

**WAC 51-11C-40508 Section C405.8—Electric motors.**

**C405.8 Electric motor efficiency (mandatory).** All electric motors, fractional or otherwise, shall meet the minimum efficiency requirements of Tables C405.8(1) through C405.8(4) when tested and rated in accordance with DOE 10 C.F.R. 431. The efficiency shall be verified through certification under an approved certification program or, where no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the motor manufacturer.

Fractional hp fan motors that are 1/12 hp or greater and less than 1 hp which are not covered by Tables C405.8(3) and C405.8(4) shall be electronically commutated motors or shall have a minimum motor efficiency of 70 percent when rated in accordance with DOE 10 C.F.R. 431. These motors shall also have the means to adjust motor speed for either balancing or remote control. Belt-driven fans may use sheave adjustments for airflow balancing in lieu of a varying motor speed.

**EXCEPTIONS:**

1. Motors that are an integral part of specialized process equipment.
2. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.
3. Motors used as a component of the equipment meeting the minimum efficiency requirements of Section C403.2.3 and Tables C403.2.3(1) through C403.2.3(10) provided that the motor input is included when determining the equipment efficiency.
4. Motors in the airstream within fan-coils and terminal units that operate only when providing heating to the space served.
5. Fan motors that are not covered by Tables C405.8(1) through C405.8(4) and are used to power heat recovery ventilators, energy recovery ventilators, or local exhaust fans in Group R subject to the high efficacy requirements of Section C403.2.11.4.
6. Domestic clothes dryer booster fans, range hood exhaust fans, and domestic range booster fans that operate intermittently.
7. Radon and contaminated soil exhaust fans.
8. Group R heat recovery ventilator and energy recovery ventilator fans that are less than 400 cfm.

**Table C405.8(1)**

**Minimum Nominal Full-load Efficiency for 60 Hz NEMA General Purpose Electric Motors (Subtype I) Rated 600 Volts or Less (Random Wound)<sup>a</sup>**

| NUMBER OF POLES▶         | OPEN DRIP-PROOF MOTORS |      |      | TOTALLY ENCLOSED FAN-COOLED MOTORS |      |      |
|--------------------------|------------------------|------|------|------------------------------------|------|------|
|                          | 2                      | 4    | 6    | 2                                  | 4    | 6    |
| SYNCHRONOUS SPEED (RPM)▶ | 3600                   | 1800 | 1200 | 3600                               | 1800 | 1200 |
| MOTOR HORSEPOWER▼        |                        |      |      |                                    |      |      |
| 1                        | 77.0                   | 85.5 | 82.5 | 77.0                               | 85.5 | 82.5 |
| 1.5                      | 84.0                   | 86.5 | 86.5 | 84.0                               | 86.5 | 87.5 |
| 2                        | 85.5                   | 86.5 | 87.5 | 85.5                               | 86.5 | 88.5 |
| 3                        | 85.5                   | 89.5 | 88.5 | 86.5                               | 89.5 | 89.5 |
| 5                        | 86.5                   | 89.5 | 89.5 | 88.5                               | 89.5 | 89.5 |
| 7.5                      | 88.5                   | 91.0 | 90.2 | 89.5                               | 91.7 | 91.0 |
| 10                       | 89.5                   | 91.7 | 91.7 | 90.2                               | 91.7 | 91.0 |
| 15                       | 90.2                   | 93.0 | 91.7 | 91.0                               | 92.4 | 91.7 |
| 20                       | 91.0                   | 93.0 | 92.4 | 91.0                               | 93.0 | 91.7 |
| 25                       | 91.7                   | 93.6 | 93.0 | 91.7                               | 93.6 | 93.0 |
| 30                       | 91.7                   | 94.1 | 93.6 | 91.7                               | 93.6 | 93.0 |
| 40                       | 92.4                   | 94.1 | 94.1 | 92.4                               | 94.1 | 94.1 |
| 50                       | 93.0                   | 94.5 | 94.1 | 93.0                               | 94.5 | 94.1 |
| 60                       | 93.6                   | 95.0 | 94.5 | 93.6                               | 95.0 | 94.5 |
| 75                       | 93.6                   | 95.0 | 94.5 | 93.6                               | 95.4 | 94.5 |
| 100                      | 93.6                   | 95.4 | 95.0 | 94.1                               | 95.4 | 95.0 |
| 125                      | 94.1                   | 95.4 | 95.0 | 95.0                               | 95.4 | 95.0 |
| 150                      | 94.1                   | 95.8 | 95.4 | 95.0                               | 95.8 | 95.8 |
| 200                      | 95.0                   | 95.8 | 95.4 | 95.4                               | 96.2 | 95.8 |

| NUMBER OF POLES►         | OPEN DRIP-PROOF MOTORS |      |      | TOTALLY ENCLOSED FAN-COOLED MOTORS |      |      |
|--------------------------|------------------------|------|------|------------------------------------|------|------|
|                          | 2                      | 4    | 6    | 2                                  | 4    | 6    |
| SYNCHRONOUS SPEED (RPM)► | 3600                   | 1800 | 1200 | 3600                               | 1800 | 1200 |
| MOTOR HORSEPOWER▼        |                        |      |      |                                    |      |      |
| 250                      | 95.0                   | 95.8 | 95.4 | 95.8                               | 96.2 | 95.8 |
| 300                      | 95.4                   | 95.8 | 95.4 | 95.8                               | 96.2 | 95.8 |
| 350                      | 95.4                   | 95.8 | 95.4 | 95.8                               | 96.2 | 95.8 |
| 400                      | 95.8                   | 95.8 | 95.8 | 95.8                               | 96.2 | 95.8 |
| 450                      | 95.8                   | 96.2 | 96.2 | 95.8                               | 96.2 | 95.8 |
| 500                      | 95.8                   | 96.2 | 96.2 | 95.8                               | 96.2 | 95.8 |

<sup>a</sup> Nominal efficiencies shall be established in accordance with DOE 10 C.F.R. 431.

**Table C405.8 (2)**  
**Minimum Nominal Full-load Efficiency of General Purpose Electric Motors (Subtype II) And All Design B Motors Greater Than 200 Horsepower<sup>a</sup>**

| NUMBER OF POLES►         | OPEN DRIP-PROOF MOTORS |      |      |      | TOTALLY ENCLOSED FAN COOLED MOTORS |      |      |      |
|--------------------------|------------------------|------|------|------|------------------------------------|------|------|------|
|                          | 2                      | 4    | 6    | 8    | 2                                  | 4    | 6    | 8    |
| SYNCHRONOUS SPEED (RPM)► | 3600                   | 1800 | 1200 | 900  | 3600                               | 1800 | 1200 | 900  |
| MOTOR HORSEPOWER▼        |                        |      |      |      |                                    |      |      |      |
| 1                        | NR                     | 82.5 | 80.0 | 74.0 | 75.5                               | 82.5 | 80.0 | 74.0 |
| 1.5                      | 82.5                   | 84.0 | 84.0 | 75.5 | 82.5                               | 84.0 | 85.5 | 77.0 |
| 2                        | 84.0                   | 84.0 | 85.5 | 85.5 | 84.0                               | 84.0 | 86.5 | 82.5 |
| 3                        | 84.0                   | 86.5 | 86.5 | 86.5 | 85.5                               | 87.5 | 87.5 | 84.0 |
| 5                        | 85.5                   | 87.5 | 87.5 | 87.5 | 87.5                               | 87.5 | 87.5 | 85.5 |
| 7.5                      | 87.5                   | 88.5 | 88.5 | 88.5 | 88.5                               | 89.5 | 89.5 | 85.5 |
| 10                       | 88.5                   | 89.5 | 90.2 | 89.5 | 89.5                               | 89.5 | 89.5 | 88.5 |
| 15                       | 89.5                   | 91.0 | 90.2 | 89.5 | 90.2                               | 91.0 | 90.2 | 88.5 |
| 20                       | 90.2                   | 91.0 | 91.0 | 90.2 | 90.2                               | 91.0 | 90.2 | 89.5 |
| 25                       | 91.0                   | 91.7 | 91.7 | 90.2 | 91.0                               | 92.4 | 91.7 | 89.5 |
| 30                       | 91.0                   | 92.4 | 92.4 | 91.0 | 91.0                               | 92.4 | 91.7 | 91.0 |
| 40                       | 91.7                   | 93.0 | 93.0 | 91.0 | 91.7                               | 93.0 | 93.0 | 91.0 |
| 50                       | 92.4                   | 93.0 | 93.0 | 91.7 | 92.4                               | 93.0 | 93.0 | 91.7 |
| 60                       | 93.0                   | 93.6 | 93.6 | 92.4 | 93.0                               | 93.6 | 93.6 | 91.7 |
| 75                       | 93.0                   | 94.1 | 93.6 | 93.6 | 93.0                               | 94.1 | 93.6 | 93.0 |
| 100                      | 93.0                   | 94.1 | 94.1 | 93.6 | 93.6                               | 94.5 | 94.1 | 93.0 |
| 125                      | 93.6                   | 94.5 | 94.1 | 93.6 | 94.5                               | 94.5 | 94.1 | 93.6 |
| 150                      | 93.6                   | 95.0 | 94.5 | 93.6 | 94.5                               | 95.0 | 95.0 | 93.6 |
| 200                      | 94.5                   | 95.0 | 94.5 | 93.6 | 95.0                               | 95.0 | 95.0 | 94.1 |
| 250                      | 94.5                   | 95.4 | 95.4 | 94.5 | 95.4                               | 95.0 | 95.0 | 94.5 |
| 300                      | 95.0                   | 95.4 | 95.4 | NR   | 95.4                               | 95.4 | 95.0 | NR   |
| 350                      | 95.0                   | 95.4 | 95.4 | NR   | 95.4                               | 95.4 | 95.0 | NR   |
| 400                      | 95.4                   | 95.4 | NR   | NR   | 95.4                               | 95.4 | NR   | NR   |
| 450                      | 95.8                   | 95.8 | NR   | NR   | 95.4                               | 95.4 | NR   | NR   |
| 500                      | 95.8                   | 95.8 | NR   | NR   | 95.4                               | 95.8 | NR   | NR   |

<sup>a</sup> Nominal efficiencies shall be established in accordance with DOE 10 C.F.R. 431.

NR - No requirement.

**Table C405.8(3)  
Minimum Average Full Load Efficiency  
for Polyphase Small Electric Motors<sup>a</sup>**

| OPEN MOTORS                |      |      |      |
|----------------------------|------|------|------|
| NUMBER OF POLES<br>=>      | 2    | 4    | 6    |
| SYNCHRONOUS<br>SPEED (RPM) | 3600 | 1800 | 1200 |
| MOTOR HORSEPOWER           |      |      |      |
| 0.25                       | 65.6 | 69.5 | 67.5 |
| 0.33                       | 69.5 | 73.4 | 71.4 |
| 0.50                       | 73.4 | 78.2 | 75.3 |
| 0.75                       | 76.8 | 81.1 | 81.7 |
| 1                          | 77.0 | 83.5 | 82.5 |
| 1.5                        | 84.0 | 86.5 | 83.8 |
| 2                          | 85.5 | 86.5 | N/A  |
| 3                          | 85.5 | 86.9 | N/A  |

<sup>a</sup> Average full load efficiencies shall be established in accordance with 10 C.F.R. 431.

**Table C405.8(4)  
Minimum Average Full Load Efficiency  
For Capacitor-start Capacitor-run  
and Capacitor-start Induction-run  
Small Electric Motors<sup>a</sup>**

| OPEN MOTORS                |      |      |      |
|----------------------------|------|------|------|
| NUMBER OF POLES<br>=>      | 2    | 4    | 6    |
| SYNCHRONOUS<br>SPEED (RPM) | 3600 | 1800 | 1200 |
| MOTOR HORSEPOWER           |      |      |      |
| 0.25                       | 66.6 | 68.5 | 62.2 |
| 0.33                       | 70.5 | 72.4 | 66.6 |
| 0.50                       | 72.4 | 76.2 | 76.2 |
| 0.75                       | 76.2 | 81.8 | 80.2 |
| 1                          | 80.4 | 82.6 | 81.1 |
| 1.5                        | 81.5 | 83.8 | N/A  |
| 2                          | 82.9 | 84.5 | N/A  |
| 3                          | 84.1 | N/A  | N/A  |

<sup>a</sup> Average full load efficiencies shall be established in accordance with 10 C.F.R. 431.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40508, 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-40508, filed 2/1/13, effective 7/1/13.]