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**Sent:** Friday, July 12, 2019 7:20 AM

**To:** Braaksma, Krista (DES) <krista.braaksma@des.wa.gov>; DES SBCC <sbcc@des.wa.gov>

**Subject:** Public Comment - 2018 WSEC - Section C403.7.6 and

Krista:

See recommended clarifications for C403.7.6 below in red highlight.

These are corrections to clarify the intent of the 2018 WSEC as there has been confusion on this in the 2015 WSEC.

Since C403.5 was clarified to require all cooling systems which would include energy recovery ventilation units with mechanical cooling recommend clarifications below to clarify intent of C403.7.6.

This also is needed to clarify the 2015 WSEC Interpretation 18-06 Question 2 to avoid conflicts with the code as DOAS units with energy recovery and mechanical cooling should include energy recovery bypass dampers or air economizer per C403.7.6.

Additionally, clarity is needed that 100% OA DOAS without energy recovery do not require airside economizer. Since there is no return air there is no way to include airside economizer.

**C403.7.6 Energy recovery ventilation systems.** Any system with minimum outside air requirements at design conditions greater than 5,000 cfm or any system where the system's supply airflow rate exceeds the value listed in Tables C403.7.6(1) and C403.7.6(2), based on the climate zone and percentage of outdoor airflow rate at design conditions, shall include an energy recovery system. Table C403.7.6(1) shall be used for all ventilation systems that operate less than 8,000 hours per year, and Table C403.7.6(2) shall be used for all ventilation systems that operate 8,000 hours or more per year. The energy recovery system shall have the capability to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass of the energy recovery media for both the outdoor air and exhaust air or return air dampers and controls which permit operation of the air economizer as required by Section C403.5. Where a single room or space is supplied by multiple units, the aggregate ventilation (cfm) of those units shall be used in applying this requirement. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C) at 30 percent relative humidity, or as calculated by the registered design professional.

**C403.5 Economizers.** Air economizers shall be provided on all new cooling systems including those serving computer server rooms, electronic equipment, radio equipment, and telephone switchgear. Economizers shall comply with Sections C403.5.1 through C403.5.5.

**Exception:** Economizers are not required for the systems listed below:

1. Cooling systems not installed outdoors nor in a mechanical room adjacent to outdoors and installed in conjunction with DOAS complying with Section C403.3.5 and serving only spaces with year-round cooling loads from lights and equipment of less than 5 watts per square foot.
2. Unitary or packaged systems serving one zone with dehumidification that affect other systems so as to increase the overall building energy consumption. New humidification equipment shall comply with Section C403.3.2.5
3. Unitary or packaged systems serving one zone where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.5.
4. Equipment serving chilled beams and chilled ceiling space cooling systems only which are provided with a water economizer meeting the requirements of Section C403.5.4.  
4.1.
5. For Group R occupancies, cooling units installed outdoors or in a mechanical room adjacent to outdoors with a total cooling capacity less than 20,000 Btu/h and other cooling units with a total cooling capacity less than 54,000 Btu/h provided that these are high-efficiency cooling equipment with IEER, CEER, SEER,

and EER values more than 15 percent higher than minimum efficiencies listed in Tables C403.3.2(1) through (3), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. For split systems, compliance is based on the cooling capacity of individual fan coil units.

6. Equipment used to cool *Controlled Plant Growth Environments* provided these are high-efficiency cooling equipment with SEER, EER and IEER values a minimum of 20 percent greater than the values listed in Tables C403.3.2(1), (3) and (7).
7. Equipment serving a space with year-round cooling loads from lights and equipment of 5 watts per square foot or greater complying with the following criteria:
  - 7.1. Equipment serving the space utilizes chilled water as the cooling source; and
  - 7.2. The chilled water plant includes a condenser heat recovery system that meets the requirements of Section C403.9.5 or the building and water-cooled system meets the following requirements:
    - 7.2.1. A minimum of 90% (capacity-weighted) of the building space heat is provided by hydronic heating water.
    - 7.2.2. Chilled water plant includes a heat recovery chiller or water-to-water heat pump capable of rejecting heat from the chilled water system to the hydronic heating equipment capacity.
8. Water-cooled equipment served by systems meeting the requirements of Section C403.9.8, Condenser heat recovery.
9. Equipment used to cool any dedicated server room, electronic equipment room or telecom switch room provided the system complies with Option a, b or c in the table below. The total cooling capacity of all fan systems without economizers shall not exceed 240,000 Btu/h per building or 10 percent of its air economizer capacity, whichever is greater. This exception shall not be used for Total Building Performance.
10. Dedicated outdoor air systems that include energy recovery per C403.7.6 but that do not include mechanical cooling.
11. Dedicated outdoor air systems not required to include energy recovery per C403.7.6 that modulate the supply airflow to provide only the minimum outdoor air required Section C403.2.2.1 for ventilation, exhaust air make-up, or other process air delivery.

	<b>Equipment Type</b>	<b>Higher Equipment Efficiency</b>	<b>Part-Load Control</b>	<b>Economizer</b>
Option a	Tables C403.3.2(1) and C403.3.2(2) <sup>a</sup>	+15% <sup>b</sup>	Required over 85,000 Btu/h <sup>c</sup>	None Required
Option b	Tables C403.3.2(1) and C403.3.2(2) <sup>a</sup>	+5% <sup>d</sup>	Required over 85,000 Btu/h <sup>c</sup>	Waterside Economizer
Option c	ASHRAE Standard 127 <sup>f</sup>	+0% <sup>g</sup>	Required over 85,000 Btu/h <sup>c</sup>	Waterside Economizer

Notes for Exception 9:

- a. For a system where all of the cooling equipment is subject to the AHRI standards listed in Tables C403.3.2(1) and C403.3.2(2), the system shall comply with all of the following (note that if the system contains any cooling equipment that exceeds the capacity limits in Table C403.3.2(1) or C403.3.2(2), or if the system contains any cooling equipment that is not included in Table C403.3.2(1) or C403.3.2(2), then the system is not allowed to use this option).
- b. The cooling equipment shall have an EER value and an IPLV value that is a minimum of 15 percent greater than the value listed in Tables C403.3.2(1) and C403.3.2(2).
- c. For units with a total cooling capacity over 85,000 Btu/h, the system shall utilize part-load capacity control schemes that are able to modulate to a part-load capacity of 50 percent of the load or less that results in the compressor operating at the same or higher EER at part loads than at full load (e.g., minimum of two-stages of compressor unloading such as cylinder unloading, two-stage scrolls, dual tandem scrolls, but hot gas bypass is not credited as a compressor unloading system).
- d. The cooling equipment shall have an EER value and an IPLV value that is a minimum of 5 percent greater than the value listed in Tables C403.3.2(1) and C403.3.2(2).
- e. The system shall include a water economizer in lieu of air economizer. Water economizers shall meet the requirements of Sections C403.5.1 and C403.5.2 and be capable of providing the total concurrent cooling load served by the connected terminal equipment lacking airside economizer, at outside air temperatures of 50°F dry-bulb/45°F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside temperatures. The equipment shall be served by a dedicated condenser water system unless a non-dedicated condenser water system exists that can provide appropriate water temperatures during hours when waterside economizer cooling is available.
- f. For a system where all cooling equipment is subject to ASHRAE Standard 127.
- g. The cooling equipment subject to ASHRAE Standard 127 shall have an EER value and an IPLV value that is equal or greater than the value listed in Tables C403.3.2(1) and C403.3.2(2) when determined in accordance with the rating conditions in ASHRAE Standard 127 (i.e., not the rating conditions in AHRI Standard 210/240 or 340/360). This information shall be provided by an independent third party.

**TABLE C403.5  
EQUIPMENT EFFICIENCY PERFORMANCE EXCEPTION FOR ECONOMIZERS**

Climate Zone	Efficiency Improvement <sup>a</sup>
4C	64%
5B	59%

- a. If a unit is rated with an IPLV, IEER or SEER then to eliminate the required air or water economizer, the minimum cooling efficiency of the HVAC unit must be increased by the percentage shown. If the HVAC unit is only rated with a full load metric like EER or COP cooling, then these must be increased by the percentage shown.

**C403.5.1 Integrated economizer control.** Economizer systems shall be integrated with the mechanical cooling system and be configured to provide partial cooling even where additional mechanical cooling is required to provide the remainder of the cooling load. Controls shall not be capable of creating a false load in the mechanical cooling system by limiting or disabling the economizer or any other means, such as hot gas bypass, except at the lowest stage of mechanical cooling.

Units that include an air economizer shall comply with the following:

1. Unit controls shall have the mechanical cooling capacity control interlocked with the air economizer controls such that the outdoor air damper is at the 100 percent open position when mechanical cooling is on and the outdoor air damper does not begin to close to prevent coil freezing due to minimum compressor run time until the leaving air temperature is less than 45°F (7°C).
2. Direct expansion (DX) units with cooling capacity 65,000 Btu/H (19 kW) or greater of rated capacity shall comply with the following:
  - 2.1. DX units that control the capacity of the mechanical cooling directly based on occupied space temperature shall have not fewer than two stages of mechanical cooling capacity.
  - 2.2. Other DX units, including those that control space temperature by modulating the airflow to the space, shall be in accordance with Table C403.5.1.

## STATE BUILDING CODE INTERPRETATION NO. 18-06

**CODE:** 2015 Washington State Energy Code, Commercial

**QUESTION 2:** For all DOAS with energy recovery, are bypass devices or controls required?

**ANSWER:** No. Bypass devices or controls are only required in a DOAS with energy recovery and economizer.

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