

**WAC 51-11C-40350 Section C403.5—Energy recovery.**

**C403.5 Energy recovery.**

**C403.5.1 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 C403.5.1(1) and C403.5.1(2), based on the climate zone and percentage of outdoor airflow rate at design conditions, shall include an energy recovery system. Table C403.5.1(1) shall be used for all ventilation systems that operate less than 8,000 hours per year, and Table C403.5.1(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 or controls which permit operation of the economizer as required by Section C403.3. 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.

- EXCEPTION: An energy recovery ventilation system shall not be required in any of the following conditions:
1. Where energy recovery systems are restricted per Section 514 of the *International Mechanical Code* to sensible energy, recovery shall comply with one of the following:
    - 1.1. Kitchen exhaust systems where they comply with Section C403.2.7.1.
    - 1.2. Laboratory fume hood systems where they comply with Exception 2 of Section C403.5.1.
    - 1.3. Other sensible energy recovery systems with the capability to provide a change in dry bulb temperature of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and the return air dry bulb temperatures, at design conditions.
  2. Laboratory fume hood systems that include at least one of the following features and also comply with Section C403.2.7.2:
    - 2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
    - 2.2. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) above room setpoint, cooled to no cooler than 3°F (1.7°C) below room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.
  3. Systems serving spaces that are heated to less than 60°F (15.5°C) and are not cooled.
  4. Where more than 60 percent of the outdoor air heating energy is provided from site-recovered or site solar energy.
  5. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
  6. Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
  7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
  8. Multiple-zone systems where the supply airflow rate is less than the values specified in Tables C403.5.1 (1) and (2), for the corresponding percent of outdoor air. Where a value of NR is listed, energy recovery shall not be required.
  9. Systems serving Group R dwelling or sleeping units where the largest source of air exhausted at a single location at the building exterior is less than 25 percent of the design outdoor air flow rate.

**Table C403.5.1(1)  
Energy Recovery Requirement  
(Ventilation systems operating less than 8,000 hours per year)**

| Percent (%) Outdoor Air at Full Design Airflow Rate |                 |                 |                 |                 |                 |                 |                 |        |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------|
| Climate zone  | ≥ 10% and < 20% | ≥ 20% and < 30% | ≥ 30% and < 40% | ≥ 40% and < 50% | ≥ 50% and < 60% | ≥ 60% and < 70% | ≥ 70% and < 80% | ≥ 80%  |
| Design Supply Fan Airflow Rate (cfm)                |                 |                 |                 |                 |                 |                 |                 |        |
| 4C, 5B  | NR              | NR              | NR              | NR              | NR              | NR              | ≥ 5000          | ≥ 5000 |

NR = Not required.

**Table C403.5.1(2)  
Energy Recovery Requirement  
(Ventilation systems operating not less than 8,000 hours per year)**

| Percent (%) Outdoor Air at Full Design Airflow Rate |                 |                 |                 |                 |                 |                 |                 |       |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------|
| Climate zone  | ≥ 10% and < 20% | ≥ 20% and < 30% | ≥ 30% and < 40% | ≥ 40% and < 50% | ≥ 50% and < 60% | ≥ 60% and < 70% | ≥ 70% and < 80% | ≥ 80% |
| Design Supply Fan Airflow Rate (cfm)                |                 |                 |                 |                 |                 |                 |                 |       |

|    |        |         |        |        |        |        |        |     |
|----|--------|---------|--------|--------|--------|--------|--------|-----|
| 4C | NR     | ≥ 19500 | ≥ 9000 | ≥ 5000 | ≥ 4000 | ≥ 3000 | ≥ 1500 | ≥ 0 |
| 5B | ≥ 2500 | ≥ 2000  | ≥ 1000 | ≥ 500  | ≥ 0    | ≥ 0    | ≥ 0    | ≥ 0 |

NR = Not required.

**C403.5.2 Condensate systems.** On-site steam heating systems shall have condensate water heat recovery. On-site includes a system that is located within or adjacent to one or more buildings within the boundary of a contiguous area or campus under one ownership and which serves one or more of those buildings.

Buildings using steam generated off-site with steam heating systems which do not have condensate water recovery shall have condensate water heat recovery.

**C403.5.3 Condenser heat recovery.** Facilities having food service, meat or deli departments and having 500,000 Btu/h or greater of remote refrigeration condensers shall have condenser waste heat recovery from freezers and coolers and shall use the waste heat for service water heating, space heating or for dehumidification reheat. Facilities having a gross conditioned floor area of 40,000 ft<sup>2</sup> or greater and 1,000,000 Btu/h or greater of remote refrigeration shall have condenser waste heat recovery from freezers and coolers and shall use the waste heat for service water heating, and either for space heating or for dehumidification reheat for maintaining low space humidity.

**C403.5.4 Heat recovery for service water heating.** Condenser heat recovery shall be installed for heating or reheating of service hot water provided the facility operates 24 hours a day, the total installed heat capacity of water cooled systems exceeds 1,500,000 Btu/hr of heat rejection, and the design service water heating load exceeds 250,000 Btu/hr.

The required heat recovery system shall have the capacity to provide the smaller of:

1. Sixty percent of the peak heat rejection load at design conditions; or
2. The preheating required to raise the peak service hot water draw to 85°F (29°C).

EXCEPTIONS: 1. Facilities that employ condenser heat recovery for space heating or reheat purposes with a heat recovery design exceeding 30 percent of the peak water-cooled condenser load at design conditions.  
2. Facilities that provide 60 percent of their service water heating from site solar or site recovered energy or from other sources.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40350, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40350, filed 2/1/13, effective 7/1/13.]