.

Electric contractors and others express concerns about the increased use of extension cords and power strips to avoid the controlled receptacles. There is also a serious potential for uncontrolled circuits to be overloaded with outlet multipliers and other devices meant for temporary use. The cumulative effect is believed to be increasing fire hazards. This proposal will eliminate the mandatory use of controlled receptacles. Building owners would still have the option to use such controls on their own volition

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

Should result in reduced construction costs for property owners.

Impact to industry relative to the cost of compliance with code

Will result in reduced construction costs for industry.

Impact to small business relative to the cost of compliance with code

Will result in reduced construction costs for small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by eliminating a provision that indirectly may increase potential fire hazards.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by eliminating a provision that indirectly may increase potential fire hazards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1, excluding section 9.4.1.1(g) <u>and section 8.4.2</u> of the standard.
2. The requirements of Sections C402 through C405. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C404, C405.2, C405.3, C405.5, C405.6 and C407. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

EN8066

65

Date Submitted	12/13/2018	**Section**	408.1	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

303.3

Summary of Modification

The operations and documentation requirements in Section C303 were written prior to the IECC having section C408. Section C408 covers commissioning requirements, & what type of operations and maintenance documents must be included in the information given to building owners and operators.

Rationale

Relocates an existing requirement. The operations and documentation requirements in Section C303 were written prior to the IECC having section C408. Section C408 covers commissioning requirements, but in several places it also addresses what type of operations and maintenance documents must be included in the information given to building owners and operators. As C408 is the new section that embraces those activities that occur as the building is "turned over" to the occupants, it is the proper place to locate this measure.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

none

Impact to industry relative to the cost of compliance with code

none

Impact to small business relative to the cost of compliance with code

none

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, brings clarity to code by relocation of code language.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by bringing clarity to code by relocation of code language.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods or systems.

Does not degrade the effectiveness of the code

Improves effectiveness of code with proper location of provision.

Delete without substitution:

~~**C303.3 Maintenance information.** Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.~~

SECTION C408

MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

C408.1 General. This section covers the provison of maintenance information and the commissioning of ~~the~~ building ~~mechanical~~ systems ~~in Section C403 and electrical power and lighting systems in Section C405~~.

Add new text as follows:

C408.1.1 Building operations and maintenance information. The buildings operations and maintenance documents shall be provided to the owner and shall consist of manufacturer's information, specifications, and recommendations, programming procedures and data points, narratives, and other mean of illustrating to the owner how the building, site, equipment and systems are intended to be installed, maintained and operated. Required regular maintenance actions for equipment and systems shall be clearly stated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

EN8093

Date Submitted	12/13/2018	**Section**	401	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

None

Summary of Modification

Mostly editorial to place the commissioning requirements for mechanical & service hot water heating and the functional testing requirements for lighting controls in one new Section 408

Rationale

This proposal is editorial in nature, and is intended to solve two problems with the existing code: First, charging language is provided for the mechanical and service hot water heating sections indicating that the commissioning requirements of Section C408 are mandatory, but similar language has not been provided for the lighting section. Rather than including this language separately in C403, C404, and C405, it makes more sense to simply add Section C408 to the list of applicable sections in C401.2, and delete the charging language from C403.2.1 and C404.11.

Second, functional testing requirements for lighting controls have been split between the mechanical and lighting sections C408.2 and C408.3. This proposal relocates all of the lighting requirements in C408.3, where they belong.

The documentation requirements for lighting functional testing have also been clarified.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes; Robust documentation ensures public safety.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

See response above.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods or systems.

Does not degrade the effectiveness of the code

Improves code language with degrading of code effectiveness.

Revise as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. **The requirements of ANSI/ASHRAE/IESNA90.1.**

2. The requirements of Sections C402 through C405 and Section C408. In addition, commercial buildingsshallcomplywithSectionC406andtenantspacesshallcomplywithSectionC406.1.1.

3. The requirements of Sections C402.5, C403.2, C404, C405.2, C405.3, C405.5, C405.6, C407, and ~~C407~~ Section C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

Delete without substitution:

~~**C403.2.11 Mechanical systems commissioning and completion requirements.** Mechanical systemsshall be commissioned and completed in accordance with Section C408.2.~~

~~**C404.11 Service water-heating system commissioning and completion requirements.** *Servicewater-heating systems*, swimming pool water-heating systems, spa water-heating systems and thecontrols for those systems shall be commissioned and completed in accordance with Section C408.2.~~

Revise as follows:

C408.1 General. This section covers the commissioning ~~of the~~ and functional testing requirementsfor building~~mechanical~~systems~~inSectionC403andelectricalpowerandlightingsystemsinSectionC405~~.

C408.2.5.2 Manuals. An operating and maintenance manual shall be provided and include all of the following:

1. Submittaldatastatingequipmentsizeandselectedoptionsforeachpieceofequipmentrequiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiringmaintenance,exceptequipmentnotfurnishedaspartoftheproject.Requiredroutine maintenance actions shall be clearlyidentified.
3. Name and address of at least one serviceagency.
4. HVAC and service hot water controls system maintenance and calibration information, including wiring diagrams, schematics and control sequence descriptions. Desired or field-determined set pointsshallbepermanentlyrecordedoncontroldrawingsatcontroldevicesor,fordigitalcontrol systems, in system programminginstructions.

5. ~~Submittal data indicating all selected options for~~a narrative of how each ~~piece of lighting equipment and lighting controls~~ system is intended to operate, including recommended setpoints.

6. ~~Operation and maintenance manuals for each piece of lighting equipment. Requiredroutine maintenance actions, cleaning and recommended relamping shall be clearlyidentified.~~
7. ~~A schedule for inspecting and recalibrating all lightingcontrols.~~

~~A narrative of how each system is intended to operate, including recommended setpoints.~~

C408.3 Lighting ~~system~~controls functional testing. ~~Controls for automatic~~ Automatic lighting ~~systems~~controls required by this code shall comply with this section.

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 instructions. Functional testing shall be in accordance with Sections C408.3.1.1 ~~and C408.3.1.2~~ through C408.3.1.3 for the applicable control type.

_C408.3.2 Documentation requirements. The *construction documents* shall specify
that the documents ~~certifying that the installed lighting controls meet documented performance criteria ofSection C405 are to~~ described in this section be provided to the building owner or owner's authorizedagent within 90 days ~~from~~ of the date of receipt of the *certificate of occupancy*.

Add new text as follows:

C408.3.2.1 Drawings. *Construction documents* shall include the location and catalogue number of eachpiece of equipment.

C408.3.2.2 Manuals. An operating and maintenance manual shall be provided and include the following:

1. Name and address of not less than one service agency for installedequipment.
2. A narrative of how each system is intended to operate, including recommended setpoints.
3. Submittaldataindicatingallselectedoptionsforeachpieceoflightingequipmentandlighting controls.
4. Operation and maintenance manuals for each piece of lighting equipment. Requiredroutine maintenance actions, cleaning and recommended relamping shall be clearlyidentified.

A schedule for inspecting and recalibrating all lightingcontrols.

C408.3.2.3 Report. A report of test results shall be provided and include the following:

1. **Results of functional performancetests.**

2. Dispositionofdeficienciesfoundduringtesting,includingdetailsofcorrectivemeasuresusedor proposed.

Date Submitted	12/13/2018	**Section**	403	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No **Alternate Language** No

Related Modifications

402 Definitions

Summary of Modification

Corrects a revision placed in the 2015 IECC & moves fan requirements to C403.2.12 to be in one location for consistency with ASHRAE Std 90.1-16

Rationale

Section C403.2.12 was added to the IECC under proposal CE239 in the hearings for 2015 IECC.Current code language limits some fan requirements to fans with motors greater than 5 hp. This is the result of a section being relocated in 90.1-2013 where it was inappropriately subject to the limit. Addendum ap to ASHRAE Standard 90.1-2013 revised 90.1 so that requirements for smaller fans are as originally intended. This proposal mirrors that revision. In addition fan requirements are moved to Section C403.2.12 so all fan requirements are in one location. Table C403.4.1.1 is relocated and revised to match the original intention and to reflect the publication date of IECC 2018.
Approval of this code change proposal will ensure consistency with ASHRAE Standard 90.1-16, which will be adopted by reference as an alternative path to the 2018 IECC Commercial Provisions. This change was made via addendum ap to ASHRAE Standard 90.1-2013

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal primarily deals with clarification and reorganization of the code to improve understanding and compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code:
The proposal primarily deals with clarification and reorganization of the code to improve understanding and compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods or systems.

Does not degrade the effectiveness of the code

Improves effectiveness of the code.

Revise as follows:

Definitions Section 202

FAN SYSTEM DESIGN CONDITIONS. Operating conditions that can be expected to occur during normal system operation that result in the highest supply fan airflow rate to conditioned spaces served by the system, other than during air economizer operation.

C403.2.12 Air system design and control. Each HVAC system ~~having~~ with a ~~total~~ fan ~~system motor nameplate horsepower (hp) exceeding 5 hp (3.7 kW)~~ shall comply with the provisions of Sections C403.2.12.1 through ~~C403.2.12.3~~ C403.2.12.5.

C403.2.12.1 Allowable fan ~~motor~~ horsepower. Each HVAC system having a total fan system motor nameplate horsepower exceeding 5 hp (3.7 kW) at fan system design conditions shall not exceed the allowable *fan system motor nameplate hp* (Option 1) or *fan system bhp* (Option 2) as shown in Table C403.2.12.1(1). This includes supply fans, exhaust fans, return/relief fans, and fan-powered terminal units associated with systems providing heating or cooling capability. Single-*zone* variable air volume systems shall comply with the constant volume fan power limitation.

Exceptions:

1. Hospital, vivarium and laboratory systems that utilize flow control devices on exhaust or returntomaintainspacepressurerelationshipsnecessaryforoccupanthealthandsafetyor environmental control shall be permitted to use variable volume fan powerlimitation.
2. Individual exhaust fans with motor nameplate horsepower of 1 hp (0.746 kW) or lessare exempt from the allowable fan horsepowerrequirement.

C403.2.12.2 Motor nameplate horsepower. For each fan, the fan brake horsepower shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

For fans less than 6 bhp (4413 W), 1.5 times the fan brakehorsepower.

2. For fans 6 bhp (4413 W) and larger, 1.3 times the fan brakehorsepower.

3. Systems complying with Section C403.2.12.1 *fan system motor nameplate hp* (Option1).

Exception: Fans with motor nameplate horsepower less than 1 hp are exempt from this section.

C403.2.12.3 Fan efficiency. Fans shall have a fan efficiency grade (FEG) of not less than 67 when determined in accordance with AMCA 205 by an *approved*, independent testing laboratory and labeled by the manufacturer. The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.

Exception: The following fans are not required to have a fan efficiency grade:

Fans of 5 hp (3.7 kW) or less asfollows:

1.1 ~~Single~~ ~~fan~~ Individual fans with a motor nameplate horsepower of 5 hp (3.7 kW) or less, unless Exception 1.2applies.

1.2 Multiple fans in series or parallel that have acombined motor nameplate horsepower of 5 hp (3.7 kW) or less and are operated as the functional equivalent of a singlefan.

1.3 Fans that are part of equipment covered under SectionC403.2.3.

1.4 Fans included in an equipment package certified by an *approved agency* for airor energyperformance.

1.5 Powered wall/roof ventilators.

1.6 Fans outside the scope of AMCA205.

1.7 Fans that are intended to operate only during emergencyconditions.

~~**C403.4.4.4**~~ **C403.2.12.4 Fractional hp fan motors.** Motors for fans that are not less than 1/ 12 hp (0.082 kW) and less than 1 hp (0.746 kW) 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 instead of a varying motor speed shall be permitted.

Exceptions: The following motors are not required to comply with this section:

1. Motorsintheairstream withinfancoils andterminalunitsthatonlyprovideheatingtothe spaceserved.

2. Motors in space-conditioning equipment that comply with Section 403.2.3 orC403.2.12.

3. Motors that comply with SectionC405.8.

~~**C403.4.1**~~ **C403.2.12.5 Fan control.** *No change to text.*

TABLE ~~C403.4.1.1~~C403.2.12.5

~~EFFECTIVE DATES~~ REQUIREMENTS FOR FAN CONTROL

COOLING SYSTEM TYPE	FAN MOTOR SIZE	MECHANICAL COOLING CAPACITY
DX cooling	Any	~~3 75,000 Btu/h (before 1/1/2016)~~
		= 65,000 Btu/h ~~(after 1/1/2016~~
Chilled water and evaporative cooling	~~3 5 hp~~	~~Any~~
	=1/4 / hp	Any

For SI: 1 British thermal unit per hour = 0.2931 W; 1 hp = 0.746 kW.

C403.4.1.1 Fan airflow control. Each cooling system listed in Table C403.4.1.1 shall be designed to vary the indoor fan airflow as a function of load and shall comply with the following requirements:

1. Direct expansion (DX) and chilled water cooling units that control the capacity of the mechanical cooling directly based on space temperature shall have not fewer than two stages of fan control. Low or minimum speed shall not be greater than 66 percent of full speed. At low or minimum speed, the fan system shall draw not more than 40 percent of the fan power at full fan speed.Low orminimum speedshallbeusedduringperiodsoflowcoolingloadandventilation-onlyoperation.

2. 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 shallbe not greater than 50 percent of full speed. At minimum speed the fan system shall draw not 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-onlyoperation.

3. UnitsthatincludeanairsideeconomizerinaccordancewithSectionC403.3shallhavenotfewer than two speeds of fan control during economizeroperation

Exceptions:

1. Modulatingfancontrolisnotrequiredforchilledwaterandevaporativecoolingunitswi th fan motors of less than 1 hp (0.746 kW) where the units are not usedto

provide *ventilation* air and the indoor fan cycles with the load.

2. Where the volume of outdoor air required to comply with the *ventilation* requirements of the *International Mechanical Code* at low speed exceeds the air that would bedelivered at the speed defined in Section C403.4.1, the minimum speed shall be selected to provide the required *ventilationair*.

C403.4.1.2 Static pressure sensor location. Static pressure sensors used to control VAV fans shall be located such that the controller set point is not greater than 1.2 inches w.c. (299 Pa). Where this results in one or more sensors being located downstream of major duct splits, not less than one sensor shall be located on each major branch to ensure that static pressure can be maintained in each branch.

C403.4.1.3 Set points for direct digital control. For systems with direct digital control of individual zones reporting to the central control panel, the static pressure set point shall be reset based on

the *zone* requiring the most pressure. In such case, 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 that is capable of all of the following:

Automatically detecting any *zone* that excessively drives the resetlogic.

Generating an alarm to the system operationallocation.

Allowing an operator to readily remove one or more zones from the resetalgorithm.

Date Submitted 12/14/2018
Chapter 4

Section 403.2.12.3
Affects HVHZ No

Proponent Amanda Hickman
Attachments Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language No

Related Modifications

#7892
#7913

Summary of Modification

This modification revises the text in section C403.2.12.3.

Rationale

This modification updates the current fan efficiency metric from a Fan Efficiency Grade (FEG) to a more current and improved metric known as Fan Energy Index (FEI). In two other related modifications, we update the definitions and standards. This change has already been recognized in ASHRAE 90.1.

In the course of a U.S. Department of Energy (DOE) rulemaking for commercial fans and blowers, a wire-to-air metric was deemed to be more effective at saving energy because it would consider the impacts of motors and drives on fan energy performance. FEI will be easier to enforce over FEG because language requiring that fans be selected “15-percentage points from peak total efficiency” is no longer needed. Also, FEI applies to all types of fans, so the exclusions for PRVs and panel fans go away, bringing a fan-efficiency requirement to more fans than previously covered.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification will make code enforcement more simple because it is a less complicated metric and also has a label requirement that will make enforcement more simplified.

Impact to building and property owners relative to cost of compliance with code

This modification could, IN SOME CASES, slightly increase the cost of construction. However, these potential minimal increases are cost effective. Moreover, this modification will result in better fan selection which will save the building owners money.

Impact to industry relative to the cost of compliance with code

The cost impact to industry will be minimal, as this new metric will result in better fan selections out of existing product portfolios, rather than marginal improvements from costly fan redesigns.

Impact to small business relative to the cost of compliance with code

There will not likely be a cost impact to small business, as the appropriate fans in accordance with the new proposed metric, will have already been selected.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification will improve the health, safety and welfare of the general public because it updates the requirements to the appropriate fan efficiency metric, thereby improving the overall HVAC system and economic welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification updates the fan efficiency requirement to the current metric, thereby strengthening the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification updates the fan efficiency requirement to the current metric, which was developed by consensus by the overall industry.

Does not degrade the effectiveness of the code

This modification updates the fan efficiency requirement to the current metric, thereby improving the effectiveness of the code.

1st Comment Period History

EN8122-G1

Proponent Mo Madani **Submitted** 2/12/2019 **Attachments** Yes

Comment:

See attached from ASHRAE

C403.2.12.3Fan efficiency.

~~Fans~~ Each fan and fan array shall have a fan ~~efficiency grade (FEG)~~ energy index (FEI) of not less than ~~67~~ 1.00 at the design point of operation when determined in accordance with AMCA ~~205~~ 208-18 by an *approved*, independent testing laboratory and labeled by the manufacturer. ~~The total efficiency of the fan at the design point of operation shall be within 15 percentage points of the maximum total efficiency of the fan.~~ Each fan and fan array used for a variable-air-volume system shall have an FEI of not less than 0.95 at the design point of operation as determined in accordance with AMCA 208 by an approved, independent testing laboratory and labeled by the manufacturer. The FEI for fan arrays shall be calculated in accordance with AMCA 208-18 Annex C.

Exceptions: The following fans are not required to have a fan ~~efficiency grade~~ energy index:

1. 1.Fans that are not embedded fans with motor nameplate horsepower of less than 1.0 ~~of 5~~ hp (~~3.7~~ 0.75 kW) or ~~less as follows:~~ with a fan nameplate electrical input power of less than 0.89 kW.
   1. ~~1.1.~~ 2.~~Single fan~~ Embedded fans ~~with~~ that have a motor nameplate horsepower of 5 hp (3.7 kW) or less, ~~unless Exception 1.2 applies.~~ or with a fan system electrical input power of 4.1 kW or less.
   2. ~~1.2.~~ 3.Multiple fans operated in series or parallel as the functional equivalent of a single fan that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less ~~and are operated as the functional equivalent of a single fan.~~ or with a fan system electrical input power of 4.1 kW or less.
2. ~~2.~~ 4.Fans that are part of equipment covered under Section C403.2.3.
3. ~~3.~~ 5Fans included in an equipment package certified by an *approved agency* for air or energy performance.

   6. Ceiling fans, i.e., nonportable devices suspended from a ceiling or overhead structure for circulating air via the rotation of fan blades.

   7. Fans used for moving gases at temperatures above 482°F (250°C).

   8. Fans used for operation in explosive atmospheres.

   9. Reversible fans used for tunnel ventilation.

4. ~~4.Powered wall/roof ventilators.~~
5. ~~5.~~ 11.Fans outside the scope of AMCA ~~205~~ 208-18.
6. ~~6.~~ 10.Fans that are intended to operate only during emergency conditions.

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President

Reply to: Nat'l Renewable Energy Lab
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February 6, 2019

Florida Building Commission
Florida Department of Business and Professional Regulation
2601 Blair Stone Road
Tallahassee, FL 32399

RE: Florida State Commercial Energy Code Proposed Modification # 8122

Dear Florida Building Commissioners:

Thank you for the opportunity to provide input on the proposed updates to the Florida Commercial Energy Code which is pending review by Technical Advisory Committee and the Florida Building Commission. ASHRAE, founded in 1894, is an international organization of over 56,000 members, including almost 1,900 in Florida. The Society and its members focus on building systems, energy efficiency, indoor air quality and sustainability within the industry. Through research, standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

As the State of Florida considers updating its commercial energy code, we ask the state to incorporate by reference the most recent version of ANSI/ASHRAE/IES Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings,* which is the 2016 version, including all of its appendices as a compliance path for your state.

This Standard, first published in 1975, is the basis for the energy standard of most U.S. commercial buildings. For over 40 years, this Standard has served as the leading resource for state and local jurisdictions that wish to promote energy efficiency, engaging interests across the building and construction sector, and yielding increased levels of efficiency in a balanced manner with input from all affected parties. As are all ASHRAE Standards, Standard 90.1 is developed and improved through the private-sector in accordance with American National Standards Institute's (ANSI) consensus-driven process.

U.S. federal law mandates the most recent version of ANSI/ASHRAE/IES Standard 90.1 as the basis for State commercial building energy codes. The Energy Conservation and Production Act mandates that all states comply with this Act. Each time the Standard is updated, which is every three years, the Act requires the Secretary of Energy to make a determination with respect to whether the revised standard would improve energy efficiency in commercial buildings. When the U.S. Department of Energy issues an affirmative determination on Standard 90.1, states are

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statutorily required to certify within two years that they have reviewed and updated the commercial provisions of their building energy code, with respect to energy efficiency, to meet or exceed the revised standard.

Thank you for your consideration of this modification to the Florida Energy Code. Please contact GovAffairs@ashrae.org if you need additional information.

Sincerely yours,

Sheila J. Hayter, PE, FASHRAE
ASHRAE President SY2018-19

Bibliography:

Title: New Federal Regulations for Ceiling Fans

Authors: New Federal Regulations for Ceiling Fans

Published: ASHRAE Journal, January 2018

File: 42-46_Taber-Ivanovich_Fans, for Web.pdf

Keywords: large diameter, ceiling fans, efficiency, performance, U.S. Department of Energy, DOE, AMCA Standard 230, AMCA Standard 208, fan energy index, FEI

Abstract: In January 2017, the U.S. Department of Energy (DOE) finalized its first efficiency performance standards for ceiling fans, which include minimum efficiency requirements for large-diameter ceiling fans. Ratings using the DOE test procedure allow comparisons of products based on electric input power and airflow. Because the DOE performance metric is not based on a specific airflow point, some additional effort on the part of the designer may be required to evaluate fan performance equitably at a specific airflow point. Here are four things to know about the DOE's regulation of ceiling fans that will help to ensure a successful and efficient ceiling-fan selection.

- Revolutionary Method of Saving Energy for Commercial and Industrial Fan Systems, Michael Ivanovich, Mark Bublitz, and Tim Mathson. Presented at the 2017 ACEEE Summer Study for Industrial Energy Efficiency, Denver, Colorado. August 15-18, 2017:
  Paper: ACEEE-2017-Paper.pdf
  PowerPoint: Bublitz FEI ACEEE Industrial EE 2017 presentation.pdf

- New Efficiency Metric for Fans Enables New Approaches for Efficiency Regulations and Incentives. Michael Ivanovich, Mike Wolf, Tom Catania. Presented at the 9th International Conference on Energy Efficiency In Domestic Appliances And Lighting (EEDAL), Irvine, California, September 13-15, 2017.
  Paper: EEDAL-2017-Paper.pdf
  Presentation: AMCA FEI EEDAL 2017 presentation.pdf

- AMCA Introduction to Fan Energy Index (FEI) for Stand-Alone Fans. A self-directed 1.5-hour interactive training course. Includes AMCA Standard 208, Calculating Fan Energy Index.

  Course link: https://courses-pes.talentlms.com/catalog/info/id:141

EN8137

Date Submitted	12/14/2018	**Section**	403.2.14	**Proponent**	Amanda Hickman
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language Yes

Related Modifications

#8139

Summary of Modification

This modification resolves conflict between Federal preemption rules and code requirements for walk-in coolers and freezers

Rationale

See attached reason statement and bibliography.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification will make it easier on code enforcement by clearly indicating that they do not have to address the thermal performance of walk-in systems that are governed by federal requirements. It will also reduce inspection time for code enforcement.

Impact to building and property owners relative to cost of compliance with code

This modification will reduce cost to building and property owners as it will clarify that only the DOE requirements apply.

Impact to industry relative to the cost of compliance with code

This modification will reduce costs to industry, as it will clarify that only the DOE requirements apply.

Impact to small business relative to the cost of compliance with code

This modification will reduce costs to small business, as it will clarify that only the DOE requirements apply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifying this section of the code, will improve the welfare of the general public by ensuring that they proper DOE requirements are met.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification will strengthen the code by clarifying that only the DOE requirements apply.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against and materials, products or methods, as it only clarifies that only the DOE requirements apply.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code, it improves the effectiveness by clarifying that only the DOE requirements apply.

1st Comment Period History

8137-A1

Proponent Amanda Hickman **Submitted** 2/18/2019 **Attachments** Yes

Rationale

This comment offers a cleaner and better way of resolving the conflict between the code and current federal requirements for this type of equipment, thereby reducing cost and confusion in the field.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This comment will resolve the conflict between the code and the federal regulations, thereby greatly reducing the confusion that is currently being caused.

Impact to building and property owners relative to cost of compliance with code

This comment will resolve the conflict between the code and the federal regulations. It will eliminate the need for unnecessary testing and need to meet unnecessary requirements, thereby, greatly reducing costs.

Impact to industry relative to the cost of compliance with code

This comment will resolve the conflict between the code and the federal regulations. It will eliminate the need for unnecessary testing and need to meet unnecessary requirements, thereby, greatly reducing costs.

Impact to Small Business relative to the cost of compliance with code

This modification will reduce costs to small business, as it will clarify that only the DOE requirements apply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. This will ensure that proper requirements are followed.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes. This will ensure that proper requirements are followed.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No. This will only improve the code by ensuring that the proper requirements are followed.

Does not degrade the effectiveness of the code

No. This will only improve the code by ensuring that the proper requirements are followed.

Revise as follows:

C403.2.14Refrigeration equipment performance.

Refrigeration equipment,as defined in 10 CFR part 431,have an energy use in kWh/day not greater than the values of Tables C403.2.14(1)and C403.2.14(2) when tested and rated in accordance with ~~AHRI Standard 1200~~10 CFR part 431.The energy use shall be verified through certification under an approved certification program or, where a certification program does not exist, the energy use shall be supported by data furnished by the equipment manufacturer.

TABLE C403.2.14(1)

MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATION

EQUIPMENT TYPE	APPLICATION	ENERGY USE LIMITS (kWh per day)[a]	TEST PROCEDURE
Refrigerator with solid doors	Holding Temperature	0.10 • V + 2.04	~~AHRI 1200~~ 10 CFR Part 431
Refrigerator with transparent doors		0.12 • V + 3.34	
Freezers with solid doors		0.40 • V + 1.38	
Freezers with transparent doors		0.75 • V + 4.10	
Refrigerators/freezers with solid doors		the greater of ~~0.12 · V + 3.34~~ 0.27AV-0.71 or 0.70	
Commercial refrigerators	Pulldown	0.126 • V + 3.51	

1. a.V = volume of the chiller or frozen compartment as defined in AHAM-HRF-1.

TABLE C403.2.14(2)MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS

EQUIPMENT TYPE				ENERGY USE LIMITS (kWh/day)[a,b]	TEST PROCEDURE
Equipment Classc	Family Code	Operating Mode	Rating Temperature		
VOP.RC.M	Vertical open	Remote condensing	Medium	0.82 • TDA + 4.07	-

SVO.RC.M	Semivertical open	Remote condensing	Medium	0.83 • TDA + 3.18	-
HZO.RC.M	Horizontal open	Remote condensing	Medium	0.35 • TDA + 2.88	- ~~AHRI 1200~~
VOP.RC.L	Vertical open	Remote condensing	Low	2.27 • TDA + 6.85	10 CFR Part 431
HZO.RC.L	Horizontal open	Remote condensing	Low	0.57 • TDA + 6.88	
VCT.RC.M	Vertical transparent door	Remote condensing	Medium	0.22 TDA + 1.95	
VCT.RC.L	Vertical transparent door	Remote condensing	Low	0.56 • TDA + 2.61	
SOC.RC.M	Service over counter	Remote condensing	Medium	0.51 • TDA + 0.11	
VOP.SC.M	Vertical open	Self-contained	Medium	1.74 • TDA + 4.71	
SVO.SC.M	Semivertical open	Self-contained	Medium	1.73 • TDA + 4.59	
HZO.SC.M	Horizontal open	Self-contained	Medium	0.77 • TDA + 5.55	
HZO.SC.L	Horizontal open	Self-contained	Low	1.92 • TDA + 7.08	
VCT.SC.I	Vertical transparent door	Self-contained	Ice cream	0.67 • TDA + 3.29	
VCS.SC.I	Vertical solid door	Self-contained	Ice cream	0.38 • V + 0.88	
HCT.SC.I	Horizontal transparent door	Self-contained	Ice cream	0.56 • TDA + 0.43	
SVO.RC.L	Semivertical open	Remote condensing	Low	2.27 • TDA + 6.85	
VOP.RC.I	Vertical open	Remote condensing	Ice cream	2.89 • TDA + 8.7	
SVO.RC.I	Semivertical open	Remote condensing	Ice cream	2.89 • TDA + 8.7	
HZO.RC.I	Horizontal open	Remote condensing	Ice cream	0.72 • TDA + 8.74	
VCT.RC.I	Vertical transparent door	Remote condensing	Ice cream	0.66 • TDA + 3.05	
HCT.RC.M	Horizontal transparent door	Remote condensing	Medium	0.16 • TDA + 0.13	
HCT.RC.L	Horizontal transparent door	Remote condensing	Low	0.34 • TDA + 0.26	

HCT.RC.I	Horizontal transparent door	Remote condensing	Ice cream	0.4 • TDA + 0.31	
VCS.RC.M	Vertical solid door	Remote condensing	Medium	0.11 • V + 0.26	
VCS.RC.L	Vertical solid door	Remote condensing	Low	0.23 • V + 0.54	
VCS.RC.I	Vertical solid door	Remote condensing	Ice cream	0.27 • V + 0.63	
HCS.RC.M	Horizontal solid door	Remote condensing	Medium	0.11 • V + 0.26	
HCS.RC.L	Horizontal solid door	Remote condensing	Low	0.23 • V + 0.54	
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	0.27 • V + 0.63	
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	0.27 • V + 0.63	
SOC.RC.L	Service over counter	Remote condensing	Low	1.08 • TDA + 0.22	
SOC.RC.I	Service over counter	Remote condensing	Ice cream	1.26 • TDA + 0.26	
VOP.SC.L	Vertical open	Self-contained	Low	4.37 • TDA + 11.82	
VOP.SC.I	Vertical open	Self-contained	Ice cream	5.55 • TDA + 15.02	
SVO.SC.L	Semivertical open	Self-contained	Low	4.34 • TDA + 11.51	
SVO.SC.I	Semivertical open	Self-contained	Ice cream	5.52 • TDA + 14.63	
HZO.SC.I	Horizontal open	Self-contained	Ice cream	2.44 • TDA + 9.0	
SOC.SC.I	Service over counter	Self-contained	Ice cream	1.76 • TDA + 0.36	
HCS.SC.I	Horizontal solid door	Self-contained	Ice cream	0.38 • V + 0.88	

a. V = Volume of the case, as measured in accordance with Appendix C of AHRI 1200.

b. TDA = Total display area of the case, as measured in accordance with Appendix D of AHRI 1200.

c.Equipment 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:

RC = remote condensing

SC = self-contained

(C) A rating temperature code:

M = medium temperature (38°F)

L = low temperature (0°F)

I = ice-cream temperature (15°F)

For example, "VOP.RC.M" refers to the "vertical-open, remote-condensing, medium-temperature" equipment class.

C403.2.15Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. *Refrigerated warehouse coolers* and *refrigerated warehouse freezers* shall comply with this section. *Walk-in coolers* and *walk-in freezers* that are not either site assembled or site constructed shall comply with the following:

-

Exception: Walk-in coolers and walk-in freezers regulated under federal law by the Department of Energy in 10 CFR 431, Subpart R - Walk-in Coolers and Walk-in Freezers.

1. Be equipped with automatic door-closers that firmly close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.

Exception: Automatic closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
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 shall be of double-pane or triple pane, inert gas-filled, heat-reflective treated glass.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall use electronically commutated motors, brushless direct current motors, or 3-phase motors.
8. Condenser fan motors that are less than 1 hp (0.746 kW) shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.
9. Where antisweat heaters without antisweat heater controls are provided, they shall have a total door rail, glass and frame heater power draw of not more than 7.1 W/ft2 (76 W/m2) of door opening for walk-in freezersand 3.0 W/ft2 (32 W/m2) of door opening for walk-in coolers.
10. Where antisweat heater controls are provided, they shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. 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.

C403.2.16Walk-in coolers and walk-in freezers.
Site-assembled or site-constructed *walk-in coolers* and *walk-in freezers* shall comply with the following:

Exception: Walk-in coolers and walk-in freezers regulated under federal law by the Department of Energy in 10 CFR 431, Subpart R - Walk-in Coolers and Walk-in Freezers.

-

1. Automatic door closers shall be provided that fully close walk-in doors that have been closed to within 1 inch (25 mm) of full closure.
Exception: Closers are not required for doors more than 45 inches (1143 mm) in width or more than 7 feet (2134 mm) in height.
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. 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.
6. 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.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be electronically commutated motors or 3-phase motors.

8. Condenser fan motors that are less than 1 hp (0.746 kW) 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 (279 m^2) in floor area are exempt.
9. Antisweat heaters that are not provided with antisweat heater controls shall have a total door rail, glass and frame heater power draw not greater than 7.1 W/ft^2 (76 W/m^2) of door opening for *walk-in freezers*, and not greater than 3.0 W/ft^2 (32 W/m^2) of door opening for *walk-in coolers*.
10. Antisweat heater controls shall be capable of reducing the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.
11. 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.

C403.2.17Refrigerated display cases.
Site-assembled or site-constructed refrigerated display cases shall comply with the following:

Exception: Refrigerated display cases regulated under federal law by the Department of Energy in 10 CFR 431, Subpart C - Commercial Refrigerators, Freezers and Refrigerator-Freezers.

1. Lighting and glass doors in refrigerated display cases shall be controlled by one of the following:

1.1 Time switch controls to turn off lights during nonbusiness hours. Timed overrides for display cases shall turn the lights on for up to 1 hour and shall automatically time out to turn the lights off.

1.2 Motion sensor controls on each display case section that reduce lighting power by at least 50 percent within 3 minutes after the area within the sensor range is vacated.

2. 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. Antisweat heater controls shall reduce the energy use of the antisweat heater as a function of the relative humidity in the air outside the door or to the condensation on the inner glass pane.

Please replace our originally proposed modification with the following proposed modification:

Delete and Substitute as follows:

~~**C403.2.14Refrigeration equipment performance.**~~

~~Refrigeration equipment shall have an energy use in kWh/day not greater than the values of Tables C403.2.14(1) and C403.2.14(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 a certification program does not exist, the energy use shall be supported by data furnished by the equipment manufacturer.~~

~~**TABLE C403.2.14(1)**~~

~~**MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATION**~~

~~**EQUIPMENT TYPE**~~	~~**APPLICATION**~~	~~**ENERGY USE LIMITS (kWh per day)[a]**~~	~~**TEST PROCEDURE**~~
~~Refrigerator with solid doors~~	~~Holding Temperature~~	~~0.10 · V + 2.04~~	~~AHRI 1200~~
~~Refrigerator with transparent doors~~		~~0.12 · V + 3.34~~	
~~Freezers with solid doors~~		~~0.40 · V + 1.38~~	
~~Freezers with transparent doors~~		~~0.75 · V + 4.10~~	
~~Refrigerators/freezers with solid doors~~		~~the greater of 0.12 · V + 3.34 or 0.70~~	
~~Commercial refrigerators~~	~~Pulldown~~	~~0.126 · V + 3.51~~	

A_{nd} is the surface area of the nondisplay door.

TABLE C403.2.16(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS

CLASS DESCRIPTOR	**CLASS**	**MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h)**	**Test Procedure**
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61	AHRI 1250

CLASS DESCRIPTOR	CLASS	MINIMUM ANNUAL WALK-IN ENERGY FACTOR AWEF (Btu/W-h)	Test Procedure
Dedicated condensing, medium temperature, outdoor system	DC.M.O	7.60	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.I, < 6,500	$9.091 \times 10^{-5} \times qnet + 1.81$	
Dedicated condensing, low temperature, indoor system, net capacity (q_{net}) ≥ 6,500 Btu/h	DC.L.I, ≥ 6,500	2.40	
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) < 6,500 Btu/h	DC.L.O, < 6,500	$6.522 \times 10^{-5} \times qnet + 2.73$	
Dedicated condensing, low temperature, outdoor system, net capacity (q_{net}) ≥ 6,500 Btu/h	DC.L.O, ≥ 6,500	3.15	
Unit cooler, medium	UC.M	9.00	
Unit cooler, low temperature, net capacity (q_{net}) < 15,500 Btu/h	UC.L, < 15,500	$1.575 \times 10^{-5} \times qnet + 3.91$	
Unit cooler, low temperature, net capacity (q_{net}) ≥ 15,500 Btu/h	UC.L,, ≥ 15,500	4.15	
-	-	-	
-	-	-	

a. $q_{net}$is net capacity (Btu/hr) as determined in accordance with AHRI Standard 1250

Reason statement:

This section of the Florida code is currently in conflict with, and preempted by, federal requirements for many walk-in coolers and walk-in freezers. This is because the 2015 International Energy Conservation Code (IECC) included provisions for commercial refrigeration products in conflict with the Department of Energy's (DOE) federal minimum efficiency standards. Manufacturers have been required to comply with DOE's energy conservation standards since 1990. The adopted IECC language within Florida codes have made it difficult for manufacturers that are selling HVAC equipment in Florida to comply with the local code, especially when it conflicts with the Code of Federal Regulations.

Under 42 U.S.C. 6297(a), it states:

§6297. Effect on other law

(a) Preemption of testing and labeling requirements

(1) Effective on March 17, 1987, this part supersedes any State regulation insofar as such State regulation provides at any time for the disclosure of information with respect to any measure of energy consumption or water use of any covered product if—

(A) such State regulation requires testing or the use of any measure of energy consumption, water use, or energy descriptor in any manner other than that provided under section 6293 of this title; or

(B) such State regulation requires disclosure of information with respect to the energy use, energy efficiency, or water use of any covered product other than information required under section 6294 of this title.

The states are prohibited from regulating additional testing or disclosure of information that is already requested by the DOE. Thus, federal law preempts any state code that conflicts with federal Energy Policy and Conservation Standards.

The proposed changes to this section remove this conflict by removing specific code requirements for these products and by directly referencing the federal requirements. The section governing refrigerated warehouse coolers and refrigerated warehouse freezers has been simplified, removing reference to those federally-governed products.

Bibliography:

1. ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, Section 312, Walk-in Coolers and Walk-in Freezers.

2. Code of Federal Regulations, 10 CFR 431.306

3. 2014-06-03 Energy Conservation Program: Energy Conservation Standards for Walk-In Coolers and Freezers; Final Rule

https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=396fdbc135febfc51995dca67c2cee17&mc=true&n=pt10.3.431&r=PART&ty=HTML#sp10.3.431.c

EN8142

Date Submitted	12/14/2018	**Section**	403	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No | **Alternate Language** No

Related Modifications

None

Summary of Modification

The proposed additional criteria to the FBC, Energy provides the ability to reduce building energy use through deeper thermostat setups and setbacks and ventilation control in unrented guestrooms without affecting occupant comfort or creating a conflict with the FBC, Mechanical Code

Rationale

The proposed additional criteria to the FBC, Energy provides the ability to reduce building energy use through deeper thermostat setups and setbacks and ventilation control in unrented guestrooms without affecting occupant comfort or creating a conflict with the International Mechanical Code. The technology exists from multiple manufacturers to support the implementation of these provisions. For standalone controls, guest rooms are considered unrented if they are unoccupied for longer than 16 hours. For systems connected to a networked guest room control, the control can be configured to indicate whether the room is scheduled to be occupied and thus setbacks and ventilation can be turned off earlier when the guest room is scheduled to be unoccupied and the networked control can return setpoints to their default levels 60 minutes in advance of scheduled check-in.

This proposal also requires that ventilation air to the guest room be shut off during unoccupied periods. This proposal includes an exception for a "purge cycle" that would provide ventilation air to the guest room one hour before scheduled check-in as indicated by a networked guest room control or through a timed outdoor air ventilation "purge cycle" one hour per day. The purge cycle exception allowed by this proposal allows for enhanced indoor air quality beyond the requirements of the International Mechanical Code, while still capturing the majority of the energy savings of the ventilation shut-off for the rest of the day. The controls would operate from an occupancy sensor, so that cleaning crews in unrented rooms would receive ventilation necessary during cleaning

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

May require verification of compliance by a licensed mechanical engineer.

Impact to building and property owners relative to cost of compliance with code

An analysis of the small hotel prototypes with the ASHRAE SSPC 90.1 activities indicates this change results in savings and paybacks that meet ASHRAE SSPC 90.1 thresholds for cost effectiveness for all climate zones for systems where the ventilation fan is simply switched off such as PTACs.

Impact to industry relative to the cost of compliance with code

For central ventilation and exhaust systems typically provided with fan coil units there is some additional cost for ventilation and exhaust dampers and pressure regulation devices

Impact to small business relative to the cost of compliance with code

Even with these added costs the proposed measure meets the SSPC 90.1 cost effectiveness criteria.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Results in energy usage savings which is the goal of the energy conservation code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code with a better system of energy conservation in lodging establishments.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No one product or system is discriminated against with this proposal.

Does not degrade the effectiveness of the code

Adds to the effectiveness of the code.

Add new definition in Section 202 as follows:

ISOLATION DEVICES Devices that isolate HVAC zones so that they can be operated independently of one another. Isolation devices include separate systems, isolation dampers, and controls providing shutoff at terminal boxes.

NETWORKED GUEST ROOM CONTROL SYSTEM A control system, accessible from the front desk or

other central location associated with a Group R-1 building, that is capable of identifying the occupancy status of each guest room according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guest room separately.

Add new text as follows:

C403.2.4.8 Automatic control of HVAC systems serving guest rooms. In Group R-1 buildings containing over 50 guest rooms, each guest room shall be provided with controls complying with the provisions of Sections C403.2.4.3.1 and C403.2.4.3.2. Card key controls comply with these requirements.

C403.2.4.8.1 Temperature setpoint controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant set-point within 30 minutes after the occupants have left the guest room. The controls shall also be capable of and configured to automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented or has been continuously unoccupied for over 16 hours or a networked guest room control system indicates that the guest room is unrented and the guest room is unoccupied for more than 30 minutes. A networked guest room control system that is capable of returning the thermostat set-points to default occupied set-points 60 minutes prior to the time a guest room is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65 percent Relative Humidity during unoccupied periods is not precluded by this section.

C403.2.4.8.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within 30 minutes of the occupants leaving the guest room or isolation devices shall be provided to each guest room that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guest room.

Exception: Guest room ventilation systems are not precluded from having an automatic daily pre- occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.el and motel guest room separately

EN8148

Date Submitted	12/14/2018	**Section**	406.1.1	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

None

Summary of Modification

This proposal clarifies that built-out tenant spaces that are or were occupied, and undergoing an alteration using the existing building provisions, do not need to comply with one or more of the packages in Section C406.

Rationale

This proposal clarifies that built-out tenant spaces that are or were occupied, and undergoing an alteration using the existing building provisions, do not need to comply with one or more of the packages in Section C406.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

none

Impact to building and property owners relative to cost of compliance with code

none

Impact to industry relative to the cost of compliance with code

none

Impact to small business relative to the cost of compliance with code

none

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has substantial connection by clarifying that built out tenant spaces undergoing alteration do not need to comply with one or more of the packages in Section C406

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code with same reason as above.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods or systems thru this clarification.

Does not degrade the effectiveness of the code

No degradation of effectiveness of the code is done by this clarification change.

Revise as follows:

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 where the entire building is in compliance.

Exception: Previously occupied tenant spaces that comply with this code in accordance with SectionC501.

EN8154

Date Submitted	12/14/2018	**Section**	406.7.1	**Proponent**	George Wiggins (BOAF)
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

None

Summary of Modification

Clarifies that minimum percentage requirements are related to a building's annual hot water requirements & not first hour rating, & Removes combined heat and power system technologies & Expands the qualifying renewable energy technology to any on site renewable

Rationale

This proposal does three things:

1. it clarifies that the minimum percentage requirements are related to a building's annual hot water requirements and not simply to first hour rating,
2. it removes combined heat and power system from the list of technologies that can be used to satisfy this sections requirements, and
3. it expands the qualifying renewable energy technology from only solar energy to any on site renewable energy.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies current code language to accomplish the goal of energy conservation as part of "welfare of the general public."

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code language with more expansive options.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Reduces potential discrimination of products or systems by language allowing more options to comply.

Does not degrade the effectiveness of the code

Improves the potential effectiveness of the Code by expanding the opportunity for builders to use on site renewable energy technologies such as wind or biomass in addition to solar energy.

Revise as follows:

C406.7.1 Load fraction. The building service water-heating system shall have one or more of the following that are sized to provide not less than 60 percent of the building's annual hot water requirements, or sized to provide 100 percent of the building's annual hot water requirements if the building shall otherwise comply with Section C403.4.5.

1. Waste heat recovery from service hot water, heat- recovery chillers, building equipment, or process equipment~~, or a combined heat and powersystem~~.

~~Solar~~*On site renewable energy*water-heatingsystems.

EN8184

Date Submitted	12/14/2018	**Section**	403.2.12.2	**Proponent**	Armin Hauer
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No | **Alternate Language** No

Related Modifications

C202 Definitions

Summary of Modification

Correct conversion error related to shaft power. Move the clause about fan system motor nameplate for better clarity. Increase the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Rationale

This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Positive impact. This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Impact to building and property owners relative to cost of compliance with code

Positive impact. This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Impact to industry relative to the cost of compliance with code

Positive impact. This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Impact to small business relative to the cost of compliance with code

Positive impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal corrects an IP / SI conversion error related to shaft power: 6 bhp equals 4476 W mechanical power.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal moves the clause about fan system motor nameplate into the exceptions section for better clarity.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal increases the design options for load-matching variable-speed fan motors, accommodates new motor and drive technologies, and it simplifies the motor selection criteria for fans.

Does not degrade the effectiveness of the code

This proposal moves the clause about fan system motor nameplate into the exceptions section for better clarity.

C403.2.12.2 Fan mMotor selection ~~nameplate horsepower~~

For each fan, the *fan brake horsepower* shall be indicated on the construction documents and the selected motor shall be no larger than the first available motor size greater than the following:

1. For fans less than 6 bhp (~~4413~~ 4476 W), 1.5 times the *fan brake horsepower*.

2. For fans 6 bhp (~~4413~~ 4476 W) and larger, 1.3 times the *fan brake horsepower*.

Exceptions:

1. Fans equipped with electronic speed control devices to vary the fan airflow as a function of load.
2. Fans with *fan nameplate electrical input power* of less than 0.89 kW.
3. Systems complying with Section 403.8.1 *fan system motor nameplate hp* (Option 1).

~~**Exceptions:**~~ 4. Fans with motor *nameplate horsepower* less than 1 hp (746 W) ~~are exempt from this section~~.

From: Armin Hauer
To: "Madani, Mo"
Subject: RE: mod 8184
Date: Friday, December 28, 2018 5:00:00 PM

Dear Mo Madani,

thank you for the alert.
I did "grab" the original language from the ICC website:

2017 Florida Building Code - Energy Conservation, Sixth Edition
(First Printing: Jul 2017)

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

C403.2.12.2 Motor nameplate horsepower.

For each fan, the fan brake horsepower shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

1. For fans less than 6 bhp (4413 W), 1.5 times the fan brake horsepower.
2. For fans 6 bhp (4413 W) and larger, 1.3 times the fan brake horsepower.
3. Systems complying with Section C403.2.12.1 *fan system motor nameplate hp* (Option 1).

I therefore cannot understand the concern that the original text does not match. Can you please help me?
Sorry, I also do not know the meaning of the acronym BBC in this context.

Proposed Code Modifications
USER: Armin Hauer

Proposed Code Modifications Menu > Manage Proposed Code Modification > **Modification Request History**

Modification #	8184
Modification Status	Need More Information

Date Requested	12/20/2018
More Information Requested	Original text of the proposed mod does not match that of 2017 BBC, EC. Please note - deadline for fixing the proposed mod is ASAP but no later than 12/28/2018
Requested By	Mo Madani
Date Responded	

Best regards

Armin Hauer
Manager
Regulatory and Government Affairs

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From: Madani, Mo [mailto:Mo.Madani@myfloridalicense.com]
Sent: Thursday, December 27, 2018 19:50
To: Armin Hauer
Subject: mod 8184

Mod 8184 – This modification has a "Need for Information."

Please note – deadline for fixing the mod is ASAP but no later than 12/28/2018

Thanks

EN8185

Date Submitted	12/14/2018	**Section**	407.3	**Proponent**	Eric Lacey
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifies the treatment of on-site renewable energy in the performance path and sets reasonable limitations on trade-offs consistent with the 2018 IECC.

Rationale

See attached file.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

We expect no significant impact on local entities.

Impact to building and property owners relative to cost of compliance with code

We expect no significant impact on cost.

Impact to industry relative to the cost of compliance with code

We expect no significant impact on the cost of compliance.

Impact to small business relative to the cost of compliance with code

We expect no significant impact on small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Maintaining a reasonable level of efficiency and comfort for occupants is critical to the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal clarifies and strengthens the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against any materials, products, or methods of construction.

Does not degrade the effectiveness of the code

This proposal improves the effectiveness of the code by setting clear scoping provisions.

1st Comment Period History

EN8185-G1

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

Revise sections C407.3 and C407.4.2 as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design)* be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design.* Energy prices used in the total building performance compliance calculation shall be those contained in software approved by the Florida Building Commission. ~~Nondepletable energy collected off site shall be treated and priced the same as purchased energy. Energy from nondepletable energy sources collected on site shall be omitted from the annual~~ The reduction in energy cost of the *proposed design* associated with *on-site renewable energy* shall not be more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

C407.4.2 Additional documentation. The *code official* shall be permitted to require the following documents:

1. Thermal zoning diagrams consisting of floor plans showing the thermal zoning scheme for *standard reference design* and *proposed design*;

2. Input and output reports from the energy analysis simulation program containing the complete input and output files, as applicable. The output file shall include energy use totals and energy use by energy source and end-use served, total hours that space conditioning loads are not met and any errors or warning messages generated by the simulation tool as applicable;

3. An explanation of any error or warning messages appearing in the simulation tool output; and

4. A certification signed by the builder providing the building component characteristics of the *proposed design* as given in Table C407.5.1(1).

5. Documentation of the reduction in energy use associated with on-site renewable energy.

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8185

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8185. This proposal limits performance path trade-offs for on-site renewable energy to 5% of total energy cost. This is an important update from the 2018 IECC to ensure a baseline of energy efficiency while encouraging the use of renewable energy.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region

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American Chemistry Council

americanchemistry.com®

Reason Statement for Clarification of, and Limitation on trade-offs for on-site renewable energy in C407

This proposal adopts the clarifying language and reasonable limitations on efficiency trade-offs for on-site renewable energy adopted into the 2018 IECC via proposal number CE251-16. The proposal adopts a 5 percent cap on the trade-off credit allowed for on-site power in the performance path, similar to the 5 percent cap that applies in ASHRAE Standard 90.1-2016 Energy Cost Budget Method.

> **2018 IECC C407.3**: "…The reduction in energy cost of the proposed design associated with on-site renewable energy shall be not more than 5 percent of the total energy cost."
>
> **ASHRAE Standard 90.1-2016, Section 11.4.3.1**: "…The reduction in *design energy cost* associated with *on-site renewable energy* shall be no more than 5% of the calculated *energy cost budget*."

It is important to note that this proposal does not limit the amount of on-site power production that can be installed on the building, nor does it apply any sort of "penalty" to buildings with on-site power. The proposal simply recognizes that a reduction in energy use is not the same thing as on-site energy production, for purposes of code compliance. This proposal also supports the long-term goal of achieving net zero energy use by helping avoid steps backward in efficiency as on-site generation increases. If unlimited efficiency trade-off credit is allowed for increases in on-site generation, progress toward net-zero energy will stall. We do not see any good reason to allow steps backward in efficiency when it can be improved simultaneously with increases in on-site power production.

EN8199

Date Submitted	12/14/2018	**Section**	406	**Proponent**	Eric Lacey
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language No

Related Modifications

Summary of Modification

Adds two new options to Section C406, providing additional flexibility consistent with changes made in the 2018 IECC through proposal CE230.

Rationale

This proposal adopts two new Additional Efficiency Options into Section C406, consistent with changes made to the 2018 IECC through proposal CE230-16. This proposal will provide additional flexibility for design professionals and builders to achieve compliance with the commercial prescriptive path.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

We expect no significant impact on local entities.

Impact to building and property owners relative to cost of compliance with code

We expect no significant impact on property owners.

Impact to industry relative to the cost of compliance with code

This proposal will facilitate compliance for industry.

Impact to small business relative to the cost of compliance with code

We expect no significant impact on small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

These changes match changes made in the 2018 IECC. It is important to Florida citizens that the Florida Building Code maintain pace with the improvements to the IECC. Keeping energy costs manageable is directly connected to building occupants and owners' health, safety, and welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal adds flexibility to the code while maintaining efficiency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against any materials.

Does not degrade the effectiveness of the code

The proposal will improve the effectiveness of the code by adding more flexibility.

Revise Section C406 as follows:

SECTION C406

ADDITIONAL EFFICIENCY PACKAGE OPTIONS

C406.1 Requirements. Buildings shall comply with at least one of the following:

1. More efficient HVAC 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 C406.7.
7. Enhanced envelope performance in accordance with Section C406.8.
8. Reduced air infiltration in accordance with Section C406.9.

Add new Sections C406.8 and C406.9 as follows:

C406.8 Enhanced envelope performance. The total UA of the building thermal envelope as designed shall be not less than 15 percent below the total UA of the building thermal envelope in accordance with Section C402.1.5.

C406.9 Reduced air infiltration. Air infiltration shall be verified by whole-building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air-leakage rate of the building envelope shall not exceed 0.25 cfm/ft2 (2.0 L/s × m2) under a pressure differential of 0.3 inches water column (75 Pa), with the calculated surface area being the sum of the above- and below-grade building envelope. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

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

EN8228

76

Date Submitted	12/14/2018	**Section**	402.5.4	**Proponent**	John Woestman
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Proposal FS101-15 for the 2018 IBC completely reorganized IBC Section 716, the pointers need to be reviewed and several revised. This proposal complements FS74-15 approved in 2015 for the 2018 IBC.

Rationale

Reason: This proposal complements FS74-15 approved in 2015 for the 2018 which reviewed all I-Code references that "point" to IBC Section 716 and / or to subsection(s) of IBC 716. With proposal FS101-15 approved last year which completely reorganized IBC Section 716, the pointers need to be reviewed and several revised. In many locations, the references to a subsection of IBC 716 many need only an editorial update to the new location of the references requirements based on the reorganized text.

Cost Impact: Will not increase the cost of construction
There should be no cost increase, if the proposed revisions are consistent with the intent of the code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Minor clarification to the energy code should have almost ne code enforcement implications.

Impact to building and property owners relative to cost of compliance with code

No costs of compliance could be identified.

Impact to industry relative to the cost of compliance with code

No costs of compliance could be identified.

Impact to small business relative to the cost of compliance with code

No costs of compliance could be identified.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Helps the code to be more appropriately interpreted and enforced for doors in the means of egress.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by removing an inaccurate reference.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Revise as follows:

C402.5.4 Doors and access openings to shafts, chutes, stairways and elevator lobbies. Doors and access openings from conditioned space to shafts, chutes stairways and elevator lobbies not within the scope of the fenestration assemblies covered by Section C402.5.2 shall be gasketed, weatherstripped or sealed.

Exceptions:

1. Door openings required to comply with Section 716 ~~or 716.4~~of the *Florida Building Code, Building.*

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

EN8259

Date Submitted	12/14/2018	**Section**	402.2.7	**Proponent**	John Woestman
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** | **Alternate Language** **No**

Related Modifications

Summary of Modification

From an building thermal envelope perspective, air spaces are sometimes not being applied correctly and this proposal provides the necessary direction.

Rationale

Air spaces are not being applied correctly and this proposal provides the necessary direction.
This proposal is consistent with recent limitations placed on the thermal resistance application of reflective and non-reflective airspaces in ASHRAE 90.1-2013 (Addenda Supplement, Addendum AC). The R-values of airspaces are based on the assumption of "no air leakage" (see 2013 ASHRAE Handbook of Fundamentals, Chapter 25, Table 3, footnote b).
Air leakage into and out of an airspace can significantly degrade its R-value, yet there is currently no standard calculation method or test method to discern this impact.
Until such a time that this effect is quantified (for which there is an ASHRAE research project request under consideration), Addendum AC to ASHRAE 90.1 has provided a rational interim solution based on extensive review of available research data and consensus regarding that data. To also provide an interim solution for the common case of enclosed airspaces located behind cladding or outside of the air barrier layer of the building, an allowance is provided to consider such airspaces as being roughly equivalent to that of an indoor air film (e.g., R-0.7). This is also needed because some cladding R-values used in design are based on the assumption of an ideal air space (no air leakage or airflow) which is unrealistic and inappropriate and results in inflated R-values for airspaces that are necessarily leaky and/or intended to provide ventilation behind claddings.

Cost Impact: The energy code is currently silent on this matter. Consequently, this proposal provides guidance and options which may result in reduced construction costs where airspaces are appropriately used to help comply with the code. On the other hand, where air spaces are used inappropriately to comply with the energy code, this proposal may result in an increase in the cost of construction and code compliance.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Proposal provides appropriate technical guidance for the use of air spaces in the building thermal envelope.

Impact to building and property owners relative to cost of compliance with code

This proposal provides guidance and options which may result in reduced construction costs where airspaces are appropriately used to help comply with the code. Where air spaces are not appropriately used to comply with the code, this proposal may result in an increase in the cost of code compliance.

Impact to industry relative to the cost of compliance with code

This proposal provides guidance and options which may result in reduced construction costs where airspaces are appropriately used to help comply with the code. Where air spaces are not appropriately used to comply with the code, this proposal may result in an increase in the cost of code compliance.

Impact to small business relative to the cost of compliance with code

This proposal provides guidance and options which may result in reduced construction costs where airspaces are appropriately used to help comply with the code. Where air spaces are not appropriately used to comply with the code, this proposal may result in an increase in the cost of code compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Appropriate use of air spaces can be important for complying with energy code requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code with appropriate requirements for air spaces.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Appropriately provides guidance on the use of air spaces for energy code compliance and does not discriminate against materials used appropriately.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code.

Add new text as follows:

C402.2.7 Airspaces. Where the thermal properties of airspaces are used to comply with this code in accordance with Section C401.2, such airspaces shall be enclosed in an unventilated cavity constructed to minimize airflow into and out of the enclosed airspace. Airflow shall be deemed minimized where the enclosed airspace is located on the interior side of the continuous air barrier and is bounded on all sides by building components.

Exception: The thermal resistance of airspaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall-covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at an air movement rate of not less than 70 mm/second.

EN8367

Date Submitted	12/15/2018	**Section**	403.2.8	**Proponent**	Oscar Calleja
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Eliminates Conflict between FECC-C403.2.8 and the Mechanical Code Section 507.5. Commercial Kitchen Hood Minimum Airflows in M507.5 are actually HIGHER than the Maximum shown in Energy Code Commercial 403.2.8. Proposed Mod eliminates the Maximum Airflows in C403.2.8.

Rationale

Commercial Kitchen Hood exhaust has a life/safety component that should take precedence over any Energy saving consideration. The Mechanical Code specifies MINIMUM airflows to guarantee smoke and grease removal. Airflow is also related to air velocities in the hood and the exhaust ducts which is the important consideration in smoke and grease movement and removal. Current commercial, factory-built Hood systems and modern fans are designed for efficient airflows. Therefore until Industry comes up with a Maximum airflow standard this section should be removed.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Makes Code enforcement possible by avoiding conflict with Mechanical Code.

Impact to building and property owners relative to cost of compliance with code

Makes Code compliance easier and saves conflicts and project delays.

Impact to industry relative to the cost of compliance with code

Makes Code enforcement possible by avoiding conflict with Mechanical Code.

Impact to small business relative to the cost of compliance with code

Makes Code enforcement possible by avoiding conflict with Mechanical Code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Allows for higher airflows and better smoke and grease removal in Commercial Kitchens. This makes for improve health of workers and reduces fire risk.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the Code by eliminating conflict with Mechanical Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products or methods.

Does not degrade the effectiveness of the code

Improves effectiveness of Code.

C403.2.8 Kitchen exhaust systems.

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

1. The ventilation rate required to meet the space heating or cooling load.
2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is 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.

Where total kitchen hood exhaust airflow rate is greater than 5,000 cfm (2360 L/s), each hood shall be a factory built commercial exhaust hood listed by a nationally recognized testing laboratory in compliance with UL 710. Each hood shall ~~have a maximum exhaust rate as specified in Table C403.2.8 and shall~~comply with one of the following:

1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.
2. Demand ventilation systems on not less than 75 percent of the exhaust air that are capable of not less than a 50- percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.
3. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.

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

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

~~TABLE C403.2.8~~

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

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

~~For SI: 1 cfm = 0.4719 L/s; 1 foot = 305 mm.~~
~~NA = Not Allowed.~~

EN8377 79

Date Submitted	12/15/2018	**Section**	408.2	**Proponent**	Oscar Calleja
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No **Alternate Language** No

Related Modifications

Summary of Modification

Adds clarification to the Commercial Building Commissioning requirement.This Mod adds language that prevents counting individual mechanical system capacities serving the building's dwelling/sleeping units in calculating the whole building capacity.

Rationale

In calculating whether the threshold for requiring Commissioning is being crossed, buildings such as Hotels, Motels, School Dormitories, Rental Apartments, etc., would have to count all individual mechanical systems into the Total Building Capacity. That was not the intent of the Code.

By explaining that those small individual units should not be counted in the Total Building capacity, the threshold for enforcing the Commissioning requirement becomes more in tune with the original intent. Commissioning was meant to cover commercial central type equipment in buildings with more than 40 tons. A Motel with 40-12000 BTUH PTACs should not have to do Commissioning.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Makes the determination of whether Commissioning is required clearer and avoids confusion.

Impact to building and property owners relative to cost of compliance with code

Saves buildings with mainly small individual mechanical systems serving dwellings or sleeping units exempt form Commissioning requirements.

Impact to industry relative to the cost of compliance with code

Saves buildings with mainly small individual mechanical systems serving dwellings or sleeping units exempt form Commissioning requirements.

Impact to small business relative to the cost of compliance with code

Saves buildings with mainly small individual mechanical systems serving dwellings or sleeping units exempt form Commissioning requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Saves buildings with mainly small individual mechanical systems serving dwellings or sleeping units exempt form Commissioning requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifies the Commissioning requirement and makes the Code more enforceable.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products or methods.

Does not degrade the effectiveness of the code

Clarifies the Commissioning requirement and makes the Code more enforceable.

C408.2 Mechanical systems and service water-heating systems commissioning and completion requirements.

Prior to the final mechanical and plumbing inspections, the licensed design professional, electrical engineer, mechanical engineer or approved agency shall provide evidence of mechanical systems commissioning and completion in accordance with the provisions of this section.

Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner or owner's authorized agent and made available to the code official upon request in accordance with Sections C408.2.4 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
   Capacities of individual systems serving dwelling or sleeping units shall not be counted in determining the total mechanical and/or water heating systems' capacity for the whole building.

2. Systems included in Section C403.3 that serve individual dwelling units and sleeping units.

Date Submitted	11/30/2018	**Section**	403.7.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No **Alternate Language** No

Related Modifications

Summary of Modification

Disallow electric resistance from being primary space heating system type for prescriptive compliance in Climate Zone 2.

Rationale

Electric heat pumps are low cost heating systems 2.5 times more efficient than electric resistance. Change is similar to limitation in the 2010 Florida Energy Code, except 2010 Code applied to both Climate Zones 1 and 2.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Slight impact in applicable cases to verify compliance.

Impact to building and property owners relative to cost of compliance with code

Slight increase in first cost in applicable cases, however most homes are already including heat pumps.

Impact to industry relative to the cost of compliance with code

Slight impact in applicable cases; other heating options are readily available.

Impact to small business relative to the cost of compliance with code

Slight impact in applicable cases; other heating options are readily available.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by increasing heating efficiency in applicable cases.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes; strengthens from the current code by increasing heating efficiency in applicable cases. However, it is actually slightly less stringent than the 2010 Florida Energy Conservation Code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No; other heating options are readily available and electric resistance can still be primary heating system for performance compliance in Climate Zone 2.

Does not degrade the effectiveness of the code

Increases effectiveness of the code increasing heating efficiency in applicable cases.

R403.7 Heating and cooling equipment ~~(Mandatory)~~.

R403.7.1 Equipment sizing (Mandatory).

R403.7.2. Electric space heating (Prescriptive). Electric resistance space heating shall not be the primary heating system used in Climate Zone 2.

[Remaining text unchanged.]

Date Submitted	11/6/2018	**Section**	404.1	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

7203

Summary of Modification

This proposed modification revises the luminaire and lamp efficacy requirements under Section R404 to align the code with current lighting industry standards.

Rationale

This proposed modification aligns the code with the current lighting industry standards for luminaire and lamp efficacy. Setting lamps at an efficacy of at least 65 lumens-per-watt, aligns the code with the Energy Star Lamp Specification 2.1. An efficacy level for luminaires (combined lighting housings with lamps or integral light sources) with at least 45 lumens-per-watt requirements, meets the requirements established under California Title 24. The change eliminates confusion caused by the term and definition for "high efficacy lamps". Many residential luminaires now have the lamp integrated into the fixture itself as a single unit instead of two separate components. By putting the efficacy level requirements of lamps and luminaires in section R404.1, the improper "high-efficacy lamps" definition is not needed. The 90% criteria and deletion of the exception is to align the Florida Energy Code with the 2018 IECC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification enhances enforcement of the code by placing all the requirements for lighting efficacy under R404 using industry accurate efficacy values.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will reduce the amount energy consumed by lighting in a dwelling by increasing the compliance threshold by 15%.

Impact to industry relative to the cost of compliance with code

This modification may result in an increase cost of compliance. Raising the threshold of compliance from 75% to 90% means 15% more of the lighting will be required to meet the higher efficacy ratings. These lighting products tend to have a higher cost as compared to lower efficacy lighting.

Impact to small business relative to the cost of compliance with code

This proposed modification will have no impact on small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification will have no impact of the health, safety, or welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by aligning the rules for lighting efficacy with current industry standards.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7204-G1

Proponent Jeff Sonne for FSEC **Submitted** 2/13/2019 **Attachments** No

Comment:

The Florida Solar Energy Center supports this mod which is highly cost effective for Florida citizens and will help Florida keep up with national code efficiency.

R404.1 Lighting equipment (Mandatory).

Not less than ~~75~~ 90 percent of the lamps in permanently installed ~~lighting fixtures~~ luminaires shall have an efficacy of at least 45 lumens-per-watt or shall ~~be high-efficacy~~ utilize lamps with an efficacy of not less than 65 lumens-per-watt. ~~or not less than 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.~~

~~Exception: Low-voltage lighting.~~

EN7231

Date Submitted	12/6/2018	**Section**	405.5.2(1)	**Proponent**	Kelli Fleming
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

The proposed modifications are editorial in nature and are being submitted to maintain consistency with the changes that are anticipated with IECC 2021 changes.

Rationale

The proposed changes are offered to achieve consistency with changes being proposed for the 2021 IECC and to provide additional clarity to code that was previously vague. They are truly editorial changes that are intended to simplify and clarify the current FBC.

This proposal also includes the following coordinating changes:
a) In footnote (h), text from earlier code editions was restored. The restored text clarified how fenestration area is to be calculated. (It was removed in error as part of RE173-13.)
b) Editorial changes in footnote (h) simply coordinate with current terminology in this section.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code
No Impact

Impact to building and property owners relative to cost of compliance with code
N0 Impact

Impact to industry relative to the cost of compliance with code
No Impact

Impact to small business relative to the cost of compliance with code
No Impact

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public
Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction
Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities
Does not

Does not degrade the effectiveness of the code
Does not

1st Comment Period History

EN7231-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

This mod makes reference to the 2021 Energy Conservation Code. Proponent has not provide a copy of such code.

1st Comment Period History

EN7231-G2

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** No

Comment:

By changing the vertical fenestration U-factor reference specification from Table R402.1.4 to Table R402.1.2, this mod changes the U-factor reference to “NR” in climate zone 1; the reference U-factor should be defined.

This mod should also explicitly define the total fenestration area (AF) as the sum of the vertical fenestration and skylight areas.

Building Component	Standard Reference Design	Proposed Design
Vertical Fenestration other than opaque doors	Vertical Fenestration area [h] = (a) The proposed vertical fenestration area (AVF), where the proposed total fenestration area (AF) is less than 15 percent of the conditioned floor area (CFA) (b) The adjusted vertical fenestration area (AVF_{adj}), where ~~the proposed fenestration area~~ AF is 15 percent or more of ~~theconditioned floor area~~ CFA. ~~The adjusted vertical fenestration area~~ AVF_{adj} shall be calculated as follows: $AVF_{adj} = AVF \bullet 0.15 \bullet CFA/AF$ ~~where:~~ ~~AVF_{adj} = adjusted vertical fenestration~~ ~~AVF = proposed vertical fenestration area~~ ~~CFA = conditioned floor area~~ ~~AF = proposed total fenestration area~~	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W)	As proposed
	U-factor: as specified for Fenestration in Table R402.1.42	As proposed
	SHGC: as specified for Glazed Fenestration in Table R402.1.2 except that for climates zones with no requirement (NR) SHGC=0.40 shall be used.	As proposed
	Interior shade fraction: 0.92 - (0.21 x SHGC for the standard reference design)	Interior shade fraction: 0.92 - (0.21 x SHGC as proposed)
	External shading: none	As proposed
Skylights	Skylight area [h] = (a) The proposed skylight area (ASKY), where the proposed total fenestration area (AF)is less than 15 percent of the conditioned floor area(CFA), or (b) The adjusted skylight area ($ASKY_{adj}$),where ~~the proposed fenestration area~~ AF is 15 percent or ~~greater~~more of ~~the conditioned floor area~~CFA. ~~The adjusted skylight area~~ $ASKY_{adj}$ shall be calculated as follows: $ASKY_{adj} = ASKY \bullet 0.15 \bullet CFA/AF$ ~~where:~~ ~~$ASKY_{adj}$ = adjusted vertical fenestration~~ ~~AVF = proposed vertical fenestration area~~ ~~CFA = conditioned floor area~~ ~~AF = proposed total fenestration area~~	As proposed
	Orientation: as proposed	As proposed
	U-factor: as specified for Skylights in Table R402.1.42	As proposed
	SHGC: as specified by the exception in footnote (b) of Table R402.1.2~~including footnote (b) of that table~~, except that for climates zones with no requirement (NR), SHGC = 0.40 shall be used	As proposed
	Interior shade fraction: for the area of proposed skylights equipped and rated with ~~SHGC ratings that include pre-~~ factory-installed interior shades, the interior shade fraction is: 0.92 - (0.21 · SHGC) [SHGC as above for the standard reference design]~~)~~	As proposed, with shades assumed closed 50% of the ~~time~~ daylight hours
	External shading: none	As proposed

h. Light-transmitting fenestration area includes the area of sash, curbing or other framing elements that are part of the conditioned space enclosure, including light-transmitting assemblies in walls bounding conditioned basements. For doors where the light-transmitting opening is less than 50 percent of the door area, only the light-transmitting area is included.

For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine fenestration area:

$AF = A_s \cdot FA \cdot F$

where:

AF = Proposed ~~T~~total fenestration area.

As = Standard reference design total fenestration area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

F = (Above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.80, whichever is greater, and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

LAF. A_s and *CFA* are in the same units.

(other table entries and footnotes are unchanged)

EN7566

Date Submitted	11/30/2018	**Section**	405.2.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifies that for simulated performance compliance, the tested building air leakage rate must not exceed the proposed design leakage rate.

Rationale

There is a need to clarify that if the ACH50 (air leakage rate) entered for a performance compliance proposed design is less than the code maximum of 7 ACH50, testing must verify the proposed design's ACH50 instead of 7.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, or should assist with with enforcement by clarifying code intent.

Impact to building and property owners relative to cost of compliance with code

None; clarification only.

Impact to industry relative to the cost of compliance with code

None; clarification only.

Impact to small business relative to the cost of compliance with code

None; clarification only.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes, benefits public by clarifying the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by clarifying it.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; clarification only.

Does not degrade the effectiveness of the code

Improves code effectiveness by clarifying it.

R405.2.2 Building Air leakage testing.

Building or dwelling air leakage testing shall be in accordance with Sections R402.4 through R402.4.1.2. If an air leakage rate below seven air changes per hour at a pressure of 0.2 inch w.g. (50 pascals) is specified for the *proposed design*, testing shall verify the air leakage rate does not exceed the air leakage rate of the *proposed design* instead of seven air changes per hour.

EN7570

Date Submitted 11/30/2018
Chapter 4
Section 403.3.3
Affects HVHZ No
Proponent Jeff Sonne for FSEC
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

7575

Summary of Modification

Clarifies that duct testing is required for simulated performance compliance if credit is taken for duct sealing beyond default leakage.

Rationale

There is a need to clarify when duct leakage testing is required for performance compliance.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

While seen by the proponent as a clarification, in some cases this change may require some additional enforcement effort.

Impact to building and property owners relative to cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for performance compliance in the past but not tested.

Impact to industry relative to the cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for performance compliance in the past but not tested.

Impact to small business relative to the cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for performance compliance in the past but not tested.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; provides clarification.

Does not degrade the effectiveness of the code

Increases code effectiveness by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

R403.3.3 Duct testing (Mandatory).

Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. 1.Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. All registers shall be taped or otherwise sealed during the test.
2. 2.Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. 1.A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.
2. 2.Duct testing is not mandatory for buildings complying by Section R405 of this code when a duct air leakage Qn to outside of 0.080 is indicated in the compliance report for the *proposed design*.

[No other changes to section.]

EN7574

Date Submitted 11/30/2018
Chapter 4

Section 405.5.2
Affects HVHZ No

Proponent Jeff Sonne for FSEC
Attachments No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **No**

Related Modifications

Summary of Modification

Reword first sentence of Table R405.5.2(1) footnote "a" regarding building air leakage testing to make consistent with current Florida Code.

Rationale

Modification makes Table R405.5.2(1) footnote "a" consistent with current Section R402.4.1.2.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or simplifies enforcement by improving code consistency and clarity.

Impact to building and property owners relative to cost of compliance with code

None or lowers cost by improving code consistency and clarity.

Impact to industry relative to the cost of compliance with code

None or lowers cost by improving code consistency and clarity.

Impact to small business relative to the cost of compliance with code

None or lowers cost by improving code consistency and clarity.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by improving code consistency and clarity.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by improving code consistency and clarity.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; improves code consistency and clarity.

Does not degrade the effectiveness of the code

Improves code effectiveness by improving code consistency and clarity.

[Table R405.5.2(1) footnote "a".]

a. ~~Where required by the code official, t~~Testing shall be conducted ~~by an approved party~~ in accordance with Section R402.4.1.2. Hourly calculations as specified in the ASHRAE Handbook of Fundamentals, or the equivalent shall be used to determine the energy loads resulting from infiltration.

[No other changes to table.]

EN7575

Date Submitted	11/30/2018	**Section**	405.2.3	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No

Alternate Language No

Related Modifications

7570

Summary of Modification

Clarifies that for simulated performance compliance, the tested duct air leakage rate must not exceed the leakage rate of the proposed design.

Rationale

There is a need to clarify that when credit is taken for duct sealing beyond default leakage for performance compliance, the tested duct air leakage rate must not exceed the leakage rate of the proposed design.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

While seen by the proponent as a clarification, in some cases this change may require some additional enforcement effort.

Impact to building and property owners relative to cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for compliance in the past but not tested.

Impact to industry relative to the cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for compliance in the past but not tested.

Impact to small business relative to the cost of compliance with code

None, or small in some cases if duct leakage lower than default was used for compliance in the past but not tested.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; provides clarification.

Does not degrade the effectiveness of the code

Increases code effectiveness by clarifying that verification is required if duct leakage lower than default is used for performance compliance.

R405.2.3. Duct air leakage testing.

In cases where duct air leakage lower than the default Qn to outside of 0.080 is specified for the *proposed design*, testing in accordance with Section R403.3.2 shall verify a duct air leakage rate not exceeding the leakage rate of the *proposed design*. Otherwise, in accordance with Section R403.3.3, duct testing is not mandatory for buildings complying by Section R405.

EN7576

Date Submitted 11/30/2018	**Section** 403.6.1	**Proponent** Jeff Sonne for FSEC
Chapter 4	**Affects HVHZ** No	**Attachments** No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No | **Alternate Language** No

Related Modifications

Summary of Modification

Rewords section's electronically commutated motor requirement and adds minimum efficacy requirement for HRVs and ERVs.

Rationale

This change is highly cost effective and easy to comply with as numerous HRVs and ERVs are available with 1.2 cfm/watt and higher efficacies.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Will require small additional enforcement effort in applicable cases.

Impact to building and property owners relative to cost of compliance with code

Listing HRVs and ERVs prevents them from having to be provided at the fan efficiency level of a straight exhaust system, so allows lower cost units to be used.

Impact to industry relative to the cost of compliance with code

Listing HRVs and ERVs prevents them from having to be provided at the fan efficiency level of a straight exhaust system, so allows lower cost units to be used.

Impact to small business relative to the cost of compliance with code

Listing HRVs and ERVs prevents them from having to be provided at the fan efficiency level of a straight exhaust system, so allows lower cost units to be used.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by, in applicable cases, helping insure that efficient ventilation systems are installed in the state.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by, in applicable cases, helping insure that efficient ventilation systems are installed in the state.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; HRVs and ERVs with the minimum efficacy stipulated are readily available.

Does not degrade the effectiveness of the code

Increases code effectiveness by, in applicable cases, helping insure that efficient ventilation systems are installed in the state.

R403.6.1 Whole-house mechanical ventilation system fan efficacy.

When installed to function as a whole-house mechanical ventilation system, fans shall meet the efficacy requirements of Table R403.6.1.

Exception: ~~Where whole-house mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor .~~ Where an air handler that is integral to tested and listed HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.

TABLE R403.6.1
_WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY[a] (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	<90
Bathroom, utility room	90	2.8 cfm/watt	Any

EN7577

Date Submitted	12/3/2018	**Section**	405.5.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifies that for proposed designs with electric heating, the standard reference design heating system type is a heat pump.

Rationale

Clarifies the reference space heating system type to use for performance compliance calculations to facilitate consistency among software developers.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; clarification for software developers only.

Impact to building and property owners relative to cost of compliance with code

None; clarification for software developers only.

Impact to industry relative to the cost of compliance with code

None; clarification for software developers only.

Impact to small business relative to the cost of compliance with code

None; clarification for software developers only.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by facilitating code calculation consistency.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating code calculation consistency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; only facilitates code calculation consistency.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by facilitating code calculation consistency.

Mod 7577

[Heating systems section of Table R405.5.2(1)]

	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems [d, e]	Type: heat pump if proposed heating system is electric; otherwise as proposed	As proposed
	Efficiency: in accordance with prevailing federal minimum standards	As proposed
	Capacity: sized in accordance with Section R403.7	As proposed
	Fuel type: same as proposed	As proposed

[No other changes to table.]

EN7578

Date Submitted	11/30/2018	**Section**	405.5.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Clarifies that for proposed designs without a heating system, an electric heat pump is to be assumed for both the standard reference design and proposed design if the proposed design has an electric water heater.

Rationale

Facilitates consistency among software developers.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; clarification for software developers only.

Impact to building and property owners relative to cost of compliance with code

None; clarification for software developers only.

Impact to industry relative to the cost of compliance with code

None; clarification for software developers only.

Impact to small business relative to the cost of compliance with code

None; clarification for software developers only.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by facilitating code calculation consistency.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by facilitating code calculation consistency.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; only facilitates code calculation consistency.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by facilitating code calculation consistency.

[Table R405.5.2(1) footnote "e".]

e. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design, and this heating system shall be an electric heat pump if the proposed design has an electric water heater.

[No other changes to table.]

EN7579

Date Submitted	11/30/2018	**Section**	405.5.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Removes footnote "e" and "f" references from Service hot water section of table.

Rationale

Footnotes "e" and "f" apply to heating system and cooling systems, respectively, not service water heating.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None or simplifies enforcement by improving code clarity.

Impact to building and property owners relative to cost of compliance with code

None or lowers cost by improving code clarity.

Impact to industry relative to the cost of compliance with code

None or lowers cost by improving code clarity.

Impact to small business relative to the cost of compliance with code

None or lowers cost by improving code clarity.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by improving code clarity.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by improving code clarity.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; improves code clarity.

Does not degrade the effectiveness of the code

Improves code effectiveness by improving code clarity.

Mod 7579

[Table R405.5.2(1)]

Heating systems[d, e]	Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section R403.7 Fuel type: same as proposed	As proposed As proposed As proposed
Cooling systems[d, f]	Fuel type: electric Capacity: sized in accordance with Section R403.7. Efficiency: in accordance with prevailing federal minimum standards	As proposed As proposed As proposed
Service water heating[d, ~~e, f,~~ g]	Fuel type: as proposed Use: same as proposed design Efficiency: in accordance with prevailing federal minimum standards	As proposed gal/day = 30 + (10 × N_{br}) As proposed

[No other changes to table.]

EN7597

Date Submitted	12/13/2018	**Section**	405.5.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Increases reference water heater efficiency for proposed electric water heaters with ~= 55 gallon rated storage volume.

Rationale

For projects with proposed electric water heating systems up to 55 gallons, this code change increases the standard reference efficiency used for performance calculations to the higher federal minimum required for systems larger than 55 gallons. This change is appropriate at this time as highly efficient, cost-effective heat pump water heaters are now readily available which easily surpass this efficiency level. Florida studies (referenced below) show heat pump water heaters save ^ 65% of water heating energy compared to electric resistance, and potentially provide a 3-6% reduction in space cooling. This change would still not require heat pump water heaters to be used for electric water heating though since R405 compliance allows efficiency trade-offs.

The second rationale is this code change should deter the potential practice of installing multiple smaller electric water heaters to avoid having to install an efficient heat pump water heater in homes with large water heating loads.

A stringency impact comparison is provided in the attached PDF.

References:
- Water heating energy savings: http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-CR-2018-16.pdf
- Space cooling reduction: http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-RR-644-16.pdf

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

In applicable cases will increase cost of construction.

Impact to industry relative to the cost of compliance with code

In applicable cases will increase cost of construction.

Impact to small business relative to the cost of compliance with code

In applicable cases will increase cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by establishing highly cost effective baseline for efficiency.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens code by making efficiency requirements more consistent for all electric water heater capacities.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; still allows builders to install whichever type of water heater they like.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by making efficiency requirements more consistent for all electric water heater capacities.

Alternate Language

1st Comment Period History

7597-A2

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** Yes

Rationale

This Alt 2 mod adds the same improved hot water code calculation described in the Alt 1 mod, and removes the original mod language regarding reference service water heating efficiency. As described for the Alt 1 mod, the improved hot water calculation language accounts for 1) climate-specific effects on domestic hot water use, 2) the hot water distribution system type, and 3) the use of additional conservation measures. The vetted research behind this mod is described in a 2017 research report by the Florida Solar Energy Center which was funded and approved by the Florida Building Commission: http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-CR-2066-17.pdf.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

In many cases none, but some additional verification will be needed if certain additional water heating conservation measures are used for a given project.

Impact to building and property owners relative to cost of compliance with code

None in most cases. Slight increase in cost of compliance if heat pump or tankless gas water heaters are used for a project. May reduce cost of compliance for builders who choose to employ efficient water circulation systems.

Impact to industry relative to the cost of compliance with code

None in most cases. Slight increase in cost of compliance if heat pump or tankless gas water heaters are used for a project. May reduce cost of compliance for builders who choose to employ efficient water circulation systems.

Impact to Small Business relative to the cost of compliance with code

In applicable cases will increase cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by providing a more comprehensive means of accounting for domestic hot water use in the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing a more comprehensive means of accounting for domestic hot water use in the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Reduces discrimination by providing a more comprehensive means of accounting for domestic hot water use in the code.

Does not degrade the effectiveness of the code

Increases code effectiveness by providing a more comprehensive means of accounting for domestic hot water use in the code.

Alternate Language

1st Comment Period History

7597-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** Yes

Rationale

This Alt 1 mod adds improved hot water code calculation to the original mod. The improved hot water calculation language accounts for 1) climate-specific effects on domestic hot water use, 2) the hot water distribution system type, and 3) the use of additional conservation measures. The vetted research behind this Alt 1 mod is described in a 2017 research report by the Florida Solar Energy Center which was funded and approved by the Florida Building Commission: http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-CR-2066-17.pdf.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

In many cases none, but some additional verification will be needed if certain additional water heating conservation measures are used for a given project.

Impact to building and property owners relative to cost of compliance with code

None in most cases. Slight increase in cost of compliance if heat pump or tankless gas water heaters are used for a project. However, it allows builders who employ efficient water distribution systems to take credit which may reduce cost.

Impact to industry relative to the cost of compliance with code

None in most cases. Slight increase in cost of compliance if heat pump or tankless gas water heaters are used for a project. However, it allows builders who employ efficient water distribution systems to take credit which may reduce cost.

Impact to Small Business relative to the cost of compliance with code

In applicable cases will increase cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by providing a more comprehensive means of accounting for domestic hot water use in the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing a more comprehensive means of accounting for domestic hot water use in the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Reduces discrimination by providing a more comprehensive means of accounting for domestic hot water use in the code.

Does not degrade the effectiveness of the code

Increases code effectiveness by providing a more comprehensive means of accounting for domestic hot water use in the code.

[Add footnote "i" to Table R405.5.2(1) Service water heating standard reference design efficiency specification]:

	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating [d, e, f, g]	Fuel type: as proposed Use: same as proposed design Efficiency: in accordance with prevailing federal minimum standards[i]	As proposed gal/day = 30 + (10 × Nbr) As proposed

i. For a proposed design with an instantaneous electric resistance water heater or electric storage-type water heater with a rated storage volume between 0 and 55 gallons, the standard reference design efficiency shall be the prevailing federal minimum standard efficiency of a 56 gallon electric storage-type water heater.

[No other changes to table.]

[See attached file which adds improved hot water code calculation language to original mod.]

[See attached file which adds the improved hot water code calculation language same as the Alt 1 mod does, but removes the original mod's service water heating reference changes.]

[Starting from original 7597 Table R405.5.2(1) Service water heating mod, make the following additional changes to add improved hot water code calculation language:]

	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating [d, e, f, g]	Fuel type: as proposed Use(gal/day): ~~same as proposed design~~ determined in accordance with Appendix RD Efficiency: in accordance with prevailing federal minimum standards[i]	As proposed Use (gal/day): ~~= 30 + (10 × Nbr)~~ determined in accordance with Appendix RD Efficiency: As proposed
	Energy Consumption: determined in accordance with Appendix RD	Energy Consumption: determined in accordance with Appendix RD

i. For a proposed design with an instantaneous electric resistance water heater or electric storage-type water heater with a rated storage volume between 0 and 55 gallons, the standard reference design efficiency shall be the prevailing federal minimum standard efficiency of a 56 gallon electric storage-type water heater.

[All other parts of Table R405.5.2(1) remain unchanged.]

[Add new residential energy conservation volume appendix as follows and renumber current Appendix RD to Appendix RE:]

APPENDIX RD

CALCULATION OF HOT WATER ENERGY CONSUMPTION

#-1 Domestic Hot Water (DHW) System Modeling. Domestic hot water energy consumption shall be modeled and simulated monthly or more frequently using monthly or more frequent simulation time steps in accordance with Sections #-1.1 through #-2.2. Annual domestic hot water energy consumption shall be set equal to the sum of the simulated monthly values.

#-1.1 Standard Reference Design Hot Water Use. Domestic hot water system use in gallons per day for the Standard Reference Design shall be determined in accordance with Equation #-1

$$\mathbf{HWgpd = (refDWgpd+refCWgpd+F_{mix}*(refFgpd + refWgpd))*Ndu} \qquad \textbf{Eq. \#-1}$$

where:

HWgpd = gallons per day of hot water use

refDWgpd = reference dishwasher gallons per day = ((88.4+34.9*Nbr)*8.16)/365
refCWgpd = reference clothes washer gallons per day =

(4.52*(164+46.5*Nbr))*((3*2.08+1.59)/(2.874*2.08+1.59))/365

$F_{mix} = 1 - ((T_{set} - T_{use}) / (T_{set} - T_{mains}))$
where

T_{set} = Water heater set point temperature = 125 F

T_{use} = Temperature of mixed water at fixtures = 105 F

$T_{mains} = (T_{amb,avg} + \mathit{offset}) + \mathit{ratio} * (\Delta T_{amb,max} / 2) * \sin(0.986 * (day\# - 15 - \mathit{lag}) - 90)$
where

T_{mains} = temperature of potable water supply entering residence (°F)
$T_{amb,avg}$ = annual average ambient air temperature (°F)

$\Delta T_{amb,max}$ = maximum difference between monthly average ambient air temperatures (e.g., $T_{amb,avg,july} - T_{amb,avg,january}$) (°F)

0.986 = degrees/day (360/365)

day# = Julian day of the year (1-365)

offset = 6°F

ratio = $0.4 + 0.01 (T_{amb,avg} - 44)$

lag = $35 - 1.0 (T_{amb,avg} - 44)$

refFgpd = 14.6 + 10.0*Nbr = reference climate-normalized daily fixture water use (in gallons per day)

refWgpd = $9.8 * Nbr^{0.43}$ = reference climate-normalized daily hot water waste due to distribution system losses (in gallons per day)

where

Nbr = number of bedrooms in each dwelling unit
Ndu = number of like dwelling units

#-2 Proposed Design Hot Water Use. Domestic hot water system use in gallons per day for the Proposed Design shall be determined in accordance with Equation #-2

$$HWgpd = (DWgpd + CWgpd + F_{eff} * adjF_{mix} * (refFgpd + oWgpd + sWgpd * WD_{eff})) * Ndu \quad \text{Eq. \#-2}$$

where:

HWgpd = gallons per day of hot water use in Rated home

DWgpd = dishwasher gallons per day = ((88.4+34.9*Nbr)*8.16)/365
CWgpd = clothes washer gallons per day =

(4.52*(164+46.5*Nbr))*((3*2.08+1.59)/(2.874*2.08+1.59))/365

F_{eff} = fixture effectiveness in accordance with Table #(1)

Table #(1) Hot water fixture effectiveness

Plumbing Fixture Description	F_{eff}
Standard-flow: showers <2.5 gpm and faucets <2.2 gpm	1.00
Low-flow: all showers and faucets ≤2.0 gpm	0.95

$adjF_{mix} = 1 - ((T_{set} - T_{use}) / (T_{set} - WH_{in}T))$
where

T_{set} = 125 °F = water heater set point temperature

T_{use} = 105 °F = temperature of mixed water at fixtures
$WH_{in}T$ = water heater inlet temperature

where

$WH_{in}T = T_{mains} + WH_{in}T_{adj}$ for DWHR systems and where $WH_{in}T_{adj}$ is calculated in accordance with equation #-5

$WH_{in}T = T_{mains}$ for all other hot water systems

T_{mains} = temperature of potable water supply entering the residence calculated in accordance with Section #-1

refFgpd = reference climate-normalized daily fixture water use calculated in accordance with Section #-1.1

oWgpd = refWgpd * oFrac * (1-oCD$_{eff}$) **Eq. #-3**

where

oWgpd = daily standard operating condition waste hot water quantity

oFrac = 0.25 = fraction of hot water waste from standard operating conditions
oCD_{eff}= Approved Hot Water Operating Condition Control Device effectiveness

(default = 0.0)

sWgpd = (refWgpd – refWgpd * oFrac) * pRatio * sysFactor **Eq. #-4**

where

sWgpd = daily structural waste hot water quantity

refWgpd = reference climate-normalized distribution system waste water use calculated in accordance with Section #-1.1

oFrac = 0.25 = fraction of hot water waste from standard operating conditions
pRatio = hot water piping ratio

where

for Standard systems:

pRatio = PipeL / refPipeL
where

PipeL = measured length of hot water piping from the hot water heater to the farthest hot water fixture, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 10 feet of piping for each floor level, plus 5 feet of piping for unconditioned basements (if any)

refPipeL = $2*(CFA/Nfl)^{0.5} + 10*Nfl + 5*Bsmt$ = hot water piping length for Reference Home

where

CFA = conditioned floor area

Nfl = number of conditioned floor levels in the residence, including conditioned basements

Bsmt = presence =1.0 or absence = 0.0 of an unconditioned basement in the residence

for recirculation systems:

pRatio = BranchL /10

where

BranchL = measured length of the branch hot water piping from the recirculation loop to the farthest hot water fixture from the recirculation loop, measured longitudinally from plans, assuming the branch hot water piping does not run diagonally

sysFactor = hot water distribution system factor from Table #(2)

Table #(2) Hot Water Distribution System Insulation Factors

Distribution System Description	sysFactor	
	No pipe insulation	≥R-3 pipe insulation
Standard systems	1.00	0.90
Recirculation systems	1.11	1.00

WD_{eff} = distribution system water use effectiveness from Table#(3)

Table #(3) Distribution system water use effectiveness

Distribution System Description	WD_{eff}
Standard systems	1.00
Recirculation systems	0.10

Ndu = number of dwelling units

#-2.1 Drain Water Heat Recovery (DWHR) Units

If DWHR unit(s) is (are) installed in the Rated Home, the water heater potable water supply temperature adjustment ($WH_{in}T_{adj}$) shall be calculated in accordance with Equation #-5.

$$WH_{in}T_{adj} = Ifrac*(DWHR_{in}T - T_{mains})*DWHR_{eff}*PLC*LocF*FixF \qquad \text{Eq. \#-5}$$

where

$WH_{in}T_{adj}$ = adjustment to water heater potable supply inlet temperature (°F)

$Ifrac = 0.56 + 0.015*Nbr - 0.0004*Nbr^2$ = fraction of hot water use impacted by DWHR

$DWHR_{in}T$ = 97 °F

T_{mains} = calculated in accordance with Section #-1.1

$DWHR_{eff}$ = Drain Water Heat Recovery Unit efficiency as rated and labeled in accordance with CSA 55.1

where

$DWHR_{eff} = DWHR_{eff}*1.082$ if low-flow fixtures are installed in accordance with Table #(1)

PLC = 1 - 0.0002*pLength = piping loss coefficient

where

for standard systems:

pLength = pipeL as measured accordance with Section #-2

for recirculation systems:

pLength = branchL as measured in accordance with Section #-2

LocF = a performance factor based on the installation location of the DWHR determined from Table #(4)

Table#(4) Location factors for DWHR placement

DRHR Placement	LocF
Supplies pre-heated water to both the fixture cold water piping and the hot water heater potable supply piping	1.000
Supplies pre-heated water to only the hot water heater potable supply piping	0.777
Supplies pre-heated water to only the fixture cold water piping	0.777

FixF = Fixture Factor

where

FixF = 1.0 if all of the showers in the home are connected to DWHR units

FixF = 0.5 if there are 2 or more showers in the home and only 1 shower is connected to a DWHR unit.

#-2.2 Hot Water System Annual Energy Consumption

Service hot water energy consumption shall be calculated using Approved Software Tools and the provisions of Section #-1, Section #-2 and Section #-2.1 shall be followed to determine appropriate inputs to the calculations.

If the Proposed Design includes a hot water recirculation system, the annual electric consumption of the recirculation pump shall be added to the total hot water energy consumption. The recirculation pump kWh/y shall be calculated using Equation #-6

pumpkWh/y = pumpW * Efact **Eq. #-6**

where:

pumpW = pump power in watts (default pumpW = 50 watts)

Efact = factor selected from Table #(5)

Table #(5) Annual electricity consumption factor for hot water recirculation system pumps

Recirculation System Description	Efact
Recirculation without control or with timer control	8.76

Recirculation with temperature control	1.46
Recirculation with demand control (presence sensor)	0.15
Recirculation with demand control (manual)	0.10

Results from standard hot water energy consumption calculations considering only tested Energy Factor data ($stdEC_{HW}$) shall be adjusted to account for the energy delivery effectiveness of the hot water distribution system in accordance with equation #-7.

$EC_{HW} = stdEC_{HW} * (E_{waste} + 128) / 160$ **Eq. #-7**

where E_{waste} is calculated in accordance with equation #-8.

$E_{waste} = oEW_{fact} * (1\text{-}oCD_{eff}) + sEW_{fact} * pEratio$ **Eq. #-8**

where

$oEW_{fact} = EW_{fact} * oFrac$ = standard operating condition portion of hot water energy waste where

EW_{fact} = energy waste factor in accordance with Table #(6) oCD_{eff} is in accordance with Section #-2

$sEW_{fact} = EW_{fact} - oEW_{fact}$ = structural portion of hot water energy waste pEratio = piping length energy ratio

where

for standard system: pEratio = PipeL / refpipeL for recirculation systems: pEratio = LoopL / refLoopL and where

LoopL = hot water recirculation loop piping length including both supply and return sides of the loop, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 20 feet of piping for each floor level greater than one plus 10 feet of piping for unconditioned basements.

refLoopL = 2.0*refPipeL - 20

Table #(6) Hot water distribution system
relative annual energy waste factors

Distribution System Description	**EW_{fact}**	
	No pipe insulation	>R-3 pipe insulation
Standard systems	32.0	28.8
Recirculation without control or with timer control	500	250
Recirculation with temperature control	375	187.5
Recirculation with demand control (presence sensor)	64.8	43.2
Recirculation with demand control (manual)	43.2	28.8

[Starting from original 7597 Table R405.5.2(1) Service water heating mod, make the following changes, in effect removing the original mod's standard reference design efficiency change and adding improved hot water code calculation language:]

	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Service water heating d, e, f, g	Fuel type: as proposed Use (gal/day): ~~same as proposed design~~ determined in accordance with Appendix RD Efficiency: in accordance with prevailing federal minimum standards~~i~~	Fuel type: As proposed Use (gal/day): ~~= 30 + (10 × Nbr)~~ determined in accordance with Appendix RD Efficiency: As proposed
	Energy Consumption: determined in accordance with Appendix RD	Energy Consumption: determined in accordance with Appendix RD

~~i. For a proposed design with an instantaneous electric resistance water heater or electric storage type water heater with a rated storage volume between 0 and 55 gallons, the standard reference design efficiency shall be the prevailing federal minimum standard efficiency of a 56 gallon electric storage-type water heater.~~

[All other parts of Table R405.5.2(1) remain unchanged.]

[Add new residential energy conservation volume appendix as follows and renumber current Appendix RD to Appendix RE:]

APPENDIX RD

CALCULATION OF HOT WATER ENERGY CONSUMPTION

#-1 Domestic Hot Water (DHW) System Modeling. Domestic hot water energy consumption shall be modeled and simulated monthly or more frequently using monthly or more frequent simulation time steps in accordance with Sections #-1.1 through #-2.2. Annual domestic hot water energy consumption shall be set equal to the sum of the simulated monthly values.

#-1.1 Standard Reference Design Hot Water Use. Domestic hot water system use in gallons per day for the Standard Reference Design shall be determined in accordance with Equation #-1

$$\mathbf{HWgpd = (refDWgpd+refCWgpd+F_{mix}*(refFgpd + refWgpd))*Ndu} \qquad \textbf{Eq. \#-1}$$

where:

HWgpd = gallons per day of hot water use

refDWgpd = reference dishwasher gallons per day = ((88.4+34.9*Nbr)*8.16)/365

refCWgpd = reference clothes washer gallons per day =

$$(4.52*(164+46.5*Nbr))*((3*2.08+1.59)/(2.874*2.08+1.59))/365$$

$F_{mix} = 1 - ((T_{set} - T_{use}) / (T_{set} - T_{mains}))$
where

T_{set} = Water heater set point temperature = 125 F

T_{use} = Temperature of mixed water at fixtures = 105 F

$T_{mains} = (T_{amb,avg} + \mathit{offset}) + \mathit{ratio} * (\Delta T_{amb,max} / 2) * \sin(0.986 * (day\# - 15 - \mathit{lag}) - 90)$
where

T_{mains} = temperature of potable water supply entering residence (°F)
$T_{amb,avg}$ = annual average ambient air temperature (°F)

$\Delta T_{amb,max}$ = maximum difference between monthly average ambient air temperatures (e.g., $T_{amb,avg,july} - T_{amb,avg,january}$) (°F)

0.986 = degrees/day (360/365)

day# = Julian day of the year (1-365)

offset = 6°F

ratio = $0.4 + 0.01\,(T_{amb,avg} - 44)$

lag = $35 - 1.0\,(T_{amb,avg} - 44)$

refFgpd = 14.6 + 10.0*Nbr = reference climate-normalized daily fixture water use (in gallons per day)

refWgpd = $9.8 * Nbr^{0.43}$ = reference climate-normalized daily hot water waste due to distribution system losses (in gallons per day)

where

Nbr = number of bedrooms in each dwelling unit
Ndu = number of like dwelling units

#-2 Proposed Design Hot Water Use. Domestic hot water system use in gallons per day for the Proposed Design shall be determined in accordance with Equation #-2

$$\mathbf{HWgpd = (DWgpd + CWgpd + F_{eff} * adjF_{mix} * (refFgpd + oWgpd + sWgpd * WD_{eff})) * Ndu} \qquad \textbf{Eq. \#-2}$$

where:

HWgpd = gallons per day of hot water use in Rated home

DWgpd = dishwasher gallons per day = ((88.4+34.9*Nbr)*8.16)/365
CWgpd = clothes washer gallons per day =

(4.52*(164+46.5*Nbr))*((3*2.08+1.59)/(2.874*2.08+1.59))/365

F_{eff} = fixture effectiveness in accordance with Table #(1)

Table #(1) Hot water fixture effectiveness

Plumbing Fixture Description	**F_{eff}**
Standard-flow: showers <2.5 gpm and faucets <2.2 gpm	1.00
Low-flow: all showers and faucets ≤2.0 gpm	0.95

$adjF_{mix} = 1 - ((T_{set} - T_{use}) / (T_{set} - WH_{in}T))$
where

T_{set} = 125 °F = water heater set point temperature

T_{use} = 105 °F = temperature of mixed water at fixtures
$WH_{in}T$ = water heater inlet temperature

where

$WH_{in}T = T_{mains} + WH_{in}T_{adj}$ for DWHR systems and where $WH_{in}T_{adj}$ is calculated in accordance with equation #-5

$WH_{in}T = T_{mains}$ for all other hot water systems

T_{mains} = temperature of potable water supply entering the residence calculated in accordance with Section #-1

refFgpd = reference climate-normalized daily fixture water use calculated in accordance with Section #-1.1

oWgpd = refWgpd * oFrac * (1-oCD$_{eff}$) **Eq. #-3**

where

oWgpd = daily standard operating condition waste hot water quantity

oFrac = 0.25 = fraction of hot water waste from standard operating conditions
oCD_{eff} = Approved Hot Water Operating Condition Control Device effectiveness

(default = 0.0)

sWgpd = (refWgpd – refWgpd * oFrac) * pRatio * sysFactor **Eq. #-4**

where

sWgpd = daily structural waste hot water quantity

refWgpd = reference climate-normalized distribution system waste water use calculated in accordance with Section #-1.1

oFrac = 0.25 = fraction of hot water waste from standard operating conditions
pRatio = hot water piping ratio

where

for Standard systems:

pRatio = PipeL / refPipeL
where

PipeL = measured length of hot water piping from the hot water heater to the farthest hot water fixture, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 10 feet of piping for each floor level, plus 5 feet of piping for unconditioned basements (if any)

refPipeL = $2*(CFA/Nfl)^{0.5} + 10*Nfl + 5*Bsmt$ = hot water piping length for Reference Home

where

CFA = conditioned floor area

Nfl = number of conditioned floor levels in the residence, including conditioned basements

Bsmt = presence =1.0 or absence = 0.0 of an unconditioned basement in the residence

for recirculation systems:

pRatio = BranchL /10
where

BranchL = measured length of the branch hot water piping from the recirculation loop to the farthest hot water fixture from the recirculation loop, measured longitudinally from plans, assuming the branch hot water piping does not run diagonally

sysFactor = hot water distribution system factor from Table #(2)

Table #(2) Hot Water Distribution System Insulation Factors

Distribution System Description	**sysFactor**	
	No pipe insulation	≥R-3 pipe insulation
Standard systems	1.00	0.90
Recirculation systems	1.11	1.00

WD_{eff} = distribution system water use effectiveness from Table#(3)

Table #(3) Distribution system water use effectiveness

Distribution System Description	**WD_{eff}**
Standard systems	1.00
Recirculation systems	0.10

Ndu = number of dwelling units

#-2.1 Drain Water Heat Recovery (DWHR) Units

If DWHR unit(s) is (are) installed in the Rated Home, the water heater potable water supply temperature adjustment ($WH_{in}T_{adj}$) shall be calculated in accordance with Equation #-5.

$$WH_{in}T_{adj} = Ifrac*(DWHR_{in}T - T_{mains})*DWHR_{eff}*PLC*LocF*FixF \qquad \text{Eq. \#-5}$$

where

$WH_{in}T_{adj}$ = adjustment to water heater potable supply inlet temperature (°F)

Ifrac = 0.56 + 0.015*Nbr – 0.0004*Nbr^2 = fraction of hot water use impacted by DWHR
$DWHR_{in}T$ = 97 °F

T_{mains} = calculated in accordance with Section #-1.1

$DWHR_{eff}$ = Drain Water Heat Recovery Unit efficiency as rated and labeled in accordance with CSA 55.1

where

$DWHR_{eff} = DWHR_{eff}*1.082$ if low-flow fixtures are installed in accordance with Table #(1)

PLC = 1 - 0.0002*pLength = piping loss coefficient
where

for standard systems:

pLength = pipeL as measured accordance with Section #-2

for recirculation systems:

pLength = branchL as measured in accordance with Section #-2

LocF = a performance factor based on the installation location of the DWHR determined from Table #(4)

Table#(4) Location factors for DWHR placement

DRHR Placement	LocF
Supplies pre-heated water to both the fixture cold water piping and the hot water heater potable supply piping	1.000
Supplies pre-heated water to only the hot water heater potable supply piping	0.777
Supplies pre-heated water to only the fixture cold water piping	0.777

FixF = Fixture Factor

where

FixF = 1.0 if all of the showers in the home are connected to DWHR units

FixF = 0.5 if there are 2 or more showers in the home and only 1 shower is connected to a DWHR unit.

#-2.2 Hot Water System Annual Energy Consumption

Service hot water energy consumption shall be calculated using Approved Software Tools and the provisions of Section #-1, Section #-2 and Section #-2.1 shall be followed to determine appropriate inputs to the calculations.

If the Proposed Design includes a hot water recirculation system, the annual electric consumption of the recirculation pump shall be added to the total hot water energy consumption. The recirculation pump kWh/y shall be calculated using Equation #-6

pumpkWh/y = pumpW * Efact **Eq. #-6**

where:

pumpW = pump power in watts (default pumpW = 50 watts)

Efact = factor selected from Table #(5)

Table #(5) Annual electricity consumption factor
for hot water recirculation system pumps

Recirculation System Description	Efact
Recirculation without control or with timer control	8.76

Recirculation with temperature control	1.46
Recirculation with demand control (presence sensor)	0.15
Recirculation with demand control (manual)	0.10

Results from standard hot water energy consumption calculations considering only tested Energy Factor data ($stdEC_{HW}$) shall be adjusted to account for the energy delivery effectiveness of the hot water distribution system in accordance with equation #-7.

$EC_{HW} = stdEC_{HW} * (E_{waste} + 128) / 160$ **Eq. #-7**

where E_{waste} is calculated in accordance with equation #-8.

$E_{waste} = oEW_{fact} * (1\text{-}oCD_{eff}) + sEW_{fact} * pEratio$ **Eq. #-8**

where

$oEW_{fact} = EW_{fact} * oFrac$ = standard operating condition portion of hot water energy waste where

EW_{fact} = energy waste factor in accordance with Table #(6) oCD_{eff} is in accordance with Section #-2

$sEW_{fact} = EW_{fact} – oEW_{fact}$ = structural portion of hot water energy waste pEratio = piping length energy ratio

where

for standard system: pEratio = PipeL / refpipeL for recirculation systems: pEratio = LoopL / refLoopL and where

LoopL = hot water recirculation loop piping length including both supply and return sides of the loop, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 20 feet of piping for each floor level greater than one plus 10 feet of piping for unconditioned basements.

refLoopL = 2.0*refPipeL - 20

Table #(6) Hot water distribution system relative annual energy waste factors

Distribution System Description	**EW_{fact}**	
	No pipe insulation	>R-3 pipe insulation
Standard systems	32.0	28.8
Recirculation without control or with timer control	500	250
Recirculation with temperature control	375	187.5
Recirculation with demand control (presence sensor)	64.8	43.2
Recirculation with demand control (manual)	43.2	28.8

Performance Compliance Stringency Increase Comparison from Mod 7597 Reference Water Heater Efficiency Increase

Comparing sample Tampa project *EnergyGauge USA* run #1 below with run #2 (same project with 1.99 EF water heater, which would be the reference EF for 50 gallon electric water heaters under Mod 7597) shows the 1.99 EF water heater to reduce the total performance compliance e-Ratio by 0.07. This e-Ratio reduction is approximately equivalent to increasing the heat pump efficiency for this project from baseline SEER 14 / HSPF 8.2 to SEER 15.4 / HSPF 8.5 (run #3), or to reducing the window SHGC from 0.25 to 0.14 (run #4). [Differences between run #1 and all other runs highlighed in red.]

1) Tampa Single-family w/ 50 gallon 0.945 EF WH, 0.25 SHGC Glass, SEER 14 / HSPF 8.2 HP, and Leak Free (Qn_{out}= 0.03) Attic Ducts

Florida Code Performance Summary 2017

	Std. Reference	Proposed	e-Ratio
Heating:	3.91	3.73	0.95
Cooling:	52.50	52.62	1.00
Hot Water:	7.61	7.61	1.00
Total:	64.03	63.97	1.00

Glass/Floor Area: 0.160

PASS

View Multiple Reports | View Report(R405) | Print Multiple Reports | Close

2) Tampa Single-family w/ 50 gallon 1.99 EF WH, 0.25 SHGC Glass, SEER 14 / HSPF 8.2 HP, and Leak Free (Qn_{out}= 0.03) Attic Ducts

Florida Code Performance Summary 2017

	Std. Reference	Proposed	e-Ratio
Heating:	3.91	3.73	0.95
Cooling:	52.50	52.57	1.00
Hot Water:	7.61	3.54	0.47
Total:	64.03	59.84	0.93

Glass/Floor Area: 0.160

PASS

View Multiple Reports | View Report(R405) | Print Multiple Reports | Close

3) Tampa Single-family w/ 50 gallon 0.945 EF WH, 0.25 SHGC Glass, SEER 15.4 / HSPF 8.5 HP, and Leak Free (Qn_{out}= 0.03) Attic Ducts

Florida Code Performance Summary 2017

	Std. Reference	Proposed	e-Ratio
Heating:	3.91	3.61	0.92
Cooling:	52.50	48.60	0.93
Hot Water:	7.61	7.61	1.00
Total:	64.03	59.82	0.93

Glass/Floor Area: 0.160

PASS

View Multiple Reports | View Report(R405) | Print Multiple Reports | Close

4) Tampa Single-family w/ 50 gallon 0.945 EF WH, 0.14 SHGC Glass, SEER 14 / HSPF 8.2 HP, and Leak Free (Qn_{out}= 0.03) Attic Ducts

Florida Code Performance Summary 2017

	Std. Reference	Proposed	e-Ratio
Heating:	3.91	4.28	1.10
Cooling:	52.50	47.64	0.91
Hot Water:	7.61	7.61	1.00
Total:	64.03	59.54	0.93

Glass/Floor Area: 0.160

PASS

View Multiple Reports | View Report(R405) | Print Multiple Reports | Close

EN7649

Date Submitted	12/3/2018	**Section**	403.13	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

7651

Summary of Modification

Adds dehumidifier code sections.

Rationale

Recent Florida Solar Energy Center (FSEC) research conducted for the Florida Building Commission provides code dehumidifier recommendations which are hereby submitted for the 2020 Florida code cycle.

The full FSEC dehumidifier report is available at:
http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/07/FSEC-CR-2038-18.pdf.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None if dehumidifiers are not included in a project; if included this change will require some additional enforcement effort.

Impact to building and property owners relative to cost of compliance with code

None if dehumidifiers are not included in project; some impact possible in applicable cases depending on current practice.

Impact to industry relative to the cost of compliance with code

None if dehumidifiers are not included in project; some impact possible in applicable cases depending on current practice.

Impact to small business relative to the cost of compliance with code

None if dehumidifiers are not included in project; some impact possible in applicable cases depending on current practice.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by providing research based requirements for efficient new construction dehumidifier installations in the state. Also reinforces proper condensate drainage for dehumidifiers.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing research based requirements for efficient new construction dehumidifier installations in the state, and by reinforcing proper condensate drainage for dehumidifiers.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; provides requirements for new code equipment category.

Does not degrade the effectiveness of the code

Does not degrade code effectiveness; provides requirements for new code equipment category, and reinforces proper condensate drainage for dehumidifiers.

R403.13 Dehumidifiers (Mandatory).

If installed, a dehumidifier shall conform to the following requirements:

1. Dehumidifier sizing shall be in accordance with ACCA Manual S.

2. The minimum rated efficiency of the dehumidifier shall be greater than 1.7 Liters/ kWh if the total dehumidifier capacity for the house is less than 75 pints/day and greater than 2.38 Liters/kWh if the total dehumidifier capacity for the house is greater than or equal to 75 pints/day.

3. Operation of the dehumidifier shall not require operation of the cooling system air handler fan.

4. Control of the dehumidifier shall be by a dehumidistat that is installed in a location where it is exposed to mixed house air and does not receive undue direct influence from mechanical ventilation air or supply air from the cooling or heating system(s).

5. Any dehumidifier unit located in unconditioned space that treats air from conditioned space shall be insulated to a minimum of R-2.

6. Condensate disposal shall be in accordance with Section M1411.3.1 of the *Florida Building Code, Residential.*

R403.13.1 Ducted Dehumidifiers.

Ducted dehumidifiers shall, in addition to conforming to the requirements of Section R403.13, conform to the following requirements:

1. If a ducted dehumidifier is configured with return and supply ducts both connected into the supply side of the cooling system, a backdraft damper shall be installed in the supply air duct between the dehumidifier inlet and outlet duct.

2. If a ducted dehumidifier is configured with only its supply duct connected into the supply side of the central heating and cooling system, a backdraft damper shall be installed in the dehumidifier supply duct between the dehumidifier and central supply duct.

3. A ducted dehumidifier shall not be ducted to or from a central ducted cooling system on the return duct side upstream from the central cooling evaporator coil.

4. Ductwork associated with a dehumidifier located in unconditioned space shall be insulated to a minimum of R-6.

EN7651

Date Submitted	12/3/2018	**Section**	405.5.2	**Proponent**	Jeff Sonne for FSEC
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No   **Alternate Language** No

Related Modifications

7649

Summary of Modification

Adds dehumidifier and dehumidistat sections to performance compliance Table R405.5.2(1).

Rationale

Recent Florida Solar Energy Center (FSEC) research conducted for the Florida Building Commission provides code dehumidifier recommendations which are hereby submitted for the 2020 Florida code cycle.

The full FSEC dehumidifier report is available at:
http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/07/FSEC-CR-2038-18.pdf.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None; for software developers.

Impact to building and property owners relative to cost of compliance with code

None if dehumidifiers are not included in project; minor impact possible in applicable cases.

Impact to industry relative to the cost of compliance with code

None if dehumidifiers are not included in project; minor impact possible in applicable cases.

Impact to small business relative to the cost of compliance with code

None if dehumidifiers are not included in project; minor impact possible in applicable cases.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by providing research based stipulations for how dehumidifiers are to be accounted for in performance code calculations which also facilitates consistency among software providers.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by providing research based stipulations for how dehumidifiers are to be accounted for in performance code calculations which also facilitates consistency among software providers.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; provides research based stipulations for how dehumidifiers are to be accounted for in performance code calculations.

Does not degrade the effectiveness of the code

Improves code effectiveness by providing research based stipulations for how dehumidifiers are to be accounted for in performance code calculations which also facilitates consistency among software providers.

[Add following two sections to Table R405.5.2(1); no other changes to table.]

Building Component	Standard Reference Design	Proposed Design
Dehumidification Systems	None, except where dehumidification equipment is specified by the proposed design, in which case:	As proposed
	Fuel Type: electric	As proposed
	Capacity: sufficient to maintain humidity at setpoint all hours	Sufficient to maintain humidity at setpoint all hours
	Efficiency: 1.7 Liters/kWh if proposed house total capacity is less than 75 pints/day; 2.38 Liters/kWh if proposed house total capacity is greater than or equal to 75 pints per day	As proposed
	Location: in conditioned space	As proposed
	Dehumidifier Ducts: None	As proposed
	Dehumidifier Duct Location: N/A	As proposed
	Dehumidifier Duct R Value: N/A	As proposed
	Dehumidifier Duct Surface Area: N/A	As proposed

Dehumidistat	None, except where dehumidification equipment is specified by the proposed design, in which case: Setpoint turn on = 60% relative humidity Setpoint turn off = 55% relative humidity	Same as standard reference design

EN7783

Date Submitted	12/8/2018	**Section**	403.5.1	**Proponent**	David Porter
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **Yes**

Related Modifications

R403.5.1 Heated water circulation and temperature maintenance systems (Mandatory). IF Heated water circulation systems ARE INSTALLED, THEY shall be in accordance with Section R403.5.1.1. See Declaratory Statement DS 2018-066 approved by the FBC.

Summary of Modification

Plan reviewers & inspectors have misinterpreted 403.5.1 to mean that HW recirc systems are mandatory for every 1 & 2 family dwelling. They are not. It is the controls that are mandatory IF a HW recirc system is installed.

Rationale

Remove ambiguity about whether HW recirc systems are mandatory in all new 1 & 2 family dwellings or whether this code section requires control systems IF a HW recirc system is installed.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

None.

Impact to industry relative to the cost of compliance with code

None.

Impact to small business relative to the cost of compliance with code

None.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Clarifies ambiguous language in a code section.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Clarifies ambiguous language in a code section.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

Does not. It improves the clarity of the Code.

Alternate Language

1st Comment Period History

7783-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** Yes

Rationale

Clarifies circulation system control requirements as outlined in the Discussion and Recommendation sections of the Florida Building Commission funded Improved Hot Water Code Calculation report prepared by the Florida Solar Energy Center: http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/06/FSEC-CR-2066-17.pdf.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Helps clarify code and facilitate enforcement.

Impact to building and property owners relative to cost of compliance with code

None; clarification only.

Impact to industry relative to the cost of compliance with code

None; clarification only.

Impact to Small Business relative to the cost of compliance with code

None.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by clarifying code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by clarifying it.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; clarification only.

Does not degrade the effectiveness of the code

Increases code effectiveness by clarifying it.

1st Comment Period History

EN7783-G1

Proponent Jeff Sonne for FSEC **Submitted** 2/13/2019 **Attachments** No

Comment:

The Florida Solar Energy Center supports this clarification.

1st Comment Period History

EN7783-G2

Proponent David Porter **Submitted** 2/18/2019 **Attachments** No

Comment:

I concur with the alternate language, except where at the end of the line that identifies that section, it has the word "Mandatory." That is what started the 6th Ed confusion with plans reviewers in the first place. They could not get past that word meaning that hot water recirc systems are mandatory in all new one and two family dwellings. I question whether the clarifying language as written in the proposed modification will allow all inspectors and reviewers to see past the "mandatory" word to understand that recirc systems are NOT mandatory but if they are installed as an owner's or builder's option, then they must have mandatory controls. Perhaps the wording of the title for this section should read "Hot water recirc systems controls (Mandatory)".

R403.5.1 Heated water circulation and temperature maintenance systems (Mandatory). IF Heated water circulation systems ARE INSTALLED, THEY shall be in accordance with Section R403.5.1.1.

[Starting with mod 7783 text, add the following:]

R403.5.1 Heated water circulation and temperature maintenance systems (Mandatory).

If heated water circulation systems are installed, they shall be in accordance with Section R403.5.1.1 and controls shall be in accordance with Section R403.5.2. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily accessible.

EN7802

Date Submitted	12/9/2018	**Section**	405.4.2.2	**Proponent**	Mo Madani
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

None

Summary of Modification

Incorporating Commission's declaratory statements as required by 553.73(7)(d), Florida Statutes. DS2018-034

Rationale

To clarify that compliance report for certificate of occupancy is not required when there is no change to the proposed design during the course of construction.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

The proposed code change provide clarification to the code.

Impact to building and property owners relative to cost of compliance with code

There is no fiscal impact to building and property owners relative to the cost of compliance.

The proposed code change provide clarification to the code.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

The proposed code change provide clarification to the code.

Impact to small business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.
The proposed code change provide clarification to the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety and welfare of the general public.

The proposed code change provide for needed clarification to the code

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

The code change provides clarification to the code.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

The provide code change improve the effectiveness of the code by provided needed clarification

Revise section R405.4.2.2 to read as follows:

R405.4.2.2 Compliance report for certificate of occupancy.

A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.

2. A statement indicating that the as-built building complies with Section R405.3.

3. A certificate indicating that the building passes the performance matrix for code compliance and listing the energy saving features of the buildings.

4. A site-specific energy analysis report that is in compliance with Section R405.3.

5. The name of the individual performing the analysis and generating the report.

6. The name and version of the compliance software tool.

Exception: If there is no change to the proposed design during the course of construction and all required inspections to verify compliance has been performed a compliance report for certificate of occupancy is not required.

FILED
Department of Business and Professional Regulation
Deputy Agency Clerk
CLERK Brandon Nichols
Date 7/27/2018
File # 2018-06075

STATE OF FLORIDA
BUILDING COMMISSION

In the Matter of

CITY OF WINTER PARK

Petitioner.
_______________________________/

DS 2018-034

DECLARATORY STATEMENT

The foregoing proceeding came before the Florida Building Commission (Commission) by a Petition from Ashley Ong, for the City of Winter Park (Petitioner) that was received April 30, 2018. Based on the statements in the petition, the material subsequently submitted and the subsequent request by the Petitioner, the Commission states the following:

Findings of Fact

1. The petition is filed pursuant to, and must conform to the requirements of Rule 28-105.002, Florida Administrative Code.

2. Petitioner's representative in this matter is Ashley Ong, 401 Park Avenue, South, Winter Park, FL 32789.

3. Petitioner is a city whose building department will be performing inspections on a single-family residence and confirming the building's compliance with the Florida Building Code in order to issue a certificate of occupancy for it.

4. Petitioner seeks clarification of section R405.4.2.2, Florida Building Code, Energy Conservation, 6th Edition (2017), as it pertains to documentation which can be used to establish compliance with the Florida Building Code's residential energy efficiency requirements.

5. Specifically, the Petitioner requests answers to the following questions based upon the project described within the petition for declaratory statement:

1. Is "indicating that the building passes the performance matrix" (referenced in R405.4.2.2 Item 3) the same task as confirming the as-proposed design from R405.3 (referenced in R405.4.2.2 Item 2)?

2. Can the paperwork (as printed out from Florida Building Commission approved software) submitted for R405.4.2.1 also be used to meet R405.4.2.2?

3. If there is no change to the proposed design during the course of the construction and all required inspections to verify compliance are performed, is there a need for the building department to request the as-built compliance report per Section 405.4.2.2 prior to the issuance of the certificate of occupancy?

4. If there are changes to the proposed design during the course of construction and the compliance report is amended, and submitted for review and approval prior to conducting the required inspections, is there a need for the building department to request the as-built compliance report per Section 405.4.2.2 prior to the issuance of the certificate of occupancy?

Conclusions of Law

6. The Commission has the specific statutory authority pursuant to Section 553.775(3)(a), Florida Statutes (2018) to interpret the provisions of the Florida Building Code by issuing a declaratory statement.

7. Section R101.5, Florida Building Code, Energy Conservation, 6th Edition (2017), provides:

> **R101.5 Compliance.**
> *Residential buildings* shall meet the provisions of Florida Building Code, Energy Conservation— Residential Provisions. *Commercial buildings* shall meet the provisions of Florida Building Code, Energy Conservation— Commercial Provisions.
>
> **R101.5.1 Compliance materials.**
> The Florida Building Commission shall approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code. Commission approved code compliance demonstration forms can be found in Table R101.5.1.

TABLE R101.5.1
INDEX TO CODE COMPLIANCE FORMS

FORM	WHERE FOUND
Form R402	Appendix RD
Florida REScheck	Computer printout
Form R405	Commission approved software printout

R101.5.1.1 Residential ≤ 3 stories.

R101.5.1.1.1 Building thermal envelope alternative.
An accurately completed Residential Building Form R402 shall be submitted to the code official to demonstrate code compliance by this method. Alternatively, a Florida REScheck computer printout may be submitted to demonstrate compliance by Sections R402, R403 andR404.

R101.5.1.1.2 Simulated performance alternative.
An accurately completed Residential Building Form R405 (generated by Commission approved software) demonstrating that code compliance has been achieved shall be submitted to the building official for compliance by Section R405.

8. Section R103.4, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

Amended construction documents.
Work shall be installed in accordance with the approved construction documents, and any 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.

9. Section R104.1, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

General.
Construction or work for which a permit is required shall be subject to inspection by the *code official* or his or her designated agent, and such construction or work shall remain accessible and exposed for inspection purposes until approved. 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.

10. Section R104.2.5, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

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.

11. Section R104.6, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

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

12. Section R405.3, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

Performance-based compliance.
Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have annual total normalized Modified Loads that are less than or equal to the annual total loads of the *standard reference design* as calculated in accordance with Appendix RC of this standard.

13. Section R405.4, Florida Building Code, Energy Conservation, 6th Edition (2017) provides:

R405.4.2 Compliance report.

Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the *code official* before a certificate of occupancy is issued. Batch sampling of buildings to determine energy code compliance for all buildings in the batch shall be prohibited.

Compliance reports shall include information in accordance with Sections R405.4.2.1 and R405.4.2.2.

Where the *proposed design* of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the *proposed design* for the purposes of the application for the building permit shall be based on the worst-case orientation, worst-case configuration, worst-case building air leakage and worst- case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

R405.4.2.1 Compliance report for permit application.
A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.
2. A statement indicating that the *proposed design* complies with Section R405.3.
3. An inspection checklist documenting the building component characteristics of the *proposed design* as indicated in Table R405.5.2(1). The inspection checklist shall show results for the *proposed design* with user inputs to the compliance software to generate the results.
4. A site-specific energy analysis report that is in compliance with Section R405.3.
5. The name of the individual performing the analysis and generating the report.
6. The name and version of the compliance software tool.

Exception: Multiple orientations. When an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four cardinal (north, east, south and west) orientations, or the "Worst" orientation. Compliance software tools may calculate the "Worst Case" orientation by rotating the building through the 4 or 8 cardinal orientations.

R405.4.2.2 Compliance report for certificate of occupancy.
A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.
2. A statement indicating that the as-built building complies with Section R405.3.
3. A certificate indicating that the building passes the performance matrix for code compliance and listing the energy saving features of the buildings.
4. A site-specific energy analysis report that is in compliance with Section R405.3.
5. The name of the individual performing the analysis and generating the report.
6. The name and version of the compliance software tool.

14. Section R405.4.3, Florida Building Code, Energy Conservation, 6th Edition (2017), states:

Additional documentation.
The *code official* shall be permitted to require the following documents:
1. Verification that an EPL display card signed by the builder providing the building component characteristics of the *proposed design* will be provided to the purchaser of the home at time of title transfer.
2. Documentation of the component efficiencies used in the software calculations for the *proposed design*.

15. Section 107.4, Florida Building Code, Building, 6th Edition (2017), states:

Amended construction documents.
Work shall be installed in accordance with the *approved construction documents*, and any 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*.

16. Section 110.3.7, Florida Building Code, Building, 6th Edition (2017), states:

Energy efficiency inspections.

Inspections shall be made to determine compliance with Chapter 13 and shall include, but not be limited to, inspections for: envelope insulation R- and U-values, fenestration U-value, duct system R-value, and HVAC and water-heating equipment efficiency.

17. Section 1301, Florida Building Code, Building, 6th Edition (2017), provides:

1301.1 Scope.
This chapter governs the design and construction of buildings for energy efficiency.

1301.1.1 Criteria.
Buildings shall be designed and constructed in accordance with the Florida Building Code, Energy Conservation.

18. Section 553.998, Florida Statutes (2018), states that

All ratings must be determined using tools and procedures developed by the systems recognized under this part and must be certified by the rater as accurate and correct and in compliance with procedures of the system under which the rater is certified. The local enforcement agency shall accept duct and air infiltration tests conducted in accordance with the Florida Building Code, 5th Edition (2014) Energy Conservation, by individuals as defined in s. 553.993(5) or (7) or individuals licensed as set forth in s. 489.105(3)(f), (g), or (i). The local enforcement agency may accept inspections in whole or in part by individuals as defined in s. 553.993(5) or (7).

19. In response to Petitioner's question 1, the answer is yes. This is with the understanding that no change was made during the course of construction to the proposed design energy measures as submitted under section 405.4.2.1, Florida Building Code, Energy Conservation, 6th Edition (2017).

20. In response to Petitioner's question 2, the answer is yes. This is with the understanding that no change was made during the course of construction to the proposed design energy measures as submitted under section 405.4.2.1, Florida Building Code, Energy Conservation, 6th Edition (2017).

21. In response to Petitioner's question 3, the answer is no, provided that the building department confirms compliance with the code through its inspection duties as required by section 104, Florida Building Code, Energy Conservation, 6th Edition (2017).

22. In response to Petitioner's question 4, the answer is no, provided that the building department confirms compliance with the code through the provisions of section 103.4, Florida Building Code, Energy Conservation, 6th Edition (2017), and its inspection duties as required by section 104, Florida Building Code, Energy Conservation, 6th Edition (2017).

DONE AND ORDERED this 23rd day of JULY, 2018, in Punta Gorda, Charlotte County, State of Florida.

E. JAY CARLSON
Chairman, Florida Building Commission

NOTICE OF RIGHT TO APPEAL

Petitioner and all other interested parties are hereby advised of their right to seek judicial review of this Order in accordance with Section 120.68(2)(a), Florida Statutes (2018), and Florida Rules of Appellate Procedure 9.110(a) and 9.030(b)(1)(C). To initiate an appeal, a Notice of Appeal must be filed with the Agency Clerk, Department of Business and Professional Regulation, 2601 Blair Stone Road, Tallahassee, Florida 32399-2203 and with the appropriate District Court of Appeal not later than thirty (30) days after this Order is filed with the Clerk of the Department of Business and Professional Regulation. A Notice of Appeal filed with the District Court of Appeal shall be accompanied by the filing fee specified by Section 35.22(3), Florida Statutes (2018).

CERTIFICATE OF FILING AND SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing order has been filed with the undersigned and furnished by U. S. Mail to the persons listed below this 27th day of July, 2018.

Brenda M. Nichols

Agency Clerk's Office
Department of Business and Professional Regulation
& Florida Building Commission
2601 Blair Stone Road
Tallahassee, Florida 32399-2203

Via U.S. Mail

City of Winter Park
Attn: Ashley Ong
401 Park Avenue, South
Winter Park, FL 32789

Via Inter-Office or Email Delivery

Mo Madani, Planning Manager
Codes and Standards Section
Department of Business and Professional Regulation
2601 Blair Stone Road
Tallahassee, Florida 32399
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Marjorie Holladay
Joint Administrative Procedures Committee
Pepper Building, Room 680
Tallahassee, Florida 32399-1300

EN7958

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Date Submitted 12/12/2018	**Section** 402.1	**Proponent** Joseph Belcher for FHBA
Chapter 4	**Affects HVHZ** Yes	**Attachments** Yes

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments No **Alternate Language** No

Related Modifications

Summary of Modification

Adds Exception for log homes.

Rationale

This is an extract from the original ICC proponent's Reason for the change requested. Please see the uploaded support file for the full Reason. The design, construction and performance of log walls are quite different than the convention construction methods detailed in the IRC (and residential requirements of the IECC). ICC400 responds to the thermal envelope requirements of the IRC Chapter 11 and IECC Chapter 4. The standard offers prescriptive, calculated/engineered and performance/testing paths for substantiating the performance of log walls, and trade-off packages for each Climate Zone. Therefore, the thermal envelope of log homes would be evaluated as follows:

- THERMAL: ICC400-2012 Section 305 Thermal Envelope presents requirements for weather protection and determination of thermal properties, offering prescriptive, calculation, and performance options. TABLE 305.3.1.2 Insulation and Fenestration Requirements by Component provides one such prescriptive option.
- AIR INFILTRATION: Guidance is provided in ICC400 in Section 306 Infiltration. Section 306, along with 305.1 Weather protection and 304 Provisions for Settling in Log Structures all work in unison to address the issue. The same blower door requirement of the 2015 code shall apply to log walls as for any other method of construction.
- VAPOR RETARDERS: As noted in Exception 3 of IRC Section R702.7 Vapor retarders, "Construction where moisture or its freezing will not damage the materials." There is no cavity to protect in a log wall, and all joinery is covered by ICC400- 2012.
- EXTERIOR COVERING: The Exception in IRC Section R703.1 General refers to "Log walls designed and constructed in accordance with the provisions of ICC400." The standard covers all discussion of weather resistance, drainage planes, etc.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

May lead to cost reduction based on the size of materials required.

Impact to industry relative to the cost of compliance with code

May lead to cost reduction based on the size of materials required.

Impact to small business relative to the cost of compliance with code

May lead to cost reduction based on the size of materials required.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by allowing an alternate method for demonstrating energy compliance for a specialized construction method and material.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing an alternate method for demonstrating energy compliance for a specialized construction method and material

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

R402.1 General (Prescriptive). The *building thermal envelope* shall meet the requirements of Sections R402.1.1 through R402.1.5.

~~Exception~~ Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the *building thermal envelope* provisions of Section R402.

   1.1 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 of floor area for space-conditioning purposes.

   1.2. Those that do not contain *conditioned space.*

2. Log homes designed in accordance with ICC-400.

"This amendment refers design of log homes to ICC400 ***Standard on the Design and Construction of Log Structures*** (ICC400) as it is the only consensus standard for log building. This amendment would benefit future state and local adoption as it is consistent with existing State amendments or legislation. At least four states have passed legislation referring to ICC400, while several other states have amended their energy conservation code to add log home specific paths. In 2015, the City and County of Denver adopted language similar to the proposed, and Vermont amended the 2015 IECC to add Table 402.1.5, ***Log Home Insulation, Fenestration and Heating Requirements by Component***. Idaho added Table R402.a ***Log Home Prescriptive Thermal Envelope Requirements by Component*** to their 2014 code. Minnesota added Footnote H to Table 1102.1(1) to their 2012 IECC.

The design, construction and performance of log walls are quite different than the convention construction methods detailed in the IRC (and residential requirements of the IECC). ICC400 responds to the thermal envelope requirements of the IRC Chapter 11 and IECC Chapter 4. The standard offers prescriptive, calculated/engineered and performance/testing paths for substantiating the performance of log walls, and trade-off packages for each Climate Zone. Therefore, the thermal envelope of log homes would be evaluated as follows:

- THERMAL: ICC400-2012 Section 305 Thermal Envelope presents requirements for weather protection and determination of thermal properties, offering prescriptive, calculation, and performance options. TABLE 305.3.1.2 Insulation and Fenestration Requirements by Component provides one such prescriptive option.
- AIR INFILTRATION: Guidance is provided in ICC400 in Section 306 Infiltration. Section 306, along with 305.1 Weather protection and 304 Provisions for Settling in Log Structures all work in unison to address the issue. The same blower door requirement of the 2015 code shall apply to log walls as for any other method of construction.
- VAPOR RETARDERS: As noted in Exception 3 of IRC Section R702.7 Vapor retarders, "Construction where moisture or its freezing will not damage the materials." There is no cavity to protect in a log wall, and all joinery is covered by ICC400- 2012.
- EXTERIOR COVERING: The Exception in IRC Section R703.1 General refers to "Log walls designed and constructed in accordance with the provisions of ICC400." The standard covers all discussion of weather resistance, drainage planes, etc.

The members of the Log & Timber Homes Council have encouraged certifying log homes through Energy Star® for many years. With the attention to design and construction details in accordance with ICC400, log homes with a nominal 6" wide log profile have been certified as 5-Star Plus with ratings in the 50's and

lower. Blower door testing has demonstrated that log homes meet the 3ACH50 requirements of Climate Zones 4-8. These tests have demonstrated that perhaps it is the tightness as well as mass of a log home that provide the satisfaction and comfort of the occupants.
It is important to note that ICC400 pertains to building solid wood walls and structural framing with logs. It defaults to the I- Codes for design conditions, foundations, roofing, mechanical, electrical, plumbing, etc. In Section 305 Thermal Envelope, ICC400 calls for compliance with the requirements of the IECC with an exception for log walls. The thermal properties of log walls can be taken from prescriptive tables, tested or calculated per the stipulated equations. Application of thermal mass is described to establish conformance with the IECC.

Bibliography: *ICC Standard on the Design and Construction of Log Structures (ICC 400)*
Please note: ICC copyrighted documents can only be distributed through their publications department. Electronic and print copies can be obtained from the ICC store at
http://shop.iccsafe.org/catalogsearch/result/?order=relevance&dir=desc&q=ICC+400.
Energy Performance of Log Homes, Log & Timber Homes Council, NAHB, 2015, 42 pgs. http://loghomes.org/wp-content/uploads/2013/06/EnergyPerformanceWP_2010.pdf
Preservation & Maintenance of Log Structures, Log & Timber Homes Council, NAHB, 2003, 16 pgs. http://loghomes.org/wp-content/uploads/2013/06/Preservation-Maintenance-of-Log-Structures-10-15-03.pdf

Cost Impact: Will not increase the cost of construction
Log wall construction is an alternate method of construction from the wood frame, steel frame, and concrete masonry options addressed in the energy conservation codes. The intent is to evaluate solid wood walls rather than apply prescriptive requirements that may impact the esthetic and/or durability of the wall system.
Without this change, readers may believe that they have only three options: 1.) Build with very large logs, 2.) Add insulation to the outside, or 3.) Add insulation to the inside.

Option 1: Prescriptive mass wall R-values set minimum log widths that are not commonly available, require greater cost to build, and cannot be milled by equipment used today. These factors will constrict the industry to the high-end custom home market. It will cause the existing log home inventory significant undue stress as owners of otherwise energy efficient log homes will be pressed to insulate their nominal 6" log walls (average width of 5"-5.5"). A survey of the industry indicates that a 10" round/8x nominal or smaller covers 80% of the log home products built and in production in climate zones 5-8, which is over 55% of the log home market. The 10" round/8x nominal log size equates to an average log width of about 7"-7.5".

Option 2: This would be consistent with the details for cross-laminated timber (CLT).

Option 3: It should be noted that adding insulation to the inside of a log wall is not recommended as it restricts the benefits of mass wall effects while eliminating the opportunity for inspection that may otherwise identify a need for maintenance.

All three options are extremely costly as opposed to trade-offs in the building thermal envelope, which is why most log home companies use REScheck for compliance. This can help keep the log width to a size that is economical for production, builder and home owner. Therefore the cost of construction can actually be reduced by evaluating log walls by measures other than prescriptive wall R-value (R/inch of wood)."

Date Submitted	12/12/2018	**Section**	403.3	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

403..3.7

Summary of Modification

Adds additional method for energy code compliance - buried ducts.

Rationale

Work sponsored by the Department of Energy and their Building America program definitively shows that there is energy savings associated with burying ducts (party or fully) within attic insulation. A recent Home Innovation study measured the summertime delivered air temperature 7 degrees F colder with R-8 buried ducts than insulated ducts exposed in an attic in a hot humid climate where no evidence of condensation was measured (Mallay). Research by Steven Winters and Associates also shows that a buried duct more than compensates for the displaced attic insulation and there is a net energy savings by burying the ducts partly or fully into the attic insulation (Shapiro).

There have been concerns about burying duct work in a hot humid climate (climate zones 1A, 2A, 3A) where there is an increase in the chances of condensation on the vapor retarder around the duct insulation. In order to prevent condensation in the humid climate zones, R-18 duct insulation is required rather than R-8 insulated duct. Condensation on the exterior of the duct insulation can be prevented by an R-18 fiberglass duct with an exterior vapor retarder or a duct with less (or no) insulation that is encapsulated in a vapor retardant foam that meets the duct requirements of the IRC mechanical section or the IMC.

Bibliography: Compact Buried Ducts in a Hot Humid Climate, Mallay, D. 2016 (page 33) http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/compact-buried-ducts-hot-humid.pdf Measure Guideline: Buried and/or Encapsulated Ducts, Shapiro, C, et. al., 2013 (pages 52-56) http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_buried_encap_ducts.pdf Buried and Encapsulated Ducts, US Department of Energy, 2013 (page 1) https://www1.eere.energy.gov/buildings/residential/pdfs/ba_in_1.1.3_highperformanceducts_100213.pdf"
Please see uploaded support file.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

May lead to cost reduction.

Impact to industry relative to the cost of compliance with code

NAHB estimates a cost reduction of $731.

Impact to small business relative to the cost of compliance with code

NAHB estimates a cost reduction of $731.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by allowing an additional alternate method for demonstrating energy compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing an additional alternate method for demonstrating energy compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

1st Comment Period History

EN7987-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

May cause condensation in Zone 1, consider an Exemption for Zone 1.

1st Comment Period History

EN7987-G2

Proponent	Jeff Sonne for FSEC	**Submitted**	2/18/2019	**Attachments**	No

Comment:

The Florida Solar Energy Center supports its alt language version of related mod 8002 in place of this mod.

Revise as follows:

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through ~~R403.3.5~~ R403.3.7.

Add new text as follows:

R403.3.7 Ducts buried within ceiling insulation Supply and return ducts shall be permitted to be installed partially, or fully buried within ceiling insulation provided the ducts comply with all of the following:

Supply and return ducts shall be insulated with an R-value of not less than R-8.

At all points along the duct, the sum of the ceiling insulation R-values above the top of the duct and below the bottom of the duct shall be not less than R-18 excluding the duct R-value.

In *Climate Zones* 1A, 2A, 3A, where supply ducts are completely covered with ceiling insulation, the supply ducts shall be insulated to an R-value of not less than R-13 and the ducts shall be in accordance with the vapor retarder requirements in Section 604.11 of the *Florida Building Code-Mechanical or Section* M1601.4.6 of the *Florida Building Code-Residential* as applicable.

Exception: Sections of supply ducts less than 3 feet from the supply outlet.

Reason: A significant amount of research has been performed on ducts buried in attic insulation over the past decade, yet the energy code is silent on whether or not it is an acceptable practice. There are concerns about displaced insulation and condensation potential. Both of these issues are addressed in this proposal. Work sponsored by the Department of Energy and their Building America program definitively shows that there is energy savings associated with burying ducts (party or fully) within attic insulation. A recent Home Innovation study measured the summertime delivered air temperature 7 degrees F colder with R-8 buried ducts than insulated ducts exposed in an attic in a hot humid climate where no evidence of condensation was measured (Mallay). Research by Steven Winters and Associates also shows that a buried duct more than compensates for the displaced attic insulation and there is a net energy savings by burying the ducts partly or fully into the attic insulation (Shapiro).

There have been concerns about burying duct work in a hot humid climate (climate zones 1A, 2A, 3A) where there is an increase in the chances of condensation on the vapor retarder around the duct insulation. In order to prevent condensation in the humid climate zones, R-18 duct insulation is required rather than R-8 insulated duct. Condensation on the exterior of the duct insulation can be prevented by an R-18 fiberglass duct with an exterior vapor retarder or a duct with less (or no) insulation that
is encapsulated in a vapor retardant foam that meets the duct requirements of the IRC mechanical section or the IMC.

Bibliography: Compact Buried Ducts in a Hot Humid Climate, Mallay, D. 2016 (page 33) http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/compact-buried-ducts-hot-humid.pdf Measure Guideline: Buried and/or Encapsulated Ducts, Shapiro, C, et. al., 2013 (pages 52-56) http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_buried_encap_ducts.pdf Buried and Encapsulated Ducts, US Department of Energy, 2013 (page 1) https://www1.eere.energy.gov/buildings/residential/pdfs/ba_in_1.1.3_highperformanceducts_100213.pdf

Date Submitted	12/12/2018	**Section**	403.3	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

R403.3.7 and R403.3.8

Summary of Modification

Adds alternate methods for energy compliance.

Rationale

(Note: Reason is as provided by ICC proponent. JDB)

In addition to allowing ducts to be buried within attic insulation, this proposal sets alternate requirements for ducts to be considered within conditioned space. The DOE Zero Energy Ready Home defines ducts inside conditioned space as, "Duct distribution systems located within the home's thermal and air barrier boundary or optimized to achieve comparable performance." Item "1)" under R403.3.7 provides for the traditional code definition of being within conditioned space. However, item "2)" in the proposal provides the DOE comparable performance alternative for extremely tight ducts with a full complement of insulation, and with provision for condensation avoidance for humid climates.

Research has shown that virtually all of the benefit of locating ducts inside conditioned space can be achieved by locating the air handler in conditioned space and tested, very low leakage insulated ducts in a vented attic buried under ceiling insulation. 403.7 provides for these conditions in that: The air handler must be located completely within the continuous air barrier and the building thermal envelope; and the ducts must be tested to an extremely low but still measurable level of leakage. The sum of the duct R-value and the ceiling insulation immediately above the duct is unchanged from the amount of prescriptive or proposed ceiling insulation that would have otherwise been installed.

Bibliography: DOE Zero Energy Ready Home National Program Requirements (Rev. 04). May 11, 2015.
http://energy.gov/sites/prod/files/2015/05/f22/DOE%20Zero%20Energy%20Ready%20Home%20National%20Progra

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

May lead to cost reduction.

Impact to industry relative to the cost of compliance with code

NAHB estimates an average cost reduction of $599.

Impact to small business relative to the cost of compliance with code

NAHB estimates an average cost reduction of $599.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by allowing an additional alternate method for demonstrating energy compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing an additional alternate method for demonstrating energy compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

1st Comment Period History

EN7994-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

May cause condensation for Zone 1, consider an Exception for Zone 1.

1st Comment Period History

EN7994-G2

Proponent	Jeff Sonne for FSEC	Submitted	2/18/2019	Attachments	Yes

Comment:

See attached comment.

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through ~~R403.3.5~~ R403.3.8.

R403.3.7 Ducts buried within ceiling insulation Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts have insulation of an R-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation R-values against and above the top of the duct, and against and below the bottom of the duct is not less than R-19, excluding the R- value of the duct insulation.

3. In climate zones 1A and 2A the supply ducts are completely buried within ceiling insulation, are insulated to an R-value of not less than R-13 and are in compliance with the vapor retarder requirements of Section 604.11 of the *Florida Building Code-Mechanical* or Section M1601.4.6 or the *Florida Building Code-Residential*, as applicable.

Exception: Sections of the supply duct that are less than 3 feet from the supply outlet shall not be required to comply with these requirements.

R403.3.8 Ducts located in conditioned space For ducts to be considered as inside a conditioned space, the ducts shall comply with either of the following:

1. The duct system is located completely within the continuous air barrier and within the building thermal envelope.

2. The ducts are buried within ceiling insulation in accordance with Section R403.3.7 and all of the following conditions exist:

   2.1 The air handler is located completely within the continuous air barrier and within the building thermal envelope.

   2.2 The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m_2) of conditioned floor area served by the duct system.

   2.3 The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.

The Florida Solar Energy Center (FSEC) supports its alt language version of related mod 8002 in place of this mod.

FSEC has the following observations and concerns regarding mods like 7994 which were first noted in a 2018 Florida Building Commission funded 2018 IECC vs. 2017 Florida Energy Code comparison report by the Center (http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/07/FSEC-CR-2085-18.pdf)

- Adding the buried duct section to the FEC will provide clarification and will not reduce the stringency of the code, but condensation questions remain in our Florida climate for some cases.

- Allowing certain attic ducts to be considered as in conditioned space (proposed new Section R403.3.8) actually weakens the code. FSEC's position is that duct conduction and leakage are important parameters in Florida. Duct systems may be completely within the continuous air barrier and building thermal envelope and yet not experience the same temperatures as the main conditioned space of a home. For example, duct work in sealed attics that are separated from the conditioned space by a drywall ceiling usually experience summer afternoon temperatures about 5oF (Parker et al. 2002) higher than in the conditioned space below. That temperature difference can make a difference. Software that models the space can apply the thermal conditions experienced by the ductwork for the performance methods, so Section R403.3.8 is not needed for those methods. For the prescriptive method, the only advantage of ducts being considered in conditioned space is to bypass the duct testing under Section R403.3.3. Since R403.3.8 bullet point #2 correctly requires testing there appears to be no advantage for considering buried ducts in conditioned space for prescriptive compliance. Conclusion, R403.3.8 should not be included in the Florida Energy Code.

Reference:

Parker, D., J. Sonne, and J. Sherwin. 2002. Comparative Evaluation of the Impact of Roofing Systems on Residential Cooling Energy Demand in Florida. Proceedings of ACEEE 2002 Summer Study, American Council for an Energy Efficient Economy, Washington, DC.

EN8002

Date Submitted 12/12/2018
Chapter 4
Section 403.3
Affects HVHZ Yes
Proponent Joseph Belcher for FHBA
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments
General Comments **Yes**
Alternate Language **No**

Related Modifications

R403.3.7 and R403.3.7.1

Summary of Modification

Additional method for energy code compliance.

Rationale

Reason: The proposal, in addition to allowing ducts to be installed within ceiling insulation, also provides additional effective insulation credit for ducts deeply buried (more than 3 1/2" under insulation) to claim an effective R-value of R-25. This value is based on peer reviewed research conducted by Steven Winters and Associates (Griffiths) and similar language has been incorporated into California's Title 24 residential energy code (CEC).

This will be a valuable, energy equivalent, alternative for many builders that have difficulty designing ducts within the building.

Bibliography: Insulation Buried Attic Ducts: Analysis and Field Evaluation Findings, Griffiths, D et. al., 2008, (page 1-123)
https://aceee.org/files/proceedings/2004/data/papers/SS04_Panel1_Paper11.pdf

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

May lead to cost reduction.

Impact to industry relative to the cost of compliance with code

NAHB estimates an average cost reduction of $599.

Impact to small business relative to the cost of compliance with code

NAHB estimates an average cost reduction of $599.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by allowing an additional alternate method for demonstrating energy compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing an additional alternate method for demonstrating energy compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

1st Comment Period History

EN8002-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

May cause condensation in Zone 1, 18" insulation covering a 12" duct is not possible in many attics, consider an Exception for Zone 1.

1st Comment Period History

EN8002-G2

Proponent Jeff Sonne for FSEC **Submitted** 2/18/2019 **Attachments** No

Comment:

The Florida Solar Energy Center is providing a separate alt language mod for 8002, but also adds the following regarding such a mod which was first noted in a 2018 Florida Building Commission funded 2018 IECC vs. 2017 Florida Energy Code comparison report by the Center (http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/07/FSEC-CR-2085-18.pdf):

- Adding the buried duct section to the FEC will provide clarification and will not reduce the stringency of the code, but condensation questions remain in our Florida climate for some cases.

Revise as follows:

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through ~~R403.3.5~~ R403.3.7.

R403.3.7 Ducts buried within ceiling insulation Supply and return ducts shall be permitted to be installed partially, or fully buried within ceiling insulation provided they meet the following requirements:

1. Supply and return ducts shall be insulated to a minimum of R-8;
2. At all points along the duct, the sum of the ceiling insulation above the top of the duct and below the bottom of the duct shall be a minimum of R-19 excluding the duct R-value;
3. In *climate zone*s 1A and 2A where supply ducts are fully buried within ceiling insulation, the supply ducts shall be insulated to minimum R-18 and in accordance with the vapor retarder requirements in Chapter 16 (M1601.4.6) of the *Florida Building Code-Residential* or Chapter 6 (604.11) of the *Florida Building Code-Mechanical*

Exception: Sections of supply ducts less than 3 feet from the supply outlet.

Add new text as follows:

R403.3.7.1 Deeply buried duct effective R-value. Sections of ducts installed in accordance with Section R403.3.6 and directly on or within 5.5 inches of the ceiling board and surrounded with blown attic insulation of R-30 or greater and the top of the duct is buried a minimum of 3.5 inches below the insulation shall be permitted to claim an effective duct insulation of R-25 for the deeply buried section of the duct when using a simulated energy performance analysis.

Date Submitted	12/12/2018	**Section**	403.6.1	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Table R403.6.1

Summary of Modification

Adds fan efficacy criteria for H/ERV fans.

Rationale

(Note: Reason is ICC original proponent's reason.)

"This proposal introduces a minimum fan efficacy for H/ERVs. The efficacy proposed is the minimum required by the ENERGY STAR H/ERV specification used in Canada. This will save homeowners ~$92/year in fan energy costs versus specifying the worst performing H/ERVs currently available on the market (i.e., assuming 0.5 cfm/W fan gets replaced by 1.2 cfm/W fan, 75 cfm, 8760 hours/year of operation, $0.12/kWh). Increasing the efficacy from 0.5 cfm/W to 1.1 cfm/W is feasible without a significant change in motor technology or product cost."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

Will lead to cost reduction.

Impact to industry relative to the cost of compliance with code

NAHB estimates an average cost reduction of $857.

Impact to small business relative to the cost of compliance with code

NAHB estimates an average cost reduction of $857.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by adding fan efficacy criteria for Heat Recovery Ventilation (HRV) and Energy Recovery Ventilation (ERV) systems related to whole house mechanical ventilation.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by adding fan efficacy criteria for Heat Recovery Ventilation (HRV) and Energy Recovery Ventilation (ERV) systems related to whole house mechanical ventilation.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

Revise as follows:

R403.6.1. When installed to function as a whole house mechanical ventilation system fans shall meet the efficacy requirements of TableR403.6.1.

Exception: ~~Where whole-house mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.~~ Where an air handler that is integral to tested and listed HVAC equipment is used to provide whole-house mechanical ventilation, the air handler shall be powered by an electronically commutated motor.

TABLE R403.6.1 (N1103.6.1)

WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	.TE MINIMUM (CFM)	IINIMUM EFFICACY[a] (CFM/WATT)	.TE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI 1 cfm = 28.3 L/min.

a. When tested in accorcdance with HVI Standard 916

EN8036

Date Submitted	12/12/2018	**Section**	405.5.2	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

R403.6.1 and Table R403.6.1

Summary of Modification

Changes equations to account for minimum fan efficacy for HRV and ERV

Rationale

(Note: Reason in quotes is ICC original proponent's reason.)

"This proposal introduces a minimum fan efficacy for H/ERVs. The efficacy proposed is the minimum required by the ENERGY STAR H/ERV specification used in Canada. This will save homeowners ~$92/year in fan energy costs versus specifying the worst performing H/ERVs currently available on the market (i.e., assuming 0.5 cfm/W fan gets replaced by 1.2 cfm/W fan, 75 cfm, 8760 hours/year of operation, $0.12/kWh). Increasing the efficacy from 0.5 cfm/W to 1.1 cfm/W is feasible without a significant change in motor technology or product cost."

The proposal also takes into account the changes to Table R403.6.1 of Mod 8014 adding a fan efficacy for HVR and EVR systems.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

May lead to cost reduction.

Impact to industry relative to the cost of compliance with code

Considered in conjunction with the change adding a minimum fan efficacy, NAHB estimates an average cost reduction of $857.

Impact to small business relative to the cost of compliance with code

Considered in conjunction with the change adding a minimum fan efficacy, NAHB estimates an average cost reduction of $857.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts public health and safety by providing a means of applying fan efficacy criteria for Heat Recovery Ventilation (HRV) and Energy Recovery Ventilation (ERV) systems related to whole house mechanical ventilation added to Table R403.6.1.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by providing a means of applying the fan efficacy criteria for Heat Recovery Ventilation (HRV) and Energy Recovery Ventilation (ERV) systems related to whole house mechanical ventilation added to Table R403.6.1.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change upgrades the effectiveness of the code.

Revise as follows:

TABLE R405.5.2(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: kWh/yr = <u>(1/e_f) × (0.0876 × CFA + 65.7 × (N_{br}+1))</u> ~~0.03942 × *CFA* + 29.565 × (N_{br} +1)~~ where: *CFA* = conditioned floor area, N_{br} = number of bedrooms, <u>and e_f = the minimum exhaust fan efficacy from Table R403.6.1 corresponding to a flow rate of 0.01 × CFA + 7.5 × (N_{br}+1))</u>	As proposed
No change to the remainder of table or notes.		

Date Submitted	12/14/2018	**Section**	405	**Proponent**	Eric Lacey
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposal makes the 7th Edition Code consistent with the 2018 IECC and closes a significant performance path loophole by eliminating efficiency trade-offs for heating, cooling, and water heating equipment for which the Commission is preempted from setting efficiency requirements.

Rationale

See attached file.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There will be no significant impact on local entities.

Impact to building and property owners relative to cost of compliance with code

Eliminating this loophole will result in better-built homes that will cost lest to operate and maintain for homeowners, ultimately reducing costs over the useful life of the home.

Impact to industry relative to the cost of compliance with code

Because this change affects only one compliance path among several, we do not expect a major impact on the industry.

Impact to small business relative to the cost of compliance with code

We do not expect a major impact on small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The ability of homeowners to pay for monthly utility bills is directly connected with the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code and makes it consistent with the 2018 IECC.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against any materials or products.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code.

1st Comment Period History

EN8127-G1

Proponent Jeff Sonne for FSEC **Submitted** 2/14/2019 **Attachments** No

Comment:

The Florida Solar Energy Center opposes this mod as historically the Florida Energy Code has had the performance compliance reference design equipment efficiencies "non-floating" which offers builders the option to find the most cost effective means of meeting the code while still meeting all mandatory requirements. While the new ERI compliance method also allows equipment trade-offs, the mandatory requirements for Florida climate usually mean a project already has to pass code by one of the other methods. Thus the performance method is the only method whereby builders can choose the most cost effective option.

1st Comment Period History

EN8127-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

Revise Table R405.5.2(1) as follows:

TABLE R405.5.2(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems[d, e]	~~Efficiency: In accordance with prevailing Federal minimum standards~~ As proposed for other than electric heating without a heat pump. Where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the Florida Building Code, Energy Conservation—Commercial Provisions. Capacity: sized in accordance with Section R403.7 ~~Fuel type: same as proposed~~	~~As proposed~~ As proposed ~~As proposed~~
Cooling systems[d, f]	As proposed ~~Fuel Type: Electric~~ Capacity: sized in accordance with Section R403.7. ~~Efficiency: In accordance with prevailing Federal minimum standards~~	As proposed ~~As proposed~~ ~~As proposed~~
Service water Heating[d, e, f, g]	As proposed ~~Fuel Type: As proposed~~ Use: same as proposed design ~~Efficiency: In accordance with prevailing Federal minimum standards~~	As proposed Gal/day = 30 + (10 $\times N_{br}$) ~~As proposed~~

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8127

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8127. This proposal improves energy efficiency and aligns the Florida Building Code with the 2018 IECC by eliminating unnecessary performance path trade-offs for heating, cooling, and water heating equipment. These trade-offs have been subject of considerable debate in Florida and at the national level. The preponderance of technical evidence and the consensus decision making in the 2009, 2012, 2015, and 2018 IECC all agree that unlimited equipment trade-offs are unwarranted giveaways of energy efficiency. The gains to energy efficiency from eliminating the trade offs in the IECC are substantial (9-22% ***See*** ICF International, ***Review and Analysis of Equipment Trade-offs in Residential Energy Codes*** Sep. 2013). These trade-offs are also unnecessary, since the code permits trade-offs (with appropriate backstops and aggressive energy savings targets) through the ERI path.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

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Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

Reason Statement for RECA Proposal to Adopt Performance Path Assumptions of 2018 IECC

This proposal will save energy and reduce costs for Florida homeowners by closing a loophole in the Florida Building Code, Energy Conservation that was eliminated nine years ago in the 2009 IECC. Florida is one of only a handful of states that continues to allow trade-offs for cooling, heating, and water heating equipment in Section R405 trade-offs. In light of the new Energy Rating Index option adopted in the 6th Edition code, which includes sensible thermal envelope backstops and a reasonable target index number, the Section R405 equipment trade-off is an outdated, enormous loophole that should be eliminated from the 7th Edition Florida Building Code.

To be clear, the equipment trade-off is not energy-neutral, and in many cases will result in an overall decrease in energy efficiency (as compared to a home built to a code without equipment trade-offs). Federal law prohibits states from setting efficiency requirements for products covered under the National Appliance Energy Conservation Act (including heating, cooling, and water heating equipment). Thus, if a state includes the efficiency of these products in its performance calculations, it is required to specify the current federal minimum efficiencies in the baseline – no higher and no lower. However, because the federal minimum efficiencies tend to lag behind the efficiency of commonly-installed products, the baseline often reflects a level of efficiency far below the products being installed in homes across the nation.

If equipment trade-offs are incorporated into Florida's 7th Edition code, builders can take an artificial "credit" for any difference between the equipment efficiency and the federal minimum efficiency and *remove that efficiency from the thermal envelope*. While heating, cooling, and water heating equipment will be changed out several times over the life of a residential building, many components of the thermal envelope (such as insulation) will be part of the home for decades or even the life of the home. Homes built under such a trade-off scenario could have a far weaker thermal envelope for 50+ years – saddling homeowners permanently with higher utility bills and less comfortable homes.

In its Final Determination on the 2009 *IECC*, the U.S. Department of Energy found that, "Because building envelopes have substantially longer lives than HVAC and/or water heating equipment, energy savings from envelope improvements may persist for many more years than comparable equipment improvements. Also, because high-efficiency equipment is already the predominant choice in many markets, disallowing envelope/equipment trade-offs is likely to result in improved overall efficiency in many situations." *See* Updating State Residential Building Energy Efficiency Codes, 76 Fed. Reg. 42688, 42697 (July 19, 2011).

How much could a homeowner lose in energy efficiency and cost savings from equipment trade-offs? An analysis conducted by ICF International shows a potential **9-22% decrease in energy efficiency and cost savings** as compared to a home built without equipment trade-offs. *See* ICF International, *Review and Analysis of Equipment Trade-offs in Residential Energy Codes*

(Sep. 2013). In other words, this one provision could eliminate some or all of the efficiency gains made in recent code update cycles.

To the extent that builders seek additional flexibility in code compliance and credit for efficient equipment, the Section R406 Energy Rating Index provides a better option than the current approach to equipment trade-offs in Section R405. The ERI still contains equipment trade-offs, which, by their nature, are problematic for the reasons outlined above. However, the ERI attempts to reduce the negative impacts of these trade-offs by adding a few important details:

- The ERI target score is set at a level which makes it less likely that the home will be built with a weaker permanent thermal envelope than a home built to the prescriptive path.
- The ERI contains a minimum thermal envelope backstop to ensure that even in trade-off scenarios, at least a reasonable level of efficiency is maintained in the envelope.

While it is still far from a perfect compliance option, because of the features detailed above, the ERI is a less problematic means of incorporating equipment into code compliance than the Section R405 equipment trade-offs. We urge the Commission to reject the equipment trade-offs (consistent with the 2009, 2012, 2015, and 2018 editions of the IECC), and close this loophole.

EN8129

Date Submitted 12/14/2018
Chapter 4
Section 405
Affects HVHZ No
Proponent Eric Lacey
Attachments Yes
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments Yes
Alternate Language No

Related Modifications

8127

Summary of Modification

Provides a reasonable efficiency trade-off backstop for the performance path.

Rationale

See attached file.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No significant impact on local entities.

Impact to building and property owners relative to cost of compliance with code

No significant impact on cost of compliance. The proposed backstop is well short of the code's baseline requirements.

Impact to industry relative to the cost of compliance with code

No significant impact on industry relative to cost of compliance. The proposed backstop is well short of the code's baseline requirements.

Impact to small business relative to the cost of compliance with code

No significant impact on small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Directly connected to the health, safety, and welfare of the general public. An ability/inability to pay monthly utility bills has a profound effect on homeowner health, safety, and welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by adding a critical backstop for trade-offs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against any products. Any combination of materials or products can be used to achieve compliance.

Does not degrade the effectiveness of the code

Improves the code.

1st Comment Period History

EN8129-G1

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

1st Comment Period History

EN8129-G2

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** No

Comment:

The Florida Solar Energy Center opposes this mod. We feel that the additional performance compliance method stringency that this mod proposes is overly restrictive; the performance method is intended to allow "trade-offs" which account for less efficient components. It appears this mod would not allow glazed fenestration with an average SHGC over 0.30 to be used for performance compliance (compared with the 0.50 average SHGC allowed for performance compliance in the current code).

Revise Section R405.2 as follows:

R405.2 Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and *Solar Heat Gain Coefficients* in Table 402.1.1 or 402.1.3 of the 2009 *International Energy Conservation Code.* Supply and return ducts not completely inside the *building thermal envelope* shall be insulated to an *R*-value of not less than R-6.

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8129

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8129. This proposal applies the same thermal envelope trade-off backstop to the performance path that currently applies to the Energy Rating Index in Section R406.2 of the 6th Edition Florida Building Code. While both the ERI and the performance path allow builders to trade off a considerable amount of efficiency, we believe it is vitally important to include some limitation to help ensure a reasonable amount of efficiency in the thermal envelope given the equipment trade-offs currently allowed. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

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RECA Proposal to Add Safety Net for Consumers in Performance Path

This proposal establishes a crucial trade-off "efficiency safety net" for Florida homeowners. It would require that the thermal envelope components at least meet the 2009 IECC prescriptive values as a backstop, just like Section R406 does for the new ERI compliance option. We recommend adopting this proposal in any event, but especially if the Commission decides to continue to permit equipment trade-offs in Section R405.

As we explain in a separate proposal to eliminate the equipment trade-offs from Section R405, trade-offs between equipment and envelope components allow an unnecessary weakening of the overall efficiency of the home and can leave homeowners saddled with higher energy bills over the lifetime of the home. We believe that the most sensible solution is to follow the model of the IECC and eliminate these trade-offs, but if the Commission decides to allow equipment trade-offs in the 7th Edition code, we offer the above proposal in order to ensure at least a minimal efficiency level in the thermal envelope. This proposal would apply the same mandatory requirements, including envelope requirements at least as efficient as those specified in the 2009 IECC, in section R405 that are required in the Energy Rating Index compliance option (Section R406). We believe it is reasonable to require a sensible minimum efficiency level for the thermal envelope components, irrespective of other trade-offs.

EN8172

Date Submitted 12/14/2018
Chapter 4
Section 403
Affects HVHZ No
Proponent Eric Lacey
Attachments Yes
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes**
Alternate Language **Yes**

Related Modifications

Summary of Modification

Incorporates 2018 IECC provisions for buried ducts in attics, including proposals RE99, RE100, and RE110.

Rationale

See attached document

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There will be no negative impact to local enforcement entities.

Impact to building and property owners relative to cost of compliance with code

We expect that additional flexibility could result in additional cost savings for building owners.

Impact to industry relative to the cost of compliance with code

This will provide additional flexibility for builders.

Impact to small business relative to the cost of compliance with code

We expect very little impact on small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Maintaining low energy bills will provide health, safety, and welfare for home owners.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal adds an alternative means of complying with the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against products.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

1st Comment Period History

8172-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/18/2019 **Attachments** Yes

Rationale

- Removing "Supply" in bullet #1 of Section R403.3.7 helps clarify the section since supply duct R-value is addressed in bullet #3 of the same section. - Section R403.3.8 is removed for reasons provided in the Florida Solar Energy Center's general comment for this mod, also repeated here: Allowing certain attic ducts to be considered as in conditioned space (proposed new Section R403.3.8) actually weakens the code. FSEC's position is that duct conduction and leakage are important parameters in Florida. Duct systems may be completely within the continuous air barrier and building thermal envelope and yet not experience the same temperatures as the main conditioned space of a home. For example, duct work in sealed attics that are separated from the conditioned space by a drywall ceiling usually experience summer afternoon temperatures about 5oF (Parker et al. 2002) higher than in the conditioned space below. That temperature difference can make a difference. Software that models the space can apply the thermal conditions experienced by the ductwork for the performance methods, so Section R403.3.8 is not needed for those methods. For the prescriptive method, the only advantage of ducts being considered in conditioned space is to bypass the duct testing under Section R403.3.3. Since R403.3.8 bullet point #2 correctly requires testing there appears to be no advantage for considering buried ducts in conditioned space for prescriptive compliance. Conclusion, R403.3.8 should not be included in the Florida Energy Code. Reference: Parker, D., J. Sonne, and J. Sherwin. 2002. Comparative Evaluation of the Impact of Roofing Systems on Residential Cooling Energy Demand in Florida. Proceedings of ACEEE 2002 Summer Study, American Council for an Energy Efficient Economy, Washington, DC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Assists code enforcement by clarifying code.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to Small Business relative to the cost of compliance with code

We expect very little impact on small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits public by clarifying code and keeping it from being weakened.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by clarifying it and strengthens it by removing new proposed language that would weaken it.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; clarifies the code and keeps it from being weakened.

Does not degrade the effectiveness of the code

Improves code effectiveness by clarifying the code and keeping it from being weakened.

1st Comment Period History

EN8172-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

Buried ducts in Zone 1 may cause condensation, 12" duct with 13" insulation may not be possible in most attics, consider an Exception for this mod in Zone 1

1st Comment Period History

EN8172-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

1st Comment Period History

EN8172-G3

Proponent	Jeff Sonne for FSEC	Submitted	2/18/2019	Attachments	Yes

Comment:

See attached comment.

Revise section R403.3 as follows:

R403.3 Ducts. Ducts and air handlers shall be in accordance with Sections R403.3.1 through ~~R403.3.5~~ R403.3.8.

Add new sections R403.3.7 and R403.3.8 as follows:

R403.3.7 Ducts buried within ceiling insulation. Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation *R*-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the *R*-value of the duct insulation.

3. In *Climate Zones* 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

R403.3.7.1 Effective *R*-value of deeply buried ducts. Where using a simulated energy performance analysis, sections of ducts that are: installed in accordance with Section R403.3.6; located directly on, or within 5.5 inches (140 mm) of the ceiling; surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

R403.3.8 Ducts located in conditioned space. For ducts to be considered as inside a conditioned space, such ducts shall comply with either of the following:

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.

2. The ducts shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:

2.1. The air handler is located completely within the *continuous air barrier* and within the building thermal envelope.

2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m2) of conditioned floor area served by the duct system.

2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.

[Starting with mod 8172 text, make the following changes:]

R403.3 Ducts. Ducts and air handlers shall be in accordance with Sections R403.3.1 through R403.3.8.

[Add new sections R403.3.7 and R403.3.8 as follows:]

R403.3.7 Ducts buried within ceiling insulation. Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. Th~~e supply and~~ return ducts shall have an insulation *R*-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the *R*-value of the duct insulation.

3. In *Climate Zones* 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

R403.3.7.1 Effective *R*-value of deeply buried ducts. Where using a simulated energy performance analysis, sections of ducts that are: installed in accordance with Section R403.3.~~6~~7; located directly on, or within 5.5 inches (140 mm) of the ceiling; surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

~~**R403.3.8 Ducts located in conditioned space.** For ducts to be considered as inside a conditioned space, such ducts shall comply with either of the following:~~

-

~~1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.~~

-

~~2. The ducts shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:~~

-

~~2.1. The air handler is located completely within the *continuous air barrier* and within the building thermal envelope.~~

-

~~2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m2) of conditioned floor area served by the duct system.~~

-

~~2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.~~

American Chemistry Council

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8172

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8172. This proposal incorporates the buried duct provisions of the 2018 IECC.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

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The Florida Solar Energy Center (FSEC) is providing a separate alt language mod for 8172, but also has the following observations and concerns regarding such a mod which were first noted in a 2018 Florida Building Commission funded 2018 IECC vs. 2017 Florida Energy Code comparison report by the Center (http://publications.energyresearch.ucf.edu/wp-content/uploads/2018/07/FSEC-CR-2085-18.pdf):

- Adding the buried duct section to the FEC will provide clarification and will not reduce the stringency of the code, but condensation questions remain in our Florida climate for some cases.

- Allowing certain attic ducts to be considered as in conditioned space (proposed new Section R403.3.8) actually weakens the code. FSEC's position is that duct conduction and leakage are important parameters in Florida. Duct systems may be completely within the continuous air barrier and building thermal envelope and yet not experience the same temperatures as the main conditioned space of a home. For example, duct work in sealed attics that are separated from the conditioned space by a drywall ceiling usually experience summer afternoon temperatures about 5°F (Parker et al. 2002) higher than in the conditioned space below. That temperature difference can make a difference. Software that models the space can apply the thermal conditions experienced by the ductwork for the performance methods, so Section R403.3.8 is not needed for those methods. For the prescriptive method, the only advantage of ducts being considered in conditioned space is to bypass the duct testing under Section R403.3.3. Since R403.3.8 bullet point #2 correctly requires testing there appears to be no advantage for considering buried ducts in conditioned space for prescriptive compliance. Conclusion, R403.3.8 should not be included in the Florida Energy Code.

Reference:

Parker, D., J. Sonne, and J. Sherwin. 2002. *Comparative Evaluation of the Impact of Roofing Systems on Residential Cooling Energy Demand in Florida*. Proceedings of ACEEE 2002 Summer Study, American Council for an Energy Efficient Economy, Washington, DC.

Reason Statement for Buried Duct Provisions

This proposal incorporates changes made via proposals RE99, RE100, and RE110 to the 2018 IECC. This combination of proposals creates a new option for ducts buried under adequate insulation in the attic to be considered inside conditioned space. Because it is important that all three proposals be adopted together, we have combined them into a single proposal.

According to the National Association of Homebuilders, the original proponent of these three proposals, considerable research has gone into the development of the buried duct provisions. Where properly constructed and tested, buried ducts can provide a similar level of energy conservation as ducts located completely inside conditioned space.

EN8181

Date Submitted 12/14/2018
Chapter 4
Section 406
Affects HVHZ No
Proponent Eric Lacey
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposal aligns the Energy Rating Index target in the Florida Building Code with the 2018 IECC.

Rationale

The Energy Rating Index compliance option of the 2018 IECC is substantially similar to Section R406 of the 6th Edition Florida Code. Indeed, Florida's ERI provided the model for the 2018 IECC ERI. However, the 2018 IECC adopted a slightly lower ERI target score for Florida's climate zones. We recommend the above change to maintain consistency with the 2018 IECC ERI.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

We expect little or no impact on local entities.

Impact to building and property owners relative to cost of compliance with code

We expect little or no impact on property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There will be little or no impact on the industry.

Impact to small business relative to the cost of compliance with code

There will be little or no impact on small business for compliance costs.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal will help align Florida's energy code with the model energy code and will help maintain a reasonable level of efficiency. This will improve the health, safety and/or general welfare of the public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal slightly improves the efficiency of the energy code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, or systems of construction.

Does not degrade the effectiveness of the code

This proposal is a slight improvement in the effectiveness of the code.

1st Comment Period History

EN8181-G1

Proponent Mo Madani **Submitted** 1/27/2019 **Attachments** No

Comment:

The proposed code change is not consistent with HB 535 which mandates an ERI of 58.

1st Comment Period History

EN8181-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

1st Comment Period History

EN8181-G3

Proponent	Eric Lacey	**Submitted**	2/18/2019	**Attachments**	Yes

Comment:

See attached files

Revise Table R406.4 as follows:

Table R406.4

MAXIMUM ENERGY RATING INDEX

Climate Zone	Energy Rating Index
1	~~58~~57
2	~~58~~ 57

American Chemistry Council

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8181

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8181. This proposal revises the ERI scores in cz 1 and 2 from 58 to 57, consistent with 2018 IECC.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

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wall of a building located on a zero lot line, when the building exterior wall is separated from an adjacent building exterior wall by a distance of 6 feet or more and the roof overhang projection is separated from an adjacent building projection by a distance of 4 feet or more, with 1-hour fire-resistive construction on the underside of the overhang required, unless the separation between projections is 6 feet or more.

Section 34. The Florida Building Commission shall adopt into the Florida Building Code, 5th Edition (2014) Energy Conservation, the following:

"Section 406 relating to the Alternative Performance Path, Energy Rating Index of the 2015 International Energy Conservation Code (IECC) may be used except as follows for Table R406.4 as an option for demonstrating compliance with the Florida Building Code, Energy Conservation. TABLE R406.4 MAXIMUM ENERGY RATING INDEX shall reflect the following energy rating index: for Climate Zone 1, an index of 58; for Climate Zone 2, an index of 58. The Florida Building Commission shall continue its current adoption process of the 2015 IECC and determine by October 1, 2016, whether onsite renewable power generation may be used for compliance. The commission must also determine whether onsite renewable power generation may be used for a period longer than three years but not more than six consecutive years."

RECA Comment on Proposal EN8181

Proposal EN8181 should be approved by the Commission to maintain consistency with the 2018 IECC. In 2016, the Florida Legislature passed HB535, establishing the Energy Rating Index for the 5th Edition Florida Building Code, but **it does not dictate what should be contained in the 7th Edition Code.** For reference, we have attached a copy of the relevant provisions of HB535.

Although the Energy Rating Index was not originally included in the 5th Edition Code (which was based on the 2012 IECC), the Legislature required it to be retroactively added, with a specific ERI Index for that edition of the code:

> "The Florida Building Commission shall adopt into the Florida Building code, 5th Edition (2014) Energy Conservation, the following: Section 406 relating to the Alternative Performance path, Energy Rating Index of the 2015 International Energy Conservation Code (IECC) may be used except as follows for Table R406.4 as an option for demonstrating compliance with the Florida Building Code, Energy Conservation. Table R406.4 MAXIMUM ENERGY RATING INDEX shall reflect the following energy rating index: for Climate Zone 1, and index of 58; for Climate Zone 2, and index of 58. The Florida Building Commission shall continue its current adoption process of the 2015 IECC and determine by October 1, 2016, whether onsite renewable power generation may be used for compliance. The commission must also determine whether onsite renewable power generation may be used for a period longer than three years but not more than six consecutive years."

At the time the legislation was approved, there was still considerable debate at the national level over whether to include on-site renewable energy in the ERI at all, and with what limitations. The Florida Building Commission appointed a work group to address the issue, and the resulting compromise (which was adopted into both the 5th and 6th Edition Florida Building Codes) was used as a starting point for discussions in the ICC Code Development process. Florida's compromise was further fine-tuned and adopted into the 2018 IECC with broad support from a range of stakeholders, including builders, manufacturers, and energy and environmental advocates.

Proposal EN8181 reflects the 2018 IECC ERI numbers (which are one point more efficient than Florida's 5th and 6th Edition ERI Index numbers). **To be clear, we do not believe HB535 has any bearing on the 7th Edition Code, and the result of EN8181 would be a very small improvement in efficiency. However, it is important to maintain consistency with the 2018 IECC wherever possible, and HB535 does not limit the Commission's ability to adopt this change.**

EN8287

Date Submitted	12/15/2018	**Section**	402.1.4	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Table R402.1.4

Summary of Modification

Changes to U-Factor for fenestration.

Rationale

In August 2018, the Florida Building Commission appointed a workgroup to examine water intrusion through windows as a result of thunderstorms as well as hurricanes. Looking back at Hurricanes Jeanne and Frances in 2004, central Florida saw tremendous damage due to water intrusion through windows in the region, damage from wind-driven rain, not wind-borne debris. At the time, industry wisdom questioned if this failure was the result of the shift away from installing entry level 'commercial' class windows that had inherently higher water performance than did the entry-level 'residential' windows - about one and half times the design pressure class.

This reduction was partially driven by mandatory increases in overall energy code performance, dictated both at the federal and state level (on the overall house). Across the nation, in residential applications, vinyl windows saw exponential growth, which, on the whole, yielded many positives, such as more competition, better thermal performance, and competitive durability. As part of a free market economy, aluminum windows were crowded into commercial and architectural markets. The shift in materials was in large part due to aluminum's poor winter energy performance, which is negligible in Florida.

This code proposal anticipates that the Fenestration Water Resistant Workgroup is likely to recommend higher water design pressures for the wind-driven rain test. This may result in a conflict with the energy code as it is currently written. The energy savings between the 0.40 and 0.65 U-Factors is negligible in Florida. The vast majority of both energy and storm mitigation is to be found in updating existing buildings. This proposal allows for the important aspects of resistance to wind-driven rain and radiant heat reflectance to coexist. This will benefit the Florida consumer, and reduce problems for the Florida remodeler and the code official.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No cost impact on enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

May result in a slight increase in annual energy cost ($15 -$25) but will allow the use of stronger windows which should reduce water intrusion from the rain.

Impact to industry relative to the cost of compliance with code

No cost impact.

Impact to small business relative to the cost of compliance with code

No cost impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts the welfare of the public by allowing the use of stronger materials in the manufacture of windows which should reduce water intrusion due to wind-driven rain.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing the use of stronger materials in the manufacture of windows which should reduce water intrusion due to wind-driven rain.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code.

1st Comment Period History

EN8287-G1

Proponent Kelli Fleming **Submitted** 1/2/2019 **Attachments** No

Comment:

We would request that the increase in U-Factor in zones 1&2 would be applicable for skylights as well.

1st Comment Period History

EN8287-G2

Proponent	David Mann	Submitted	2/14/2019	Attachments	Yes

Comment:

Please see attached opposing comment.

1st Comment Period History

EN8287-G3

Proponent	Jeff Sonne for FSEC	Submitted	2/15/2019	Attachments	No

Comment:

The Florida Solar Energy Center opposes this mod as it will make the energy code less efficient and it is unsubstantiated in the rationale that the U-factor increase is needed to have stronger materials used in the manufacture of windows.

1st Comment Period History

EN8287-G4

Proponent	Eric Lacey	Submitted	2/18/2019	Attachments	No

Comment:

This proposed modification would weaken energy efficiency by increasing fenestration U-factors in climate zone 2 by over 62% -- from 0.40 to 0.65. This will result in more energy use, higher costs for homeowners, and less comfortable homes.

The proponent claims that this proposal "anticipates" that the Fenestration Water Resistant Workgroup will recommend higher water design pressures. This Workgroup has not yet begun its work, and it is unclear what its recommendations will be. The Commission should not weaken the code based on speculation. Fenestration U-factor is not even mentioned in the Proposed Water Intrusion Study's Initial Conclusions, nor is it within the scope of the Research Project. See http://www.floridabuilding.org/fbc/commission/FBC_0219/fenestration_WG/Lavrich_Project.pdf Even if the Workgroup recommends higher design pressures, this proposal does not increase design pressures – instead it raises U-factors for all residential buildings in climate zone 2, whether they have higher design pressure requirements or not.

Florida has been requiring a 0.40 U-factor in climate zone 2 since at least the 2014 edition of the code (based on the 2012 IECC). This proposal would be a significant step backward in efficiency for no demonstrated need. Because much of the fenestration already being installed in Florida is likely well under a 0.40 U-factor, this proposal will likely create unnecessary "trade-off credit" that will simply be used to weaken the efficiency of other parts of the buildings (reduced insulation, reduced equipment or lighting efficiency, etc.).

TABLE R402.1.2

INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR [b]	SKYLIGHT [b] *U*-FACTOR	GLAZED FENESTRATION SHGC [b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE [i]	FLOOR *R*-VALUE	BASEMENT [c] WALL *R*-VALUE	SLAB [d] *R*-VALUE & DEPTH	CRAWL SPACE [c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	~~0.40~~ 0.65	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 [h]	8/13	19	5/13 [f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 [h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 [h]	13/17	30 [g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 [h]	15/20	30 [g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 [h]	19/21	38 [g]	15/19	10, 4 ft	15/19

American Chemistry Council

February 13, 2019

RE: ACC Comments Opposing Florida Building Code 7th Edition Update Energy Proposal #8287

I am writing on behalf of the American Chemistry Council (ACC) to oppose proposal #8287 to raise fenestration U-factor in cz2 from 0.40 to 0.65. This is a weakening amendment to the current code and will decrease efficiency across all compliance paths.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. This proposal is a clear weakening amendment that would reverse years of progress made by the Florida Building Commission to improve the efficiency of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. Therefore, we request that you oppose 8287 in favor of the provisions of the 2018 IECC.

About ACC and Building Energy Codes

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Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region

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American Chemistry Council

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Date Submitted	12/15/2018	**Section**	402.1.4	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Table R402.1.2

Summary of Modification

Changes to U-Factor for fenestration.

Rationale

In August 2018, the Florida Building Commission appointed a workgroup to examine water intrusion through windows as a result of thunderstorms as well as hurricanes. Looking back at Hurricanes Jeanne and Frances in 2004, central Florida saw tremendous damage due to water intrusion through windows in the region, damage from wind-driven rain, not wind-borne debris. At the time, industry wisdom questioned if this failure was the result of the shift away from installing entry level 'commercial' class windows that had inherently higher water performance than did the entry-level 'residential' windows - about one and half times the design pressure class.

This reduction was partially driven by mandatory increases in overall energy code performance, dictated both at the federal and state level (on the overall house). Across the nation, in residential applications, vinyl windows saw exponential growth, which, on the whole, yielded many positives, such as more competition, better thermal performance, and competitive durability. As part of a free market economy, aluminum windows were crowded into commercial and architectural markets. The shift in materials was in large part due to aluminum's poor winter energy performance, which is negligible in Florida.

This code proposal anticipates that the Fenestration Water Resistant Workgroup is likely to recommend higher water design pressures for the wind-driven rain test. This may result in a conflict with the energy code as it is currently written. The energy savings between the 0.40 and 0.65 U-Factors is negligible in Florida. The vast majority of both energy and storm mitigation is to be found in updating existing buildings. This proposal allows for the important aspects of resistance to wind-driven rain and radiant heat reflectance to coexist. This will benefit the Florida consumer, and reduce problems for the Florida remodeler and the code official.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No cost impact on enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

May result in a slight increase in annual energy cost ($15 -$25) but will allow the use of stronger windows which should reduce water intrusion from the rain.

Impact to industry relative to the cost of compliance with code

No cost impact.

Impact to small business relative to the cost of compliance with code

No cost impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The change impacts the welfare of the public by allowing the use of stronger materials in the manufacture of windows which should reduce water intrusion due to wind-driven rain.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The change improves the code by allowing the use of stronger materials in the manufacture of windows which should reduce water intrusion due to wind-driven rain.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code.

1st Comment Period History

EN8289-G1

Proponent	Kelli Fleming	**Submitted**	1/2/2019	**Attachments**	No

Comment:

We would request that the increase in U-Factor in zones 1&2 would be applicable for skylights as well.

1st Comment Period History

EN8289-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached opposing comment.

1st Comment Period History

EN8289-G3

Proponent Jeff Sonne for FSEC **Submitted** 2/15/2019 **Attachments** No

Comment:

The Florida Solar Energy Center opposes this mod. The fenestration U-factors in Table 402.1.4 are referenced in the U-factor alternative method, Total UA alternative method and performance compliance reference and need to be defined for each climate zone. There are still three methods for complying with the code for builders installing windows with higher U-factors in climate zone 1 (prescriptive R-value, performance and ERI).

The mod will also make the energy code less efficient and it is unsubstantiated in the rationale that the U-factor increase is needed to have stronger materials used in the manufacture of windows.

1st Comment Period History

EN8289-G4

Proponent Eric Lacey **Submitted** 2/18/2019 **Attachments** Yes

Comment:

See attached file

TABLE R402.1.4

EQUIVALENT *U*-FACTORS [a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR	SKYLIGHT *U*-FACTOR	CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTORb	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
1	~~0.50~~ NR	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	~~0.40~~ 0.65	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

American Chemistry Council

February 13, 2019

RE: ACC Comments Opposing Florida Building Code 7th Edition Update Energy Proposal #8289

I am writing on behalf of the American Chemistry Council (ACC) to oppose proposal #8289 to raise the fenestration U-factor in cz2 from 0.40 to 0.65 and replace the 0.50 U-factor requirement in cz1 with "NR". This is a weakening amendment to the current code and will decrease efficiency across all compliance paths. Additionally, "NR" is inappropriate in the U-factor table. The U-factor table is used to set the baseline for all trade-off paths, including the Total UA and simulated performance path. Trade-off programs and compliance software need to have a baseline against which efficiencies can be compared, and a lack of a baseline U-factor in climate zone 1 will simply not work for these compliance paths.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. This proposal would clearly weaken the energy efficiency of the code and would reverse years of work by the Florida Building Commission to improve the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. Therefore, we request that you oppose 8289 in favor of the provisions of the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

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Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

RECA Comment on Proposal EN8289

Oppose. Similar to proposal EN8287, this proposed modification would weaken energy efficiency by increasing fenestration U-factors in climate zone 2 by over 62% -- from 0.40 to 0.65. However, this proposal is also technically flawed because it changes the fenestration U-factor in climate zone 1 to NR in Table R402.1.4.

Specifying "NR" as the fenestration U-factor in Table R402.1.4 is problematic because this table is used to set the baseline for all trade-off paths, including the Total UA and simulated performance path. Trade-off programs and compliance software need to have a baseline against which efficiencies can be compared, and a lack of a baseline U-factor in climate zone 1 will simply not work for these compliance paths.

Our concerns with proposal EN8287 apply to EN8289 as well: The increase in fenestration U-factor from 0.40 to 0.65 will result in more energy use, higher costs for homeowners, and less comfortable homes. The proponent claims that this proposal "anticipates" that the Fenestration Water Resistant Workgroup will recommend higher water design pressures. This Workgroup has not yet begun its work, and it is unclear what its recommendations will be. The Commission should not weaken the code based on speculation. Fenestration U-factor is not even mentioned in the Proposed Water Intrusion Study's Initial Conclusions, nor is it within the scope of the Research Project. *See* http://www.floridabuilding.org/fbc/commission/FBC_0219/fenestration_WG/Lavrich_Project.pdf Even if the Workgroup recommends higher design pressures, this proposal does not increase design pressures – instead it raises U-factors for all residential buildings in climate zone 2, whether they have higher design pressure requirements or not.

Florida has been requiring a 0.40 U-factor in climate zone 2 since at least the 2014 edition of the code (based on the 2012 IECC). This would be a significant step backward in efficiency for no demonstrated need. Because much of the fenestration already being installed in Florida is likely well under a 0.40 U-factor, this proposal will create unnecessary "trade-off credit" that will simply be used to weaken the efficiency of other parts of the buildings (reduced insulation, reduced equipment or lighting efficiency, etc.).

Date Submitted	12/15/2018	**Section**	406.4	**Proponent**	Joseph Belcher for FHBA
Chapter	4	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

N/A

Summary of Modification

Establishes ERI Reference Design ventilation rate.

Rationale

R406.4 ERI-based compliance. The ERI for the rated design shall be determined in accordance with ANSI/RESNET/ICC 301, including Addendum A-2015, and be shown to have an ERI less than or equal to the appropriate value listed in Table R406.4.The ERI Reference Design ventilation rate shall be = 0.01 × total square foot area of house + 7.5 × number of bedrooms + 1 and the ERI Rated Design ventilation rate shall comply with the mechanical ventilation requirements of the Florida Building Code-Residential, M1507.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact on the cost of enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No cost impact relative to compliance with the code.

Impact to industry relative to the cost of compliance with code

No cost impact relative to compliance with the code.

Impact to small business relative to the cost of compliance with code

No cost impact relative to compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The proposal is connected with the health of the public. The proposal recognizes the specific needs of the Florida climate and will prevent overventilation resulting in bringing more moisture into Florida homes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal improves the code because it modifies the code to address a large Florida specific need.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The proposed change does not degrade the effectiveness of the code.

1st Comment Period History

EN8390-G1

Proponent Jeff Sonne for FSEC **Submitted** 2/18/2019 **Attachments** No

Comment:

The Florida Solar Energy Center opposes mod 8390. This mod writes an exception to an ANSI Standard which is unlikely to make any difference in compliance with the Florida Code or with ERI calculations for homes constructed in accordance with Florida's envelope air tightness requirements.

Furthermore the modification is not complete. It does not spell out what reference home power should be applied to the ventilation system as does ANSI/RESNET/ICC 301 Table 4.2.2(1). It also does not specify a revised infiltration rate for the reference home.

Please note that the formula, if used, should instead state ...7.5 x (number of bedrooms + 1). We believe the parentheses were inadvertently omitted from this mod.

R406.4 ERI-based compliance. The ERI for the *rated design* shall be determined in accordance with ANSI/RESNET/ICC 301~~,~~ including Addendum A-2015~~,~~ and be shownto have an ERI less than or equal to the appropriate valuelisted in Table R406.4.The ERI Reference Design ventilation rate shall be = 0.01 × total square foot area of house + 7.5 × number of bedrooms + 1 and the ERI Rated Design ventilation rate shall comply with the mechanical ventilation requirements of the Florida Building Code-Residential, M1507.

EN8392

Date Submitted	12/15/2018	**Section**	403.7.1.4	**Proponent**	Arlene Stewart
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Makes provisions for heating and cooling equipment powered by generators during natural disasters and recovery

Rationale

As more and more Floridians add hard wired generators, they also want to hard wire their heating and cooling systems. However, it is impractical to power whole house HVAC systems by generators meant for emergency usage. Consequently, HVAC contractors are fielding calls from homeowners wanting to add supplement PTAC units that are permanently installed that can be powered by permanently installed generators to cool a smaller portion of the house for a shorter period of time, through and after a storm. However, code currently prohibits extra capacity to be designed into a house, save for entertainment purposes, and certainly not using a temporary, alternative power source. Without it, consumers may be driven to weekend, non-permitted installation, or purchase of window or free standing ac systems that may not be vented properly or may ultimately compromise closed shell of the building during the storm (because the AC must be installed within the open window). This proposal makes provision provides a pathway to allow Floridians to safely shelter in place in lower category storms while still smartly considering energy efficiency provisions.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This will positively impact the community as it will assist in making advanced permanent storm preparations easier. This is also an option, not a requirement, so there is no fiscal impact to those who chose not to partake.

Impact to building and property owners relative to cost of compliance with code

There is not fiscal impact as it is only an option. However it is a cost benefit as it provides a compliance path that did not previously exist.

Impact to industry relative to the cost of compliance with code

It is a cost benefit to the industry because it provides a solution to provide a service that customers have been more frequently requesting that did not previously exist

Impact to small business relative to the cost of compliance with code

This positively impacts small businesses more because they do not have the resources larger businesses have to seek solutions to code difficulties. This pathway will allow them to provide them to more quickly respond to customer inquiries for generator powered AC systems.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Installing HVAC systems specifically for storm use has skyrocketed in the past year, and the addition of this specialized path, that is ONLY for storms, but NOT excessive capacity that can add to daily moisture build up is essential to keep both families and structures safe and health

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This provision improves the code by making provision for both energy and storm provisions to co-exist.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This provision only addresses sizing. Materials, products, method and systems are not affected and therefore cannot be discriminated against.

Does not degrade the effectiveness of the code

This provision increases the effectiveness of the code, does not degrade it.

1st Comment Period History

8392-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/13/2019 **Attachments** Yes

Rationale

As battery systems are starting to be installed in homes (especially those with PV systems), including batteries as a power option increases this mod's potential application and benefit.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Same as original mod.

Impact to building and property owners relative to cost of compliance with code

Same as original mod.

Impact to industry relative to the cost of compliance with code

Same as original mod.

Impact to Small Business relative to the cost of compliance with code

This positively impacts small businesses more because they do not have the resources larger businesses have to seek solutions to code difficulties. This pathway will allow them to provide them to more quickly respond to customer inquiries for generator powered AC systems.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Same as original mod.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Same as original mod.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Same as original mod.

Does not degrade the effectiveness of the code

Same as original mod.

R403.7.1.4 Extra capacity for units in natural disasters. Permanently installed cooling or heating equipment, intended for intermittent usage during or in the recovery of a natural disaster, powered by a generator until municipal utility service is restored, shall be sized for the room in which it is installed. Alternatively, an enclosed zone shall be permitted to be defined to match the capacity of the unit installed.

[The Florida Solar Energy Center supports this mod and suggests the following additional language:]

R403.7.1.4 Extra capacity for units in natural disasters. Permanently installed cooling or heating equipment, intended for intermittent usage during or in the recovery of a natural disaster, powered by a generator or battery until municipal utility service is restored, shall be sized for the room in which it is installed. Alternatively, an enclosed zone shall be permitted to be defined to match the capacity of the unit installed.

Date Submitted	11/12/2018	**Section**	503.1.4	**Proponent**	Bryan Holland
Chapter	5	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification

Rationale

In this proposed modification, 50% is changed to 10% for alterations to residential lighting systems to correlate and match the 10% exception for commercial lighting systems in Section C503.6.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will increase the cost of construction for alterations where greater than 10% of the lighting is replaced.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by increasing the overall efficacy of lighting in residential buildings.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by harmonizing the requirements in both residential and commercial construction and by lowering the threshold where lower efficacy lighting can remain in use during alterations.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7243-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

This proposed mod changes the current code exception for residential alterations that replace less than 50% of luminaries in a space to 10%. It is my opinion that 10% is extremely restrictive.

1st Comment Period History

EN7243-G2

Proponent Jeff Sonne for FSEC **Submitted** 2/18/2019 **Attachments** No

Comment:

The Florida Solar Energy Center supports this mod which is highly cost effective for Florida citizens.

R503.1.4 Lighting. New lighting systems that are part of the alteration shall comply with Section R404.1.

Exception: Alterations that replace less than ~~50~~ 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

EN7254

Date Submitted 11/13/2018
Chapter 5
Section 503.1.1.1
Affects HVHZ No
Proponent Eric Lacey
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **Yes**
Alternate Language **No**

Related Modifications

Summary of Modification

Provides additional flexibility for builders by allowing replacement fenestration U-factors and SHGCs to be area-weighted averaged, consistent with 2018 IECC.

Rationale

The purpose of this code proposal is to clarify that the weighted average performance of replacement fenestration units can be used for compliance purposes. Area-weighted averaging is already permitted in the commercial chapter. This change will provide additional flexibility for builders, lowering costs in many cases. This proposal is based on RE184-16, which was successfully adopted into the 2018 IECC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This will help simplify enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposal will likely reduce costs.

Impact to industry relative to the cost of compliance with code

This proposal will likely reduce costs.

Impact to small business relative to the cost of compliance with code

This proposal will likely reduce costs.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Will help facilitate the replacement of fenestration products, which will help reduce energy use and negative environmental impacts while improving occupant comfort and well-being.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Provides additional flexibility to achieve compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Improves effectiveness of code.

1st Comment Period History

EN7254-G1

Proponent Jeff Sonne for FSEC **Submitted** 2/13/2019 **Attachments** No

Comment:

The Florida Solar Energy Center supports this mod which may allow for SHGC flexibility based on orientation.

1st Comment Period History

EN7254-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

R503.1.1.1 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 as provided in Table R402.1.2. Where more than one replacement *fenestration* unit is being installed, an area-weighted average of the U-factor and/or SHGC of all replacement *fenestration* units shall be permitted to be used to demonstrate compliance.

American Chemistry Council

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #7254

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #7254. This proposal allows replacement fenestration U-factors and SHGCs to be determined by area-weighted average, consistent with 2018 IECC. This is a commonsense amendment that provides flexibility without reducing energy efficiency.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region

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American Chemistry Council

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EN7598

Date Submitted	11/30/2018	**Section**	503.2	**Proponent**	Jeff Sonne for FSEC
Chapter	5	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

To make exception consistent with Florida Code Section R405.3, replace "energy cost" language with "loads" language.

Rationale

"Energy cost" is IECC language; the Florida Energy Code uses "loads" instead.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, or facilitates enforcement by making code more consistent.

Impact to building and property owners relative to cost of compliance with code

None, or facilitates compliance by making code more consistent.

Impact to industry relative to the cost of compliance with code

None, or facilitates compliance by making code more consistent.

Impact to small business relative to the cost of compliance with code

None, or facilitates compliance by making code more consistent.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by making code more consistent.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by making it more consistent.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code more consistent.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by making it more consistent.

R503.2 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.

Exception: Where the simulated performance option in Section R405 is used to comply with this section, the annual ~~energy cost~~ total normalized Modified Loads of the proposed design ~~is~~ are permitted to be 110 percent of the annual ~~energy cost otherwise allowed by Section R405.3~~total loads of the standard reference design as calculated in accordance with Appendix RC of this standard.

EN7599

Date Submitted	11/30/2018	**Section**	505.2	**Proponent**	Jeff Sonne for FSEC
Chapter	5	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

7598

Summary of Modification

To make exception consistent with Florida Code Section R405.3, replace "energy cost" language with "loads" language.

Rationale

"Energy cost" is IECC language; the Florida Energy Code uses "loads" instead.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, or facilitates enforcement by making code more consistent.

Impact to building and property owners relative to cost of compliance with code

None, or facilitates compliance by making code more consistent.

Impact to industry relative to the cost of compliance with code

None, or facilitates compliance by making code more consistent.

Impact to small business relative to the cost of compliance with code

None, or facilitates compliance by making code more consistent.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Benefits general public by making code more consistent.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves code by making it more consistent.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate; makes code more consistent.

Does not degrade the effectiveness of the code

Increases effectiveness of the code by making it more consistent.

R505.2 General.

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 simulated performance option in Section R405 is used to comply with this section, the annual ~~energy cost~~ total normalized Modified Loads of the proposed design ~~is~~ are permitted to be 110 percent of the annual ~~energy cost otherwise allowed by Section R405.3~~total loads of the standard reference design as calculated in accordance with Appendix RC of this standard.

EN8371

Date Submitted	12/15/2018	**Section**	501.7	**Proponent**	Oscar Calleja
Chapter	5	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

On existing Residential buildings, replacement of AC ductwork is required to comply with the Prescriptive requirements of the Energy Code. This means min R-8 ductwork in attics. This Mod removes that requirement allowing for R-6 ductwork to be installed.

Rationale

In most Residential existing dwellings the space needed for AC ductwork is usually a problem. Attic truss space limits the size of ducts that will fit through.

Current Residential Energy Code Section 501.7 mandates that when a complete duct system is replaced the duct must comply with the Prescriptive requirements. Those include a Minimum R value of R-8 for ducts. R-8 ducts have larger outside dimensions and therefore present a problem when replacing smaller sized ducts. This Mod creates an exception so that R-6 ducts can be used but only when the Energy consumption of the dwelling is not increased. That can be proven by utilizing Energy Gauge or other approved software with a before and after whole house annual Energy consumption.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Allows enforcement by requiring an Energy use report when using duct R-value less than R-8.

Impact to building and property owners relative to cost of compliance with code

Solves huge problem when R-8 duct will not fit in current attic space. Avoids having to reduce the internal duct size.

Impact to industry relative to the cost of compliance with code

Solves huge problem when R-8 duct will not fit in current attic space. Avoids having to reduce the internal duct size.

Impact to small business relative to the cost of compliance with code

Solves huge problem when R-8 duct will not fit in current attic space. Avoids having to reduce the internal duct size.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Allows new air distribution systems to be installed replacing old dirty and leaking ducts.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Allows new air distribution systems to be installed replacing old dirty and leaking ducts.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products or methods.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of Code by requiring that Energy use of home not be increased.

Alternate Language

1st Comment Period History

8371-A1

Proponent Jeff Sonne for FSEC **Submitted** 2/14/2019 **Attachments** Yes

Rationale

Alt language intended to insure that if space limitations do not allow Code stipulated duct R-value to be used, the highest R-value that will fit in available space be used.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Same as original mod.

Impact to building and property owners relative to cost of compliance with code

Same as original mod.

Impact to industry relative to the cost of compliance with code

Same as original mod.

Impact to Small Business relative to the cost of compliance with code

Solves huge problem when R-8 duct will not fit in current attic space. Avoids having to reduce the internal duct size.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Same as original mod.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Same as original mod.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Same as original mod.

Does not degrade the effectiveness of the code

Same as original mod.

1st Comment Period History

EN8371-G1

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached opposing comment.

R501. 7Building systems and components.
Thermal efficiency standards are set for the following building systems and components where new products are installed or replaced in existing buildings, and for which a permit must be obtained. New products shall meet the minimum efficiencies allowed by this code for the following systems and components:

Heating, ventilating or air-conditioning systems;
Service water or pool heating systems;
Lighting systems; and
Replacement fenestration.

Exceptions:

1. Where part of a functional unit is repaired or replaced. For example, replacement of an entire HVAC system is not required because a new compressor or other part does not meet code when installed with an older system.
2. If the unit being replaced is itself a functional unit, such as a condenser, it does not constitute a repair. Outdoor and indoor units that are not designed to be operated together must meet the U.S. Department of Energy certification requirements contained in Section R303.1.2. Matched systems are required; this match may be verified by any one of the following means:

    a. AHRI data
    b. Accredited laboratory
    c. Manufacturer's letter
    d. Letter from registered P.E. State of Florida
3. Where existing components are utilized with a replacement system, such as air distribution system ducts or electrical wiring for lights, such components or controls need not meet code if meeting code would require that component's replacement.
4. Replacement equipment that would require extensive revisions to other systems, equipment or elements of a building where such replacement is a like-for-like replacement, such as through-the-wall condensing units and PTACs, chillers and cooling towers in confined spaces.
5. <u>**Replacement air distribution systems need not meet current Code's prescriptive R-value as long as overall building energy use after replacement is not more than the original building's prior to alteration.**</u>

5. Replacement air distribution systems shall either ~~need not~~ meet current Code's prescriptive R-value requirement or if space does not permit, then the highest available R-value duct insulation that will fit in the available space, as long as overall building energy use after replacement is not more than the original building's energy use prior to alteration.

American Chemistry Council

February 13, 2019

RE: ACC Comments Opposing Florida Building Code 7th Edition Update Energy Proposal #8371

I am writing on behalf of the American Chemistry Council (ACC) to oppose proposal #8371. This proposal exempts replacement duct systems from code R-value requirements. The exemption would result in less insulation and higher energy costs. Ducts are commonly installed in attics, where temperatures can exceed 130-140 degrees Fahrenheit. While we understand the desire for some flexibility in the code requirements as they pertain to existing buildings, the losses in energy efficiency could be significant if this proposal is adopted. Because the opportunities to improve Florida's existing building stock are so rare, we urge the Commission to be especially careful with any proposals that could weaken code provisions that apply to existing buildings.

We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. Therefore we request that you oppose 8371 in favor of the provisions of the 2018 IECC.

About ACC and Building Energy Codes
ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,

americanchemistry.com®

1995 North Park Place, Suite 240 | Atlanta, GA | (770)-421-2991

Michael Power
Senior Director, Southern Region
American Chemistry Council

Date Submitted	11/19/2018	**Section**	503.1	**Proponent**	Bryan Holland
Chapter	5	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Summary of Modification

This proposed modification deletes an unintended and unnecessary exception for alterations.

Rationale

This proposed modification deletes exception #7 related to lighting alterations as was originally intended by the authors of this Section in the 2015 IECC. The current rule in Section C503.6 is the correct requirement for lighting alterations. This modification removes the conflict between the two parts of the same section.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by correcting the code for proper use and enforcement.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by removing an exception that is conflict the correct requirement in another part of the same section.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

1st Comment Period History

EN7330-G1

Proponent pete quintela **Submitted** 1/14/2019 **Attachments** No

Comment:

I do not agree with this mod, I think it is extremely restrictive. This code section exceptions address common types of alterations where the need for upgrading to the new code requirements are not warranted.

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 to the provisions of this code than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

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. Surface-applied window film installed on existing single-pane fenestration assemblies reducing solar heat gain, provided the code does not require the glazing or fenestration to be replaced.

3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.

4. Construction where the existing roof, wall or floor cavity is not exposed.

5. Roof recover.

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

~~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.~~

EN8190

Date Submitted	12/14/2018	**Section**	503.2	**Proponent**	Eric Lacey
Chapter	5	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

Adopts reasonable exceptions to code requirements for existing buildings.

Rationale

This proposal will help align the 7th Edition Code with the 2018 IECC by adopting changes brought about by proposal CE285. According to the original proponent of CE285, "... where existing buildings undergo a change in space conditioning or change in occupancy or use, the current code requires 'full compliance with this code.' Such a stringent requirement is overly burdensome and in many cases unacheivable, particularly for the building envelope. Details such as slab edges, basement wall insulation, entry doors and the like can be difficult or impossible to bring up to current code without completely rebuilding the facades. This proposal allows a limited amount of "wiggle room" for buildings undergoing change in space conditioning or change in use, where they use either the component performance trade-off method in Section C402.1.5 or the total building performance method in Section C407."

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal will help clarify and streamline enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposal will facilitate compliance by permitting additional flexibility.

Impact to industry relative to the cost of compliance with code

This proposal will facilitate compliance by permitting additional flexibility.

Impact to small business relative to the cost of compliance with code

This proposal will help reduce costs by permitting additional flexibility.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Providing minimum reasonable energy requirements for commercial buildings is critical to the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal clarifies the current code provisions.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal does not discriminate against materials, products, or systems of construction.

Does not degrade the effectiveness of the code

This proposal improves the effectiveness of the code.

1st Comment Period History

EN8190-G1

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached comments.

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.

Exceptions:

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

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 C405.4.2(1) or C405.4.2(2) to another use in Table C405.4.2(1) or C405.4.2(2), the installed lighting wattage shall comply with Section C405.4.

Exceptions:

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

American Chemistry Council

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8190

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8190. This proposal requires buildings undergoing changes in space conditioning to demonstrate total UA no higher than 110% of the target UA, consistent with 2018 IECC.

ACC supports adoption of the provisions of the 2018 IECC into the Florida Building Code 7th Edition. We appreciate the need for Florida specific amendments, but only so long as they recognize that the model code is a floor, not a ceiling, and do not weaken the substantive requirements of the code. Strong thermal envelope requirements enhance energy efficiency, drive materials and product innovation, and support continued economic and job growth. We request that you support this proposal to bring in these important updates from the 2018 IECC.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

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Date Submitted	12/14/2018	**Section**	1	**Proponent**	Amanda Hickman
Chapter	2717	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments No

Alternate Language No

Related Modifications

#7882 - Table C407.5.1(1)

Summary of Modification

Adds reference standard ASHRAE 55-2013

Rationale

This modification updates that ASHRAE 55 standard, which is in desperate need of being updated from the 1992 edition. The changes in the 2013 edition reflect many new technologies.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification, in conjunction with modification # 7882, will update the standard to the current edition (2013). This will update the specifications in the performance path to be more reflective of credit that is available for current technologies.

Impact to building and property owners relative to cost of compliance with code

This modification updates to the current standard, which will allow more credit for current technologies in the performance path. This could reduce cost.

Impact to industry relative to the cost of compliance with code

This modification updates the standard to the current edition, which will capture newer technologies that were left out of the previous edition.

Impact to small business relative to the cost of compliance with code

This modification brings in the current standard, which could reduce cost for small business, as it recognizes newer technologies.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification updates the standard to the current edition which will provide additional comfort for human occupancy.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification updates to the current standard which is more reflective of current technologies.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No. The update to the current standard is more inclusive and recognizes more technological advances.

Does not degrade the effectiveness of the code

No. This modification updates to the current edition of the standard, which will improve the effectiveness of the code.

Add new reference standards as follows:

ASHRAE 55-2013:

Thermal Environmental Conditions for Human Occupancy

ASHRAE Standards are available on-line as read-only format.

Standard 55 can be located via the following link, under the heading "Standards Referenced in Code"

https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards

EN7885

Date Submitted	12/14/2018	**Section**	1	**Proponent**	Amanda Hickman
Chapter	2717	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

#7884 - delete definition of fan efficiency grade
#7886 - delete language in section C403.2.12.3

Summary of Modification

This modification removes reference standard AMCA 205-12

Rationale

AMCA International and a consensus of its member companies have decided that the Fan Energy Index (FEI) metric is to replace the Fan Efficiency Grade (FEG) metric for efficiency codes, standards and regulations.

FEI emerged as the metric of choice from public stakeholder negotiations as a recommendation to the Department of Energy toward its rulemaking initiative for commercial fans and blowers. Although that rulemaking has been postponed, it has not been canceled.

ASHRAE Technical Committee TC 5.1 for fans voted to remove FEG from ASHRAE 90.1. The 90.1 Mechanical Subcommittee vetted FEI and decided to replace FEG with FEI, which was upheld by the full committee.

FEI is replacing FEG in ASHRAE 90.1 in the 2019 edition.

FEI has been added to EnergyPlus modeling software and the DOE Fan System Assessment Tool.

FEI also has been vetted by ISO and is being added to the ISO Standard 12759 Fans - Energy Efficiency classification of fans.

Globally, the direction for regulation of motor driven units (fans, pumps, and compressors) focuses on metrics that include motors, drives and controllers. FEG is the only metric that is not in synch with this direction.

AMCA International has expanded its fan certification program to include FEI ratings.

Therefore, in concert with the proposal to replace FEG with FEI, AMCA is proposing that The FEG provision be deleted from the Florida Energy Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification removes the reference standard for an unused and unsupported fan efficiency metric. This will decrease confusion and increase enforceability.

Impact to building and property owners relative to cost of compliance with code

This modification removes the reference standard for an unused and unsupported fan efficiency metric, which has the potential to decrease cost.

Impact to industry relative to the cost of compliance with code

This modification removes the reference standard for an unused and unsupported fan efficiency metric, which has the potential to decrease cost.

Impact to small business relative to the cost of compliance with code

This modification removes the reference standard for an unused and unsupported fan efficiency metric, which has the potential to decrease cost.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification removes a reference standard for an unused and unsupported fan efficiency metric, which will allow the general public the ability to choose more efficient products.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification removes the reference standard for an unused and unsupported fan efficiency metric, which will decrease confusion and thereby strengthening the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification only removes the reference standard for an unused and unsupported fan efficiency metric.

Does not degrade the effectiveness of the code

This modification removes the reference standard for an unused and unsupported fan efficiency metric, thereby increasing the effectiveness of the code.

Delete Reference Standard:

~~AMCA 205-12 Energy Efficiency Classification for Fans~~

EN7913

Date Submitted	12/14/2018	**Section**	1	**Proponent**	Amanda Hickman
Chapter	2717	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

#7892 - FEI definitions
#8122 - FEI language

Summary of Modification

This modification adds the reference standard AMCA 208-18: Calculation of the Fan Energy Index.

Rationale

This modification adds a new reference standard, AMCA 208-18: Calculation of the Fan Energy Index. This standard is needed due to the updates to the current fan efficiency metric from a Fan Efficiency Grade (FEG) to a more current and improved metric known as Fan Energy Index (FEI).

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification provides the current, appropriate standard for calculating fan energy index, thereby making it easier to enforce the code.

Impact to building and property owners relative to cost of compliance with code

This modification is to only add a new standard, therefore there will be no cost impact.

Impact to industry relative to the cost of compliance with code

This modification is to only add a new standard, therefore there will be no cost impact.

Impact to small business relative to the cost of compliance with code

This modification is to only add a new standard, therefore there will be no cost impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification adds the reference standard for the newest fan efficiency metric, thereby improving the HVAC system and improving the economic welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification adds a new, current standard which strengthens and improves the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, this modification does not discriminate against materials, products, methods, or systems of construction. This modification only adds a new reference standard.

Does not degrade the effectiveness of the code

No, this modification does not degrade the effectiveness of the code. This modification only adds a new reference standard, which actually strengthens the effectiveness of the code.

Add new reference standard as follows:

AMCA 208-18: Calculation of the Fan Energy Index

STANDARD

ANSI/AMCA Standard 208-18

Calculation of the Fan Energy Index

An American National Standard
Approved by ANSI on January 24, 2018

Air Movement and Control Association International

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ANSI/AMCA Standard 208-18

Calculation of the Fan Energy Index

Air Movement and Control Association International
30 West University Drive
Arlington Heights, Illinois
60004

AMCA Publications

Authority AMCA Standard 208-17 was adopted by the membership of the Air Movement and Control Association International Inc. on November 22, 2017. It was approved as an American National Standard on January 24, 2018

Objections The Air Movement and Control Association (AMCA) International Inc. will consider and take action upon all written complaints regarding its standards, certification programs or interpretations thereof. For information on procedures for submitting and handling complaints, write to

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Review Committee

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Joanna Mauer	Appliance Standards Awareness Project
Sarah Widder	Pacific Northwest National Lab
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Kai Aschenbach	Ziehl-Abegg
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PS Nishar	Etisalat Facilities Management
Dr. R Rajasekar	Spruce Airwin Mech Engg PVT LTD
Gary Shamshoian	Best Technologies/HVAC Manufacturing, Inc.
Ang Kee Goh	MMC-Gamuda KVMRT (T) Sdn. Bhd.
Efe Unal	Aironn Ventilation Group
David Mayer	Greenheck Fan
Alexander Han	Jangho Group Co. Ltd.
Mike Brendel	Lau Fan
Matt Raymond	New York Blower
Alejandro Galdamez	California Energy Commission
Louis Starr	NEEA
Bryan Boyce	Energy Solutions
Reiner Kelch	System Air GmbH
Samuel Brugnaroto	GSI Brazil
David Johnson	Berner International LLC
Aron Reid	New York Blower

Thomas Gustafson	Hartzell Air Movement
Joe Brooks	AMCA International Staff

Contents

Calculation of the Fan Energy Index

1. Purpose and Scope

This standard defines the calculation method for the fan energy index (FEI), which is an energy efficiency metric for fans inclusive of motors and drives. This metric provides a standardized and consistent basis to compare fan energy performance across fan types and sizes at a given fan duty point.

Fan specifiers can use FEI to understand and communicate the fan efficiency design intent. Legislative or regulatory bodies can use FEI to define the energy efficiency requirements of fans.

The scope includes all fan and motor sizes and all applications, including fans with fan air performance based on tests in accordance with one of the following fan test standards: ANSI/AMCA Standard 210, ANSI/AMCA Standard 230, ANSI/AMCA Standard 250, ANSI/AMCA Standard 260, ISO 5801, or ISO 13350. All other fans are excluded (including air curtain units that are tested in accordance with ANSI/AMCA Standard 220).

2. Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

1. ANSI/AMCA Standard 99-16
   Standards Handbook
2. ANSI/AMCA Standard 207-17
   Fan System Efficiency and Fan System Input Power Calculation
3. ANSI/AMCA Standard 210-16/ASHRAE Standard 51-16
   Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
4. AMCA Publication 211
   Certified Ratings Program Product Rating Manual for Fan Air Performance
5. ANSI/AMCA Standard 230-15
   Laboratory Methods of Testing Air Circulating Fans for Rating and Certification
6. ANSI/AMCA Standard 250-12
   Laboratory Methods of Testing Jet Tunnel Fans for Performance
7. ANSI/AMCA Standard 260-13
   Laboratory Methods of Testing Induced Flow Fans for Rating
8. IEC 60034-2-1 Ed. 2.0 b:2014
   Rotating electrical machines—Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)
9. IEC 60034-30-1 Ed. 1.0 (2014-03)
   Rotating electrical machines—Part 30-1: Efficiency classes of line operated AC motors (IE code)
10. IEEE 112-2004
    IEEE Standard Test Procedure for Polyphase Induction Motors and Generators
11. IEEE 114-2010
    IEEE Standard Test Procedure for Single-Phase Induction Motors
12. ISO 5801:2007
    Fans—Performance testing using standardized airways
13. ISO 13350:2015
    Fans—Performance testing of jet fans

14. NEMA MG 1-2016 (with 2017 Supplement [Part 34]) *Motors and Generators*
15. GB/T 1032-2012
    Test procedures for three-phase induction motors

3. Definitions/Units of Measure/Symbols

3.1 Definitions

For the purposes of this document, the terms and definitions given in ANSI/AMCA Standard 207, ANSI/AMCA Standard 99 and the following apply.

3.1.1 General definitions

3.1.1.1 Duty point
A single airflow and pressure point within the published operating range of the fan.

3.1.1.2 Reference fan
A conceptual fan used to relate all fans to a common baseline. The reference fan is one capable of producing the required airflow and fan pressure at a specified shaft input power, uses a V-belt transmission, has a motor efficiency based on a four-pole, 60 Hz, IE3 motor and does not include a speed control.

3.1.1.3 Regulated motor
A motor whose efficiency or power usage is subject to regulations under IEC 60034-30, GB 18613 or Subpart B or X in Part 431 of Title 10 of the Code of Federal Regulations (10CFR 431).

3.1.1.4 Default motor efficiency
A default efficiency assigned to the motor at its operating point when either the specific motor is not identified or the efficiency of the motor used is unknown. The assumed motor efficiency is representative of a premium efficiency (IE3) three-phase, four-pole, general purpose squirrel-cage induction motor.

3.1.1.5 Embedded fan
A fan that is set or fixed firmly inside or attached to a surrounding piece of equipment whose purpose exceeds that of a fan or is different than that of a standalone fan. This equipment may have safety or energy efficiency requirements of its own. Examples of embedded fans include supply fans in air handling units, condenser fans in heat rejection equipment, tangential blowers in air curtain units and induced or forced draft combustion blowers in boilers or furnaces.

3.1.1.6 Standalone fan
A fan in at least a minimum testable configuration, as defined in Section 4.1. This includes any motor, transmission or motor controller if included in the rated fan. It also includes any appurtenances included in the rated fan, and it excludes the impact of any surrounding equipment whose purpose exceeds or is different than that of the fan. Standalone fans do not include provisions for air conditioning, air filtration, air mixing, air treatment or heating. Examples include power roof ventilators, side-wall exhaust fans, whole house fans, inline fans, ceiling fans, jet tunnel fans and induced-flow laboratory exhaust fans.

3.1.1.7 Bare shaft fan
A fan without motor, transmission or motor controller.

3.1.1.8 Continuous control fan
A fan that has the capability to vary the operation of the fan continuously over the fans operating range either by varying the speed of the fan or varying the pitch of the impeller.

3.1.1.9 Non-continuous control fan
A fan that varies its operation to a discrete number of non-continuous operating points.

3.1.1.10 Fan
A rotary bladed machine used to convert power to air power, with an energy output limited to 25 kJ/kg of air, consisting of an impeller, a shaft, bearings and a structure or housing. It includes any transmissions, driver and/or controls if integrated, assembled or packaged by the manufacturer at the time of sale.

3.1.1.11 Impeller
A rotary bladed aerodynamic component that transfers mechanical energy to the airstream delivered by the fan.

3.1.1.12 Structure
Any component(s) of the fan necessary to support the impeller.

3.1.1.13 Housing
Any component or components of the fan that direct airflow into or away from the impeller and/or provide protection to the internal components. A housing may serve as a fan's structure.

3.1.1.14 Inlet
The area in contact with the fan's inlet area.

3.1.1.15 Outlet
The area in contact with the fan's outlet area

3.1.1.16 Motor controller
Any device that can be used to control the speed of the fan.

3.1.1.17 Driven fan
A fan configuration including a driver and, if included by the manufacturer, transmissions and controls.

3.1.1.18 Transmission
Any component that transfers energy from a driver to an impeller.

3.1.1.19 Direct-driven fan
A driven fan configuration in which the fan impeller is connected directly to the driver.

3.1.1.20 Belt-driven fan
A driven fan configuration in which the fan impeller is connected to the driver through a set of belts and sheaves mounted on the driver shaft and fan shaft. This includes fans with V-belt or synchronous belt power transmission.

3.1.1.21 V-belt power transmission
Drive belts having a substantially trapezoidal cross section that use sheaves (pulleys) having smooth contact surfaces. Conventional V-belts have a constant cross section along their length, while notched V-belts (also known as cogged V-belts) have slots running perpendicular to their length. The slots reduce bending resistance and offer improved efficiency over conventional V-belts. This standard does not account for this improved efficiency.

3.1.1.22 Synchronous belt power transmission
Drive belts having a substantially rectangular cross section containing teeth that engage corresponding teeth on the sheaves (pulleys), resulting in no-slip power transmission. These belts are sometimes called timing or toothed belts.

3.1.2 Impeller types

3.1.2.1 Axial impeller
An impeller (propeller) with a number of blades extending radially from a central hub in which airflow through the impeller is axial in direction; that is, airflow enters and exits the impeller parallel to the shaft axis (i.e., with a fan flow angle less than or equal to 20 degrees). Blades can either be single thickness or airfoil shaped.

3.1.2.2 Centrifugal impeller
An impeller with a number of blades extending between a back plate and shroud in which airflow enters axially through one or two inlets and exits radially at the impeller periphery. The airflow exits either into open space or into a housing with a fan flow angle greater than or equal to 70 degrees. Impellers can be classified as single inlet or double inlet. Blades can be tilted backward or forward with respect to the direction of impeller rotation. Impellers with backward tilted blades can be

airfoil shaped (AF), backward curved single thickness (BC), backward inclined single thickness flat (BI) or radial tipped (RT). Impellers with forward tilted blades are known as forward curved (FC).

3.1.2.3 Radial impeller
A form of centrifugal impeller with a number of blades extending radially from a central hub in which airflow enters axially through a single inlet and exits radially at the impeller periphery into a housing with impeller blades positioned such that the outward direction of the blade at the impeller periphery is perpendicular within 25 degrees to the axis of rotation. Impellers can optionally have a back plate and/or shroud.

3.1.2.4 Mixed flow impeller
An impeller with construction characteristics between those of an axial and centrifugal impeller with a fan flow angle greater than 20 degrees and less than 70 degrees. Airflow enters axially through a single inlet and exits with combined axial and radial directions at a mean diameter greater than the inlet.

3.1.2.5 Fan flow angle
The angle of the centerline of the air-conducting surface of a fan blade measured at the midpoint of its trailing edge with the centerline of the rotation axis, in a plane through the rotation axis and the midpoint of the trailing edge.

3.1.3 Fan types

3.1.3.1 Centrifugal housed fan
A fan with a centrifugal or radial impeller in which airflow exits into a housing that is generally scroll shaped to direct the air through a single fan outlet. Inlets and outlets can optionally be ducted.

3.1.3.2 Centrifugal inline fan
A fan with a centrifugal impeller in which airflow enters axially at the fan inlet and the housing redirects radial airflow from the impeller to exit the fan in an axial direction. Inlets and outlets can optionally be ducted.

3.1.3.3 Centrifugal unhoused fan
A fan with a centrifugal impeller in which airflow enters through a panel and discharges into free space. Inlets and outlets are not ducted. This fan type also includes fans designed for use in fan arrays that have partition walls separating the fan from other fans in the array.

3.1.3.4 Power roof/wall ventilator (PRV)
A fan with an internal driver and a housing to prevent precipitation from entering the building. It has a base designed to fit over a roof or wall opening, usually by means of a roof curb.

3.1.3.5 Centrifugal PRV exhaust
A PRV with a centrifugal impeller that exhausts air from a building. Inlets are typically ducted, but outlets are not ducted.

3.1.3.6 Centrifugal PRV supply
A PRV with a centrifugal impeller that supplies air to a building. Inlets are not ducted, and outlets are typically ducted.

3.1.3.7 Axial PRV
A PRV with an axial impeller that either supplies or exhausts air to a building. Inlets and outlets are typically not ducted.

3.1.3.8 Axial inline fan
A fan with an axial impeller and a cylindrical housing with or without turning vanes. Inlets and outlets can optionally be ducted.

3.1.3.9 Axial panel fan
A fan with an axial impeller mounted in a short housing that can be a panel, ring or orifice plate. The housing is typically mounted to a wall separating two spaces and the fans are used to increase the pressure across this wall. Inlets and outlets are not ducted.

3.1.3.10 Laboratory exhaust fan
A fan designed specifically for exhausting contaminated air vertically away from a building. Fan outlets are typically constricted to achieve a high outlet velocity. Induced flow lab exhaust fans use their high velocity discharge to entrain additional air to mix with contaminated building exhaust air. Inlets can optionally be ducted, and outlets are not ducted.

3.1.3.11 Jet fan
A fan used for producing a high velocity flow of air in a space. Typical function is to add momentum to the air within a tunnel. Inlets and outlets are not ducted.

3.1.3.12 Circulating fan
A fan used for moving air within a space that has no provision for connection to ducting or separation of the fan inlet from its outlet. It is designed to be used for the general circulation of air.

3.1.3.13 Crossflow fan
A fan with a housing that creates an airflow path through the impeller in a direction at right angles to its axis of rotation and with airflow both entering and exiting the impeller at its periphery. Inlets and outlets can optionally be ducted.

3.1.3.14 Fan array
A common application of fans using multiple fans in parallel between two plenum sections for a factory packaged or field erected air handling unit.

3.2 Symbols

Symbol	Description	SI Unit	I-P Unit
A	Fan outlet or discharge area	m^2	ft^2
A, B, C, D, E	Constants	dimensionless	
F_t	Force due to thrust, jet fans	N	lbf
$FEI_{t,i}$	Fan energy index, fan total pressure basis, at duty point *i*	dimensionless	
$FEI_{s,i}$	Fan energy index, fan static pressure basis, at duty point *i*	dimensionless	
FEP_{ref}	Fan electrical input power, reference	kW	kW
FEP_{act}	Fan electrical input power, actual	kW	kW
$H_{i,ref}$	Fan shaft power, reference	kW	hp
$H_{i,act}$	Fan shaft power, actual	kW	hp
$H_{t,ref}$	Motor output power, reference	kW	hp
$H_{t,act}$	Motor output power, actual	kW	hp
$H_{t,def}$	Motor output power, default	kW	hp
P_o	Pressure constant	Pa	in. wg
$P_{s,i}$	Fan static pressure at duty point *i*	Pa	in. wg
$P_{t,i}$	Fan total pressure at duty point *i*	Pa	in. wg
Q_i	Fan airflow at duty point *i*	m^3/s	cfm
Q_0	Airflow constant	m^3/s	cfm
η_0	Fan efficiency constant	dimensionless	
$\eta_{trans,ref}$	Transmission efficiency, reference	dimensionless	
$\eta_{trans,act}$	Transmission efficiency, actual	dimensionless	
$\eta_{mtr,ref}$	Motor efficiency, reference	dimensionless	
$\eta_{mtr,act}$	Motor efficiency, actual	dimensionless	

$\eta_{ctrl,ref}$	Motor controller efficiency, reference	dimensionless	
ρ	Fan air density	kg/m^3	lbm/ft^3
ρ_{std}	Standard air density	kg/m^3	lbm/ft^3

4. General

4.1 Minimum testable configuration

The FEI calculation is based on fan performance derived from tests in accordance with recognized fan test standards. See Annex A to determine the appropriate test standard for each fan type. These test standards each require some minimum configuration in order to run the tests. This standard is also based on tests of fans in at least a minimum testable configuration, including the following:

1. Impeller
2. Shaft and bearings and/or motor to support the impeller
3. Structure or housing, unless the fan does not require these (e.g., an unshrouded circulating fan)

4.2 FEI pressure basis

The FEI is calculated using either fan total pressure or fan static pressure, based on the fan type. See Annex A for a complete explanation of the pressure basis and to learn which pressure to use.

4.3 Appurtenances

Certain accessories or appurtenances can be used to improve fan performance, including but not limited to inlet bells, diffusers, stators or guide vanes. The effect of these appurtenances can be included in the FEI calculation only if they were present during the test and are supplied with the fan. Test ducts included during testing are not required to be supplied with the fan.

Other appurtenances placed at or near the fan inlet or discharge will often result in reduced overall fan performance. These include but are not limited to guards, dampers, filters or weather hoods. The effect of these appurtenances on fan performance can be tested and published to aid in fan selection, but it is not included in the fan test used to determine FEI.

As illustrated in Figure 1, the reduced performance of a fan with appurtenances (the curve labeled *2*) can be published and matched against system pressures in order to make proper fan selections. The process of fan selection includes determining the fan speed and/or blade pitch needed to achieve the required system pressure (P_{req}) at the required airflow (Q_{req}) (point B in Figure 1). Once the required fan speed and/or blade pitch are determined, the FEI is determined from the standalone fan performance (the curve labeled *1* in Figure 1) at the same airflow, fan speed and blade pitch (point A in Figure 1).

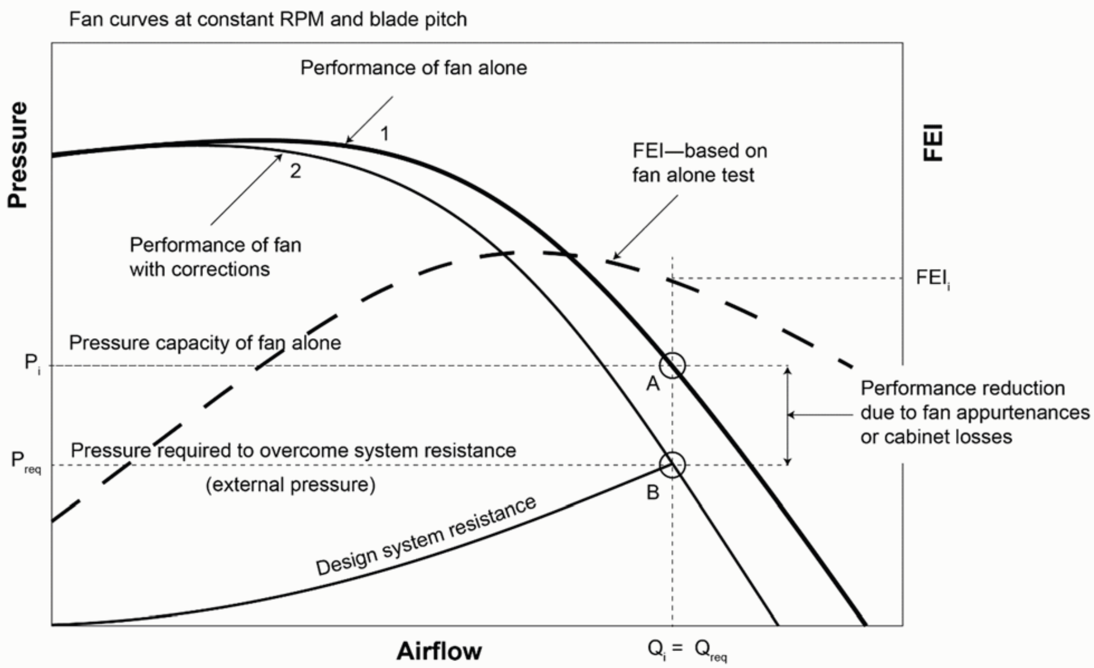


Figure 1—Fan Curves at Constant RPM and Blade Pitch

4.4 Fans embedded in other equipment

This standard does not apply to fan performance when tested embedded inside of other equipment. However, the standard can be used to calculate FEI for a fan that, while tested in a standalone configuration, will be embedded into other equipment. As with appurtenances and referring to Figure 1, corrections may need to be applied to the standalone fan performance data to account for a difference between how the fan was tested and how it is applied. The FEI for the embedded fan is determined from the standalone fan performance at the same airflow, fan speed and blade pitch of the fan as embedded in the equipment.

See Annex D for detailed guidance on the conversion of standalone fan performance to that of an embedded fan.

Each rated fan model must be rated according to the applicable fan type listed in Table A.2 of Annex A, as defined in Section 3, in accordance with with how that fan is distributed in commerce. For example, if a fan meets the definition of a PRV, it must be rated as a PRV with all necessary appurtenances, and performance ratings for a standalone centrifugal or axial fan used inside a PRV must not be used to describe the performance of the PRV itself.

5. Fan Energy Index

5.1 General

The fan energy index (FEI) is defined as a ratio of the electrical input power of a reference fan to the electrical input power of the actual fan for which the FEI is calculated, both calculated at the same duty point, *i*, which is characterized by a value of airflow (Q_i) and pressure ($P_{t,i}$ or $P_{s,i}$). FEI can be calculated for each point on a fan curve.

$$FEI_{t,i} \text{ or } FEI_{s,i} = \frac{\text{Reference Fan Electrical Input Power}}{\text{Actual Fan Electrical Input Power}} = \frac{FEP_{ref,i}}{FEP_{act,i}} \quad \text{Eq. 5.1}$$

5.2 Reference fan electrical input power

The reference fan concept is used to normalize the FEI calculation to a consistent power level independent of fan type, fan drive components or any regulatory requirements. The reference fan electrical input power is a function of airflow and fan pressure. The reference fan is defined as one that requires a certain reference fan shaft power, uses a V-belt drive, has a motor efficiency based on the IE3 level for a four-pole 60 Hz motor and does not have a speed control.

$$FEP_{ref,i} = \mathrm{H}_{\mathrm{i,ref}}\left(\frac{1}{\eta_{\mathrm{trans,ref}}}\right)\left(\frac{1}{\eta_{\mathrm{mtr,ref}}}\right)\left(\frac{1}{\eta_{\mathrm{ctrl,ref}}}\right) \qquad \text{Eq. 5.2 SI}$$

$$FEP_{ref,i} = \mathrm{H}_{\mathrm{i,ref}}\left(\frac{1}{\eta_{\mathrm{trans,ref}}}\right)\left(\frac{1}{\eta_{\mathrm{mtr,ref}}}\right)\left(\frac{1}{\eta_{\mathrm{ctrl,ref}}}\right) \times 0.7457 \qquad \text{Eq. 5.2 I-P}$$

5.2.1 Reference fan shaft power

The reference fan shaft power, $H_{i,ref}$, is calculated either on a fan total pressure basis or a fan static pressure basis, depending on the fan type. See Annex A for a complete description and a list of fan types and the FEI pressure basis.

5.2.1.1 Total pressure basis

For fans identified in Annex A as using a total pressure basis, the reference fan shaft power at a given duty point is a function of airflow (Q_i) and fan total pressure ($P_{t,i}$) at that duty point. It is calculated according to the following equation:

$$\mathrm{H}_{\mathrm{i,ref}} = \frac{(Q_i + Q_0)(P_{t,i} + P_0 \times \frac{\rho}{\rho_{std}})}{1000 \times \eta_0} \qquad \text{Eq. 5.3 SI}$$

$$\mathrm{H}_{\mathrm{i,ref}} = \frac{(Q_i + Q_0)(P_{t,i} + P_0 \times \frac{\rho}{\rho_{std}})}{6343 \times \eta_0} \qquad \text{Eq. 5.3 I-P}$$

Where

Q_i		is fan airflow in m^3/s (SI) or cfm (I-P)
$P_{t,i}$		is fan total pressure in Pa (SI) or in. wg (I-P)
ρ		is air density in kg/m^3 (SI) or lbm/ft^3 (I-P)
ρ_{std}		is standard air density, 1.2 kg/m^3 (0.075 lbm/ft^3)
Q_0	=	0.118 m^3/s (SI) or 250 cfm (I-P)
P_0	=	100 Pa (SI) or 0.40 in.wg (I-P)
η_0	=	66%

5.2.1.2 Static pressure basis

For fans identified in Annex A as using a static pressure basis, the reference fan shaft power at a given duty point is a function of airflow (Q_i) and fan static pressure ($P_{s,i}$) at that duty point. It is calculated according to the following equation:

$$\mathrm{H}_{\mathrm{i,ref}} = \frac{(Q_i + Q_0)(P_{s,i} + P_0 \times \frac{\rho}{\rho_{std}})}{1000 \times \eta_0} \qquad \text{Eq. 5.4 SI}$$

$$\mathrm{H}_{\mathrm{i,ref}} = \frac{(Q_i + Q_0)(P_{s,i} + P_0 \times \frac{\rho}{\rho_{std}})}{6343 \times \eta_0} \qquad \text{Eq. 5.4 I-P}$$

Where

Q_i		is fan airflow in m^3/s (SI) or cfm (I-P)
$P_{s,i}$		is fan static pressure in Pa (SI) or in. wg (I-P)
ρ		is air density in kg/m^3 (SI) or lbm/ft^3 (I-P)
ρ_{std}		is standard air density, 1.2 kg/m^3 (0.075 lbm/ft^3)
Q_0	=	0.118 m^3/s (SI) or 250 cfm (I-P)
P_0	=	100 Pa (SI) or 0.40 in.wg (I-P)
η_0	=	60%

5.2.2 Reference fan transmission efficiency
For consistency, the reference fan is defined as one having a V-belt drive transmission, regardless of the drive arrangement of the actual fan for which the FEI is calculated. The reference fan transmission efficiency is calculated using the same equations as found in ANSI/AMCA Standard 207 for V-belt drives:

$$\eta_{\mathrm{trans,ref}} = 0.96\left(\frac{H_{i,ref}}{H_{i,ref}+1.64}\right)^{.05}$$ Eq. 5.5 SI

$$\eta_{\mathrm{trans,ref}} = 0.96\left(\frac{H_{i,ref}}{H_{i,ref}+2.2}\right)^{.05}$$ Eq. 5.5 I-P

5.2.3 Reference fan motor efficiency
The reference fan is defined as having a motor efficiency based on the IE3 level for a four-pole 60 Hz motor. In order to simplify the calculation of part load efficiency for this reference fan motor and to avoid sizing and otherwise identifying a specific motor for this reference fan, a curve fit is used through the IE3 motor efficiency requirements. The result is a reference motor efficiency that varies continuously based on the required motor output power.

Reference fan motor output power:

$$H_{t,ref} = \frac{H_{i,ref}}{\eta_{trans,ref}}$$ Eq. 5.6

The reference fan motor efficiency is calculated according to Equation 5.7 using the coefficients A–E found in table 5.1:

$$\eta_{\mathrm{mtr,ref}} = A\cdot\left[\log_{10}(H_{t,ref})\right]^4 + B\cdot\left[\log_{10}(H_{t,ref})\right]^3 + C\cdot\left[\log_{10}(H_{t,ref})\right]^2 + D\cdot\left[\log_{10}(H_{t,ref})\right]^1 + E$$

Eq. 5.7 SI

$$\eta_{\mathrm{mtr,ref}} = A\cdot\left[\log_{10}(H_{t,ref}\times 0.7457)\right]^4 + B\cdot\left[\log_{10}(H_{t,ref}\times 0.7457)\right]^3 + C\cdot\left[\log_{10}(H_{t,ref}\times 0.7457)\right]^2 + D\cdot\log_{10}(H_{t,ref}\times 0.7457) + E$$

Eq. 5.7 I-P

Table 5.1—Reference Motor Efficiency Coefficients

	$H_{t,ref}$<185 kW (<250 BHP)	$H_{t,ref}$≥185 kW (≥250 BHP)
A	-0.003812	0
B	0.025834	0
C	-0.072577	0
D	0.125559	0
E	0.850274	0.962

5.2.4 Reference fan motor controller efficiency
The reference fan is defined as a constant speed fan. Therefore, the motor controller efficiency is 100%.

$$\eta_{ctrl,ref} = 1$$ Eq. 5.8

5.3 Actual fan electrical input power FEP_{act}
FEP_{act} is the fan electrical input power associated with a given fan duty point in terms of airflow and pressure.

Actual fan electrical input power must be determined by one of the methods found in Sections 5.3.1 through 5.3.4. The applicable methods to determine fan electrical input power are defined as a function of the fan configuration being rated, as defined in Table 5.2:

Table 5.2—FEP_{act} Methods

Fan Configuration	Motor Type	Applicable AMCA 208 Section	FEP Determination	Example Applications
Fan for which the motor is not yet selected	N/A	5.3.4	Default motor efficiency calculation	• Fans sold without motors • Catalogs used for fan selection prior to motor selection
Fan with motor	Any	5.3.1	Wire-to-air measurement, AMCA 211 ratings	• Wire-to-air measurement and density corrections of fans rated with motors • Motors for which no test standards apply
	Polyphase induction motors, both regulated and non-regulated, with nameplate power and poles that fall within the range covered in Annex A of AMCA 207	5.3.2	AMCA 207 calculation	• 3 phase integral regulated motors • 3 phase integral non-regulated motors (AO, XP, 2 speed, etc.)
	Motor for which 5.3.2 does not apply and the performance can be measured in accordance with a known test standard	5.3.3 (as applicable)	Motor test according to industry-recognized standard	• Single phase regulated motors • Single phase non-regulated motors • 3 phase fractional motors
	Motor for which 5.3.2 or 5.3.3 do not apply	5.3.4	Default motor efficiency calculation	• No motor test results available
Fan with motor and speed control	Any	5.3.1	Wire-to-air measurement, AMCA 211 ratings	• Wire-to-air measurement and density and/or speed corrections of fans rated with a motor and controller. • Motors with controllers for which no test standards apply
	Polyphase induction motors, both regulated and non-regulated, with nameplate power and poles that fall within the range covered in Annex A of AMCA 207	5.3.2	AMCA 207 calculation	• 3 phase integral regulated motors • 3 phase integral non-regulated motors (AO, XP, 2 speed, etc.)

5.3.1 Measurement of fan electrical input power

This section covers direct measurement of fan electrical input power to the fan motor or, if present, motor controller per ANSI/AMCA Standard 210, ANSI/AMCA Standard 230, ANSI/AMCA Standard 260 or ISO 5801 (i.e., wire-to-air testing) or rating of fan electrical input power from these measurements in accordance with AMCA Publication 211. This method can be used by all fans except those without motors. It covers direct measurement of fan electrical input power at the tested operating points and conversion of measured values to other operating points.

The fan electrical input power (FEP_{act}) is the motor input power for fans without speed control and is the motor controller input power for fans with speed control included.

5.3.2 Fan electrical input power calculation using ANSI/AMCA Standard 207

This section covers measurement of fan shaft input power per ANSI/AMCA Standard 210, ANSI/AMCA Standard 250, ANSI/AMCA Standard 260, ISO 5801 or ISO 13350, or rating of fan shaft input power ($H_{i,act}$) in accordance with AMCA Publication 211 or ISO 13348, combined with power drive component efficiency calculations of ANSI/AMCA Standard 207. This method is applicable to (1) fans with motors that fall directly within the scope of ANSI/AMCA Standard 207 or (2) other three-phase induction motors with nameplate power and number of poles that otherwise fall within the scope of ANSI/AMCA Standard 207, either with or without speed controllers. It calculates the fan electrical input power based on the tested fan performance, the known full load motor efficiency and assumed default losses.

For fans with motors that fall within the scope of ANSI/AMCA Standard 207, fan electrical input power (FEP_{act}) is calculated according to ANSI/AMCA Standard 207, except that the nominal regulated motor efficiency, η_R, in Section 4.1.3 of ANSI/AMCA Standard 207 shall be either the nominal efficiency as listed in Annex A of ANSI/AMCA Standard 207 or the certified full-load efficiency of the motor as determined in accordance with the relevant regulations (10CFR 431—subpart B, IEC 60034-2-1, or GB/T 1032).

For fans with three-phase induction motors outside the scope of ANSI/AMCA Standard 207 but with nameplate power and number of poles that otherwise fall within the scope of ANSI/AMCA Standard 207, fan electrical input power is calculated according to ANSI/AMCA Standard 207 with the following exceptions:

1. If the motor nameplate power is listed in the tables in Annex A of ANSI/AMCA Standard 207, then the nominal regulated motor efficiency, η_R, in Section 4.1.3 of ANSI/AMCA Standard 207 shall be the minimum of that shown on the motor nameplate and that of Annex A of ANSI/AMCA Standard 207. The motor nameplate power and efficiency must be the full-load motor output power and efficiency determined based on testing in accordance with IEEE 112 (polyphase), IEC 60034-2-1 or NEMA MG-1 (Section IV, Part 34, for air over motors), as applicable.
2. If the motor nameplate power falls between those listed in Annex A of ANSI/AMCA Standard 207, then the nominal regulated motor efficiency, η_R, in Section 4.1.3 of ANSI/AMCA Standard 207 shall be the minimum of that shown on the motor nameplate and that of the next smaller motor listed in Annex A of ANSI/AMCA Standard 207. The load ratios and part load efficiency constants used in the ANSI/AMCA Standard 207 calculations shall be based on that of the next smaller motor size in the tables of Annex A–D of ANSI/AMCA Standard 207. The motor nameplate power and efficiency must be the full-load motor output power and efficiency determined based on testing in accordance with IEEE 112 (polyphase), IEC 60034-2-1 or NEMA MG-1 (Section IV, Part 34 for air over motors), as applicable.

The fan electrical input power (FEP_{act}) is the motor input power for fans without speed control and is the motor controller input power for fans with speed control included.

5.3.3 Fan electrical input power calculation for fans with motors of known part-load efficiency

This section covers measurement of fan shaft input power per ANSI/AMCA Standard 210, ANSI/AMCA Standard 250, ANSI/AMCA Standard 260, ISO 5801 or ISO 13350, or rating of fan shaft input power ($H_{i,act}$) in accordance with AMCA Publication 211 or ISO 13348. This is combined with a specific motor that is not within the scope of Section 5.3.2 (i.e., single-phase motors and polyphase motors with nameplate power and/or number of poles beyond those addressed by ANSI/AMCA Standard 207) but where the full and part load efficiency of the motor is established through testing of the same model motor. This testing must be done in accordance with IEEE 112 (polyphase), IEEE 114 (single phase), IEC 60034-2-1 or NEMA MG-1 (Section IV, Part 34 for air over motors), as applicable. Any tested motor efficiency values must be generated by testing in accordance with an applicable referenced motor test standard. For example, only NEMA MG-1 (Section IV, Part 34) is applicable to air over motors. None of the referenced motor test standards are applicable to fans tested with motors and speed controls. This method is only applicable to fans where the motor part load efficiency has been tested in accordance with these standards. The tested motor part load performance values (motor speed and motor efficiency) corresponding with the fan duty point *i* shall be applied to fan shaft input power to calculate fan input electrical power as follows:

$$FEP_{act} = H_{i,act}\left(\frac{1}{\eta_{trans,act}}\right)\left(\frac{1}{\eta_{mtr,act}}\right) \qquad \text{Eq. 5.12 SI}$$

$\mathrm{FEP_{act}} = \mathrm{H_{i,act}}\left(\frac{1}{\eta_{\mathrm{trans,act}}}\right)\left(\frac{1}{\eta_{\mathrm{mtr,act}}}\right) \times 0.7457$ Eq. 5.12 I-P

For direct driven fans:

$\eta_{\mathrm{trans,act}} = 1$ Eq. 5.13

For fans using V-belt drives:

$\eta_{\mathrm{trans,act}} = 0.96\left(\frac{\mathrm{H_{i,act}}}{\mathrm{H_{i,act}}+1.64}\right)^{.05}$ Eq. 5.14 SI

$\eta_{\mathrm{trans,act}} = 0.96\left(\frac{\mathrm{H_{i,act}}}{\mathrm{H_{i,act}}+2.2}\right)^{.05}$ Eq. 5.14 I-P

Actual motor output power:

$\mathrm{H_{t,act}} = \frac{\mathrm{H_{i,act}}}{\eta_{\mathrm{trans,act}}}$ Eq. 5.15

$\eta_{mtr,act}$ is the motor part load efficiency determined from IEEE 112, IEEE 114 or IEC 60034-2-1 test data interpolated to the actual load $H_{t,act}$ using a polynomial curve fit. In no case shall the interpolated motor efficiency exceed the nearest tested values, nor shall the motor efficiency be extrapolated, either in load or speed, beyond tested values.

5.3.4 Fan electrical input power calculation for fans with motors of unknown efficiency

This section covers measurement of fan shaft input power per ANSI/AMCA Standard 210, ANSI/AMCA Standard 250, ANSI/AMCA Standard 260, ISO 5801 or ISO 13350, or rating of fan shaft input power in accordance with AMCA Publication 211 or ISO 13348. It specifically refers to those that are (1) provided with no motors, (2) provided with motors that have not yet been chosen (fan selection tables) or (3) provided with a specific motor not conforming to Sections 5.3.2 or 5.3.3. This method uses default motor efficiency values and is applicable only when Sections 5.3.2 or 5.3.3 do not apply. Speed controllers are not considered with this method.

$\mathrm{FEP_{act}} = \mathrm{H_{i,act}}\left(\frac{1}{\eta_{\mathrm{trans,act}}}\right)\left(\frac{1}{\eta_{\mathrm{mtr,def}}}\right)$ Eq. 5.16 SI

$\mathrm{FEP_{act}} = \mathrm{H_{i,act}}\left(\frac{1}{\eta_{\mathrm{trans,act}}}\right)\left(\frac{1}{\eta_{\mathrm{mtr,def}}}\right) \times 0.7457$ Eq. 5.16 I-P

For fans only offered as direct drive:

$\eta_{\mathrm{trans,def}} = 1$ Eq. 5.17

For fans offered as V-belt driven only or as either belt or direct driven:

$\eta_{\mathrm{trans,act}} = 0.96\left(\frac{\mathrm{H_{i,act}}}{\mathrm{H_{i,act}}+1.64}\right)^{.05}$ Eq. 5.18 SI

$\eta_{\mathrm{trans,act}} = 0.96\left(\frac{\mathrm{H_{i,act}}}{\mathrm{H_{i,act}}+2.2}\right)^{.05}$ Eq. 5.18 I-P

Required motor output power:

$$H_{t,def} = \frac{H_{i,act}}{\eta_{trans,act}} \quad \text{Eq. 5.19}$$

The default motor efficiency is calculated according to Equation 5.20 with the coefficients A–E found in Table 5.3. These coefficients are derived from curve fits of IE3 nominal efficiency limits for four-pole motors as listed in IEC 60034-30-1. These defaults shall only be used in regions or jurisdictions where motor IE3 levels (or equivalent) reflect the minimum motor efficiency requirements in that jurisdiction. Other jurisdictions with lower motor efficiency requirements must establish their own default values.

$$\eta_{mtr,def} = A \cdot \left[\log_{10}\left(H_{t,def}\right)\right]^4 + B \cdot \left[\log_{10}\left(H_{t,def}\right)\right]^3 + C \cdot \left[\log_{10}\left(H_{t,def}\right)\right]^2 + D \cdot \left[\log_{10}\left(H_{t,def}\right)\right]^1 + E$$

Eq. 5.20 SI

$$\eta_{mtr,def} = A \cdot \left[\log_{10}\left(H_{t,def} \times 0.7457\right)\right]^4 + B \cdot \left[\log_{10}\left(H_{t,def} \times 0.7457\right)\right]^3 + C \cdot \left[\log_{10}\left(H_{t,def} \times 0.7457\right)\right]^2 + D \cdot \log_{10}\left(H_{t,def} \times 0.7457\right) + E$$

Eq. 5.20 I-P

Table 5.3—Default Motor Efficiency Coefficients

	60 Hz IE3		**50 Hz IE3**		
Applicability Examples	**USA, Canada, Mexico**		**Europe, China**		
	$H_{t,def}$<185 kW ($H_{t,def}$ <250 BHP)	$H_{t,def}$ ≥185 kW ($H_{t,def}$ ≥250 BHP)	$H_{t,def}$ <0.75 kW ($H_{t,def}$ <1.0 BHP)	0.75≤ $H_{t,def}$≤ 200 kW (1.0≤ $H_{t,def}$≤ 270 BHP)	$H_{t,def}$ >185 kW ($H_{t,def}$ >270 BHP)
A	-0.003812	0	0	0	0
B	0.025834	0	0.076356	0.000773	0
C	-0.072577	0	0.048236	-0.018951	0
D	0.125559	0	0.210903	0.092984	0
E	0.850274	0.962	0.860998	0.837025	0.960

Notes:
1. Jurisdictions with motor efficiency requirements lower than IE3 levels (or equivalent) shall not use these default coefficients.

6. Use of FEI

6.1 Requirements for use of FEI

This section includes only the mandatory requirements for fan manufacturers using FEI. Additional information including examples of published FEI and use by consumers and code and regulatory bodies are provided in Annex B.

6.1.1 Manufacturers' FEI calculations

Fan manufacturers shall calculate FEI values for each duty point offered for sale or required by a code or regulatory body.

6.1.2 Published FEI values

Published FEI values shall be rounded to the nearest hundredth and presented alongside other fan performance parameters (airflow, pressure, power, etc.) in fan selection tables and graphs. When FEI values are published in a catalog or submittal and a specific motor size and type are specified, the FEI values shown shall be calculated for that specific motor. When FEI values are published in a catalog or submittal and the same fan performance could apply to multiple motor sizes, the FEI values shown shall be calculated using default motor efficiencies according to Section 5.3.4 and shall be clearly identified as such.

Annex A
Fan Types, Test Configurations and FEI Pressure Basis (Normative)

A.1 Use of test or installation types

The fan test configuration ["Installation Type" in ANSI/AMCA Standard 210 and "Installation Category" or "Test Configuration" in ISO 5801] will have an impact on the determination of the fan air performance and efficiency. The test configuration distinguishes the arrangement of ducting to the inlet and outlet of the fan during the test (see Table A.1). These configurations are consistent with the test requirements of ANSI/AMCA Standard 210, ANSI/AMCA Standard 230, ANSI/AMCA Standard 250, ANSI/AMCA Standard 260, ISO 5801 and ISO 13350, although not all configurations are found in each standard.

Test duct conditions do not necessarily determine how the fan is applied in the field. While performance corrections may need to be applied to test data to account for a difference between how the fan was tested and how it is applied, these corrections are not used in the calculation of FEI.

In general, the presence of an outlet duct during the original test will determine whether the FEI is calculated based on fan total or fan static pressures. This is specifically done to encourage the use of total pressure when selecting fans for ducted systems. For fans that are installed with an outlet duct, system pressures are typically calculated in terms of total pressure. Both the static and velocity pressures at the outlet of the fan contribute to overcome system losses. For these fans, the FEI calculation is based on the fan total pressure. However, for fans that are installed without outlet ducts (free outlet), the velocity pressure at the fan discharge is immediately dissipated, and only the fan static pressure can be used to overcome system losses. For these fans, the FEI calculation is based on the fan static pressure.

There are a few exceptions to this requirement. Circulating fans and jet fans are non-ducted, but their sole purpose is to increase the momentum of the air. Laboratory exhaust fans typically require a minimum discharge velocity of 3000–5000 fpm in addition to their fan static pressure requirement. Each of these non-ducted fan types uses the fan total pressure as a basis for FEI calculation to more appropriately account for the velocity pressure at the fan outlet.

Table A.1—Test Configuration or Installation Types for Fans

Test Configuration	Configuration of Ducts
A	Free inlet, free outlet with partition
B	Free inlet, ducted outlet
C	Ducted inlet, free outlet
D	Ducted inlet, ducted outlet
E	Free inlet, free outlet without partition

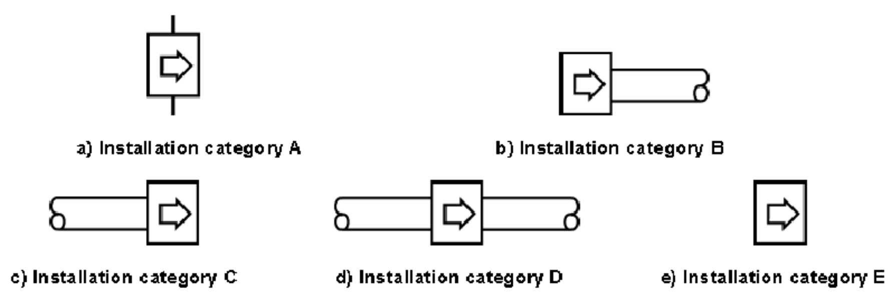


Figure 2—Installation Categories

Table A.2—Fan Types, Test Configurations and FEI Pressure Basis

The following fan types are used to define consistent test standards, test procedures and the pressure used for FEI calculation. These fan types do not imply that all fans within a given type must be regulated by code bodies or that they must be assigned the same minimum FEI requirements.

Fan Type	Impeller Type	Housing Type/ Examples	Test Standard	Test Config/ Installation Type	FEI Pressure Basis	Notes
Centrifugal housed	AF, BC, BI, MF, FC, Radial, Radial tipped	Single or double inlet scroll (not inline)	AMCA 210, ISO 5801	B or D	Total	1
			AMCA 210 ISO 5801	A or C	Static	
Centrifugal inline	AF, BC, BI, MF, FC	Square, rect, cylindrical	AMCA 210 ISO 5801	B or D	Total	1
				A or C	Static	
Centrifugal unhoused	AF, BC, BI, MF	None	AMCA 210 ISO 5801	A	Static	2
Centrifugal PRV exhaust	AF, BC, BI, MF, FC	Spun alum, upblast, hooded, wall housing	AMCA 210 ISO 5801	A or C	Static	3
Centrifugal PRV supply	AF, BC, BI, MF, FC	Hooded or otherwise enclosed	AMCA 210 ISO 5801	B or D	Total	1,3
				A or C	Static	
Axial inline	Propeller	Cylindrical (tube axial or vane axial)	AMCA 210 ISO 5801	B or D	Total	1
				A or C	Static	
Axial panel	Propeller	Panel, ring	AMCA 210 ISO 5801	A	Static	
Axial PRV	Propeller	Sup and ex, spun alum, upblast, hooded, wall housing	AMCA 210 ISO 5801	A or C	Static	
Laboratory exhaust	Any	High Velocity Discharge	AMCA 210 ISO 5801	A or C	Total	4
	Any	Induced flow	AMCA 260	A or C	Total	4,5
Jet fan	Propeller or AF, BC, BI	Unidirectional, reversible	AMCA 250 ISO 13350	E	Total	4,6
Circulating	Propeller	Cylindrical, panel, unhoused	AMCA 230	E	Total	4,7
Crossflow	Crossflow		AMCA 210 ISO 5801	A or C	Static	
				B, D or E	Total	

Notes:

1. Centrifugal housed, centrifugal inline, centrifugal PRV supply and axial inline fans shall be tested using Test Configuration B or D with fan total pressure used for the FEI calculation or can be tested using Test Configuration A or C with fan static pressure used for the FEI calculation.

2. The centrifugal unhoused fan type also includes fans with integral housings used to separate multiple fans in a fan array. These fans use fan static pressure for the FEI calculation and also use a special procedure found in Annex C.
3. Centrifugal PRVs are typically used with ducted air systems. Exhaust fans shall be tested without discharge ducts (A or C) and shall be evaluated on a fan static pressure basis. Supply fans shall be tested with discharge ducts (B or D) and shall be evaluated on a fan total pressure basis, or can be tested using Test Configuration A or C with fan static pressure used for the FEI calculation.
4. Fan types that are tested without an outlet duct but normally applied where a high velocity discharge is required for proper function use fan total pressure as a basis for FEI calculation.
5. Induced flow laboratory exhaust fans use the fan total pressure based on the velocity pressure at the discharge nozzle as a basis for FEI calculation. The airflow, Q_i, used in this standard is the inlet airflow, Q_1 determined from the test in Section 7.1 of ANSI/AMCA Standard 260. The fan total pressure, $P_{t,i}$, used in this standard is the fan total pressure, P_{v2}-P_{t1}, determined from the test in Section 7.1 of ANSI/AMCA Standard 260.
6. Jet fans use test standards ANSI/AMCA Standard 250 or ISO 13350. Jet fans use fan total pressure based on the dynamic pressure at the fan outlet for FEI calculation (see Section A.2).
7. Circulating fans use test standard ANSI/AMCA Standard 230. Circulating fans use fan total pressure based on the dynamic pressure at the fan outlet for FEI calculation (see Section A.2).

A.2 Fans tested using thrust

For fans with airflow determined per ANSI/AMCA Standard 230, the fan total pressure at a given airflow shall be calculated according to the following equations:

$$\mathrm{P}_{\mathbf{t,i}} = \frac{\rho}{2}\left(\frac{Q_i}{A}\right)^2$$ Eq. A.1 SI

$$\mathrm{P}_{\mathbf{t,i}} = \rho\left(\frac{Q_i}{1097.8\times A}\right)^2$$ Eq. A.1 I-P

Where,
A = Fan outlet or discharge area, m² (ft²)
$P_{t,I}$ = Fan total pressure, Pa (in. wg)
Q_i = Airflow rate, m³/h (cfm)
ρ = Air density, kg/m³ (lbm/ft³)

For fans with thrust determined per ANSI/AMCA Standard 250 or ISO 13350, fan total pressure shall be calculated according to Equation A.1. Airflow shall be calculated according to the following equations:

$$Q_i = \sqrt{\frac{\mathrm{AF_t}}{\rho}}$$ Eq. A.2 SI

$$Q_i = 340.3\sqrt{\frac{\mathrm{AF_t}}{\rho}}$$ Eq. A.2 I-P

Where,
A = Fan outlet or discharge area, m² (ft²)
F_t = Force due to thrust, N (lbf)
Q_i = Airflow rate, m³/h (cfm)
ρ = Air density, kg/m³ (lbm/ft³)

Annex B
Usage of FEI (informative)

B.1 General

This annex provides guidance to fan manufacturers, fan consumers and code and regulatory bodies in the use and specification of FEI values.

B.2 Published FEI values

Section 6.1.2 includes specific requirements for published FEI values. This section provides examples of published fan performance, showing how FEI is used to supplement this data to help the consumer in making good fan selections.

B.2.1 Fan performance table using default motor efficiencies

The following is an example of a fan performance table as found in manufacturers' catalogs for the purpose of making fan selections. This example is for a single fan model that is belt driven and can be configured for any speed within the range shown, with any number of different motors. This fan was tested and is applied without an outlet duct, so FEI is calculated using a static pressure basis.

Airflow (cfm)		Static Pressure (in.wg)					
		0	1	2	3	4	5
7500	rpm	1010	1180	1331	1468		
	BHP	1.65	3.07	4.60	6.18		
	FEIs	**1.67**	**1.54**	**1.46**	**1.40**		
10000	rpm	1230	1378	1505	1626	1738	1843
	BHP	2.56	4.32	6.18	8.19	10.23	12.29
	FEIs	**1.42**	**1.45**	**1.43**	**1.40**	**1.38**	**1.36**
12500	rpm	1467	1590	1709	1814	1912	2009
	BHP	3.86	5.93	8.16	10.43	12.83	15.36
	FEIs	**1.18**	**1.31**	**1.35**	**1.37**	**1.36**	**1.35**
15000	rpm	1712	1819	1921	2021	2112	2196
	BHP	5.56	8.02	10.55	13.22	15.93	18.70
	FEIs	**0.98**	**1.16**	**1.25**	**1.29**	**1.31**	**1.33**
17500	rpm	1961	2058	2146	2233	2320	2402
	BHP	7.81	10.70	13.54	16.50	19.58	22.77
	FEIs	**0.81**	**1.01**	**1.13**	**1.20**	**1.24**	**1.27**
20000	rpm	2214	2301	2382	2459	2535	2612
	BHP	10.69	13.92	17.22	20.48	23.86	27.34
	FEIs	**0.67**	**0.89**	**1.02**	**1.11**	**1.17**	**1.21**

Performance shown is for installation type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). FEI_S values are calculated in accordance with ANSI/AMCA Standard 208 and are based on default motor efficiencies. FEI_S values for fans with specific motors will vary slightly from those shown.

B.2.2 Fan performance curves showing lines of constant FEI$_T$ using default motor efficiencies:
The following is an example of fan performance curves as found in manufacturers' catalogs for the purpose of making fan selections. This example is for a single fan model that is belt driven and can be configured for any speed within the range shown, with any of a number of different motors. This fan was tested with an outlet duct, so FEI is calculated using a total pressure basis.

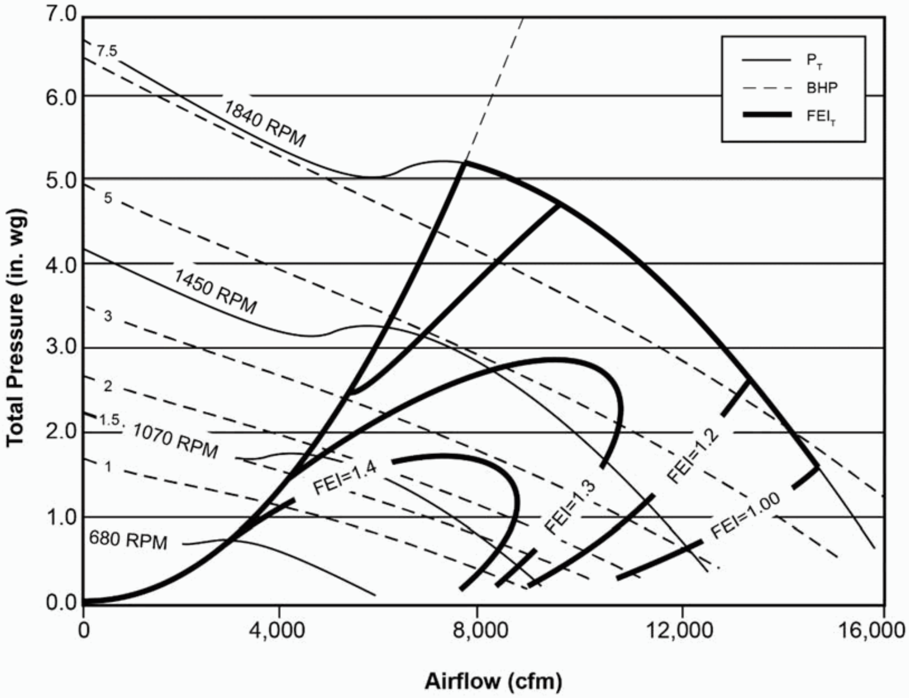


Figure 3—Performance Curves

Performance shown is for installation type B: free inlet, ducted outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). FEI$_T$ values are calculated in accordance with ANSI/AMCA Standard 208 and are based on default motor efficiencies. FEI$_T$ values for fans with specific motors will vary slightly from those shown.

B.2.3 Electronic fan selection software showing specific motor selections
The following is an example of fan performance for multiple fan sizes as found in manufacturers' electronic selection software for the purpose of making fan selections. Each of the sizes shown is selected for, and is capable of, providing the required airflow (10,000 cfm) at the required fan total pressure (4.77 in. wg). These are belt-driven fan models with specific motor sizes selected, all of which are covered within the scope of ANSI/AMCA Standard 207. This fan was tested and is applied with an outlet duct, so FEI is calculated using a total pressure basis.

Fan Size	Fan Class	Fan Speed (rpm)	Fan Shaft Power (BHP)	Elect. Input Power (kW)	Motor Size (hp)	Outlet Area (sf)	Outlet Vel (ft/min)	TE (%)	FEI$_T$
18	III	3,047	15.3	12.8	20	1.92	5,208	49%	**0.83**
20	II	2,448	13.0	10.9	15	2.30	4,348	58%	**0.98**
22	II	1,940	11.2	9.42	15	2.85	3,509	67%	**1.13**
24	II	1,621	10.1	8.49	15	3.45	2,899	75%	**1.25**
27	I	1,378	9.81	8.27	15	4.19	2,387	77%	**1.28**
30	I	1,185	9.89	8.33	15	5.17	1,934	76%	**1.27**
33	I	1,058	10.5	8.82	15	6.26	1,597	72%	**1.20**

Note: Performance shown is for installation type B: free inlet, ducted outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). FEI$_T$ values are calculated in accordance with ANSI/AMCA Standard 208 and are based on four-pole TEFC motors of the size shown.

B.2.4 Fan performance table for a distributer catalog sold without motors.
The following is an example of a fan performance table as found in a distributor's catalog. This example is for a single fan model that is belt driven, but neither the belt drive nor the motor are supplied with the fan. This fan was tested and is applied without an outlet duct, so FEI is calculated using a static pressure basis.

Model	Prop Dia.	Fan Speed (rpm)	Max Shaft Input Power (BHP)	Airflow (cfm)/FEI$_S$ at Fan Static Pressure Shown				
				0.00	**0.125**	**0.250**	**0.375**	**0.500**
ABC	54 in.	400	2.01	28,000	24,300	14,000		
				1.44	1.65	1.50		
		450	2.86	31,500	27,500	22,200	11,000	
				1.16	1.34	1.44	1.02	
		500	3.93	35,000	32,000	27,000	16,800	13,000
				0.95	1.14	1.23	1.13	1.02
		550	5.23	38,500	35,500	32,000	27,000	16,000
				0.79	0.96	1.08	1.15	0.94

B.3 Examples of consumer use of FEI

FEI requirements should be communicated on the respective equipment schedules. Minimum FEI requirements may vary by fan type, application, locale or on a project-by-project basis. Most specifications contain a section that lists external references. Add to this list:

X. ANSI/AMCA Standard 208: Calculation of the Fan Energy Index (FEI)

Some specifications are structured such that fans have their own section. Other specifications are structured such that fans are a subsection within a larger section (i.e., "Central Station Air Handing Units", "Custom Air Handling Units," "Energy Recovery Units," etc.). The reference to ANSI/AMCA Standard 208 should be added to any specification section that contains fans.

As for specification language, insert some or all of the following:

1. *Fans shall be AMCA-certified for air, sound and FEI (fan energy index).*

2. *Fans shall meet or exceed the minimum FEI scheduled at the specified airflow and pressure.*

Example schedules

Vane Axial Fans					
Tag	Airflow	Fan Total Pressure	Minimum FEI_T	Motor Size (kW/HP)	Fan RPM

Central Station Air Handling Units—Supply Fans (Plenum Type Impellers)					
Tag	Airflow	Fan Static Pressure	Minimum FEI_S	Motor Size (kW/HP)	Fan RPM

As previously mentioned, the minimum FEI may vary by fan type, project, etc. If a current equipment schedule template has a column that defines maximum allowable fan input power or minimum allowable fan efficiency, the minimum FEI value can replace that column. A minimum FEI requirement integrates both maximum allowable fan input power and minimum required fan efficiency into a single value.

The scheduled minimum FEI value can be used to communicate the minimum level established by a regulatory or program requirement. The scheduled minimum FEI can also be used to communicate the requirement for a lower power solution for a specific application (in this case, the minimum FEI value will be a larger number). The value scheduled for minimum FEI clearly communicates what is required for that specific application. Product substitutions should only be allowed if the specified FEI level and intended utility are met by the alternate product.

Consumers performing fan selections for a specific application should use FEI values as one tool to evaluate various fan options. FEP_{ref} is always based on the required fan airflow and pressure. Various fans can be compared using FEI values. Fans with higher FEI values will consume less power for the same airflow and pressure than fans with lower FEI values. Consumers should verify that each potential fan selection meets any minimum FEI levels established by codes or regulatory bodies.

B.5 Codes and regulatory references

Any code or regulatory reference to FEI should include the scope of products covered. The scope should, include at least the following: the minimum and maximum power, the minimum allowable FEI levels for each covered fan type, labeling requirements and any product or application exemptions.

Utility rebates or other incentives can be created based on FEI. The incentive offered could be based on the fan selection exceeding a specified minimum FEI level. Alternatively, it can be based on the amount that the selected fan's FEI exceeds a minimum FEI level set by a different code or regulatory entity.

Legislative, regulatory and code entities may allow reduced FEI values for fans with variable speed motor controllers that are applied in variable speed applications. The reduced FEI value shall, at a minimum, account for the increase in input power caused by the fan motor controller. Reduced FEI values shall only be allowed when the fan motor controller is included in the actual fan electrical input power.

Annex C
Fan Arrays (Informative)

C.1 General

Any number of fans can be used in a fan array configuration where the total required airflow is divided among each of the fans. In order to ensure a consistent calculation of FEI regardless of the number of fans used, a fan array is treated as a single fan moving the total required airflow through the array.

The procedures of this annex shall be used to calculate the FEI for fans used in fan arrays. This procedure shall not be applied to all fans operating in parallel but only to fan arrays applied in air handling units (either factory packaged or field erected). The following characteristics of fan arrays shall be met in order to use this procedure:

- The total required airflow enters a single inlet plenum immediately upstream of the fan array, and the total required airflow discharges into a common plenum immediately downstream of the fan array.
- Both plenums are components within a single air handling unit boundary.
- At least one of the plenums is connected to a separate duct system that supplies, returns or exhausts air from zones or rooms within the building.
- The room or area being cooled, heated or ventilated shall not be considered part of the air handling unit.

C.2 Calculation procedure

1. Calculate FEP_{ref} for the fan array using Section 5.2, with *Q* equal to the total airflow shared among all fans in the array.
2. Calculate FEP_{ref} for an individual fan by dividing FEP_{ref} for the fan array by the number of fans used in the array.
3. Calculate FEP_{act} for an individual fan as normal, using Section 5.3.
4. Calculate FEI as normal, using Section 5.1.

C.3 Labeling

Note that a fan evaluated for use in a fan array will have a different FEI rating for the same individual fan performance point depending on the number of fans used in the array. When FEI ratings are calculated for fan arrays per this annex, they must be clearly labeled as to the number of fans used in the array.

C.4 Example

Total required airflow through a fan array is 50,000 cfm at a fan static pressure of 6.0 in. wg. at standard air density. Multiple quantities of fans are being considered for this application.

FEP_{ref} is calculated as in Section 5.2 for the total airflow through the array (treated as a single fan). All other fan quantities considered use a fraction of this FEP_{ref} depending on the number of fans used. The resulting FEI values are inversely proportional to the total input power, thus providing an accurate indication of the total electrical input power.

No. Fans (n)	Airflow (cfm)	$H_{i,\ ref}$ (BHP)	$\eta_{trans,\ ref}$	$\eta_{mtr,\ ref}$	FEP_{ref}/n (kW)	η_s	$H_{i,\ act}$ (BHP)	$\eta_{trans,\ def}$	$\eta_{mtr,\ def}$	FEP_{act} (kW)	Total kW	FEI
1	50,000	84.5	95.9%	95.2%	69.1	65%	72.8	95.9%	95.0%	59.6	59.6	1.16
2	25,000	84.5	95.9%	95.2%	34.5	65%	36.4	95.7%	94.2%	30.1	60.2	1.15
4	12,500	84.5	95.9%	95.2%	17.3	65%	18.2	95.5%	93.1%	15.3	61.1	1.13
10	5,000	84.5	95.9%	95.2%	6.91	65%	7.28	94.7%	91.4%	6.27	62.7	1.10
20	2,500	84.5	95.9%	95.2%	3.45	65%	3.64	93.8%	89.5%	3.23	64.7	1.07

If the procedure described above is not used and FEP_{ref} is calculated from the individual fan airflow, the results will be as shown below. FEI now becomes misleading as an indicator of total input power:

No. Fans	Airflow	$H_{i,ref}$	$\eta_{trans,ref}$	$\eta_{mtr,ref}$	FEP_{re}	η_s	$H_{i,act}$	$\eta_{trans,def}$	$\eta_{mtr,def}$	FEP_{act}	Total kW	FEI
1	50,000	84.5	95.9%	95.2%	69.1	65%	72.8	95.9%	95.0%	59.6	59.6	1.16
2	25,000	42.5	95.8%	94.4%	35.0	65%	36.4	95.7%	94.2%	30.1	60.2	1.16
4	12,500	21.4	95.5%	93.4%	17.9	65%	18.2	95.5%	93.1%	15.3	61.1	1.17
10	5,000	8.83	94.9%	91.8%	7.56	65%	7.28	94.7%	91.4%	6.27	62.7	1.21
20	2,500	4.62	94.2%	90.2%	4.06	65%	3.64	93.8%	89.5%	3.23	64.7	1.26

In the second case, the option with the highest FEI value actually has the highest energy use. The unintended consequence of this would be the use of even more fans resulting in yet a higher FEI value, but with even more actual energy use.

Note that for this example and for illustration purposes only, the calculation of FEP_{act} was based on a fan static efficiency of 65% for every fan. In an actual comparison, various combinations of fans will result in operation at different points on their respective fan curves, and the fan static efficiency will vary accordingly. Also, default motor efficiencies were used for the comparison. Motors covered under Section 5.3.3 of ANSI/AMCA Standard 207 would have varying efficiencies depending on the specific motor being used. These two factors combined could result in a certain combination of fans having an optimal FEI or a minimum total input power value.

Annex D
Embedded Fans (informative)

Air-system design processes result in an ideal fan type, size and speed for ideal conditions. But in practice, actual conditions are often less than ideal. Obstacles to duct runs lead to sharp turns or changes in elevation, and then another correction is needed to resume the planned path. Or there might not be enough room for the ideal length of inlet or outlet duct to establish fully developed airflow. The results of less-than-ideal fan conditions like these are summarily called "system effect."

Once a fan is installed in a cabinet (e.g., an air handling unit or a packaged rooftop), a number of factors can influence performance and thus any metric associated with the energy consumed. The effect of some of these factors can be approximated, but the combinations should be tested for accurate performance. Some common equipment "system effects" include:

- Fan location
- Cabinet proximity
- Component proximity (coils, filters, internal control enclosures, etc.)
- Motor proximity
- The presence of bearings, sheaves and other drive components
- Full face opening discharge losses
- Fan orientation
- Discharge orientation
- Fan guarding

Since existing equipment-test and rating standards include many of these system effects, an equipment test will provide the most accurate estimate of the final in situ performance.

Addressing these effects can have as much, if not more, influence on overall energy use than addressing fan efficiency itself.

D.1 Location of an embedded fan within the unit

The location of the fan relative to other components is an important consideration. When components are located downstream of the fan section in an air handling unit or a rooftop unit, unhoused fans will generally use less energy than housed fans. However, some components require a specific velocity profile—gas heat exchangers and electrical heating elements, for example—and may require trading off small unit size for fan energy efficiency.

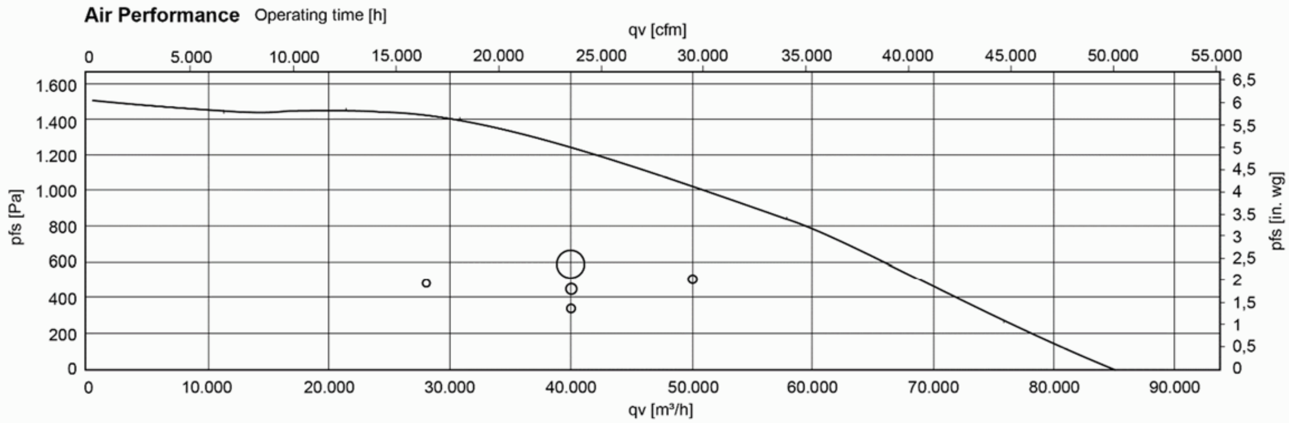
Embedded fans can be used as a supply fan or as a return/relief fan for centralized building pressurization control or economizing. The duty point of a supply fan can be very different from the duty point of a return/relief fan, and it often varies widely throughout the year.

D.2 Economizers

Economizing is a method of free cooling for building air conditioning. If done properly, it can save a tremendous amount of energy compared to air conditioning without an economizer, even if the economizer fan efficiency is compromised by non-energy design criteria.

In an economizer application, the return/relief fan can run at two substantially different operating points depending on mode of operation. During economizer operation, the return/relief fan will often operate far to the right of the fan's best efficiency point. Also, if a fan design exhibits an operating area with an unstable characteristic, an optimization for the best fan efficiency may be compromised by the risk for instability.

Codes and standards authorities, when setting minimum FEI requirements, should consider the necessarily wide operating range of economizer fans. Appropriate energy optimization requires estimated annual run hours with associated fan duty points.



The fan combination selected in the results list is displayed as a characteristic curve at maximum modulation. The specified operating points are also shown; the size of the points represents the proportional operating duration.

Figure 5—Overview of the Weighted Operating Points in the Air Performance Diagram

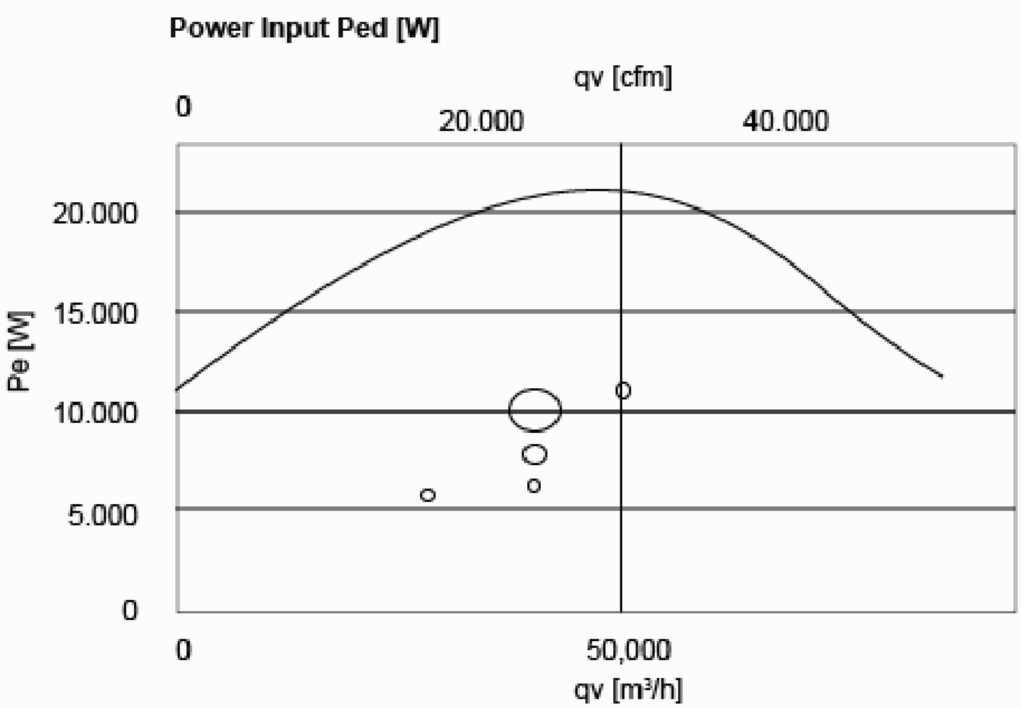


Figure 6—Representation of the Power Consumption of the Corresponding Operating Points

D.3 Application of the embedded fan

A standalone fan test does not always address the wide variety of applications in which fans are used. For example, heat rejection fans are often designed for a specific purpose, and a standalone fan test may not adequately capture the useful work of a fan. A heat rejection fan like one used to reject heat from a condenser coil is designed to balance a number of factors, including the need to maximize heat rejection with minimal input power to the equipment, all forms of energy being considered. Any improvement in velocity profile, for example, will likely not be realized in a standalone fan test. It would be difficult or impractical to apply a correction to approximate any added benefit.

D.4 Applying the FEI to an embedded fan

System effects and optional fan accessories are generally estimated as pressure losses and simply added to a standalone fan's duty point. However, equipment system effects are included or "built in" with the rating data when an equipment test is conducted. To avoid confusion with other, more visible system effects, we will use the term "latent" to describe these built-in effects in what follows.

Recall that the FEI calculation is not intended to apply directly to fan performance obtained with the fan embedded inside other equipment (e.g., furnaces) or with optional accessories (e.g., guarding). To properly evaluate these fans based on the performance obtained in the minimum testable configuration, care must be taken to choose the correct duty point.

D.5 Embedded fans tested in-accordance with an equipment test standard

D.5.1 Certified air handling unit example

Suppose an embedded fan that has been tested in accordance with a test standard has a duty point of 8,500 CFM at 4 in. wg. In the minimum testable configuration, this fan draws 7.42 BHP at 1,538 rpm and results in an FEI of 1.35.

However, when tested in accordance with a test standard, this same fan running at the same duty point (8,500 CFM and 4 in. wg.) actually draws 8.502 BHP at 1,597 rpm. These values are different from the minimum testable configuration because any latent losses are built into the equipment fan curve. Thus, the 8,500 cfm at 4 in. wg. duty point does not represent the fan's actual duty point.

Recognize that a fan duty point can be defined with any two variables from the following: flow, pressure, speed or power consumed. Since the pressure and power values can be affected by latent losses, the duty point of an embedded fan should be defined in terms of flow and speed.

D.5.2 Certified air handling unit example (revisited)

We can approximate the latent loss in our example by finding the performance of a fan in a minimum testable configuration with flow and speed (the higher speed from the embedded fan data set) as inputs. At 8,500 cfm and 1,597 rpm, a fan in a minimum testable configuration would draw 8.32 BHP and result in an FEI of 1.34.

We can also find the pressure corresponding with a duty point of 4.492 in. wg. The embedded fan thus has a latent loss of 4.492 - 4.0 = 0.492 in. wg. and 8.502 - 8.32 = 0.182 BHP. Note how the flow/speed approach does not fully account for the change in power being consumed.

To determine FEP_{ref} by calculation, a pressure must be used. This pressure can be found by using the pressure corresponding with the intersection of flow and speed in the minimum testable configuration (4.492 in. wg., in our example above).

In the field, the determination of FEI or FEP_{act} should be straightforward. Simply use the intersection of flow and speed with a published fan curve or selection software.

D.5.3 Embedded fans without latent losses

Not all equipment, particularly custom or built-up air handling equipment, is tested in accordance with a test standard. Manufacturers of these types of equipment will often estimate the latent loss using guides like AMCA Publication 201, which instructs the user to increase the pressure by a specific amount. In this case, the duty point pressure will be increased and the FEI can be determined using a flow/pressure combination or a flow/speed combination.

D.5.4 Custom air handling unit example

Suppose the same fan above is embedded in a custom air handler that is not tested in accordance with a test standard but is otherwise identical (e.g., same latent loss) to the example above. To account for the unknown latent loss, the equipment manufacturer estimates the loss at 0.2 in. wg. and selects the fan at 8,500 cfm and 4.2 in. wg. of pressure. In the minimum testable configuration, this fan draws 7.78 BHP at 1562 rpm and results in an FEI of 1.35.

D.5.5 Minimum testable configuration drawbacks

Notice that the latent pressure losses were different between the two examples above, despite the fact that the real (if tested in both cases) latent loss is the same. In one case, the loss is known to be 0.492 in. wg., and in the other, it is estimated to be 0.2 in. wg. This is just an example, but it serves to highlight the potential differences in FEI that could be encountered. Also, keep in mind that the flow/speed approach does not fully account for the change in power being consumed.

Although the flow/speed approach suggested above ensures an efficient fan is being operated in an efficient region of the fan curve once embedded, it does not fully account for all potential inefficiencies. As stated previously, an equipment test will yield the most accurate estimate of final, in situ performance. A user should thus continue to review the actual power consumed—not necessarily FEP_{act}—to choose the most efficient equipment or fan for the application.

RESOURCES

AMCA Membership Information
http://www.amca.org/members/members.php

AMCA International Headquarters and Laboratory
www.amca.org

AMCA White Papers
www.amca.org/whitepapers

Searchable CRP Database of AMCA Certified Products
www.amca.org/certified-listed/cpsearch.php

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Air Movement and Control Association International

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The Air Movement and Control Association International Inc. is a not-for-profit association of the world's manufacturers of air system equipment, such as fans, louvers, dampers, air curtains, airflow measurement stations, acoustic attenuators and other air system components for the industrial and commercial markets.

EN8139

Date Submitted	12/14/2018	**Section**	1	**Proponent**	Amanda Hickman
Chapter	2717	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

8137

Summary of Modification

This modification adds two new references to Chapter 6.

Rationale

Please see attached rationale and bibliography.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification will make it easier on code enforcement by clearly indicating that they do not have to address the thermal performance of walk-in systems that are governed by federal requirements. It will also reduce inspection time for code enforcement.

Impact to building and property owners relative to cost of compliance with code

This modification will reduce cost to building and property owners as it will clarify that only the DOE requirements apply.

Impact to industry relative to the cost of compliance with code

This modification will reduce costs to industry, as it will clarify that only the DOE requirements apply.

Impact to small business relative to the cost of compliance with code

This modification will reduce costs to small business, as it will clarify that only the DOE requirements apply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Adding these reference standards will improve the welfare of the general public by ensuring that they proper DOE requirements are met.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification will strengthen the code by clarifying that only the DOE requirements apply.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against and materials, products or methods, as it only clarifies that only the DOE requirements apply.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code, it improves the effectiveness by clarifying that only the DOE requirements apply.

1st Comment Period History

8139-A1

Proponent Amanda Hickman **Submitted** 2/18/2019 **Attachments** Yes

Rationale

This comment updates the reference standards to harmonize with the comment revision we made in mod #8137. AHRI 1250 is the correct test procedure for walk-in cooler and freezer refrigeration systems. AHRI 1250 is available for free download via this link: http://www.ahrinet.org/App_Content/ahri/files/STANDARDS/ANSI/ANSI_AHRI_Standard_1250_I-P_2014_with_Errata.pdf

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This comment provides the correct test procedure standard which will aid code enforcement.

Impact to building and property owners relative to cost of compliance with code

This comment provides the correct test procedure standard which will reduce cost.

Impact to industry relative to the cost of compliance with code

This comment provides the correct test procedure standard which will reduce cost.

Impact to Small Business relative to the cost of compliance with code

This modification will reduce costs to small business, as it will clarify that only the DOE requirements apply.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. This comment provides the correct test procedure standard which will ensure the correct requirements are being followed.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes. This comment provides the correct test procedure standard which will ensure the correct requirements are being followed.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No. This comment provides the correct test procedure standard which will ensure the correct requirements are being followed.

Does not degrade the effectiveness of the code

No. This comment provides the correct test procedure standard which will ensure the correct requirements are being followed.

Add to Chapter 6 Referenced Standards:

DOE

10 CFR 431, Subpart C - Commercial Refrigerators, Freezers and Refrigerator-Freezers

10 CFR 431, Subpart R - Walk-in Coolers and Walk-in Freezers

Please revise original modification as follows:

DOE

~~10 CFR 431, Subpart C - Commercial Refrigerators, Freezers and Refrigerator-Freezers~~

AHRI 1250- (IP) 2014: Standard for Performance Rating in Walk-in Coolers and Freezers

Available through the [Electronic Code of Federal Regulations]

Subpart R—Walk-in Coolers and Walk-in Freezers

Source: 74 FR 12074, Mar. 23, 2009, unless otherwise noted.

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§431.301 Purpose and scope.

This subpart contains energy conservation requirements for walk-in coolers and walk-in freezers, pursuant to Part C of Title III of the Energy Policy and Conservation Act, as amended, 42 U.S.C. 6311-6317.

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§431.302 Definitions concerning walk-in coolers and walk-in freezers.

Adaptive defrost means a factory-installed defrost control system that reduces defrost frequency by initiating defrosts or adjusting the number of defrosts per day in response to operating conditions (*e.g.,* moisture levels in the refrigerated space, measurements that represent coil frost load) rather than initiating defrost strictly based on compressor run time or clock time.

Basic model means all components of a given type of walk-in cooler or walk-in freezer (or class thereof) manufactured by one manufacturer, having the same primary energy source, and which have essentially identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency; and

(1) With respect to panels, which do not have any differing features or characteristics that affect U-factor.

(2) [Reserved]

Dedicated condensing unit means a positive displacement condensing unit that is part of a refrigeration system (as defined in this section) and is an assembly that

(1) Includes 1 or more compressors, a condenser, and one refrigeration circuit; and

(2) Is designed to serve one refrigerated load.

Dedicated condensing refrigeration system means one of the following:

(1) A dedicated condensing unit;

(2) A single-package dedicated system; or

(3) A matched refrigeration system.

Display door means a door that:

(1) Is designed for product display; or

(2) Has 75 percent or more of its surface area composed of glass or another transparent material.

Display panel means a panel that is entirely or partially comprised of glass, a transparent material, or both and is used for display purposes.

Door means an assembly installed in an opening on an interior or exterior wall that is used to allow access or close off the opening and that is movable in a sliding, pivoting, hinged, or revolving manner of movement. For walk-in coolers and walk-in freezers, a door includes the door panel, glass, framing materials, door plug, mullion, and any other elements that form the door or part of its connection to the wall.

Envelope means—

(1) The portion of a walk-in cooler or walk-in freezer that isolates the interior, refrigerated environment from the ambient, external environment; and

(2) All energy-consuming components of the walk-in cooler or walk-in freezer that are not part of its refrigeration system.

Freight door means a door that is not a display door and is equal to or larger than 4 feet wide and 8 feet tall.

Indoor dedicated condensing refrigeration system means a dedicated condensing refrigeration system designated by the manufacturer for indoor use or for which there is no designation regarding the use location.

K-factor means the thermal conductivity of a material.

Manufacturer of a walk-in cooler or walk-in freezer means any person who:

(1) Manufactures a component of a walk-in cooler or walk-in freezer that affects energy consumption, including, but not limited to, refrigeration, doors, lights, windows, or walls; or

(2) Manufactures or assembles the complete walk-in cooler or walk-in freezer.

Matched condensing unit means a dedicated condensing unit that is distributed in commerce with one or more unit cooler(s) specified by the condensing unit manufacturer.

Matched refrigeration system (also called “matched-pair”) means a refrigeration system including the matched condensing unit and the one or more unit coolers with which it is distributed in commerce.

Outdoor dedicated condensing refrigeration system means a dedicated condensing refrigeration system designated by the manufacturer for outdoor use.

Panel means a construction component that is not a door and is used to construct the envelope of the walk-in, i.e., elements that separate the interior refrigerated environment of the walk-in from the exterior.

Passage door means a door that is not a freight or display door.

Refrigerated means held at a temperature at or below 55 degrees Fahrenheit using a refrigeration system.

Refrigerated storage space means a space held at refrigerated (as defined in this section) temperatures.

Refrigeration system means the mechanism (including all controls and other components integral to the system's operation) used to create the refrigerated environment in the interior of a walk-in cooler or walk-in freezer, consisting of:

(1) A dedicated condensing refrigeration system (as defined in this section); or

(2) A unit cooler.

Single-packaged dedicated system means a refrigeration system (as defined in this section) that is a single-package assembly that includes one or more compressors, a condenser, a means for forced circulation of refrigerated air, and elements by which heat is transferred from air to refrigerant, without any element external to the system imposing resistance to flow of the refrigerated air.

U-factor means the heat transmission in a unit time through a unit area of a specimen or product and its boundary air films, induced by a unit temperature difference between the environments on each side.

Unit cooler means an assembly, including means for forced air circulation and elements by which heat is transferred from air to refrigerant, thus cooling the air, without any element external to the cooler imposing air resistance.

Walk-in cooler and walk-in freezer mean an enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 degrees Fahrenheit that can be walked into, and has a total chilled storage area of less than 3,000 square feet; however the terms do not include products designed and marketed exclusively for medical, scientific, or research purposes.

Walk-in process cooling refrigeration system means a refrigeration system that is capable of rapidly cooling food or other substances from one temperature to another. The basic model of such a system must satisfy one of the following three conditions:

(1) Be distributed in commerce with an insulated enclosure consisting of panels and door(s) such that the assembled product has a refrigerating capacity of at least 100 Btu/h per cubic foot of enclosed internal volume;

(2) Be a unit cooler having an evaporator coil that is at least four-and-one-half (4.5) feet in height and whose height is at least one-and-one-half (1.5) times the width. The height of the evaporator coil is measured perpendicular to the tubes and is also the fin height, while its width is the finned length parallel to the tubes, as illustrated in Figure 1; or

(3) Be a dedicated condensing unit that is distributed in commerce exclusively with a unit cooler meeting description (2) or with an evaporator that is not a unit cooler, *i.e.,* an evaporator that is not distributed or installed as part of a package including one or more fans.

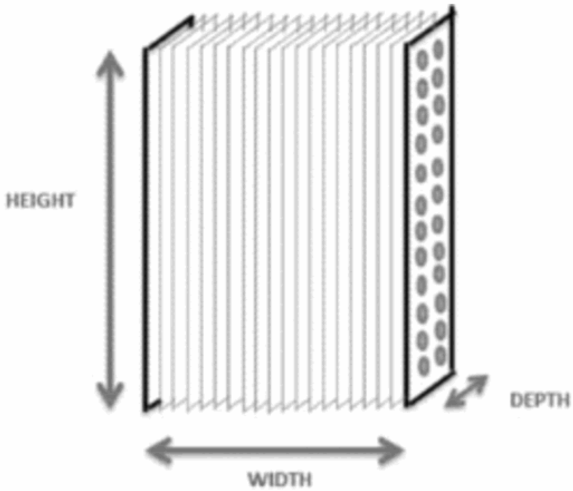

Figure 1: Evaporator Coil Dimensions

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[74 FR 12074, Mar. 23, 2009, as amended at 76 FR 12504, Mar. 7, 2011; 76 FR 21604, Apr. 15, 2011; 76 FR 33631, June 9, 2011; 79 FR 32123, June 3, 2014; 81 FR 95801, Dec. 28, 2016]

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Test Procedures

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§431.303 Materials incorporated by reference.

(a) *General.* Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. Any amendment to a standard by the standard-setting organization will not affect the DOE regulations unless and until amended by DOE. Material is incorporated as it exists on the date of the approval. To enforce any edition other than that specified in this section, the U.S. Department of Energy must publish a document in the Federal Register and the material must be available to the public. All approved material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza SW., Washington, DC 20024, 202-586-2945, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays, or go to: *http://www1.eere.energy.gov/buildings/appliance_standards/*], and is available from the sources listed below. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030 or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(b) *AHRI.* Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, (703) 600-0366, or *http://www.ahrinet.org.*

(1) ANSI/AHRI Standard 420-2008 (“AHRI 420-2008”), “Performance Rating of Forced-Circulation Free-Delivery Unit Coolers for Refrigeration,” Copyright 2008, IBR approved for appendix C to subpart R of part 431.

(2) AHRI Standard 1250P (I-P)-2009 (“AHRI 1250-2009”), “Standard for Performance Rating of Walk-in Coolers and Freezers, (including Errata sheet dated December 2015), copyright 2009, except Table 15 and Table 16. IBR approved for appendix C to subpart R of part 431.

(c) *ASHRAE.* The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1971 Tullie Circle NE., Atlanta, GA 30329, or *www.ashrae.org/.*

(1) ANSI/ASHRAE Standard 23.1-2010, (“ASHRAE 23.1-2010”), “Methods of Testing for Rating the Performance of Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Temperatures of the Refrigerant,” ANSI approved January 28, 2010, IBR approved for appendix C to subpart R of part 431.

(2) [Reserved]

(d) *ASTM.* American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9500, or *http://www.astm.org.*

(1) IBR approved for appendix B to subpart R of part 431.

(2) [Reserved]

(e) *NFRC.* National Fenestration Rating Council, 6305 Ivy Lane, Ste. 140, Greenbelt, MD 20770, (301) 589-1776, or *http://www.nfrc.org/.*

(1) NFRC 100-2010[E0A1], (“NFRC 100”), Procedure for Determining Fenestration Product U-factors, approved June 2010, IBR approved for appendix A to subpart R of part 431.

(2) [Reserved]

[74 FR 12074, Mar. 23, 2009, as amended at 76 FR 21605, Apr. 15, 2011; 76 FR 33631, June 9, 2011; 79 FR 27412, May 13, 2014; 81 FR 95802, Dec. 28, 2016]

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§431.304 Uniform test method for the measurement of energy consumption of walk-in coolers and walk-in freezers.

(a) *Scope.* This section provides test procedures for measuring, pursuant to EPCA, the energy consumption of walk-in coolers and walk-in freezers.

(b) Determine the energy efficiency and/or energy consumption of the specified walk-in cooler and walk-in freezer components by conducting the appropriate test procedure as follows:

(1) Determine the U-factor, conduction load, and energy use of walk-in cooler and walk-in freezer display panels by conducting the test procedure set forth in appendix A to this subpart.

(2) Determine the energy use of walk-in cooler and walk-in freezer display doors and non-display doors by conducting the test procedure set forth in appendix A to this subpart.

(3) Determine the R-value of walk-in cooler and walk-in freezer non-display panels and non-display doors by conducting the test procedure set forth in appendix B to this subpart.

(4) Determine the AWEF and net capacity of walk-in cooler and walk-in freezer refrigeration systems by conducting the test procedure set forth in appendix C to this subpart.

[74 FR 12074, Mar. 23, 2009, as amended at 76 FR 21605, Apr. 15, 2011; 76 FR 33631, June 9, 2011; 76 FR 65365, Oct. 21, 2011; 79 FR 27412, May 13, 2014; 79 FR 32123, June 3, 2014; 81 FR 95802, Dec. 28, 2016]

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§431.305 Walk-in cooler and walk-in freezer labeling requirements.

(a) Panel nameplate—(1) Required information. The permanent nameplate of a walk-in cooler or walk-in freezer panel for which standards are prescribed in §431.306 must be marked clearly with the following information:

(i) The panel brand or manufacturer; and

(ii) One of the following statements, as appropriate:

(A) “This panel is designed and certified for use in walk-in cooler applications.”

(B) “This panel is designed and certified for use in walk-in freezer applications.”

(C) “This panel is designed and certified for use in walk-in cooler and walk-in freezer applications.”

(2) Display of required information. All orientation, spacing, type sizes, typefaces, and line widths to display this required information must be the same as or similar to the display of the other performance data included on the panel's permanent nameplate. The permanent nameplate must be visible unless the panel is assembled into a completed walk-in.

(b) Door nameplate—(1) Required information. The permanent nameplate of a walk-in cooler or walk-in freezer door for which standards are prescribed in §431.306 must be marked clearly with the following information:

(i) The door brand or manufacturer; and

(ii) One of the following statements, as appropriate:

(A) “This door is designed and certified for use in walk-in cooler applications.”

(B) “This door is designed and certified for use in walk-in freezer applications.”

(C) “This door is designed and certified for use in walk-in cooler and walk-in freezer applications.”

(2) Display of required information. All orientation, spacing, type sizes, typefaces, and line widths to display this required information must be the same as or similar to the display of the other performance data included on the door's permanent nameplate. The permanent nameplate must be visible unless the door is assembled into a completed walk-in.

(c) Refrigeration system nameplate—(1) Required information. The permanent nameplate of a walk-in cooler or walk-in freezer refrigeration system for which standards are prescribed in §431.306 must be marked clearly with the following information:

(i) The refrigeration system brand or manufacturer;

(ii) The refrigeration system model number;

(iii) The date of manufacture of the refrigeration system (if the date of manufacture is embedded in the unit's serial number, then the manufacturer of the refrigeration system must retain any relevant records to discern the date from the serial number);

(iv) If the refrigeration system is a dedicated condensing refrigeration system, and is not designated for outdoor use, the statement, “Indoor use only” (for a matched pair this must appear on the condensing unit); and

(v) One of the following statements, as appropriate:

(A) “This refrigeration system is designed and certified for use in walk-in cooler applications.”

(B) “This refrigeration system is designed and certified for use in walk-in freezer applications.”

(C) “This refrigeration system is designed and certified for use in walk-in cooler and walk-in freezer applications.”

(2) Process cooling refrigeration systems. The permanent nameplate of a process cooling refrigeration system (as defined in §431.302) must be marked clearly with the statement, “This refrigeration system is designed for use exclusively in walk-in cooler and walk-in freezer process cooling refrigeration applications.”

(3) Display of required information. All orientation, spacing, type sizes, typefaces, and line widths to display this required information must be the same as or similar to the display of the other performance data included on the refrigeration system's permanent nameplate. The model number must be in one of the following forms: “Model ___” or “Model number ___” or “Model No. ___.” The permanent nameplate must be visible unless the refrigeration system is assembled into a completed walk-in.

(d) A manufacturer may not mark the nameplate of a component with the required information if the manufacturer has not submitted a certification of compliance for the relevant model.

(e) Disclosure of efficiency information in marketing materials. Each catalog that lists the component and all materials used to market the component must include:

(1) For panels—The R-value in the form "R-value__."

(2) For doors—The energy consumption in the form "EC__kWh/day."

(3) For those refrigeration system for which standards are prescribed—The AWEF in the form "AWEF __."

(4) The information that must appear on a walk-in cooler or walk-in freezer component's permanent nameplate pursuant to paragraphs (a)-(c) of this section must also be prominently displayed in each catalog that lists the component and all materials used to market the component.

[81 FR 95802, Dec. 28, 2016]

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Energy Conservation Standards

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§431.306 Energy conservation standards and their effective dates.

(a) Each walk-in cooler or walk-in freezer manufactured on or after January 1, 2009, shall—

(1) Have automatic door closers that firmly close all walk-in doors that have been closed to within 1 inch of full closure, except that this paragraph shall not apply to doors wider than 3 feet 9 inches or taller than 7 feet;

(2) Have strip doors, spring hinged doors, or other method of minimizing infiltration when doors are open;

(3) Contain wall, ceiling, and door insulation of at least R-25 for coolers and R-32 for freezers, except that this paragraph shall not apply to:

(i) Glazed portions of doors not to structural members and

(ii) A walk-in cooler or walk-in freezer component if the component manufacturer has demonstrated to the satisfaction of the Secretary in a manner consistent with applicable requirements that the component reduces energy consumption at least as much as if such insulation requirements of subparagraph (a)(3) were to apply.

(4) Contain floor insulation of at least R-28 for freezers;

(5) For evaporator fan motors of under 1 horsepower and less than 460 volts, use—

(i) Electronically commutated motors (brushless direct current motors); or

(ii) 3-phase motors;

(6) For condenser fan motors of under 1 horsepower, use—

(i) Electronically commutated motors (brushless direct current motors);

(ii) Permanent split capacitor-type motors; or

(iii) 3-phase motors; and

(7) For all interior lights, use light sources with an efficacy of 40 lumens per watt or more, including ballast losses (if any), except that light sources with an efficacy of 40 lumens per watt or less, including ballast losses (if any), may be used in conjunction with a timer or device that turns off the lights within 15 minutes of when the walk-in cooler or walk-in freezer is not occupied by people.

(b) Each walk-in cooler or walk-in freezer with transparent reach-in doors manufactured on or after January 1, 2009, shall also meet the following specifications:

(1) Transparent reach-in doors for walk-in freezers and windows in walk-in freezer doors shall be of triple-pane glass with either heat-reflective treated glass or gas fill.

(2) Transparent reach-in doors for walk-in coolers and windows in walk-in cooler doors shall be—

(i) Double-pane glass with heat-reflective treated glass and gas fill; or

(ii) Triple-pane glass with either heat-reflective treated glass or gas fill.

(3) If the walk-in cooler or walk-in freezer has an antisweat heater without antisweat heat controls, the walk-in cooler and walk-in freezer 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 freezers) and 3.0 watts per square foot of door opening (for coolers).

(4) If the walk-in cooler or walk-in freezer has an antisweat heater with antisweat heat controls, and the total door rail, glass, and frame heater power draw is more than 7.1 watts per square foot of door opening (for freezers) and 3.0 watts per square foot of door opening (for coolers), the antisweat heat controls shall reduce the energy use of the antisweat heater in a quantity corresponding to the relative humidity in the air outside the door or to the condensation on the inner glass pane.

(c) *Walk-in cooler and freezer display doors.* All walk-in cooler and walk-in freezer display doors manufactured starting June 5, 2017, must satisfy the following standards:

Class descriptor	**Class**	**Equations for maximum energy consumption (kWh/day)***
Display Door, Medium Temperature	DD.M	$0.04 \times A_{dd} + 0.41$.
Display Door, Low Temperature	DD.L	$0.15 \times A_{dd} + 0.29$.

*A_{dd} represents the surface area of the display door.

(d) *Walk-in cooler and freezer non-display doors.* All walk-in cooler and walk-in freezer non-display doors manufactured starting on June 5, 2017, must satisfy the following standards:

Class descriptor	Class	Equations for maximum energy consumption (kWh/day)*
Passage door, Medium Temperature	PD.M	$0.05 \times A_{nd} + 1.7$.
Passage Door, Low Temperature	PD.L	$0.14 \times A_{nd} + 4.8$.
Freight Door, Medium Temperature	FD.M	$0.04 \times A_{nd} + 1.9$.
Freight Door, Low Temperature	FD.L	$0.12 \times A_{nd} + 5.6$.

*A_{nd} represents the surface area of the non-display door.

(e) *Walk-in cooler refrigeration systems.* All walk-in cooler and walk-in freezer refrigeration systems manufactured starting on the dates listed in the table, except for walk-in process cooling refrigeration systems (as defined in §431.302), must satisfy the following standards:

Equipment class	Minimum AWEF (Btu/W-h)*	Compliance date: equipment manufactured starting on . . .
Dedicated Condensing System—Medium, Indoor	5.61	June 5, 2017.
Dedicated Condensing System—Medium, Outdoor	7.60	
Dedicated Condensing System—Low, Indoor with a Net Capacity (q_{net}) of:		
< 6,500 Btu/h	$9.091 \times 10^{-5} \times q_{net} + 1.81$	July 10, 2020.
≥ 6,500 Btu/h	2.40	
Dedicated Condensing System—Low, Outdoor with a Net Capacity (q_{net}) of:		
< 6,500 Btu/h	$6.522 \times 10^{-5} \times q_{net} + 2.73$	
≥ 6,500 Btu/h	3.15	
Unit Cooler—Medium	9.00	

Unit Cooler—Low with a Net Capacity (q_{net}) of:		
< 15,500 Btu/h	$1.575 \times 10^{-5} \times q_{net} + 3.91$	
≥ 15,500 Btu/h	4.15	

*Where q_{net} is net capacity as determined in accordance with §431.304 and certified in accordance with 10 CFR part 429.

[74 FR 12074, Mar. 23, 2009, as amended at 78 FR 62993, Oct. 23, 2013; 79 FR 32123, June 3, 2014; 80 FR 69838, Nov. 12, 2015; 82 FR 31885, July 10, 2017]

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Appendix A to Subpart R of Part 431—Uniform Test Method for the Measurement of Energy Consumption of the Components of Envelopes of Walk-In Coolers and Walk-In Freezers

1.0 Scope

This appendix covers the test requirements used to measure the energy consumption of the components that make up the envelope of a walk-in cooler or walk-in freezer.

2.0 Definitions

The definitions contained in §431.302 are applicable to this appendix.

3.0 Additional Definitions

3.1 Automatic door opener/closer means a device or control system that “automatically” opens and closes doors without direct user contact, such as a motion sensor that senses when a forklift is approaching the entrance to a door and opens it, and then closes the door after the forklift has passed.

3.2 [Reserved]

3.3 [Reserved]

3.4 Surface area means the area of the surface of the walk-in component that would be external to the walk-in cooler or walk-in freezer as appropriate.

3.5 Rated power means the electricity consuming device's power as specified on the device's nameplate. If the device does not have a nameplate or such nameplate does not list the device's power, then the rated power must be read from the device's product data sheet.

3.6 Rating conditions means, unless explicitly stated otherwise, all conditions shown in Table A.1 of this section.

3.7 Percent time off (PTO) means the percent of time that an electrical device is assumed to be off.

Table A.1—Temperature Conditions

Internal Temperatures (cooled space within the envelope)	
Cooler Dry Bulb Temperature	35 °F
Freezer Dry Bulb Temperature	−10 °F
External Temperatures (space external to the envelope)	
Freezer and Cooler Dry Bulb Temperatures	75 °F.

4.0 Calculation Instructions

4.1 Display Panels

(a) Calculate the U-factor of the display panel in accordance with section 5.3 of this appendix, Btu/h-ft^2- °F.

(b) Calculate the display panel surface area, as defined in section 3.4 of this appendix, A_{dp}, ft^2, with standard geometric formulas or engineering software.

(c) Calculate the temperature differential, ΔT_{dp}, °F, for the display panel, as follows:

$$\Delta T_{dp} = |T_{DB,ext,dp} - T_{DB,int,dp}| \qquad (4\text{-}1)$$

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Where:

$T_{DB,ext,dp}$ = dry-bulb air external temperature, °F, as prescribed in Table A.1; and

$T_{DB,int,dp}$ = dry-bulb air temperature internal to the cooler or freezer, °F, as prescribed in Table A.1.

(d) Calculate the conduction load through the display panel, $Q_{cond\text{-}dp}$, Btu/h, as follows:

$$Q_{cond,dp} = A_{dp} \times \Delta T_{dp} \times U_{dp} \qquad (4\text{-}2)$$

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Where:

A_{dp} = surface area of the walk-in display panel, ft^2;

ΔT_{dp} = temperature differential between refrigerated and adjacent zones, °F; and

U_{dp} = thermal transmittance, U-factor, of the display panel in accordance with section 5.3 of this appendix, Btu/h-ft^2- °F.

(e) Select Energy Efficiency Ratio (EER), as follows:

(1) For coolers, use EER = 12.4 Btu/W-h

(2) For freezers, use EER = 6.3 Btu/W-h

(f) Calculate the total daily energy consumption, E_{dp}, kWh/day, as follows:

$$E_{dp} = \frac{Q_{cond,dp}}{EER} \times \frac{24\ h \times 1\ kW}{1\ day \times 1000\ W} \qquad (4\text{-}3)$$

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Where:

$Q_{cond,\,dp}$ = the conduction load through the display panel, Btu/h; and EER = EER of walk-in (cooler or freezer), Btu/W-h.

4.2 [Reserved]

4.3 [Reserved]

4.4 Display Doors

4.4.1 Conduction Through Display Doors

(a) Calculate the U-factor of the door in accordance with section 5.3 of this appendix, Btu/h-ft^2-°F

(b) Calculate the surface area, as defined in section 3.4 of this appendix, of the display door, A_{dd}, ft^2, with standard geometric formulas or engineering software.

(c) Calculate the temperature differential, ΔT_{dd}, °F, for the display door as follows:

$$\Delta T_{dd} = \left| T_{DB,ext,dd} - T_{DB,int,dd} \right| \qquad (4\text{-}18)$$

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Where:

$T_{DB,ext,\,dd}$ = dry-bulb air temperature external to the display door, °F, as prescribed in Table A.1; and

$T_{DB,int,\,dd}$ = dry-bulb air temperature internal to the display door, °F, as prescribed in Table A.1.

(d) Calculate the conduction load through the display doors, $Q_{cond\text{-}dd}$, Btu/h, as follows:

$$Q_{cond,dd} = A_{dd} \times \Delta T_{dd} \times U_{dd} \qquad (4\text{-}19)$$

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Where:

ΔT_{dd} = temperature differential between refrigerated and adjacent zones, °F;

A_{dd} = surface area walk-in display doors, ft^2; and

U_{dd} = thermal transmittance, U-factor of the door, in accordance with section 5.3 of this appendix, $Btu/h\text{-}ft^2\text{-}°F$.

4.4.2 Direct Energy Consumption of Electrical Component(s) of Display Doors

Electrical components associated with display doors could include, but are not limited to: heater wire (for anti-sweat or anti-freeze application); lights (including display door lighting systems); control system units; and sensors.

(a) Select the required value for percent time off (PTO) for each type of electricity consuming device, PTO_t (%)

(1) For lights without timers, control system or other demand-based control, PTO = 25 percent. For lighting with timers, control system or other demand-based control, PTO = 50 percent.

(2) For anti-sweat heaters on coolers (if included): Without timers, control system or other demand-based control, PTO = 0 percent. With timers, control system or other demand-based control, PTO = 75 percent. For anti-sweat heaters on freezers (if included): Without timers, control system or other auto-shut-off systems, PTO = 0 percent. With timers, control system or other demand-based control, PTO = 50 percent.

(3) For all other electricity consuming devices: Without timers, control system, or other auto-shut-off systems, PTO = 0 percent. If it can be demonstrated that the device is controlled by a preinstalled timer, control system or other auto-shut-off system, PTO = 25 percent.

(b) Calculate the power usage for each type of electricity consuming device, $P_{dd\text{-}comp,u,t}$, kWh/day, as follows:

$$P_{dd-comp,u,t} = P_{rated,u,t} \times \left(1 - PTO_{u,t}\right) \times n_{u,t} \times \frac{24h}{day} \qquad (4\text{-}20)$$

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Where:

u = the index for each of type of electricity-consuming device located on either (1) the interior facing side of the display door or within the inside portion of the display door, (2) the exterior facing side of the display door, or (3) any combination of (1) and (2). For purposes of this calculation, the interior index is represented by u = int and the exterior index is represented by u = ext. If the electrical component is both on the interior and exterior side of the display door then u = int. For anti-sweat heaters sited anywhere in the display door, 75 percent of the total power is be attributed to u = int and 25 percent of the total power is attributed to u = ext;

t = index for each type of electricity consuming device with identical rated power;

$P_{rated,u,t}$ = rated power of each component, of type t, kW;

$PTO_{u,t}$ = percent time off, for device of type t, %; and

$n_{u,t}$ = number of devices at the rated power of type t, unitless.

(c) Calculate the total electrical energy consumption for interior and exterior power, $P_{dd-tot,int}$ (kWh/day) and $P_{dd-tot,ext}$ (kWh/day), respectively, as follows:

$$P_{dd-tot,int} = \sum_1^t P_{dd-comp,int,t} \qquad (4\text{-}21)$$

$$P_{dd-tot,ext} = \sum_1^t P_{dd-comp,ext,t} \qquad (4\text{-}22)$$

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Where:

t = index for each type of electricity consuming device with identical rated power;

$P_{dd-comp,int,t}$ = the energy usage for an electricity consuming device sited on the interior facing side of or in the display door, of type t, kWh/day; and

$P_{dd-comp,ext,t}$ = the energy usage for an electricity consuming device sited on the external facing side of the display door, of type t, kWh/day.

(d) Calculate the total electrical energy consumption, P_{dd-tot}, (kWh/day), as follows:

$$\mathbf{P_{dd-tot} = P_{dd-tot,int} + P_{dd-tot,ext}} \qquad (4\text{-}23)$$

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Where:

$P_{dd-tot,int}$ = the total interior electrical energy usage for the display door, kWh/day; and

$P_{dd-tot,ext}$ = the total exterior electrical energy usage for the display door, kWh/day.

4.4.3 Total Indirect Electricity Consumption Due to Electrical Devices

(a) Select Energy Efficiency Ratio (EER), as follows:

(1) For coolers, use EER = 12.4 Btu/Wh

(2) For freezers, use EER = 6.3 Btu/Wh

(b) Calculate the additional refrigeration energy consumption due to thermal output from electrical components sited inside the display door, $C_{dd-load}$, kWh/day, as follows:

$$C_{dd-load} = P_{dd-tot,int} \times \frac{3.412}{EER}\frac{Btu}{W-h} \qquad (4\text{-}24)$$

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Where:

EER = EER of walk-in cooler or walk-in freezer, Btu/W-h; and

$P_{dd\text{-}tot,int}$ = The total internal electrical energy consumption due for the display door, kWh/day.

4.4.4 Total Display Door Energy Consumption

(a) Select Energy Efficiency Ratio (EER), as follows:

(1) For coolers, use EER = 12.4 Btu/W-h

(2) For freezers, use EER = 6.3 Btu/W-h

(b) Calculate the total daily energy consumption due to conduction thermal load, $E_{dd,\ thermal}$, kWh/day, as follows:

$$E_{dd,thermal} = \frac{Q_{cond,dd}}{EER} \times \frac{24\ h \times 1\ kW}{1\ day \times 1000\ W} \qquad (4\text{-}25)$$

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Where:

$Q_{cond,\ dd}$ = the conduction load through the display door, Btu/h; and

EER = EER of walk-in (cooler or freezer), Btu/W-h.

(c) Calculate the total energy, $E_{dd,tot}$, kWh/day,

$$\mathbf{E_{dd,tot} = E_{dd,thermal} + P_{dd-tot} + C_{dd-load}} \qquad (4\text{-}26)$$

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Where:

$E_{dd,\ thermal}$ = the total daily energy consumption due to thermal load for the display door, kWh/day;

$P_{dd\text{-}tot}$ = the total electrical load, kWh/day; and

$C_{dd\text{-}load}$ = additional refrigeration load due to thermal output from electrical components contained within the display door, kWh/day.

4.5 Non-Display Doors

4.5.1 Conduction Through Non-Display Doors

(a) Calculate the surface area, as defined in section 3.4 of this appendix, of the non-display door, A_{nd}, ft^2, with standard geometric formulas or with engineering software.

(b) Calculate the temperature differential of the non-display door, ΔT_{nd}, °F, as follows:

$$\Delta T_{nd} = |T_{DB,ext,nd} - T_{DB,int,nd}| \qquad (4\text{-}27)$$

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Where:

$T_{DB,ext,nd}$ = dry-bulb air external temperature, °F, as prescribed by Table A.1; and

$T_{DB,int,nd}$ = dry-bulb air internal temperature, °F, as prescribed by Table A.1. If the component spans both cooler and freezer spaces, the freezer temperature must be used.

(c) Calculate the conduction load through the non-display door: $Q_{cond-nd}$, Btu/h,

$$Q_{cond-nd} = \Delta T_{nd} \times A_{nd} \times U_{nd} \qquad (4\text{-}28)$$

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Where:

ΔT_{nd} = temperature differential across the non-display door, °F;

U_{nd} = thermal transmittance, U-factor of the door, in accordance with section 5.3 of this appendix, Btu/h-ft^2- °F; and

A_{nd} = area of non-display door, ft^2.

4.5.2 Direct Energy Consumption of Electrical Components of Non-Display Doors

Electrical components associated with a walk-in non-display door comprise any components that are on the non-display door and that directly consume electrical energy. This includes, but is not limited to, heater wire (for anti-sweat or anti-freeze application), control system units, and sensors.

(a) Select the required value for percent time off for each type of electricity consuming device, PTO_t (%)

(1) For lighting without timers, control system or other demand-based control, PTO = 25 percent. For lighting with timers, control system or other demand-based control, PTO = 50 percent.

(2) For anti-sweat heaters on coolers (if included): Without timers, control system or other demand-based control, PTO = 0 percent. With timers, control system or other demand-based control, PTO = 75 percent. For anti-sweat heaters on freezers (if included): Without timers, control system or other auto-shut-off systems, PTO = 0 percent. With timers, control system or other demand-based control, PTO = 50 percent.

(3) For all other electricity consuming devices: Without timers, control system, or other auto-shut-off systems, PTO = 0 percent. If it can be demonstrated that the device is controlled by a preinstalled timer, control system or other auto-shut-off system, PTO = 25 percent.

(b) Calculate the power usage for each type of electricity consuming device, $P_{nd\text{-}comp,u,t}$, kWh/day, as follows:

$$\mathbf{P_{nd-comp,u,t}} = \mathbf{P_{rated,u,t}} \times \left(1 - \mathbf{PTO_{u,t}}\right) \times \mathbf{n_{u,t}} \times \frac{\mathbf{24h}}{\mathbf{day}} \qquad (4\text{-}29)$$

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Where:

u = the index for each of type of electricity-consuming device located on either (1) the interior facing side of the display door or within the inside portion of the display door, (2) the exterior facing side of the display door, or (3) any combination of (1) and (2). For purposes of this calculation, the interior index is represented by u = int and the exterior index is represented by u = ext. If the electrical component is both on the interior and exterior side of the display door then u = int. For anti-sweat heaters sited anywhere in the display door, 75 percent of the total power is be attributed to u = int and 25 percent of the total power is attributed to u = ext;

t = index for each type of electricity consuming device with identical rated power;

$P_{rated,u,t}$ = rated power of each component, of type t, kW;

$PTO_{u,t}$ = percent time off, for device of type t, %; and

$n_{u,t}$ = number of devices at the rated power of type t, unitless.

(c) Calculate the total electrical energy consumption for interior and exterior power, $P_{nd\text{-}tot,\ int}$ (kWh/day) and $P_{nd\text{-}tot,\ ext}$ (kWh/day), respectively, as follows:

$$P_{nd-tot,int} = \sum_1^t P_{nd-comp,int,t} \qquad (4\text{-}30)$$

$$P_{nd-tot,ext} = \sum_1^t P_{nd-comp,ext,t} \qquad (4\text{-}31)$$

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Where:

t = index for each type of electricity consuming device with identical rated power;

$P_{nd\text{-}comp,int,\ t}$ = the energy usage for an electricity consuming device sited on the internal facing side or internal to the non-display door, of type t, kWh/day; and

$P_{nd\text{-}comp,ext,\ t}$ = the energy usage for an electricity consuming device sited on the external facing side of the non-display door, of type t, kWh/day. For anti-sweat heaters,

(d) Calculate the total electrical energy consumption, $P_{nd\text{-}tot}$, kWh/day, as follows:

$$P_{nd-tot} = P_{nd-tot,int} + P_{nd-tot,ext} \qquad (4\text{-}32)$$

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Where:

$P_{nd-tot,int}$ = the total interior electrical energy usage for the non-display door, of type t, kWh/day; and

$P_{nd-tot,ext}$ = the total exterior electrical energy usage for the non-display door, of type t, kWh/day.

4.5.3 Total Indirect Electricity Consumption Due to Electrical Devices

(a) Select Energy Efficiency Ratio (EER), as follows:

(1) For coolers, use EER = 12.4 Btu/Wh

(2) For freezers, use EER = 6.3 Btu/Wh

(b) Calculate the additional refrigeration energy consumption due to thermal output from electrical components associated with the non-display door, $C_{nd-load}$, kWh/day, as follows:

$$C_{nd-load} = P_{nd-tot,int} \times \frac{3.412}{EER}\frac{Btu}{W-h} \qquad (4\text{-}33)$$

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Where:

EER = EER of walk-in cooler or freezer, Btu/W-h; and

$P_{nd-tot,int}$ = the total interior electrical energy consumption for the non-display door, kWh/day.

4.5.4 Total Non-Display Door Energy Consumption

(a) Select Energy Efficiency Ratio (EER), as follows:

(1) For coolers, use EER = 12.4 Btu/W-h

(2) For freezers, use EER = 6.3 Btu/W-h

(b) Calculate the total daily energy consumption due to thermal load, $E_{nd,\,thermal}$, kWh/day, as follows:

$$E_{nd,thermal} = \frac{Q_{cond-nd}}{EER} \times \frac{24\ h \times 1\ kW}{1\ day \times 1000\ W} \qquad (4\text{-}34)$$

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Where:

$Q_{cond-nd}$ = the conduction load through the non-display door, Btu/hr; and

EER = EER of walk-in (cooler or freezer), Btu/W-h.

(c) Calculate the total energy, $E_{nd,tot}$, kWh/day, as follows:

$$\mathbf{E_{nd,tot} = E_{nd,thermal} + P_{nd-tot} + C_{load}} \qquad (4\text{-}35)$$

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Where:

$E_{nd,\ thermal}$ = the total daily energy consumption due to thermal load for the non-display door, kWh/day;

$P_{nd\text{-}tot}$ = the total electrical energy consumption, kWh/day; and

$C_{nd\text{-}load}$ = additional refrigeration load due to thermal output from electrical components contained on the inside face of the non-display door, kWh/day.

5.0 Test Methods and Measurements

5.1-5.2 [Reserved]

5.3 U-factor of Doors and Display Panels

(a) Follow the procedure in NFRC 100, (incorporated by reference; see §431.303), exactly, with these exceptions:

(1) The average surface heat transfer coefficient on the cold-side of the apparatus shall be 30 Watts per square-meter-Kelvin (W/m^2*K) ±5%. The average surface heat transfer coefficient on the warm-side of the apparatus shall be 7.7 Watts per square-meter-Kelvin (W/m^2*K) ±5%.

(2) Cold-side conditions:

(i) Air temperature of 35 °F (1.7 °C) for cooler doors and −10 °F (−23.3 °C) for freezer doors

(ii) Mean inside radiant temperature must be the same as shown in section 5.3(a)(2)(i), above.

(3) Warm-side conditions

(i) Air temperature of 75 °F (23.9 °C)

(ii) Mean outside radiant temperature must be the same as section 5.3(a)(3)(i), above.

(4) Direct solar irradiance = 0 W/m^2 ($Btu/h\text{-}ft^2$).

(b) Required Test Measurements

(i) Display Doors and Display Panels

1. Thermal Transmittance: U_{dd}

(ii) Non-Display Door

1. Thermal Transmittance: U_{nd}

[76 FR 21606, Apr. 15, 2011, as amended at 76 FR 31796, June 2, 2011; 76 FR 33632, June 9, 2011; 79 FR 27414, May 13, 2014; 81 FR 95803, Dec. 28, 2016]

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Appendix B to Subpart R of Part 431—Uniform Test Method for the Measurement of R-Value for Envelope Components of Walk-In Coolers and Walk-In Freezers

1.0 Scope

This appendix covers the test requirements used to measure the R-value of non-display panels and non-display doors of a walk-in cooler or walk-in freezer.

2.0 Definitions

The definitions contained in §431.302 apply to this appendix.

3.0 Additional Definitions

3.1 *Edge region* means a region of the panel that is wide enough to encompass any framing members. If the panel contains framing members (*e.g.,* a wood frame) then the width of the edge region must be as wide as any framing member plus an additional 2 in. ± 0.25 in.

4.0 Test Methods, Measurements, and Calculations

4.1 The R value shall be the 1/K factor multiplied by the thickness of the panel.

4.2 The K factor shall be based on ASTM C518 (incorporated by reference; see §431.303).

4.3 For calculating the R value for freezers, the K factor of the foam at 20 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ±0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

4.4 For calculating the R value for coolers, the K factor of the foam at 55 ± 1 degrees Fahrenheit (average foam temperature) shall be used. Test results from a test sample 1 ± 0.1-inches in thickness may be used to determine the R value of panels with various foam thickness as long as the foam is of the same final chemical form.

4.5 Foam shall be tested after it is produced in its final chemical form. For foam produced inside of a panel (“foam-in-place”), “final chemical form” means the foam is cured as intended and ready for use as a finished panel. For foam produced as board stock (typically polystyrene), “final chemical form” means after extrusion and ready for assembly into a panel or after assembly into a panel. Foam from foam-in-place panels must not include any structural members or non-foam materials. Foam produced as board stock may be tested prior to its incorporation into a final panel. A test sample 1 ± 0.1-inches in thickness must be taken from the center of a panel and any protective skins or facers must be removed. A high-speed band-saw and a meat slicer are two types of recommended cutting tools. Hot wire cutters or other heated tools must not be used for cutting foam test samples. The two surfaces of the test sample that will contact the hot plate assemblies (as defined in ASTM C518 (incorporated by reference, see §431.303)) must both maintain ±0.03 inches flatness tolerance and also maintain parallelism with respect to one another within ±0.03 inches. Testing must be completed within 24 hours of samples being cut for testing.

4.6 Internal non-foam member and/or edge regions shall not be considered when testing in accordance with ASTM C518 (incorporated by reference, see §431.303).

4.7 For panels consisting of two or more layers of dissimilar insulating materials (excluding facers or protective skins), test each material as described in sections 4.1 through 4.6 of this appendix. For a panel with N layers of insulating material, the overall R-Value shall be calculated as follows:

$$R_{panel} = \sum_{i=1}^{N} \frac{t_i}{k_i}$$

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Where:

k_i is the k factor of the ith material as measured by ASTM C518, (incorporated by reference, see §431.303);

t_i is the thickness of the ith material that appears in the panel; and

N is the total number of material layers that appears in the panel.

[81 FR 95803, Dec. 28, 2016]

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Appendix C to Subpart R of Part 431—Uniform Test Method for the Measurement of Net Capacity and AWEF of Walk-In Cooler and Walk-In Freezer Refrigeration Systems

1.0 Scope

This appendix covers the test requirements used to determine the net capacity and the AWEF of the refrigeration system of a walk-in cooler or walk-in freezer.

2.0 Definitions

The definitions contained in §431.302 and AHRI 1250-2009 (incorporated by reference; see §431.303) apply to this appendix. When definitions in standards incorporated by reference are in conflict or when they conflict with this section, the hierarchy of precedence shall be in the following order: §431.302, AHRI 1250-2009, and then either AHRI 420-2008 (incorporated by reference; see §431.303) for unit coolers or ASHRAE 23.1-2010 (incorporated by reference; see §431.303) for dedicated condensing units.

3.0 Test Methods, Measurements, and Calculations

Determine the Annual Walk-in Energy Factor (AWEF) and net capacity of walk-in cooler and walk-in freezer refrigeration systems by conducting the test procedure set forth in AHRI 1250-2009 (incorporated by reference; see §431.303), with the modifications to that test procedure provided in this section. When standards that are incorporated by reference are in conflict or when they conflict with this section, the hierarchy of precedence shall be in the following order: §431.302, AHRI 1250-2009, and then either AHRI 420-2008 (incorporated by reference; see §431.303) or ASHRAE 23.1-2010 (incorporated by reference; see §431.303).

3.1. *General modifications: Test Conditions and Tolerances.*

When conducting testing in accordance with AHRI 1250-2009 (incorporated by reference; see §431.303), the following modifications must be made.

3.1.1. In Table 1, Instrumentation Accuracy, refrigerant temperature measurements shall have a tolerance of ±0.5 F for unit cooler in/out, ±1.0 F for all other temperature measurements.

3.1.2. In Table 2, Test Operating and Test Condition Tolerances for Steady-State Test, electrical power frequency shall have a Test Condition Tolerance of 1 percent.

3.1.3. In Table 2, the Test Operating Tolerances and Test Condition Tolerances for Air Leaving Temperatures shall be deleted.

3.1.4. In Tables 2 through 14, the Test Condition Outdoor Wet Bulb Temperature requirement and its associated tolerance apply only to units with evaporative cooling.

3.1.5. Tables 15 and 16 shall be modified to read as follows:

Table 15—Refrigerator Unit Cooler

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power	35	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	35	<50	25	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.

Refrigeration Capacity Suction B	35	<50	20	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.

Note: Superheat to be set according to equipment specification in equipment or installation manual. If no superheat specification is given, a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of the standard rating.

Table 16—Freezer Unit Cooler

Test description	Unit cooler air entering dry-bulb, °F	Unit cooler air entering relative humidity, %	Saturated suction temp, °F	Liquid inlet saturation temp, °F	Liquid inlet subcooling temp, °F	Compressor capacity	Test objective
Off Cycle Fan Power	−10	<50	—	—	—	Compressor Off	Measure fan input power during compressor off cycle.
Refrigeration Capacity Suction A	−10	<50	−20	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Refrigeration Capacity Suction B	−10	<50	−26	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler.
Defrost	−10	Various	—	—	—	Compressor Off	Test according to Appendix C Section C11.

Note: Superheat to be set according to equipment specification in equipment or installation manual. If no superheat specification is given, a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of the standard rating.

3.2. General Modifications: Methods of Testing

When conducting testing in accordance with appendix C of AHRI 1250-2009 (incorporated by reference; see §431.303), the following modifications must be made.

3.2.1. In appendix C, section C3.1.6, any refrigerant temperature measurements upstream and downstream of the unit cooler may use sheathed sensors immersed in the flowing refrigerant instead of thermometer wells.

3.2.2. It is not necessary to perform composition analysis of refrigerant (appendix C, section C3.3.6) or refrigerant oil concentration testing (appendix C, section C3.4.6).

3.2.3. In appendix C, section C3.4.5, for verification of sub-cooling downstream of mass flow meters, only the sight glass and a temperature sensor located on the tube surface under the insulation are required.

3.2.4. In appendix C, section C3.5, regarding unit cooler fan power measurements, for a given motor winding configuration, the total power input shall be measured at the highest nameplate voltage. For three-phase power, voltage imbalances shall be no more than 2 percent from phase to phase.

3.2.5. In the test setup (appendix C, section C8.3), the liquid line and suction line shall be constructed of pipes of the manufacturer-specified size. The pipe lines shall be insulated with a minimum total thermal resistance equivalent to ½ -inch thick insulation having a flat-surface R-Value of 3.7 ft^2- °F-hr/Btu per inch or greater. Flow meters need not be insulated but must not be in contact with the floor. The lengths of the connected liquid line and suction line shall be 25 feet ± 3 inches, not including the requisite flow meters, each. Of this length, no more than 15 feet shall be in the conditioned space. Where there are multiple branches of piping, the maximum length of piping applies to each branch individually as opposed to the total length of the piping.

3.3. *Matched systems, single-package dedicated systems, and unit coolers tested alone:* Use the test method in AHRI 1250-2009 (incorporated by reference; see §431.303), appendix C as the method of test for matched refrigeration systems, single-package dedicated systems, or unit coolers tested alone, with the following modifications:

3.3.1. For unit coolers tested alone, use test procedures described in AHRI 1250-2009 (incorporated by reference; see §431.303) for testing unit coolers for use in mix-match system ratings, except that for the test conditions in Tables 15 and 16, use the Suction A saturation condition test points only. Also for unit coolers tested alone, use the calculations in section 7.9 to determine AWEF and net capacity described in AHRI 1250-2009 for unit coolers matched to parallel rack systems.

3.3.2. In appendix C, section C.13, the version of AHRI Standard 420 used for test methods, requirements, and procedures shall be AHRI 420-2008 (incorporated by reference; see §431.303).

3.3.3. Use appendix C, section C10 of AHRI 1250-2009 for off-cycle evaporator fan testing, with the exception that evaporator fan controls using periodic stir cycles shall be adjusted so that the greater of a 50% duty cycle (rather than a 25% duty cycle) or the manufacturer default is used for measuring off-cycle fan energy. For adjustable-speed controls, the greater of 50% fan speed (rather than 25% fan speed) or the manufacturer's default fan speed shall be used for measuring off-cycle fan energy. Also, a two-speed or multi-speed fan control may be used as the qualifying evaporator fan control. For such a control, a fan speed no less than 50% of the speed used in the maximum capacity tests shall be used for measuring off-cycle fan energy.

3.3.4. Use appendix C, section C11 of AHRI 1250-2009 (incorporated by reference, see §431.303) for defrost testing. The Frost Load Condition Defrost Test (C11.1.1) is optional.

3.3.4.1. If the frost load condition defrost test is performed:

3.3.4.1.1 Operate the unit cooler at the dry coil conditions as specified in appendix C, section C11.1 to obtain dry coil defrost energy, DF_d, in W-h.

3.3.4.1.2 Operate the unit cooler at the frost load conditions as specified in appendix C, sections C11.1 and C11.1.1 to obtain frosted coil defrost energy, DF_f, in W-h.

3.3.4.1.3 The number of defrosts per day, N_{DF}, shall be calculated from the time interval between successive defrosts from the start of one defrost to the start of the next defrost at the frost load conditions.

3.3.4.1.4 Use appendix C, equations C13 and C14 in section C11.3 to calculate, respectively, the daily average defrost energy, DF, in W-h and the daily contribution of the load attributed to defrost Q_{DF} in Btu.

3.3.4.1.5 The defrost adequacy requirements in appendix C, section C11.3 shall apply.

3.3.4.2 If the frost load test is not performed:

3.3.4.2.1 Operate the unit cooler at the dry coil conditions as specified in appendix C, section C11.1 to obtain dry coil defrost energy, DF_d, in W-h.

3.3.4.2.2 The frost load defrost energy, DF_f, in W-h shall be equal to 1.05 multiplied by the dry coil energy consumption, DF_d, measured using the dry coil condition test in appendix C, section C11.1.

3.3.4.2.3 The number of defrosts per day N_{DF} used in subsequent calculations shall be 4.

3.3.4.2.4 Use appendix C, equation C13 in section C11.3 to calculate the daily average defrost energy, DF, in W-h.

3.3.4.2.5 The daily contribution of the load attributed to defrost Q_{DF} in Btu shall be calculated as follows:

$$Q_{DF} = 0.95 \times 3.412\ \text{Btu/W-h} \times \frac{2.05\ \times DF_d}{2} \times 4$$

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Where:

DF_d = the defrost energy, in W-h, measured at the dry coil condition

3.3.5. If a unit has adaptive defrost, use appendix C, section C11.2 of AHRI 1250-2009 as follows:

3.3.5.1. When testing to certify to the energy conservation standards in §431.306, do not perform the optional test for adaptive or demand defrost in appendix C, section C11.2.

3.3.5.2. When determining the represented value of the calculated benefit for the inclusion of adaptive defrost, conduct the optional test for adaptive or demand defrost in appendix C, section C11.2 to establish the maximum time interval allowed between dry coil defrosts. If this time is greater than 24 hours, set its value to 24 hours. Then, calculate N_{DF} (the number of defrosts per day) by averaging the time in hours between successive defrosts for the dry coil condition with the time in hours between successive defrosts for the frosted coil condition, and dividing 24 by this average time. (The time between successive defrosts for the frosted coil condition is found as specified in section 3.3.4 of this appendix C of AHRI 1250-2009: That is, if the optional frosted coil test was performed, the time between successive defrosts for the frosted coil condition is found by performing the frosted coil test as specified in section 3.3.4.1 of this appendix; and if the optional frosted coil test was not performed, the time between successive defrosts for the frosted coil condition shall be set to 4 as specified in section 3.3.4.2. of this appendix) Use this new value of N_{DF} in subsequent calculations.

3.3.6. For matched refrigeration systems and single-package dedicated systems, calculate the AWEF using the calculations in AHRI 1250-2009 (incorporated by reference; see §431.303), section 7.4, 7.5, 7.6, or 7.7, as applicable.

3.3.7. For unit coolers tested alone, calculate the AWEF and net capacity using the calculations in AHRI 1250-2009, (incorporated by reference; see §431.303), section 7.9. If the unit cooler has variable-speed evaporator fans that vary fan speed in response to load, then:

3.3.7.1. When testing to certify compliance with the energy conservation standards in §431.306, fans shall operate at full speed during on-cycle operation. Do not conduct the calculations in AHRI 1250-2009, section 7.9.3. Instead, use AHRI 1250-2009, section 7.9.2 to determine the system's AWEF.

3.3.7.2. When calculating the benefit for the inclusion of variable-speed evaporator fans that modulate fan speed in response to load for the purposes of making representations of efficiency, use AHRI 1250-2009, section 7.9.3 to determine the system AWEF.

3.4. *Dedicated condensing units that are not matched for testing and are not single-package dedicated systems*

3.4.1. Refer to appendix C, section C.12 of AHRI 1250-2009 (incorporated by reference; see §431.303), for the method of test for dedicated condensing units. The version of ASHRAE Standard 23 used for test methods, requirements, and procedures shall be ANSI/ASHRAE Standard 23.1-2010 (incorporated by reference; see §431.303). When applying this test method, use the applicable test method modifications listed in sections 3.1 and 3.2 of this appendix. For the test conditions in AHRI 1250-2009, Tables 11, 12, 13, and 14, use the Suction A condition test points only.

3.4.2. Calculate the AWEF and net capacity for dedicated condensing units using the calculations in AHRI 1250-2009 (incorporated by reference; see §431.303) section 7.8. Use the following modifications to the calculations in lieu of unit cooler test data:

3.4.2.1. For calculating enthalpy leaving the unit cooler to calculate gross capacity, (a) The saturated refrigerant temperature (dew point) at the unit cooler coil exit, T_{evap}, shall be 25 °F for medium-temperature systems (coolers) and −20 °F for low-temperature systems (freezers), and (b) the refrigerant temperature at the unit cooler exit shall be 35 °F for medium-temperature systems (coolers) and −14 °F for low-temperature systems (freezers). For calculating gross capacity, the measured enthalpy at the condensing unit exit shall be used as the enthalpy entering the unit cooler.

3.4.2.2. The on-cycle evaporator fan power in watts, $EF_{comp,on}$, shall be calculated as follows:

For medium-temperature systems (coolers), $EF_{comp,on} = 0.013 \times q_{mix,cd}$

For low-temperature systems (freezers), $EF_{comp,on} = 0.016 \times q_{mix,cd}$

Where:

$q_{mix,cd}$ is the gross cooling capacity of the system in Btu/h, found by a single test at the Capacity A, Suction A condition for outdoor units and the Suction A condition for indoor units.

3.4.2.3. The off-cycle evaporator fan power in watts, $EF_{comp,off}$, shall be calculated as follows:

$EF_{comp,off} = 0.2 \times EF_{comp,on}$

Where:

$EF_{comp,on}$ is the on-cycle evaporator fan power in watts.

3.4.2.4. The daily defrost energy use in watt-hours, DF, shall be calculated as follows:

For medium-temperature systems (coolers), DF = 0

For low-temperature systems (freezers), $DF = 8.5 \times 10^{-3} \times q_{mix,cd}^{1.27} \times N_{DF}$

Where:

$q_{mix,cd}$ is the gross cooling capacity of the system in Btu/h, found by a single test at the Capacity A, Suction A condition for outdoor units and the Suction A condition for indoor units, and

N_{DF} is the number of defrosts per day, equal to 4.

3.4.2.5. The daily defrost heat load contribution in Btu, Q_{DF}, shall be calculated as follows:

For medium-temperature systems (coolers), $Q_{DF} = 0$

For low-temperature systems (freezers), $Q_{DF} = 0.95 \times DF \times 3.412$

Where:

DF is the daily defrost energy use in watt-hours.

3.5 Hot Gas Defrost Refrigeration Systems

For all hot gas defrost refrigeration systems, remove the hot gas defrost mechanical components and disconnect all such components from electrical power.

3.5.1 Hot Gas Defrost Dedicated Condensing Units Tested Alone: Test these units as described in section 3.4 of this appendix for electric defrost dedicated condensing units that are not matched for testing and are not single-package dedicated systems.

3.5.2 Hot Gas Defrost Matched Systems, Single-package Dedicated Systems, and Unit Coolers Tested Alone: Test these units as described in section 3.3 of this appendix for electric defrost matched systems, single-package dedicated systems, and unit coolers tested alone, but do not conduct defrost tests as described in sections 3.3.4 and 3.3.5 of this appendix. Calculate daily defrost energy use as described in section 3.4.2.4 of this appendix. Calculate daily defrost heat contribution as described in section 3.4.2.5 of this appendix.

[81 FR 95803, Dec. 28, 2016]

Available through the Electronic Code of Federal Regulations

Subpart C—Commercial Refrigerators, Freezers and Refrigerator-Freezers

Source: 70 FR 60414, Oct. 18, 2005, unless otherwise noted.

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§431.61 Purpose and scope.

This subpart contains energy conservation requirements for commercial refrigerators, freezers and refrigerator-freezers, pursuant to Part C of Title III of the Energy Policy and Conservation Act, as amended, 42 U.S.C. 6311-6317.

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§431.62 Definitions concerning commercial refrigerators, freezers and refrigerator-freezers.

Air-curtain angle means:

(1) For equipment without doors and without a discharge air grille or discharge air honeycomb, the angle between a vertical line extended down from the highest point on the manufacturer's recommended load limit line and the load limit line itself, when the equipment is viewed in cross-section; and

(2) For all other equipment without doors, the angle formed between a vertical line and the straight line drawn by connecting the point at the inside edge of the discharge air opening with the point at the inside edge of the return air opening, when the equipment is viewed in cross-section.

Basic model means all commercial refrigeration equipment manufactured by one manufacturer within a single equipment class, having the same primary energy source, and that have essentially identical electrical, physical, and functional characteristics that affect energy consumption.

Chef base or griddle stand means commercial refrigeration equipment that is designed and marketed for the express purpose of having a griddle or other cooking appliance placed on top of it that is capable of reaching temperatures hot enough to cook food.

Closed solid means equipment with doors, and in which more than 75 percent of the outer surface area of all doors on a unit are not transparent.

Closed transparent means equipment with doors, and in which 25 percent or more of the outer surface area of all doors on the unit are transparent.

Commercial freezer means a unit of commercial refrigeration equipment in which all refrigerated compartments in the unit are capable of operating below 32 °F (±2 °F).

Commercial hybrid means a unit of commercial refrigeration equipment:

(1) That consists of two or more thermally separated refrigerated compartments that are in two or more different equipment families, and

(2) That is sold as a single unit.

Commercial refrigerator means a unit of commercial refrigeration equipment in which all refrigerated compartments in the unit are capable of operating at or above 32 °F (±2 °F).

Commercial refrigerator-freezer means a unit of commercial refrigeration equipment consisting of two or more refrigerated compartments where at least one refrigerated compartment is capable of operating at or above 32 °F (±2 °F) and at least one refrigerated compartment is capable of operating below 32 °F (±2 °F).

Commercial refrigerator, freezer, and refrigerator-freezer means refrigeration equipment that—

(1) Is not a consumer product (as defined in §430.2 of part 430);

(2) Is not designed and marketed exclusively for medical, scientific, or research purposes;

(3) Operates at a chilled, frozen, combination chilled and frozen, or variable temperature;

(4) Displays or stores merchandise and other perishable materials horizontally, semi-vertically, or vertically;

(5) Has transparent or solid doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no doors;

(6) Is designed for pull-down temperature applications or holding temperature applications; and

(7) Is connected to a self-contained condensing unit or to a remote condensing unit.

Door means a movable panel that separates the interior volume of a unit of commercial refrigeration equipment from the ambient environment and is designed to facilitate access to the refrigerated space for the purpose of loading and unloading product. This includes hinged doors, sliding doors, and drawers. This does not include night curtains.

Door angle means:

(1) For equipment with flat doors, the angle between a vertical line and the line formed by the plane of the door, when the equipment is viewed in cross-section; and

(2) For equipment with curved doors, the angle formed between a vertical line and the straight line drawn by connecting the top and bottom points where the display area glass joins the cabinet, when the equipment is viewed in cross-section.

Holding temperature application means a use of commercial refrigeration equipment other than a pull-down temperature application, except a blast chiller or freezer.

Horizontal Closed means equipment with hinged or sliding doors and a door angle greater than or equal to 45°.

Horizontal Open means equipment without doors and an air-curtain angle greater than or equal to 80° from the vertical.

Ice-cream freezer means a commercial freezer that is designed to operate at or below −5 °F (±2 °F) (−21 °C ±1.1 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

Integrated average temperature means the average temperature of all test package measurements taken during the test.

Lighting occupancy sensor means a device which uses passive infrared, ultrasonic, or other motion-sensing technology to automatically turn off or dim lights within the equipment when no motion is detected in the sensor's coverage area for a certain preset period of time.

Lowest application product temperature means the lowest integrated average temperature at which a given basic model is capable of consistently operating (*i.e.,* maintaining so as to comply with the steady-state stabilization requirements specified in ASHRAE 72-2005 (incorporated by reference, see §431.63) for the purposes of testing under the DOE test procedure).

Night curtain means a device which is temporarily deployed to decrease air exchange and heat transfer between the refrigerated case and the surrounding environment.

Operating temperature means the range of integrated average temperatures at which a self-contained commercial refrigeration unit or remote-condensing commercial refrigeration unit with a thermostat is capable of operating or, in the case of a remote-condensing commercial refrigeration unit without a thermostat, the range of integrated average temperatures at which the unit is marketed, designed, or intended to operate.

Pull-down temperature application means a commercial refrigerator with doors that, when fully loaded with 12 ounce beverage cans at 90 degrees F, can cool those beverages to an average stable temperature of 38 degrees F in 12 hours or less.

Rating temperature means the integrated average temperature a unit must maintain during testing (i.e., either as listed in the table at §431.66(d)(1) or the lowest application product temperature).

Remote condensing unit means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of 1 or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

Scheduled lighting control means a device which automatically shuts off or dims the lighting in a display case at scheduled times throughout the day.

Self-contained condensing unit means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is an integral part of the refrigerated equipment and consists of 1 or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

Semivertical Open means equipment without doors and an air-curtain angle greater than or equal to 10° and less than 80° from the vertical.

Service over counter means equipment that has sliding or hinged doors in the back intended for use by sales personnel, with glass or other transparent material in the front for displaying merchandise, and that has a height not greater than 66 inches and is intended to serve as a counter for transactions between sales personnel and customers. "*Service over the counter, self-contained, medium temperature commercial refrigerator*", also defined in this section, is one specific equipment class within the service over counter equipment family.

Service over the counter, self-contained, medium temperature commercial refrigerator or *SOC-SC-M* means a commercial refrigerator—

(1) That operates at temperatures at or above 32 °F;

(2) With a self-contained condensing unit;

(3) Equipped with sliding or hinged doors in the back intended for use by sales personnel, and with glass or other transparent material in the front for displaying merchandise; and

(4) That has a height not greater than 66 inches and is intended to serve as a counter for transactions between sales personnel and customers.

Test package means a packaged material that is used as a standard product temperature-measuring device.

Transparent means greater than or equal to 45 percent light transmittance, as determined in accordance with the ASTM Standard E 1084-86 (Reapproved 2009), (incorporated by reference, see §431.63) at normal incidence and in the intended direction of viewing.

Vertical Closed means equipment with hinged or sliding doors and a door angle less than 45°.

Vertical Open means equipment without doors and an air-curtain angle greater than or equal to 0° and less than 10° from the vertical.

Wedge case means a commercial refrigerator, freezer, or refrigerator-freezer that forms the transition between two regularly shaped display cases.

[70 FR 60414, Oct. 18, 2005, as amended at 71 FR 71369, Dec. 8, 2006; 74 FR 1139, Jan. 9, 2009; 76 FR 12503, Mar. 7, 2011; 77 FR 10318, Feb. 21, 2012; 78 FR 62993, Oct. 23, 2013; 78 FR 79598, Dec. 31, 2013; 79 FR 22307, Apr. 21, 2014; 79 FR 17816, Mar. 28, 2014]

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Test Procedures

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§431.63 Materials incorporated by reference.

(a) *General.* We incorporate by reference the following standards into subpart C of part 431. The material listed has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR 51. Any subsequent amendment to a standard by the standard-setting organization will not affect the DOE regulations unless and until amended by DOE. Material is incorporated as it exists on the date of the approval and a notice of any change in the material will be published in the Federal Register. All approved material is available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030 or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* Also, this material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024, 202-586-2945, or go to: *http://www1.eere.energy.gov/buildings/appliance_standards/.* Standards can be obtained from the sources listed below.

(b) *ANSI.* American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, 212-642-4900, or go to *http://www.ansi.org:*

(1) ANSI /AHAM HRF-1-2004, *Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers*, approved July 7, 2004, IBR approved for §431.64 and appendices A and B to subpart C to part 431.

(2) AHAM HRF-1-2008 (“HRF-1-2008”), Association of Home Appliance Manufacturers, *Energy and Internal Volume of Refrigerating Appliances* (2008) including *Errata to Energy and Internal Volume of Refrigerating Appliances,* Correction Sheet issued November 17, 2009, IBR approved for §431.64 and appendices A and B to subpart C to part 431.

(c) AHRI. Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201, (703) 524-8800, *ahri@ahrinet.org,* or *http://www.ahrinet.org/Content/StandardsProgram_20.aspx.*

(1) ARI Standard 1200-2006, *Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets,* 2006, IBR approved for §§431.64 and 431.66, and appendices A and B to subpart C of part 431.

(2) AHRI Standard 1200 (I-P)-2010 (“AHRI Standard 1200 (I-P)-2010”), *2010 Standard for Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets,* 2010, IBR approved for §§431.64 and 431.66, and appendices A and B to subpart C of part 431.

(d) *ASHRAE.* The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1971 Tullie Circle NE., Atlanta, GA 30329, or *http://www.ashrae.org/.*

(1) ANSI/ASHRAE Standard 72-2005, (ASHRAE 72-2005), “Method of Testing Commercial Refrigerators and Freezers,” Copyright 2005, IBR approved for §431.62, and appendices A and B to subpart C of part 431.

(2) [Reserved]

(e) *ASTM.* ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428, (877) 909-2786, or go to *http://www.astm.org/.*

(1) ASTM E 1084 (Reapproved 2009), “Standard Test Method for Solar Transmittance (Terrestrial) of Sheet Materials Using Sunlight,” approved April 1, 2009, IBR approved for §431.62.

(2) [Reserved]

[74 FR 1139, Jan. 9, 2009, as amended at 77 FR 10318, Feb. 21, 2012; 78 FR 62993, Oct. 23, 2013; 79 FR 22308, Apr. 21, 2014]

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§431.64 Uniform test method for the measurement of energy consumption of commercial refrigerators, freezers, and refrigerator-freezers.

(a) *Scope.* This section provides the test procedures for measuring, pursuant to EPCA, the daily energy consumption in kilowatt hours per day (kWh/day) for a given product category and volume or total display area of commercial refrigerators, freezers, and refrigerator-freezers.

(b) *Testing and calculations.* Determine the daily energy consumption of each covered commercial refrigerator, freezer, or refrigerator-freezer by conducting the appropriate test procedure set forth below, in appendix A or B to this subpart. The daily energy consumption of commercial refrigeration equipment shall be calculated using raw measured values and the final test results shall be reported in increments of 0.01 kWh/day.

[70 FR 60414, Oct. 18, 2005, as amended at 77 FR 10318, Feb. 21, 2012; 79 FR 22308, Apr. 21, 2014]

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Energy Conservation Standards

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§431.66 Energy conservation standards and their effective dates.

(a) In this section—

(1) The term “AV” means the adjusted volume (ft^3) (defined as 1.63 × frozen temperature compartment volume (ft^3) + chilled temperature compartment volume (ft^3)) with compartment volumes measured in accordance with the Association of Home Appliance Manufacturers Standard HRF1-1979.

(2) The term “V” means the chilled or frozen compartment volume (ft^3) (as defined in the Association of Home Appliance Manufacturers Standard HRF1-1979).

(3) For the purpose of paragraph (d) of this section, the term “TDA” means the total display area (ft^2) of the case, as defined in ARI Standard 1200-2006, appendix D (incorporated by reference, see §431.63). For the purpose of paragraph (e) of this section, the term “TDA” means the total display area (ft^2) of the case, as defined in AHRI Standard 1200 (I-P)-2010, appendix D (incorporated by reference, see §431.63).

(b)(1) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit designed for holding temperature applications manufactured on or after January 1, 2010 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) that does not exceed the following:

Category	Maximum daily energy consumption (kilowatt hours per day)
Refrigerators with solid doors	0.10V + 2.04.
Refrigerators with transparent doors	0.12V + 3.34.
Freezers with solid doors	0.40V + 1.38.
Freezers with transparent doors	0.75V + 4.10.
Refrigerator/freezers with solid doors	the greater of 0.27AV-0.71 or 0.70.

(2) Each service over the counter, self-contained, medium temperature commercial refrigerator (SOC-SC-M) manufactured on or after January 1, 2012, shall have a total daily energy consumption (in kilowatt hours per day) of not more than 0.6 × TDA + 1.0. As used in the preceding sentence, "TDA" means the total display area (ft^2) of the case, as defined in the AHRI Standard 1200 (I-P)-2010, appendix D (incorporated by reference, see §431.63).

(c) Each commercial refrigerator with a self-contained condensing unit designed for pull-down temperature applications and transparent doors manufactured on or after January 1, 2010 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) of not more than 0.126V + 3.51.

(d) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit and without doors; commercial refrigerator, freezer, and refrigerator-freezer with a remote condensing unit; and commercial ice-cream freezer manufactured on or after January 1, 2012 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) that does not exceed the levels specified:

(1) For equipment other than hybrid equipment, refrigerator-freezers or wedge cases:

Equipment category	Condensing unit configuration	Equipment family	Rating temp. (°F)	Operating temp. (°F)	Equipment class designation*	Maximum daily energy consumption (kWh/day)
Remote Condensing Commercial Refrigerators and Commercial Freezers	Remote (RC)	Vertical Open (VOP)	38 (M) 0 (L)	≥32±2 <32±2	VOP.RC.M VOP.RC.L	0.82 × TDA + 4.07 2.27 × TDA + 6.85
		Semivertical Open (SVO)	38 (M) 0 (L)	≥32±2 <32±2	SVO.RC.M SVO.RC.L	0.83 × TDA + 3.18 2.27 × TDA + 6.85
		Horizontal Open (HZO)	38 (M) 0 (L)	≥32±2 <32±2	HZO.RC.M HZO.RC.L	0.35 × TDA + 2.88

						0.57 × TDA + 6.88
		Vertical Closed Transparent (VCT)	38 (M) 0 (L)	≥32±2 <32±2	VCT.RC.M VCT.RC.L	0.22 × TDA + 1.95 0.56 × TDA + 2.61
		Horizontal Closed Transparent (HCT)	38 (M) 0 (L)	≥32±2 <32±2	HCT.RC.M HCT.RC.L	0.16 × TDA + 0.13 0.34 × TDA + 0.26
		Vertical Closed Solid (VCS)	38 (M) 0 (L)	≥32±2 <32±2	VCS.RC.M VCS.RC.L	0.11 × V + 0.26 0.23 × V + 0.54
		Horizontal Closed Solid (HCS)	38 (M) 0 (L)	≥32±2 <32±2	HCS.RC.M HCS.RC.L	0.11 × V + 0.26 0.23 × V + 0.54
		Service Over Counter (SOC)	38 (M) 0 (L)	≥32±2 <32±2	SOC.RC.M SOC.RC.L	0.51 × TDA + 0.11 1.08 × TDA + 0.22
Self-Contained Commercial Refrigerators and Commercial Freezers without Doors	Self-Contained (SC)	Vertical Open (VOP)	38 (M) 0 (L)	≥32±2 <32±2	VOP.SC.M VOP.SC.L	1.74 × TDA + 4.71 4.37 × TDA + 11.82
		Semivertical Open (SVO)	38 (M) 0 (L)	≥32±2 <32±2	SVO.SC.M SVO.SC.L	1.73 × TDA + 4.59 4.34 × TDA + 11.51
		Horizontal Open	38 (M) 0 (L)	≥32±2 <32±2	HZO.SC.M HZO.SC.L	0.77 × TDA + 5.55 1.92 × TDA + 7.08
Commercial Ice-Cream Freezers	Remote (RC)	Vertical Open (VOP)	−15 (I)	≤−5±2****	VOP.RC.I	2.89 × TDA + 8.7
		Semivertical Open (SVO)			SVO.RC.I	2.89 × TDA + 8.7

		Horizontal Open (HZO)			HZO.RC.I	0.72 × TDA + 8.74
		Vertical Closed Transparent (VCT)			VCT.RC.I	0.66 × TDA + 3.05
		Horizontal Closed Transparent (HCT)			HCT.RC.I	0.4 × TDA + 0.31
		Vertical Closed Solid (VCS)			VCS.RC.I	0.27 × V + 0.63
		Horizontal Closed Solid (HCS)			HCS.RC.I	0.27 × V + 0.63
		Service Over Counter (SVO)			SOC.RC.I	1.26 × TDA + 0.26
	Self-Contained (SC)	Vertical Open (VOP)			VOP.SC.I	5.55 × TDA + 15.02
		Semivertical Open (SVO)			SVO.SC.I	5.52 × TDA + 14.63
		Horizontal Open (HZO)			HZO.SC.I	2.44 × TDA + 9
		Vertical Closed Transparent (VCT)			VCT.SC.I	0.67 × TDA + 3.29
		Horizontal Closed Transparent (HCT)			HCT.SC.I	0.56 × TDA + 0.43
		Vertical Closed Solid (VCS)			VCS.SC.I	0.38 × V + 0.88

		Horizontal Closed Solid (HCS)			HCS.SC.I	0.38 × V + 0.88
		Service Over Counter (SVO)			SOC.SC.I	1.76 × TDA + 0.36

*The meaning of the letters in this column is indicated in the three columns to the left.

**Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below −5 °F (−21 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

(2) For commercial refrigeration equipment with two or more compartments (*i.e.*, hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers), the maximum daily energy consumption (MDEC) for each model shall be the sum of the MDEC values for all of its compartments. For each compartment, measure the TDA or volume of that compartment, and determine the appropriate equipment class based on that compartment's equipment family, condensing unit configuration, and designed operating temperature. The MDEC limit for each compartment shall be the calculated value obtained by entering that compartment's TDA or volume into the standard equation in paragraph (d)(1) of this section for that compartment's equipment class. Measure the calculated daily energy consumption (CDEC) or total daily energy consumption (TDEC) for the entire case:

(i) For remote condensing commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, where two or more independent condensing units each separately cool only one compartment, measure the total refrigeration load of each compartment separately according to the ARI Standard 1200-2006 test procedure (incorporated by reference, see §431.63). Calculate compressor energy consumption (CEC) for each compartment using Table 1 in ARI Standard 1200-2006 using the saturated evaporator temperature for that compartment. The CDEC for the entire case shall be the sum of the CEC for each compartment, fan energy consumption (FEC), lighting energy consumption (LEC), anti-condensate energy consumption (AEC), defrost energy consumption (DEC), and condensate evaporator pan energy consumption (PEC) (as measured in ARI Standard 1200-2006).

(ii) For remote condensing commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, where two or more compartments are cooled collectively by one condensing unit, measure the total refrigeration load of the entire case according to the ARI Standard 1200-2006 test procedure (incorporated by reference, see §431.63). Calculate a weighted saturated evaporator temperature for the entire case by:

(A) Multiplying the saturated evaporator temperature of each compartment by the volume of that compartment (as measured in ARI Standard 1200-2006),

(B) Summing the resulting values for all compartments, and

(C) Dividing the resulting total by the total volume of all compartments.

Calculate the CEC for the entire case using Table 1 in ARI Standard 1200-2006 (incorporated by reference, see §431.63), using the total refrigeration load and the weighted average saturated evaporator temperature. The CDEC for the entire case shall be the sum of the CEC, FEC, LEC, AEC, DEC, and PEC.

(iii) For self-contained commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, measure the TDEC for the entire case according to the ARI Standard 1200-2006 test procedure (incorporated by reference, see §431.63).

(3) For remote-condensing and self-contained wedge cases, measure the CDEC or TDEC according to the ARI Standard 1200-2006 test procedure (incorporated by reference, see §431.63). The MDEC for each model shall be the amount derived by incorporating into the standards equation in paragraph (d)(1) of this section for the appropriate equipment class a value for the TDA that is the product of:

(i) The vertical height of the air-curtain (or glass in a transparent door) and (ii) The largest overall width of the case, when viewed from the front.

(e) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit designed for holding temperature applications and with solid or transparent doors; commercial refrigerator with a self-contained condensing unit designed for pull-down temperature applications and with transparent doors; commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit and without doors; commercial refrigerator, freezer, and refrigerator-freezer with a remote condensing unit; and commercial ice-cream freezer manufactured on or after March 27, 2017, shall have a daily energy consumption (in kilowatt-hours per day) that does not exceed the levels specified:

(1) For equipment other than hybrid equipment, refrigerator/freezers, or wedge cases:

Equipment category	Condensing unit configuration	Equipment family	Rating temp. °F	Operating temp. °F	Equipment class designation*	Maximum daily energy consumption kWh/day
Remote Condensing Commercial Refrigerators and Commercial Freezers	Remote (RC)	Vertical Open (VOP)	38 (M)	≥32	VOP.RC.M	0.64 × TDA + 4.07.
			0 (L)	<32	VOP.RC.L	2.2 × TDA + 6.85.
		Semivertical Open (SVO)	38 (M)	≥32	SVO.RC.M	0.66 × TDA + 3.18.
			0 (L)	<32	SVO.RC.L	2.2 × TDA + 6.85.
		Horizontal Open (HZO)	38 (M)	≥32	HZO.RC.M	0.35 × TDA + 2.88.

			0 (L)	<32	HZO.RC.L	0.55 × TDA + 6.88.
		Vertical Closed Transparent (VCT)	38 (M)	≥32	VCT.RC.M	0.15 × TDA + 1.95.
			0 (L)	<32	VCT.RC.L	0.49 × TDA + 2.61.
		Horizontal Closed Transparent (HCT)	38 (M)	≥32	HCT.RC.M	0.16 × TDA + 0.13.
			0 (L)	<32	HCT.RC.L	0.34 × TDA + 0.26.
		Vertical Closed Solid (VCS)	38 (M)	≥32	VCS.RC.M	0.1 × V + 0.26.
			0 (L)	<32	VCS.RC.L	0.21 × V + 0.54.
		Horizontal Closed Solid (HCS)	38 (M)	≥32	HCS.RC.M	0.1 × V + 0.26.
			0 (L)	<32	HCS.RC.L	0.21 × V + 0.54.
		Service Over Counter (SOC)	38 (M)	≥32	SOC.RC.M	0.44 × TDA + 0.11.
			0 (L)	<32	SOC.RC.L	0.93 × TDA + 0.22.
Self-Contained Commercial Refrigerators and Commercial Freezers Without Doors	Self-Contained (SC)	Vertical Open (VOP)	38 (M)	≥32	VOP.SC.M	1.69 × TDA + 4.71.
			0 (L)	<32	VOP.SC.L	4.25 × TDA + 11.82.
		Semivertical Open (SVO)	38 (M)	≥32	SVO.SC.M	1.7 × TDA + 4.59.

			0 (L)	<32	SVO.SC.L	4.26 × TDA + 11.51.
		Horizontal Open (HZO)	38 (M)	≥32	HZO.SC.M	0.72 × TDA + 5.55.
			0 (L)	<32	HZO.SC.L	1.9 × TDA + 7.08.
Self-Contained Commercial Refrigerators and Commercial Freezers With Doors	Self-Contained (SC)	Vertical Closed Transparent (VCT)	38 (M)	≥32	VCT.SC.M	0.1 × V + 0.86.
			0 (L)	<32	VCT.SC.L	0.29 × V + 2.95.
		Vertical Closed Solid (VCS)	38 (M)	≥32	VCS.SC.M	0.05 × V + 1.36.
				<32	VCS.SC.L	0.22 × V + 1.38.
		Horizontal Closed Transparent (HCT)	38 (M)	≥32	HCT.SC.M	0.06 × V + 0.37.
			0 (L)	<32	HCT.SC.L	0.08 × V + 1.23.
		Horizontal Closed Solid (HCS)		≥32	HCS.SC.M	0.05 × V + 0.91.
			0 (L)	<32	HCS.SC.L	0.06 × V + 1.12.
		Service Over Counter (SOC)		≥32	SOC.SC.M	0.52 × TDA + 1.
			0 (L)	<32	SOC.SC.L	1.1 × TDA + 2.1.
Self-Contained Commercial Refrigerators with Transparent Doors	Self-Contained (SC)	Pull-Down (PD)	38 (M)	≥32	PD.SC.M	0.11 × V + 0.81.

for Pull-Down Temperature Applications						
Commercial Ice-Cream Freezers	Remote (RC)	Vertical Open (VOP)	−15 (I)	≤−5**	VOP.RC.I	2.79 × TDA + 8.7.
		Semivertical Open (SVO)			SVO.RC.I	2.79 × TDA + 8.7.
		Horizontal Open (HZO)			HZO.RC.I	0.7 × TDA + 8.74.
		Vertical Closed Transparent (VCT)			VCT.RC.I	0.58 × TDA + 3.05.
		Horizontal Closed Transparent (HCT)			HCT.RC.I	0.4 × TDA + 0.31.
		Vertical Closed Solid (VCS)			VCS.RC.I	0.25 × V + 0.63.
		Horizontal Closed Solid (HCS)			HCS.RC.I	0.25 × V + 0.63.
		Service Over Counter (SOC)			SOC.RC.I	1.09 × TDA + 0.26.
	Self-Contained (SC)	Vertical Open (VOP)			VOP.SC.I	5.4 × TDA + 15.02.
		Semivertical Open (SVO)			SVO.SC.I	5.41 × TDA + 14.63.
		Horizontal Open (HZO)			HZO.SC.I	2.42 × TDA + 9.
		Vertical Closed Transparent (VCT)			VCT.SC.I	0.62 × TDA + 3.29.
		Horizontal Closed			HCT.SC.I	0.56 × TDA + 0.43.

		Transparent (HCT)				
		Vertical Closed Solid (VCS)			VCS.SC.I	0.34 × V + 0.88.
		Horizontal Closed Solid (HCS)			HCS.SC.I	0.34 × V + 0.88.
		Service Over Counter (SOC)			SOC.SC.I	1.53 × TDA + 0.36.

*The meaning of the letters in this column is indicated in the columns to the left.

**Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below −5 °F *(−21 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

(2) For commercial refrigeration equipment with two or more compartments (*i.e.,* hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers), the maximum daily energy consumption for each model shall be the sum of the MDEC values for all of its compartments. For each compartment, measure the TDA or volume of that compartment, and determine the appropriate equipment class based on that compartment's equipment family, condensing unit configuration, and designed operating temperature. The MDEC limit for each compartment shall be the calculated value obtained by entering that compartment's TDA or volume into the standard equation in paragraph (e)(1) of this section for that compartment's equipment class. Measure the CDEC or TDEC for the entire case as described in §431.66(d)(2)(i) through (iii), except that where measurements and calculations reference ARI Standard 1200-2006 (incorporated by reference, see §431.63), AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) shall be used.

(3) For remote condensing and self-contained wedge cases, measure the CDEC or TDEC according to the AHRI Standard 1200 (I-P)-2010 test procedure (incorporated by reference, see §431.63). For wedge cases in equipment classes for which a volume metric is used, the MDEC shall be the amount derived from the appropriate standards equation in paragraph (e)(1) of this section. For wedge cases of equipment classes for which a TDA metric is used, the MDEC for each model shall be the amount derived by incorporating into the standards equation in paragraph (e)(1) of this section for the equipment class a value for the TDA that is the product of:

(i) The vertical height of the air curtain (or glass in a transparent door) and

(ii) The largest overall width of the case, when viewed from the front.

(f) *Exclusions.* The energy conservation standards in paragraphs (b) through (e) of this section do not apply to salad bars, buffet tables, and chef bases or griddle stands.

[70 FR 60414, Oct. 18, 2005, as amended at 74 FR 1140, Jan. 9, 2009; 78 FR 62993, Oct. 23, 2013; 79 FR 22308, Apr. 21, 2014; 79 FR 17816, Mar. 28, 2014]

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Appendix A to Subpart C of Part 431—Uniform Test Method for the Measurement of Energy Consumption of Commercial Refrigerators, Freezers, and Refrigerator-Freezers

Note: After October 20, 2014 but before March 28, 2017, any representations made with respect to the energy use or efficiency of commercial refrigeration equipment must be made in accordance with the results of testing pursuant to this appendix.

Manufacturers conducting tests of commercial refrigeration equipment after May 21, 2014 and prior to October 20, 2014, must conduct such test in accordance with either this appendix or §431.64 as it appeared at 10 CFR part 430, subpart B, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2014. Any representations made with respect to the energy use or efficiency of such commercial refrigeration equipment must be in accordance with whichever version is selected. Given that after October 20, 2014 representations with respect to the energy use or efficiency of commercial refrigeration equipment must be made in accordance with tests conducted pursuant to this appendix, manufacturers may wish to begin using this test procedure as soon as possible.

1. Test Procedure

1.1. Determination of Daily Energy Consumption. Determine the daily energy consumption of each covered commercial refrigerator, freezer, refrigerator-freezer or ice-cream freezer by conducting the test procedure set forth in the Air-Conditioning and Refrigeration Institute (ARI) Standard 1200-2006, “Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets,” section 3, “Definitions,” section 4, “Test Requirements,” and section 7, “Symbols and Subscripts” (incorporated by reference, see §431.63). For each commercial refrigerator, freezer, or refrigerator-freezer with a self-contained condensing unit, also use ARI Standard 1200-2006, section 6, “Rating Requirements for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets.” For each commercial refrigerator, freezer, or refrigerator-freezer with a remote condensing unit, also use ARI Standard 1200-2006, section 5, “Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets.”

1.2. Methodology for Determining Applicability of Transparent Door Equipment Families. To determine if a door for a given model of commercial refrigeration equipment is transparent: (1) Calculate the outer door surface area including frames and mullions; (2) calculate the transparent surface area within the outer door surface area excluding frames and mullions; (3) calculate the ratio of (2) to (1) for each of the outer doors; and (4) the ratio for the transparent surface area of all outer doors must be greater than 0.25 to qualify as a transparent equipment family.

1.3. Additional Specifications for Testing of Components and Accessories. Subject to the provisions regarding specific components and accessories listed below, all standard components that would be used during normal operation of the basic model in the field shall be installed and in operation during testing as recommended by the manufacturer and representative of their typical operation in the field unless such installation and operation is inconsistent with any requirement of the test procedure. The specific components and accessories listed in the subsequent sections shall be operated as stated during the test.

1.3.1. Energy Management Systems. Applicable energy management systems may be activated during the test procedure provided they are permanently installed on the case, configured as sold and in such a manner so as to operate automatically without the intervention of the operator, and do not conflict with any of other requirements for a valid test as specified in this appendix.

1.3.2. Lighting. Energize all lighting, except customer display signs/lights as described in section 1.3.3 and UV lighting as described in section 1.3.6 of this appendix, to the maximum illumination level for the duration of testing. However, if a closed solid unit of commercial refrigeration equipment includes an automatic lighting control system that can turn off internal case lighting when the door is closed, and the manufacturer recommends the use of this system in writing in the product literature delivered with the unit, then the lighting control should be operated in the automatic setting, even if the model has a manual switch that disables the automatic lighting control.

1.3.3. Customer display signs/lights. Do not energize supplemental lighting that exists solely for the purposes of advertising or drawing attention to the case and is not integral to the operation of the case.

1.3.4. Condensate pan heaters and pumps. For self-contained equipment only, all electric resistance condensate heaters and condensate pumps must be installed and operational during the test. This includes the stabilization period (including pull-down), steady-state, and performance testing periods. Prior to the start of the stabilization period as defined by ASHRAE 72-2005 (incorporated by reference, see §431.63), the condensate pan must be dry. Following the start of the stabilization period, allow any condensate moisture generated to accumulate in the pan. Do not manually add or remove water from the condensate pan at any time during the test.

1.3.5. Anti-sweat door heaters. Anti-sweat door heaters must be in operation during the entirety of the test procedure. Models with a user-selectable setting must have the heaters energized and set to the maximum usage position. Models featuring an automatic, non-user-adjustable controller that turns on or off based on environmental conditions must be operating in the automatic state. If a unit is not shipped with a controller from the point of manufacture and is intended to be used with an automatic, non-user-adjustable controller, test the unit with a manufacturer-recommended controller that turns on or off based on environmental conditions.

1.3.6. Ultraviolet lights. Do not energize ultraviolet lights during the test.

1.3.7. Illuminated temperature displays and alarms. All illuminated temperature displays and alarms shall be energized and operated during the test as they would be during normal field operation.

1.3.8. Condenser filters. Remove any nonpermanent filters that are provided to prevent particulates from blocking a model's condenser coil.

1.3.9. Refrigeration system security covers. Remove any devices used to secure the condensing unit against unwanted removal.

1.3.10. Night curtains and covers. Do not deploy night curtains or covers.

1.3.11. Grill options. Remove any optional, non-standard grills used to direct airflow.

1.3.12. Misting or humidification systems. Misting or humidification systems must be inactive during the test.

1.3.13. Air purifiers. Air purifiers must be inactive during the test.

1.3.14. General purpose outlets. During the test, do not connect any external load to any general purpose outlets contained within a unit.

1.3.15. Crankcase heaters. Crankcase heaters must be operational during the test. If a control system, such as a thermostat or electronic controller, is used to modulate the operation of the crankcase heater, it must be activated during the test.

1.3.16. Drawers. Drawers are to be treated as identical to doors when conducting the DOE test procedure. Commercial refrigeration equipment with drawers should be configured with the drawer pans that allow for the maximum packing of test simulators and filler packages without the filler packages and test simulators exceeding 90 percent of the refrigerated volume. Packing of test simulators and filler packages shall be in accordance with the requirements for commercial refrigerators without shelves, as specified in section 6.2.3 of ASHRAE 72-2005 (incorporated by reference, see §431.63).

2. Test Conditions

2.1. Integrated Average Temperatures. Conduct the testing required in section 1 and 2 of this appendix A, and determine the daily energy consumption at the applicable integrated average temperature as found in the following table.

Category	Test procedure	Integrated average temperature
(i) Refrigerator with Solid Door(s)	ARI Standard 1200-2006[1]	38 °F (±2 °F).
(ii) Refrigerator with Transparent Door(s)	ARI Standard 1200-2006[1]	38 °F (±2 °F).
(iii) Freezer with Solid Door(s)	ARI Standard 1200-2006[1]	0 °F (±2 °F).
(iv) Freezer with Transparent Door(s)	ARI Standard 1200-2006[1]	0 °F (±2 °F).
(v) Refrigerator-Freezer with Solid Door(s)	ARI Standard 1200-2006[1]	38 °F (±2 °F) for refrigerator compartment. 0 °F (±2 °F) for freezer compartment.
(vi) Commercial Refrigerator with a Self-Contained Condensing Unit Designed for Pull-Down Temperature Applications and Transparent Doors	ARI Standard 1200-2006[1]	38 °F (±2 °F).
(vii) Ice-Cream Freezer	ARI Standard 1200-2006[1]	−15.0 °F (±2 °F).

(viii) Commercial Refrigerator, Freezer, and Refrigerator-Freezer with a Self-Contained Condensing Unit and without Doors	ARI Standard 1200-2006[1]	(A) 0 °F (±2 °F) for low temperature applications. (B) 38 °F (±2 °F) for medium temperature applications.
(ix) Commercial Refrigerator, Freezer, and Refrigerator-Freezer with a Remote Condensing Unit	ARI Standard 1200-2006[1]	(A) 0 °F (±2 °F) for low temperature applications. (B) 38 °F (±2 °F) for medium temperature applications.

[1]Incorporated by reference, see §431.63.

2.2. Lowest Application Product Temperature. If a unit of commercial refrigeration equipment is not able to be operated at the integrated average temperature specified in the table in paragraph 2.1, test the unit at the lowest application product temperature (LAPT), as defined in §431.62. For units equipped with a thermostat, LAPT is the lowest thermostat setting. For remote condensing equipment without a thermostat or other means of controlling temperature at the case, the lowest application product temperature is the temperature achieved with the dew point temperature (as defined in AHRI Standard 1200 (I-P)-2010 (incorporated by reference see §431.63)) set to 5 degrees colder than that required to maintain the manufacturer's lowest specified operating temperature.

2.3. Testing at NSF Test Conditions. For commercial refrigeration equipment that is also tested in accordance with NSF test procedures (Type I and Type II), integrated average temperatures and ambient conditions used for NSF testing may be used in place of the DOE-prescribed integrated average temperatures and ambient conditions provided they result in a more stringent test. That is, the measured daily energy consumption of the same unit, when tested at the rating temperatures and/or ambient conditions specified in the DOE test procedure, must be lower than or equal to the measured daily energy consumption of the unit when tested with the rating temperatures or ambient conditions used for NSF testing. The integrated average temperature measured during the test may be lower than the range specified by the DOE applicable temperature specification provided in paragraph 2.1 of this appendix, but may not exceed the upper value of the specified range. Ambient temperatures and/or humidity values may be higher than those specified in the DOE test procedure.

3. Volume and Total Display Area

3.1. Determination of Volume. Determine the volume of a commercial refrigerator, freezer, refrigerator-freezer, or ice-cream freezer using the method set forth in the ANSI/AHAM HRF-1-2004, “Energy, Performance and Capacity of Household Refrigerators, Refrigerator-Freezers and Freezers” (incorporated by reference, see §431.63), section 3.21, “Volume,” sections 4.1 through 4.3, “Method for Computing Total Refrigerated Volume and Total Shelf Area of Household Refrigerators and Household Wine Chillers,” and sections 5.1 through 5.3, “Method for Computing Total Refrigerated Volume and Total Shelf Area of Household Freezers.”

3.2. Determination of Total Display Area. Determine the total display area of a commercial refrigerator, freezer, refrigerator-freezer, or ice-cream freezer using the method set forth in ARI Standard 1200-2006 (incorporated by reference, see §431.63), but disregarding the specification that “transparent material (≥65% light transmittance) in Appendix D. Specifically, total display area shall be the sum of the projected area(s) of visible product, expressed in ft^2 (*i.e.,* portions through which product can be viewed from an angle normal, or perpendicular, to the transparent area). Determine L as the interior length of the CRE model, provided no more than 10 percent of that length consists of non-transparent material. For those cases with greater than 10 percent of non-transparent area, L shall be determined as the projected linear dimension(s) of visible product plus 10 percent of non-transparent area.

See Figures A3.1, A3.2, A3.3, A3.4, and A3.5 as examples of how to calculate the dimensions associated with calculation of total display area. In the diagrams, D_h and L represent the dimensions of the projected visible product.

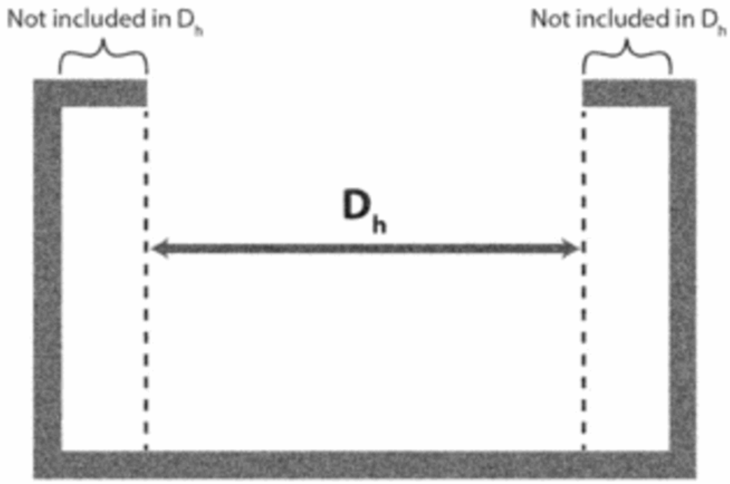

Figure A3.1 Horizontal open display case, where the distance "D_h" is the dimension of the projected visible product.

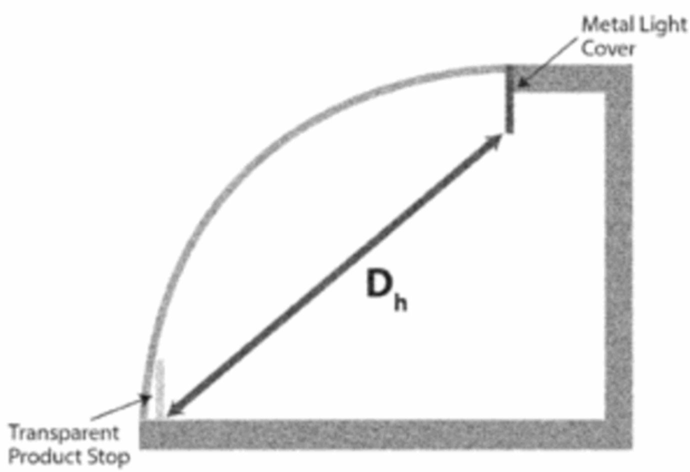

Figure A3.2 Service over counter display case, the distance "D_h" is the dimension of the projected visible product, that being the dimension transverse to the length of the case through which product can be viewed, excluding areas of the product zone that cannot be viewed as part of a direct projection through the glass front.

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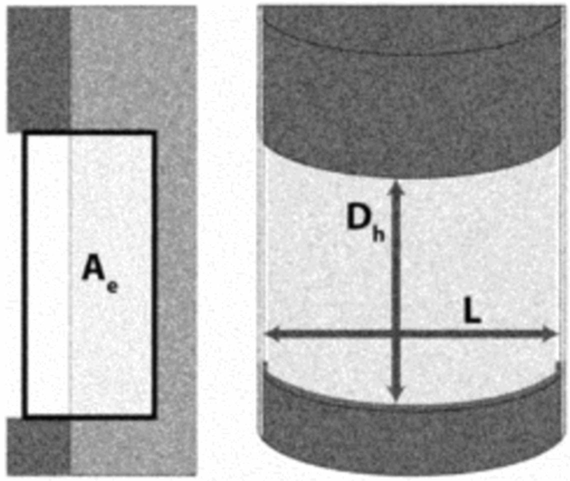

Figure A3.3 Radius case, where the distances "D_h" and "L," and the area "A_e," are representative of the planar projections of visible product when viewed at an angle normal to the transparent surface or opening.

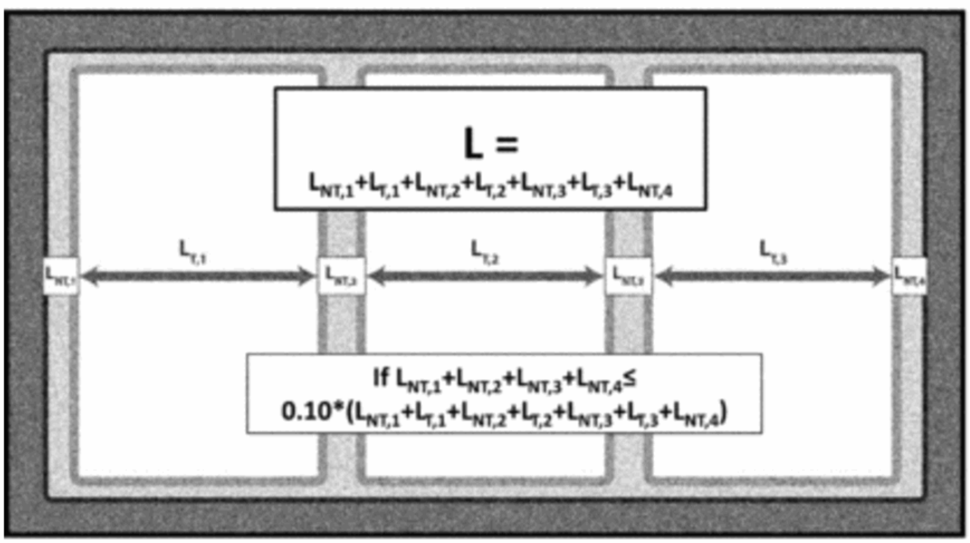

Figure A3.4 Three-door vertical closed transparent display case, where the distance "L" is the collective length of portions of the merchandiser through which product can be seen, including the linear dimension of transparent ($L_{T,i}$) and non-transparent ($L_{NT,i}$) areas, provided the total linear dimension of non-transparent areas are less than 5 inches.

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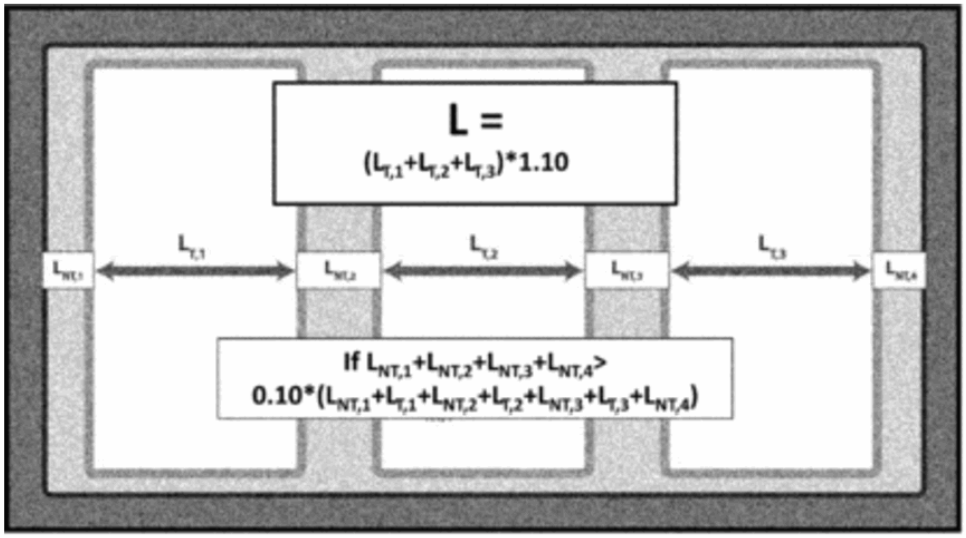

Figure A3.5 Three-door vertical closed transparent display case, where the distance "L" is the collective length of portions of the merchandiser through which product can be seen, including the linear dimension of transparent ($L_{T,i}$) and non-transparent ($L_{NT,i}$) areas, and the total linear dimension of non-transparent areas is greater than 5 inches.

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[79 FR 22308, Apr. 21, 2014]

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Appendix B to Subpart C of Part 431—Amended Uniform Test Method for the Measurement of Energy Consumption of Commercial Refrigerators, Freezers, and Refrigerator-Freezers

Note: Any representations made on or after March 28, 2017, with respect to the energy use or efficiency of commercial refrigeration equipment must be made in accordance with the results of testing pursuant to this appendix.

1. Test Procedure

1.1. Determination of Daily Energy Consumption. Determine the daily energy consumption of each covered commercial refrigerator, freezer, refrigerator-freezer or ice-cream freezer by conducting the test procedure set forth in the AHRI Standard 1200 (I-P)-2010, section 3, "Definitions," section 4, "Test Requirements," and section 7, "Symbols and Subscripts" (incorporated by reference, see §431.63). For each commercial refrigerator, freezer, or refrigerator-freezer with a self-contained condensing unit, also use AHRI Standard 1200 (I-P)-2010, section 6, "Rating Requirements for Self-contained Commercial Refrigerated Display Merchandisers and Storage

Cabinets." For each commercial refrigerator, freezer, or refrigerator-freezer with a remote condensing unit, also use AHRI Standard 1200 (I-P)-2010, section 5, "Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets."

1.2. Methodology for Determining Applicability of Transparent Door Equipment Families

To determine if a door for a given model of commercial refrigeration equipment is transparent: (1) Calculate the outer door surface area including frames and mullions; (2) calculate the transparent surface area within the outer door surface area excluding frames and mullions; (3) calculate the ratio of (2) to (1) for each of the outer doors; and (4) the ratio for the transparent surface area of all outer doors must be greater than 0.25 to qualify as a transparent equipment family.

1.3. Additional Specifications for Testing of Components and Accessories. All standard components that would be used during normal operation of the basic model in the field shall be installed and used during testing as recommended by the manufacturer and representative of their typical operation in the field unless such installation and operation is inconsistent with any requirement of the test procedure. The specific components and accessories listed in the subsequent sections shall be operated as stated during the test.

1.3.1. Energy Management Systems. Applicable energy management systems may be activated during the test procedure provided they are permanently installed on the case, configured and sold in such a manner so as to operate automatically without the intervention of the operator, and do not conflict with any of other requirements for a valid test as specified in this appendix.

1.3.2. Lighting. All lighting except for customer display signs/lights as described in section 1.3.3 and UV lighting as described in section 1.3.6 of this appendix shall be energized to the maximum illumination level for the duration of testing for commercial refrigeration equipment with lighting except when the unit is equipped with lighting occupancy sensors and controls. If the unit includes an automatic lighting control system, it should be enabled during test. If the unit is equipped with lighting occupancy sensors and controls in should be tested in accordance with section 1.3.2.1 of this appendix.

1.3.2.1. Lighting Occupancy Sensors and Controls. For units with lighting occupancy sensors and/or scheduled lighting controls installed on the unit, determine the effect of the controls/sensors on daily energy consumption by either a physical test or a calculation method and using the variables that are defined as:

CEC_A is the alternate compressor energy consumption (kilowatt-hours);

LEC_{sc} is the lighting energy consumption of internal case lights with lighting occupancy sensors and controls deployed (kilowatt-hours);

P_{li} is the rated power of lights when they are fully on (watts);

$P_{li(off)}$ is the power of lights when they are off (watts);

$P_{li(dim)}$ is the power of lights when they are dimmed (watts);

$TDEC_o$ is the total daily energy consumption with lights fully on, as measured by AHRI Standard 1200 (I-P)-2010 (kilowatt-hours);

t_{dim} is the time period during which the lights are dimmed due to the use of lighting occupancy sensors or scheduled lighting controls (hours);

$t_{dim,controls}$ is the time case lighting is dimmed due to the use of lighting controls (hours);

$t_{dim,sensors}$ is the time case lighting is dimmed due to the use of lighting occupancy sensors (hours);

t_l is the time period when lights would be on without lighting occupancy sensors and/or scheduled lighting controls (24 hours);

t_{off} is the time period during which the lights are off due to the use of lighting occupancy sensors and/or scheduled lighting controls (hours);

$t_{off,controls}$ is the time case lighting is off due to the use of scheduled lighting controls (hours);

$t_{off,sensors}$ is the time case lighting is off due to the use of lighting occupancy sensors (hours); and

t_{sc} is the time period when lighting is fully on with lighting occupancy sensors and scheduled lighting controls enabled (hours).

1.3.2.1.i. For both a physical test and a calculation method, determine the estimated time off or dimmed, t_{off} or t_{dim}, as the sum of contributions from lighting occupancy sensors and scheduled lighting controls that dim or turn off lighting, respectively, as shown in the following equation:

$$t_{off} = t_{off,sensors} + t_{off,controls}$$

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$$t_{dim} = t_{dim,sensors} + t_{dim,controls}$$

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The sum of t_{sc}, t_{off}, and t_{dim} should equal 24 hours and the total time period during which the lights are off or dimmed shall not exceed 10.8 hours. For cases with scheduled lighting controls, the time the case lighting is off and/or dimmed due to scheduled lighting controls ($t_{off,controls}$ and/or $t_{dim,controls}$, as applicable) shall not exceed 8 hours. For cases with lighting occupancy sensors installed, the time the case lighting is off and/or dimmed due to lighting occupancy sensors ($t_{off,sensors}$ and/or $t_{dim,sensors}$, as applicable) shall not exceed 10.8 hours. For cases with lighting occupancy sensors and scheduled lighting controls installed, the time the case lighting is off and/or dimmed due to lighting occupancy sensors ($t_{off,sensors}$ and/or $t_{dim,sensors}$, as applicable) shall not exceed 2.8 hours and the time the case lighting is off and/or dimmed due to scheduled lighting controls ($t_{off,controls}$ and/or $t_{dim,controls}$, as applicable) shall not exceed 8 hours.

1.3.2.1.ii. If using a physical test to determine the daily energy consumption, turn off the lights for a time period equivalent to t_{off} and dim the lights for a time period equal to t_{dim}. If night curtains are also being tested on the case, the period of lights off and/or dimmed shall begin at the same time that the night curtain is being deployed and shall continue consecutively, in that order, for the appropriate number of hours.

1.3.2.1.iii. If using a calculation method to determine the daily energy consumption—

1.3.2.1.iii.A. Calculate the LEC_{sc} using the following equation:

$$LEC_{sc} = \frac{\left((P_{li} \times t_{sc}) + (P_{li(off)} \times t_{off}) + (P_{li(dim)} \times t_{dim})\right)}{(1000)}$$

1.3.2.1.iii.B. Calculate the CEC_A using the following equation:

$$CEC_A = 0.73 \times \frac{3.4121 \times \left(LEC_{sc} - P_{li} \times {}^{t_l}/_{1000}\right)}{EER}$$

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Where EER represents the energy efficiency ratio from Table 1 in AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) for remote condensing equipment or the values shown in the following table for self-contained equipment:

EER for Self-Contained Commercial Refrigerated Display Merchandisers and Storage Cabinets

Operating temperature class	**EER** *Btu/W*
Medium	11
Low	7
Ice Cream	5

1.3.2.1.iii.C. For remote condensing units, calculate the revised compressor energy consumption (CEC_R) by adding the CEC_A to the compressor energy consumption (CEC) measured in AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63). The CDEC for the entire case is the sum of the CEC_R and LEC_{sc} (as calculated above) and the fan energy consumption (FEC), anti-condensate energy consumption (AEC), defrost energy consumption (DEC), and condensate evaporator pan energy consumption (PEC) (as measured in AHRI Standard 1200 (I-P)-2010).

1.3.2.1.iii.D. For self-contained units, the TDEC for the entire case is the sum of total daily energy consumption as measured by the AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) test with the lights fully on ($TDEC_o$) and CEC_A, less the decrease in lighting energy use due to lighting occupancy sensors and scheduled lighting controls, as shown in following equation.

$$TDEC = TDEC_o + CEC_A - \left({}^{(P_{li} \times t_l)}/_{1000} - LEC_{sc}\right)$$

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1.3.3. Customer display signs/lights. Do not energize supplemental lighting that exists solely for the purposes of advertising or drawing attention to the case and is not integral to the operation of the case.

1.3.4. Condensate pan heaters and pumps. For self-contained equipment only, all electric resistance condensate heaters and condensate pumps must be installed and in operation during the test. This includes the stabilization period (including pull-down), steady-state, and performance testing periods. Prior to the start of the stabilization period as defined by ASHRAE 72-2005 (incorporated by reference, see §431.63), the condensate pan must be dry. Following the start of the stabilization period, allow any condensate moisture generated to accumulate in the pan. Do not manually add or remove water to or from the condensate pan at any time during the test.

1.3.5. Anti-sweat door heaters. Anti-sweat door heaters must be operational during the entirety of the test procedure. Models with a user-selectable setting must have the heaters energized and set to the maximum usage position. Models featuring an automatic, non-user-adjustable controller that turns on or off based on environmental conditions must be operating in the automatic state. If a unit is not shipped with a controller from the point of manufacture and is intended to be used with an automatic, non-user-adjustable controller, test the unit with a manufacturer-recommended controller that turns on or off based on environmental conditions.

1.3.6. Ultraviolet lights. Do not energize ultraviolet lights during the test.

1.3.7. Illuminated temperature displays and alarms. All illuminated temperature displays and alarms shall be energized and operated during the test as they would be during normal field operation.

1.3.8. Condenser filters. Remove any nonpermanent filters that are provided to prevent particulates from blocking a model's condenser coil.

1.3.9. Refrigeration system security covers. Remove any devices used to secure the condensing unit against unwanted removal.

1.3.10. Night curtains and covers. For display cases sold with night curtains installed, the night curtain shall be employed for 6 hours; beginning 3 hours after the start of the first defrost period. Upon the completion of the 6-hour period, the night curtain shall be raised until the completion of the 24-hour test period.

1.3.11. Grill options. Remove any optional non-standard grills used to direct airflow.

1.3.12. Misting or humidification systems. Misting or humidification systems must be inactive during the test.

1.3.13. Air purifiers. Air purifiers must be inactive during the test.

1.3.14. General purpose outlets. During the test, do not connect any external load to any general purpose outlets contained within a unit.

1.3.15. Crankcase heaters. Crankcase heaters must be operational during the test. If a control system, such as a thermostat or electronic controller, is used to modulate the operation of the crankcase heater, it must be utilized during the test.

1.3.16. Drawers. Drawers are to be treated as identical to doors when conducting the DOE test procedure. Commercial refrigeration equipment with drawers should be configured with the drawer pans that allow for the maximum packing of test simulators and filler packages without the filler packages and test simulators exceeding 90 percent of the refrigerated volume. Packing of test simulators and filler packages shall be in accordance with the requirements for commercial refrigerators without shelves, as specified in section 6.2.3 of ASHRAE 72-2005 (incorporated by reference, see §431.63).

2. Test Conditions

2.1. Integrated Average Temperatures. Conduct the testing required in section 1 of this appendix B, and determine the daily energy consumption at the applicable integrated average temperature in the following table.

Category	Test procedure	Integrated average temperature
(i) Refrigerator with Solid Door(s)	AHRI Standard 1200 (I-P)-2010[1]	38 °F (±2 °F).
(ii) Refrigerator with Transparent Door(s)	AHRI Standard 1200 (I-P)-2010[1]	38 °F (±2 °F).
(iii) Freezer with Solid Door(s)	AHRI Standard 1200 (I-P)-2010[1]	0 °F (±2 °F).
(iv) Freezer with Transparent Door(s)	AHRI Standard 1200 (I-P)-2010[1]	0 °F (±2 °F).
(v) Refrigerator-Freezer with Solid Door(s)	AHRI Standard 1200 (I-P)-2010[1]	38 °F (±2 °F) for refrigerator compartment. 0 °F (±2 °F) for freezer compartment.
(vi) Commercial Refrigerator with a Self-Contained Condensing Unit Designed for Pull-Down Temperature Applications and Transparent Doors	AHRI Standard 1200 (I-P)-2010[1]	38 °F (±2 °F).
(vii) Ice-Cream Freezer	AHRI Standard 1200 (I-P)-2010[1]	−15.0 °F (±2 °F).
(viii) Commercial Refrigerator, Freezer, and Refrigerator-Freezer with a Self-Contained Condensing Unit and without Doors	AHRI Standard 1200 (I-P)-2010[1]	(A) 0 °F (±2 °F) for low temperature applications. (B) 38.0 °F (±2 °F) for medium temperature applications.
(ix) Commercial Refrigerator, Freezer, and Refrigerator-Freezer with a Remote Condensing Unit	AHRI Standard 1200 (I-P)-2010[1]	(A) 0 °F (±2 °F) for low temperature applications. (B) 38.0 °F (±2 °F) for

		medium temperature applications.

[1]Incorporated by reference, see §431.63.

2.2. Lowest Application Product Temperature. If a unit of commercial refrigeration equipment is not able to be operated at the integrated average temperature specified in the table in paragraph 2.1 of this appendix, test the unit at the lowest application product temperature (LAPT), as defined in §431.62. For units equipped with a thermostat, LAPT is the lowest thermostat setting. For remote condensing equipment without a thermostat or other means of controlling temperature at the case, the lowest application product temperature is the temperature achieved with the dew point temperature (as defined in AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63)) set to 5 degrees colder than that required to maintain the manufacturer's lowest specified application temperature.

2.3. Testing at NSF Test Conditions. For commercial refrigeration equipment that is also tested in accordance with NSF test procedures (Type I and Type II), integrated average temperatures and ambient conditions used for NSF testing may be used in place of the DOE-prescribed integrated average temperatures and ambient conditions provided they result in a more stringent test. That is, the measured daily energy consumption of the same unit, when tested at the rating temperatures and/or ambient conditions specified in the DOE test procedure, must be lower than or equal to the measured daily energy consumption of the unit when tested with the rating temperatures or ambient conditions used for NSF testing. The integrated average temperature measured during the test may be lower than the range specified by the DOE applicable temperature specification provided in paragraph 2.1 of this appendix, but may not exceed the upper value of the specified range. Ambient temperatures and/or humidity values may be higher than those specified in the DOE test procedure.

3. Volume and Total Display Area

3.1. Determination of Volume. Determine the volume of a commercial refrigerator, freezer, refrigerator-freezer, or ice-cream freezer using the method set forth in the HRF-1-2008 (incorporated by reference, see §431.63), section 3.30, “Volume,” and sections 4.1 through 4.3, “Method for Computing Refrigerated Volume of Refrigerators, Refrigerator-Freezers, Wine Chillers and Freezers.”

3.2. Determination of Total Display Area. Determine the total display area of a commercial refrigerator, freezer, refrigerator-freezer, or ice-cream freezer using the method set forth in ARI Standard 1200-2006 (incorporated by reference, see §431.63), but disregarding the specification that “transparent material (≥65% light transmittance) in Appendix D. Specifically, total display area shall be the sum of the projected area(s) of visible product, expressed in ft^2 (*i.e.,* portions through which product can be viewed from an angle normal, or perpendicular, to the transparent area). Determine L as the interior length of the CRE model, provided no more than 5 inches of that length consists of non-transparent material. For those cases with greater than 5 inches of non-transparent area, L shall be determined as the projected linear dimension(s) of visible product plus 5 inches of non-transparent area.

See Figures A3.1, A3.2, and A3.3 as examples of how to calculate the dimensions associated with calculation of total display area. In the diagrams, D_h and L represent the dimensions of the projected visible product.

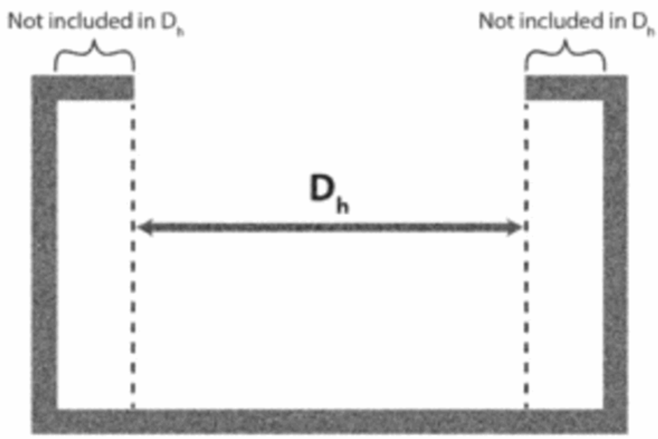

Figure A3.1 Horizontal open display case, where the distance "D_h" is the dimension of the projected visible product.

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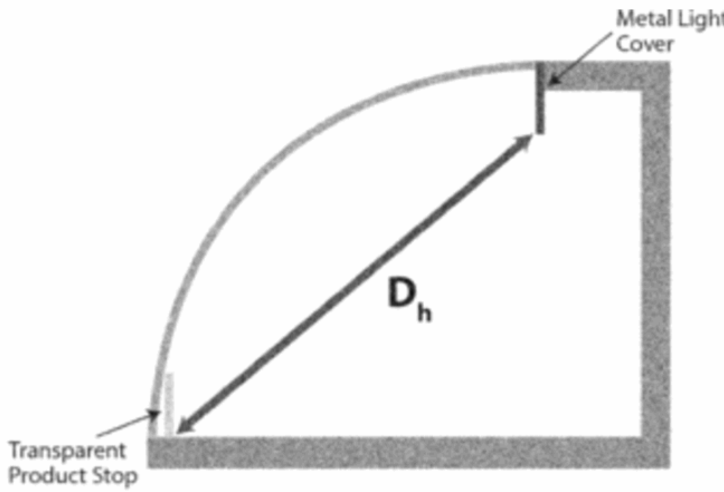

Figure A3.2 Service over counter display case, the distance "D_h" is the dimension of the projected visible product, that being the dimension transverse to the length of the case through which product can be viewed, excluding areas of the product zone that cannot be viewed as part of a direct projection through the glass front.

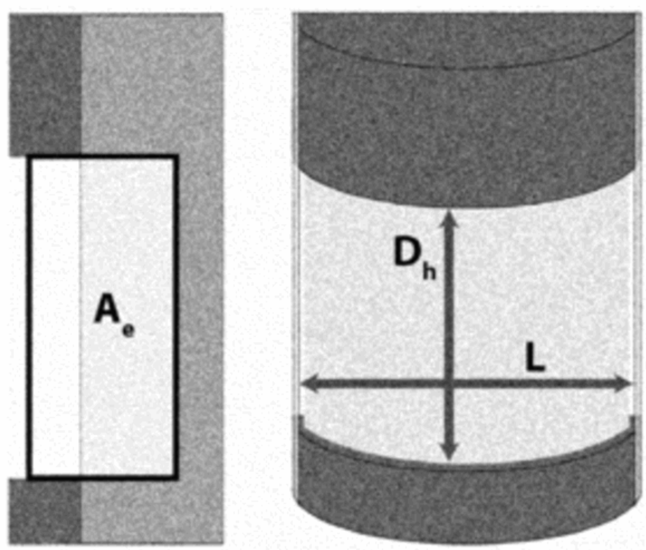

Figure A3.3 Radius case, where the distances "D_h" and "L," and the area "A_e," are representative of the planar projections of visible product when viewed at an angle normal to the transparent surface or opening.

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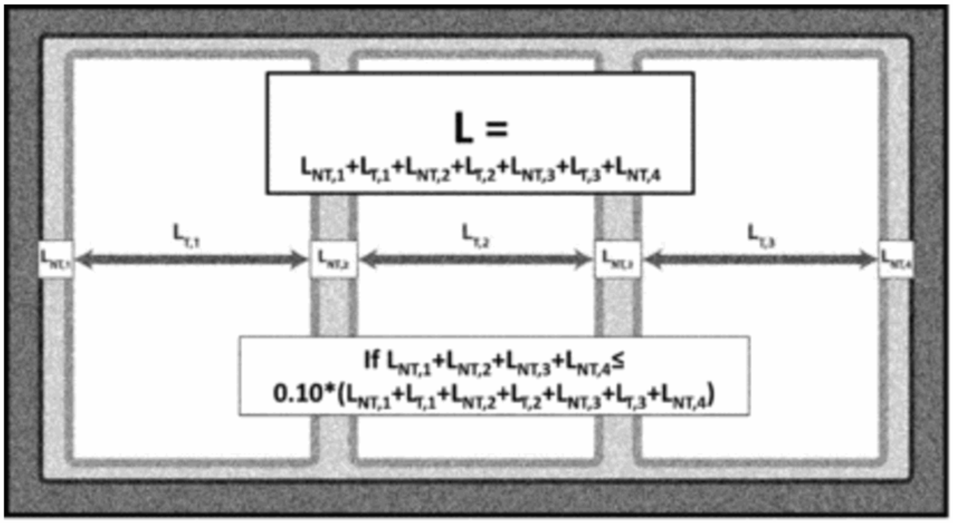

Figure A3.4 Three-door vertical closed transparent display case, where the distance "L" is the collective length of portions of the merchandiser through which product can be seen, including the linear dimension of transparent ($L_{T,i}$) and non-transparent ($L_{NT,i}$) areas, provided the total linear dimension of non-transparent areas are less than 5 inches.

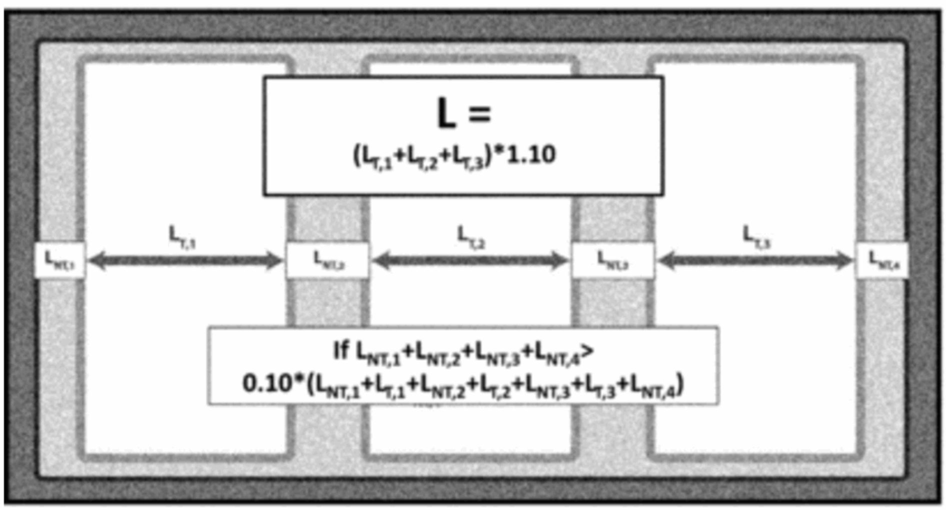

Figure A3.5 Three-door vertical closed transparent display case, where the distance "L" is

including the linear dimension of transparent ($L_{T,i}$) and non-transparent ($L_{NT,i}$) areas, and the total linear dimension of non-transparent areas is greater than 5 inches.

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[79 FR 22308, Apr. 21, 2014]

Reason statement:

This section of the Florida code is currently in conflict with, and preempted by, federal requirements for many walk-in coolers and walk-in freezers. This is because the 2015 International Energy Conservation Code (IECC) included provisions for commercial refrigeration products in conflict with the Department of Energy's (DOE) federal minimum efficiency standards. Manufacturers have been required to comply with DOE's energy conservation standards since 1990. The adopted IECC language within Florida codes have made it difficult for manufacturers that are selling HVAC equipment in Florida to comply with the local code, especially when it conflicts with the Code of Federal Regulations.

Under 42 U.S.C. 6297(a), it states:

§6297. Effect on other law

(a) Preemption of testing and labeling requirements

(1) Effective on March 17, 1987, this part supersedes any State regulation insofar as such State regulation provides at any time for the disclosure of information with respect to any measure of energy consumption or water use of any covered product if—

(A) such State regulation requires testing or the use of any measure of energy consumption, water use, or energy descriptor in any manner other than that provided under section 6293 of this title; or

(B) such State regulation requires disclosure of information with respect to the energy use, energy efficiency, or water use of any covered product other than information required under section 6294 of this title.

The states are prohibited from regulating additional testing or disclosure of information that is already requested by the DOE. Thus, federal law preempts any state code that conflicts with federal Energy Policy and Conservation Standards.

The proposed changes to this section remove this conflict by removing specific code requirements for these products and by directly referencing the federal requirements. The section governing refrigerated warehouse coolers and refrigerated warehouse freezers has been simplified, removing reference to those federally-governed products.

Bibliography:

1. ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, Section 312, Walk-in Coolers and Walk-in Freezers.

2. Code of Federal Regulations, 10 CFR 431.306

3. 2014-06-03 Energy Conservation Program: Energy Conservation Standards for Walk-In Coolers and Freezers; Final Rule

https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=396fdbc135febfc51995dca67c2cee17&mc=true&n=pt10.3.431&r=PART&ty=HTML#sp10.3.431.c

EN8176

Date Submitted 12/14/2018
Chapter 2717
Section 6
Affects HVHZ No
Proponent Mo Madani
Attachments No
TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments Yes | **Alternate Language** No

Related Modifications

None

Summary of Modification

The proposed code change update standard ASHRAE 90.1 to the 2016 edition.

Rationale

The proposed code change updates standard ASHRAE 90.1 to the 2016 edition for compliance with Title III of the Energy Conservation and Production Act, as amended (42 U.S.C. 6831-6837), which requires states to certify to the U.S. Department of Energy (DOE) that they have reviewed the energy provisions of their building code and made a determination as to whether their code meets or exceeds the 2016 edition of the Energy Standard for Buildings, Except Low-Rise Residential Buildings, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)/ Illuminating Engineering Society of North America (IESNA) Standard 90.1.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Update standard as mandated by U.S. DOE.

Impact to building and property owners relative to cost of compliance with code

Update standard as mandated by U.S. DOE.

Impact to industry relative to the cost of compliance with code

Update standard as mandated by U.S. DOE.

Impact to small business relative to the cost of compliance with code

Update standard as mandated by U.S. DOE.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety and welfare of the general public. The proposed code change adopts the latest edition of the national energy standard.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making ASHRAE 90.1 - 16 part of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

1st Comment Period History

EN8176-G2

Proponent David Mann **Submitted** 2/14/2019 **Attachments** Yes

Comment:

Please see attached supporting comment.

Chapter 6 (CE)

ANSI/ASHRAE/IESNA

90.1—20~~13~~ 16 Energy Standard for Buildings Except Low-rise Residential Buildings,

excluding section 9.4.1.1(g) C304.1,1, C304.3.1.4, C304.3.2.1

February 13, 2019

RE: ACC Comments Supporting Florida Building Code 7th Edition Update Energy Proposal #8176

I am writing on behalf of the American Chemistry Council (ACC) to support proposal #8176. This proposal updates reference to ASHRAE Standard 90.1 from 2013 to 2016.

ACC supports adoption of the most recent model code provisions into the Florida Building Code 7th Edition. We request that you support this proposal to bring in these important updates from ASHRAE 90.1.

About ACC and Building Energy Codes

ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $526 billion enterprise and a key element of the nation's economy. Chemistry companies are among the largest investors in research and development, investing $91 billion in 2016. In the state of Florida, chemical manufacturing is a $9B industry employing over 15,000 people and another 26,000 in related jobs.

Florida's energy code impacts ACC's members and their employees. The chemical industry supplies many products and materials to the building and construction value chain, including those that deliver energy efficiency throughout the entire structure. ACC's members are also large users of energy so the responsible use of energy is important to the industry's economic health and competitiveness. Energy efficiency is the lowest cost option for meeting energy demand. Energy efficient buildings create economic opportunities for businesses and industry by promoting new energy efficient technologies and reducing energy waste.

ACC has extensive knowledge regarding building code development. ACC is a partner in recent building science research, including projects with the Department of Energy and Home Innovation Research Labs. ACC representatives serve on the ICC, ASHRAE, ASTM, AAMA, and other code and standard setting bodies.

Please contact me at (404) 242-5016 or Michael_Power@AmericanChemistry.com if we can be of any further assistance.

Regards,
Michael Power
Senior Director, Southern Region
American Chemistry Council

americanchemistry.com®

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Sub Code: Residential

EN7893

2-Definitions 122

Date Submitted	12/11/2018	**Section**	202	**Proponent**	Joseph Hetzel
Chapter	2	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Adding a definition of "opaque door".

Rationale

Provides a missing definition for a term used in the code, such as in the Fenestration definition

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact.

Impact to building and property owners relative to cost of compliance with code

No impact.

Impact to industry relative to the cost of compliance with code

No impact.

Impact to small business relative to the cost of compliance with code

No impact.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Upholds the health, safety, and welfare by clarifying the definition of "opaque door" as used in the code..

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens and improves the code by clarifying the definition of "opaque door" as used in the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code by clarifying the definition of "opaque door" as used in the code.

OPAQUE DOOR. A door that is not less than 50 percent opaque in surface area.

EN7655

Date Submitted	12/3/2018	**Section**	408.3	**Proponent**	Ann Russo8
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Pending Review
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

RB187-16

Summary of Modification

This change adds an option for dehumidification for unvented crawl spaces.

Rationale

Typical conditioning measures involve supplying conditioned air from the occupied (conditioned) space of the building or exhausting air from the crawl space with make up air provided from the occupied (conditioned) space of the building. This code change allows another means of conditioning and controlling moisture, specifically dehumidification. Dehumidification is a proven technology.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Adding optional method only. No impact on code enforcement.

Impact to building and property owners relative to cost of compliance with code

This change will not increase the cost of construction as it is only adding an optional method for treatment of unvented crawl spaces.

Impact to industry relative to the cost of compliance with code

This change will not increase the cost of construction as it is only adding an optional method for treatment of unvented crawl spaces.

Impact to small business relative to the cost of compliance with code

This change will not increase the cost of construction as it is only adding an optional method for treatment of unvented crawl spaces.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This change is only adding an optional method for treatment of unvented crawl spaces so will not effect the code requirements or enforcement.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This change is only adding an optional method for treatment of unvented crawl spaces so will not effect the code requirements or enforcement.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This change is only adding an optional method for treatment of unvented crawl spaces so will not effect the code requirements or enforcement. Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This change is only adding an optional method for treatment of unvented crawl spaces so will not effect the code requirements or enforcement. Does not degrade the effectiveness of the code.

Mod 7655

R408.3 Unvented crawl space. Ventilation openings in under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where the following items are provided:

1. Exposed earth is covered with a continuous Class I vapor retarder. Joints of the vapor retarder shalloverlapby6inches(152mm)andshallbesealedortaped.Theedgesofthevaporretarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.

2. One of the following is provided for the under-floorspace:

    2.1.Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m2) of crawl space floor area, including an air pathwaytothecommonarea(suchasaductortransfergrille),andperimeterwallsinsulated in accordance with the Florida Building Code, Energy Conservation.

    2.2.*Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m2) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with the Florida Building Code, Energy Conservation.

    2.3.Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum.

    <u>2.4. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 ft2 (93 m2) of crawl space floor area.</u>

EN7726

Date Submitted	12/6/2018	**Section**	806.5	**Proponent**	Ann Russo1
Chapter	8	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Pending Review				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

Summary of Modification

Editorial improvement.

Rationale

This is an editorial improvement, which makes the code clearer. There is no change in the requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No negative impact to local entity relative to enforcement of code.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal is simply an editorial improvement which makes the code clearer.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal will make to code clearer which will improve the application of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal will not discriminate against materials, products, methods or systems of construction.

Does not degrade the effectiveness of the code

This proposal will not degrade the effectiveness of the code.

Revise as follows to make the code clearer:

R806.5 Unvented attic and unvented enclosed rafter assemblies.

(no change to the text in between)

5.1.2 Where air-permeable insulation is ~~provided inside the building thermal envelope, it shall be installed in accordance withSection 5.1.1. In addition to the air-permeable insulation~~ installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the R-values in Table R806.5 for condensation control.

(no change to the text below)