

(Effective until July 1, 2020)

WAC 51-11C-403238 Table C403.2.3(8)—Minimum efficiency requirements—Heat rejection equipment.

**Table C403.2.3(8)
Minimum Efficiency Requirements—Heat Rejection Equipment**

| Equipment Type ^a | Total System Heat Rejection Capacity at Rated Conditions | Subcategory or Rating Condition | Performance Required ^{b,c,d,g,h} | Test Procedure ^{e,f} |
|--|--|--|---|-------------------------------|
| Propeller or axial fan open circuit cooling towers | All | 95°F Entering Water 85°F Leaving Water 75°F Entering wb | ≥ 38.2 gpm/hp | CTI ATC-105 and CTI STD-201 |
| Centrifugal fan open circuit cooling towers | All | 95°F Entering Water 85°F Leaving Water 75°F Entering wb | ≥ 20.0 gpm/hp | CTI ATC-105 and CTI STD-201 |
| Propeller or axial fan closed circuit cooling towers | All | 102°F Entering Water 90°F Leaving Water 75°F Entering wb | ≥ 14.0 gpm/hp | CTI ATC-105S and CTI STD-201 |
| Centrifugal closed circuit cooling towers | All | 102°F Entering Water 90°F Leaving Water 75°F Entering wb | ≥ 7.0 gpm/hp | CTI ATC-105S and CTI STD-201 |
| Propeller or axial fan evaporative condensers | All | R-507A Test Fluid 165°F Entering Gas Temperature 105°F Condensing Temperature 75°F Entering wb | ≥ 157,000 Btu/h • hp | CTI ATC-106 |
| Propeller or axial fan evaporative condensers | All | Ammonia Test Fluid 140°F Entering Gas Temperature 96.3°F Condensing Temperature 75°F Entering wb | ≥ 134,000 Btu/h • hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | R-507A Test Fluid 165°F Entering Gas Temperature 105°F Condensing Temperature 75°F Entering wb | ≥ 135,000 Btu/h • hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | Ammonia Test Fluid 140°F Entering Gas Temperature 96.3°F Condensing Temperature 75°F Entering wb | ≥ 110,000 Btu/h • hp | CTI ATC-106 |
| Air cooled condensers | All | 125°F Condensing Temperature R-22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering db | ≥ 176,000 Btu/h • hp | AHRI 460 |

For SI: °C = [(°F) - 32]/1.8, L/s • kW = (gpm/hp)/(11.83), COP = (Btu/h • hp)/(2550.7).

db = dry bulb temperature, °F;
wb = wet bulb temperature, °F.

- a The efficiencies and test procedures for both open and closed circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of wet and dry heat exchange sections.
- a For purposes of this table, open circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the fan nameplate rated motor power.
- c For purposes of this table, closed circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the sum of the fan nameplate rated motor power and the spray pump nameplate rated motor power.
- d For purposes of this table, air cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate rated motor power.
- e Chapter 6 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- f Where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program, or, where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report.
- g Cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories and/or options included in the capacity of the cooling tower.
- h For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table, divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.
- i Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A as test fluids in this table. Evaporative condensers intended for use with halocarbon refrigerants other than R-507A must meet the minimum efficiency requirements listed above with R-507A as the test fluid.

[Statutory Authority: RCW 19.27A.025, 19.27A.045, 19.27A.160, and 19.27.074. WSR 17-10-062, § 51-11C-403238, filed 5/2/17, effective 6/2/17. Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-403238, 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-403238, filed 2/1/13, effective 7/1/13.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

(Effective July 1, 2020)

WAC 51-11C-403238 Table C403.3.2(8)—Minimum efficiency requirements—Heat rejection equipment.

**Table C403.3.2(8)
Minimum Efficiency Requirements—Heat Rejection Equipment**

| Equipment Type^a | Total System Heat Rejection Capacity at Rated Conditions | Subcategory or Rating Condition | Performance Required^{b,c,d,g,h} | Test Procedure^{e,f} |
|--|---|--|---|-------------------------------------|
| Propeller or axial fan open circuit cooling towers | All | 95°F Entering Water 85°F Leaving Water 75°F Entering wb | ≥ 40.2 gpm/hp | CTI ATC-105 and CTI STD-201 RS |
| Centrifugal fan open circuit cooling towers | All | 95°F Entering Water 85°F Leaving Water 75°F Entering wb | ≥ 20.0 gpm/hp | CTI ATC-105 and CTI STD-201 RS |
| Propeller or axial fan closed circuit cooling towers | All | 102°F Entering Water 90°F Leaving Water 75°F Entering wb | ≥ 16.1 gpm/hp | CTI ATC-105S and CTI STD-201 RS |
| Centrifugal closed circuit cooling towers | All | 102°F Entering Water 90°F Leaving Water 75°F Entering wb | ≥ 7.0 gpm/hp | CTI ATC-105S and CTI STD-201 RS |
| Propeller or axial fan evaporative condensers | All | R-507A Test Fluid 165°F Entering Gas Temperature 105°F Condensing Temperature 75°F Entering wb | ≥ 157,000 Btu/h • hp | CTI ATC-106 |
| Propeller or axial fan evaporative condensers | All | Ammonia Test Fluid 140°F Entering Gas Temperature 96.3°F Condensing Temperature 75°F Entering wb | ≥ 134,000 Btu/h • hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | R-507A Test Fluid 165°F Entering Gas Temperature 105°F Condensing Temperature 75°F Entering wb | ≥ 135,000 Btu/h • hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | Ammonia Test Fluid 140°F Entering Gas Temperature 96.3°F Condensing Temperature 75°F Entering wb | ≥ 110,000 Btu/h • hp | CTI ATC-106 |
| Air cooled condensers | All | 125°F Condensing Temperature R-22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering db | ≥ 176,000 Btu/h • hp | AHRI 460 |

For SI: °C = [(°F) - 32]/1.8, L/s • kW = (gpm/hp)/(11.83), COP = (Btu/h • hp)/(2550.7).

db = dry-bulb temperature, °F;
wb = wet-bulb temperature, °F.

- a The efficiencies and test procedures for both open and closed circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of wet and dry heat exchange sections.
- b For purposes of this table, open circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition divided by the fan nameplate rated motor power.
- c For purposes of this table, closed circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition divided by the sum of the fan nameplate rated motor power and the spray pump nameplate rated motor power.
- d For purposes of this table, air cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate rated motor power.
- e Chapter 12 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- f Where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program, or, where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report.
- g Cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories and/or options included in the capacity of the cooling tower.
- h For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table, divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.

- i Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A as test fluids in this table. Evaporative condensers intended for use with halocarbon refrigerants other than R-507A must meet the minimum efficiency requirements listed above with R-507A as the test fluid.

[Statutory Authority: RCW 19.27A.020, 19.27A.025, 19.27A.160 and chapter 19.27 RCW. WSR 19-24-040, § 51-11C-403238, filed 11/26/19, effective 7/1/20. Statutory Authority: RCW 19.27A.025, 19.27A.045, 19.27A.160, and 19.27.074. WSR 17-10-062, § 51-11C-403238, filed 5/2/17, effective 6/2/17. Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-403238, 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-403238, filed 2/1/13, effective 7/1/13.]

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