STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Log No. **128**
Proponent Revision 8/27/21
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Washington State Energy Code Development

Standard Energy Code Proposal Form

Code being amended: ☒ Commercial Provisions ☐ Residential Provisions

Code Section # __ **C410**_____

Brief Description:

The IECC refrigeration language has implemented a confusing set of changes that are not logically consistent and also remove all regulation of refrigerated warehouses. This was partially incorporated into the integrated draft. Do to time constraints during the integrated draft deliberations it was decided that a proposal should be submitted with language consistent with the intent of the integrated draft, to adopt 2021 IECC without reducing efficiency or clarity. This proposal hopes to have achieved that.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

SECTION C410
REFRIGERATION SYSTEM REQUIREMENTS

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C410.1 General. Walk-in coolers, walk-in freezers, refrigerated warehouse coolers, refrigerated warehouse freezers, and refrigerated ~~display~~ cases shall comply with this Section.

~~Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C402. Section C402.1.5, Component performance alternative, may be used if granted prior approval by the jurisdiction~~

C410.2~~1.1~~ Commercial refrigerators, freezers, and refrigerator-freezers. ~~Refrigeration equipment performance.~~ Refrigeration equipment, defined in DOE 10 CFR Part 431.62, shall have an energy use in kWh/day not greater than the values of Tables C410.1~~2~~.1(1) ~~and C410.1.1(2)~~ when tested and rated in accordance with ~~AHRI Standard 1200~~DOE 10 CFR Part 431 Subpart C. 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.

~~**Exception:** Walk-in coolers and walk-in freezers regulated under federal law in accordance with Subpart R of DOE 10 CFR 431.~~

~~**C410.2.1 Refrigerated display cases.** Refrigerated display cases shall comply with the following:~~

- ~~Lighting in refrigerated display cases shall be controlled by one of the following:~~
  - ~~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.~~
  - ~~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.~~
- ~~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.~~
- ~~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.~~

C410.~~2~~ 3 Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers. ~~Refrigeration equipment, defined in DOE 10 CFR Part 431.62, shall have an energy use in kWh/day not greater than the values of Table C410.2 when tested and rated in accordance with AHRI Standard 1200. Other~~~~Site-assembled and site-constructed w~~Walk-in coolers ~~and~~ , walk-in freezers, ~~and~~ refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the ~~following~~requirements of this section. ~~:~~The C402.1.5 component performance alternative may be used to demonstrate compliance with the envelope requirements using the prescriptive U-values defined in this section. Where cooler or freezer envelope components are not addressed in this section they shall comply with Section C402.

Exception: Walk-in coolers and walk-in freezers less than 3,000 sf, and components thereof, that are regulated by and labeled in accordance with DOE 10 CFR Part 431 Subpart~~k~~ R.

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: *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 be provided with 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 be provided with continuous wall, ceiling, and door insulation of not less than R-25 or have wall, ceiling and door assembly *U*-factors no greater than *U*-0.039. *Walk-in freezers* and *refrigerated warehouse freezers* shall be provided with wall, ceiling and door insulation of not less than R-32 or have wall, ceiling and door assembly *U*-factors no greater than *U*-0.030.
   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 coolers* shall be provided with continuous floor insulation of not less than R-25 or have a floor assembly *U*-factor no greater than *U*-0.040. The floor of *walk-in freezers* shall be provided with continuous floor insulation of not less than R-28 or have a floor assembly *U*-factor no greater than *U*-0.035~~.~~
   Exception: Insulation is not required in the floor of a *walk-in cooler* that is mounted directly on a slab on grade.
5. Transparent fixed windows and reach-in doors for *walk-in freezers* and windows in *walk-in freezer* doors shall be provided with triple-pane glass, with the interstitial spaces filled with inert gas, or be provided with heat-reflective treated glass.
6. Transparent fixed windows and reach-in doors for *walk-in coolers* and windows for *walk-in cooler* doors shall be provided with double-pane or triple-pane glass, with interstitial spaces filled with inert gas, or be provided with heat-reflective treated glass.
7. Evaporator fan motors that are less than 1 hp (0.746 kW) and less than 460 volts shall be provided with 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. Antisweat heaters that are not provided with antisweat heater controls shall have a total door rail, glass and frame heater power draw of not greater than 7.1 W/ft^2 (76 W/m2) of door opening for *walk-in freezers* and not greater than 3.0 W/ft2 (32 W/m2) of door opening for *walk-in coolers*.
10. Where antisweat heater controls are provided, they 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. Lights in *walk-in coolers*, *walk-in freezers*, *refrigerated warehouse coolers* and *refrigerated warehouse freezers* shall either be provided with light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall be provided with a device that turns off the lights within 15 minutes of when the *walk-in cooler* or *walk-in freezer* space is not occupied.
12. Where HVAC equipment covered by Table C403.3.2 is used, equipment efficiency shall comply with Section C403.3.2.

TABLE C410.2
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS AND REFRIGERATION

Equipment Category	Condensing Unit Configuration	Equipment Family	Rating Temp. °F	Operating Temp. °F	Equipment Classification[c]	Maximum Daily Energy Consumption kWh/day[d,e]	Test Standard
Remote condensing commercial refrigerators and commercial freezers	Remote (RC)	Vertical open (VOP)	38 (M)	≥32	VOP.RC.M	0.64 × TDA + 4.07	AHRI 1200
			0 (L)	<32	VOP.RC.L	2.20 × TDA + 6.85	
		Semivertical open (SVO)	38 (M)	≥32	SVO.RC.M	0.66 × TDA + 3.18	
			0 (L)	<32	SVO.RC.L	2.20 × 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	0.10 × V + 0.26	
			0 (L)	<32	VCS.RC.L	0.21 × V + 0.54	
		Horizontal closed solid (HCS)	38 (M)	≥32	HCS.RC.M	0.10 × 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 with and without doors	Self-contained (SC)	Vertical open (VOP)	38 (M)	≥32	VOP.RC.M	1.69 × TDA + 4.71	AHRI 1200
			0 (L)	<32	VOP.RC.L	4.25 × TDA + 11.82	
		Semivertical open (SVO)	38 (M)	≥32	SVO.RC.M	1.70 × TDA + 4.59	
			0 (L)	<32	SVO.RC.L	4.26 × TDA + 11.51	
		Horizontal open (HZO)	38 (M)	≥32	HZO.RC.M	0.72 × TDA + 5.55	
			0 (L)	<32	HZO.RC.L	1.90 × TDA + 7.08	
		Vertical closed transparent (VCT)	38 (M)	≥32	VCT.RC.M	0.10 × V + 0.86	
			0 (L)	<32	VCT.RC.L	0.29 × V + 2.95	
		Vertical closed solid (VCS)	38 (M)	≥32	VCS.RC.M	0.05 × V + 1.36	
			0 (L)	<32	VCS.RC.L	0.22 × V + 1.38	
		Horizontal closed transparent (HCT)	38 (M)	≥32	HCT.RC.M	0.06 × V + 0.37	
			0 (L)	<32	HCT.RC.L	0.08 × V + 1.23	
		Horizontal closed solid (HCS)	38 (M)	≥32	HCS.RC.M	0.05 × V + 0.91	
			0 (L)	<32	HCS.RC.L	0.06 × V + 1.12	
		Service over counter (SOC)	38 (M)	≥32	SOC.RC.M	0.52 × TDA + 1.00	
			0 (L)	<32	SOC.RC.L	1.10 × TDA + 2.10	

TABLE C410.2 – continued
MINIMUM EFFICIENCY REQUIREMENTS: COMMERCIAL REFRIGERATORS AND FREEZERS AND REFRIGERATION

Equipment Category	Condensing Unit Configuration	Equipment Family	Rating Temp. °F	Operating Temp. °F	Equipment Classification[c]	Maximum Daily Energy Consumption kWh/day[d,e]	Test Standard
Self-contained commercial refrigerators with transparent doors for pull-down temperature applications	Self-contained (SC)	Pull-down	38(M)	≥32	PD.SC.M	0.11 × V + 0.81	AHRI 1200
Commercial ice cream freezers	Remote (RC)	Vertical open (VOP)	-15 (I)	≤-5[b]	VOP.RC.I	2.79 × TDA + 8.70	AHRI 1200
		Semivertical open (SVO)			SVO.RC.I	2.79 × TDA + 8.70	
		Horizontal open (HZO)			HZO.RC.I	0.70 × TDA + 8.74	
		Vertical closed transparent (VCT)			VCT.RC.I	0.58 × TDA + 3.05	
		Horizontal closed transparent (HCT)			HCT.RC.I	0.40 × 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)	-15 (I)	≤-5[b]	VOP.SC.I	× TDA +	AHRI 1200
		Semivertical open (SVO)			SVO.SC.I	× TDA +	
		Horizontal open (HZO)			HZO.SC.I	× TDA +	
		Vertical closed transparent (VCT)			VCT.SC.I	× TDA +	
		Horizontal closed transparent (HCT)			HCT.SC.I	× TDA +	
		Vertical closed solid (VCS)			VCS.SC.I	× V +	
		Horizontal closed solid (HCS)			HCS.SC.I	× V +	
		Service over counter (SOC)			SOC.SC.I	× TDA +	

For SI: 1 square foot = 0.0929 m2, 1 cubic foot = 0.02832 m3, °C = (°F – 32)/1.8.

a The meaning of the letters in this column is indicated in the columns to the left..

b Ice cream freezer is defined in DOE 10 CFR 431.62 as a commercial freezer that is designed to operate at or below -5°F and that the manufacturer designs, markets or intends for the storing, displaying or dispensing of ice cream.

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 = Semi-vertical 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.

d. V is the volume of the case (ft3) as measured in AHRI 1200, Appendix C.

e. TDA is the total display area of the case (ft2) as measured in AHRI 1200, Appendix D.

C410.32.1 Performance standards. Site-assembled and site-constructed walk-in coolers and walk-in freezers shall meet the requirements of Tables C410.32.1(1), C410.32.1(2) and C410.32.1(3).

TABLE C410.32.1(1)
WALK-IN COOLER AND FREEZER DISPLAY DOORS EFFICIENCY REQUIREMENTS

Class Description	Class	Maximum Energy Consumption (kWh/day)[a]
Display Door, Medium Temperature	DD, M	0.04 x A_{dd} + 0.41
Display Door, Low Temperature	DD, L	0.15 x A_{dd} + 0.29

a. A_{dd} is the surface area of the display door

TABLE C410.32.1(2)
WALK-IN COOLER AND FREEZER NON-DISPLAY DOORS EFFICIENCY REQUIREMENTS

Class Description	Class	Maximum Energy Consumption (kWh/day)[a]
Passage Door, Medium Temperature	PD, M	0.05 x A_{nd} + 1.7
Passage Door, Low Temperature	PD, L	0.14 x A_{nd} + 4.8
Freight Door, Medium Temperature	FD, M	0.04 x A_{nd} + 1.9
Freight Door, Low Temperature	FD, L	0.12 x A_{nd} + 5.6

a. A_{nd} is the surface area of the display door

TABLE C410.32.1(3)
WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEMS EFFICIENCY REQUIREMENTS

Class Descriptor	Class	Minimum Annual Walk-in Energy Factor AWEF (Btu/hW-h)	Test Procedure
Dedicated condensing, medium temperature, indoor system	DC.M.I	5.61	AHRI 1250
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 × 10^{-5} ×q_{net} + 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	9.091 × 10^{-5} ×q_{net} + 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	9.091 × 10^{-5} ×q_{net} + 2.73	
Unit cooler, low temperature, net capacity (q_{net}) ≥15,500 Btu/h	UC.L, ≥15,500	4.15	

C410.4 Refrigerated case and walk-in display doors. Lighting in glass doors in all walk-in cooler and freezers and all refrigerated warehouse coolers and freezers shall comply with the following:

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.
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.

Exception: Display doors installed in refrigeration equipment tested and rated in accordance with DOE 10 CFR Part 431 Subpart C and complying with Table C410.2.

Commented [MK1]: Application to Walk in doors is from 90.1

~~**C410.2.2 Refrigerated display cases.** Site-assembled or site-constructed refrigerated display cases shall comply with the following:~~

~~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.~~

C410.53 Refrigeration systems. Refrigerated display cases, *walk-in coolers* or *walk-in freezers* that are served by remote compressor and remote condensers not located in a *condensing unit*, shall comply with Sections C410.3.1, C410.3.2, and C403.9.2.3.

Exception: Systems where the working fluid in the refrigeration cycle goes through both subcritical and supercritical states (transcritical) or that use ammonia refrigerant are exempt.

C410.53.1 Condensers serving refrigeration systems. Fan-powered condensers shall comply with the following:

1. The design *saturated condensing temperatures* for air-cooled condensers shall not exceed the design dry-bulb temperature plus 10°F (5.6°C) for low-*temperature refrigeration systems*, and the design dry-bulb temperature plus 15°F (8°C) for *medium temperature refrigeration systems* where the *saturated condensing temperature* for blend refrigerants shall be determined using the average of liquid and vapor temperatures as converted from the condenser drain pressure.
2. Condenser fan motors that are less than 1 hp (0.75 kW) shall use electronically commutated motors, permanent split-capacitor-type motors or 3-phase motors.
3. Condenser fans for air-cooled condensers, evaporatively cooled condensers, air- or water-cooled fluid coolers or cooling towers shall reduce fan motor demand to not more than 30 percent of design wattage at 50 percent of design air volume, and incorporate one of the following continuous variable speed fan control approaches:
   3.1. Refrigeration system condenser control for air-cooled condensers shall use variable set point control logic to reset the condensing temperature set point in response to ambient dry-bulb temperature.
   3.2. Refrigeration system condenser control for evaporatively cooled condensers shall use variable set point control logic to reset the condensing temperature set point in response to ambient wet-bulb temperature.
4. Multiple fan condensers shall be controlled in unison.
5. The minimum condensing temperature set point shall be not greater than 70°F (21°C).

C410.53.2 Compressor systems. Refrigeration compressor systems shall comply with the following:

1. Compressors and multiple-compressor system suction groups shall include control systems that use floating suction pressure control logic to reset the target suction pressure temperature based on the temperature requirements of the attached refrigeration display cases or walk-ins.

   Exception: Controls are not required for the following:

   1. Single-compressor systems that do not have variable capacity capability.
   2. Suction groups that have a design saturated suction temperature of 30°F (-1.1°C) or higher, suction groups that comprise the high stage of a two-stage or cascade system, or suction groups that primarily serve chillers for secondary cooling fluids.
2. Liquid subcooling shall be provided for all low-temperature compressor systems with a design cooling capacity equal to or greater than 100,000 Btu/hr (29.3 kW) with a design-saturated suction temperature of -10°F (-23°C) or lower. The subcooled liquid temperature shall be controlled at a maximum temperature set point of 50°F (10°C) at the exit of the subcooler using either compressor economizer (interstage) ports or a separate compressor suction group operating at a saturated suction temperature of 18°F (-7.8°C) or higher.
   2.1. Insulation for liquid lines with a fluid operating temperature less than 60°F (15.6°C) shall comply with Table C403.2.10.
3. Compressors that incorporate internal or external crankcase heaters shall provide a means to cycle the heaters off during compressor operation.

C410.64 Commissioning. Refrigeration systems shall be commissioned in accordance with Section C408.

Exception: Self-contained units.

Purpose of code change:

Return code to previous stringency and fix IECC language. The IECC attempted to remove regulation of walk-in coolers and freezers that are regulated in national standards. The language does this inconsistently and also removed coverage of units not covered by the standards and also warehouses.

Your amendment must meet one of the following criteria. Select at least one:

- ☐ Addresses a critical life/safety need.
- ☒ The amendment clarifies the intent or application of the code.
- ☒ Addresses a specific state policy or statute. (Note that energy conservation is a state policy)
- ☒ Consistency with state or federal regulations.
- ☐ Addresses a unique character of the state.
- ☐ Corrects errors and omissions.

Check the building types that would be impacted by your code change:

- ☐ Single family/duplex/townhome
- ☐ Multi-family 1 – 3 stories
- ☒ Multi-family 4 + stories
- ☒ Commercial / Retail
- ☒ Institutional
- ☒ Industrial

Your name	Mike Kennedy	Email address	mikekennedy@energysims.com
Your organization	Mike Kennedy, Inc	Phone number	3603010098

Other contact name Click here to enter text.

Instructions: Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov. For further information, call the State Building Code Council at 360-407-9278.

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

No change in stringency from the WSEC 2018 is proposed. The primary benefit will be code clarity.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost **Analysis tool** and **Instructions;** use these **Inputs**. **Webinars on the tool can be found Here and Here**)

No cost calculation completed since stringency is same as the WSEC 2018.

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

No cost calculation completed since stringency is same as the WSEC 2018

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

Should decrease time as section is much more understandable

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.