Definitions

The definition of coefficient of performance (COP) has been rewritten to clarify that it is based upon net cooling capacity. Although this rating factor was always based upon net capacity, it is now clear that the efficiency is based upon the same value.

A definition for sensible COP (SCOP) has been added and subsequently used as the basis for all energy-efficiency ratings. This recognizes that the primary load in a computer and data processing room (CDPR) is a sensible load. As new loads are added to the space, these new loads are 100% sensible. A typical CDPR room today is 90% sensible and that ratio is increasing. In data processing rooms, units with too much latent capacity waste energy.

A definition for adjusted sensible COP (ASCOP) has also been added. Data processing equipment typically operates year round, and so a method for documenting a seasonal efficiency rating based on the climate data for a particular city has been established.

Rating Requirements

The primary rating point (the Full Cooling Test A of Table 1) has been redefined at 23.9°C/45 RH (75°F/45 RH) versus the prior revision rating point of 22°C/50 RH (71.6°F/ 50 RH). The change was made to align the test conditions with the recommendations published in ASHRAE’s Thermal Guidelines for Data Processing Environments. In addition, test points are defined in Table 1 for establishment of the ASCOP.

The system static pressure requirements (Section 5.1.4.5) have been adjusted as well as the physical unit arrangement required for testing in order to better reflect the three different types of units found in CDPR rooms. The orientation of a down-flow raised floor plenum CDPR unit during test has been defined according to how units are typically installed in actual applications.

Other key changes are as follows: standards for the testing and rating of the humidification and dehumidification systems have been added or clarified (Section 5.5), a minimum MERV rating for the air filters has been established (Section 5.6), a standard method for the test and rating of the noise emitted by the units has been established (Section 5.9), and the tolerance of the unit rating verses the test results has been tightened (Section 5.11).
**standard rating**: a rating based on tests performed at standard rating conditions (see Section 5.1).

**application rating**: a rating based on tests performed at application rating conditions (i.e., conditions other than standard rating conditions). Application ratings do not require retesting, but can be extrapolated from standard rating tests. Application ratings are not required, but may be published at the manufacturer’s option (see Section 5.8).

**rating conditions**: any set of operating conditions under which a single level of performance results, and which causes only that level of performance to occur.

**standard rating conditions**: rating conditions used as the basis of comparison of performance characteristics.

### 4. CLASSIFICATION

#### 4.1 Normally, CDPR units within the scope of this standard can be classified as shown below. There are five basic types of unitary air conditioners:

1. **Single-Package Unit.** A complete stand-alone unit.
2. Condensing Unit with Separate Coil and Fan. The remote part of this unit contains the compressor and condenser while the indoor part of the unit is an evaporator and blower.
3. **Unit with Remote Condenser.** The remote part of the unit is an air-cooled condenser only, while the indoor part of the unit contains the compressor(s), evaporator coils, and fan.
4. **Unit with Remote Air-Cooled Fluidcooler or Cooling Tower.** The indoor part of the unit contains the compressor(s), evaporator coil, fan, and condenser. The heat rejection is by means of a remote device (a cooling tower or air-cooled fluidcooler) that uses water or glycol to transfer the heat.
5. **Chilled-Water Unit.** The indoor part of the unit is an air handler with a water-cooled coil that is connected to the building chilled-water system.

**Note:** Any of the above types may utilize a second, or dual, cooling coil that provides cooling by means of a free cooling liquid economizer or a separate building chilled-water system. Any of the above types may contain an internal humidifier and/or reheat capabilities.

### 5. RATING REQUIREMENTS

Section 5 describes all of the testing and rating requirements for this standard. A summary listing of the tests required is provided in Normative Appendix A.

#### 5.1 Cooling System Standard Ratings and Sensible Cooling Efficiency Rating (SCOP).

Standard rating capacity shall be established at the standard rating conditions specified in Full Cooling Test A of Table 1. Standard cooling capacity shall be stated as total (sensible plus latent) cooling capacity and sensible cooling capacity and shall be net values, reflecting the effects of circulating fan heat.

The efficiency rating (SCOP) shall be published at each of the four test points defined in Table 1. For Tests B through D the unit’s net sensible cooling load shall be fixed at the sensible capacity established in Test A. During the test, the room temperature must be maintained to a tolerance of ±1°C (±2°F).

If the test tolerance cannot be maintained, use the values from Test A for that test. A SCOP ratio shall be established at the defined test points by dividing this sensible capacity by the average kW/h input power over a two-hour period. Fan cfm is allowed to deviate from Test A provided that the sensible capacity is held constant.

Standard input ratings shall be the total power input to the compressor(s), fan(s), control(s), air-cooled condenser, or air-cooled fluidcooler fan(s) if used (excluding reheaters and humidifiers), and to any other items included as part of the model number(s). The values of SCOP and ASCOP should not be used to compare between various system classifications (air-cooled vs. water-cooled vs. CW, etc.) since there is no proper way to account for the unmeasured parts of the system. The air-cooled unit is the only complete system being analyzed. The other classifications are missing power consuming items, such as cooling towers, water pumps, fluid coolers, and chillers, to name a few.

#### 5.1.1 Values of Standard Cooling System Input Ratings. These cooling ratings shall be expressed in terms of kW with three significant digits (e.g., 10.2 kW and 105 kW).

#### 5.1.2 Value of Standard Capacity Ratings. These ratings shall be expressed in terms of kW with three significant digits (e.g., 10.2 kW and 105 kW).

#### 5.1.3 Values of Standard Cooling System Coefficient of Performance Ratings. Coefficient of performance (COP) in kW per kW shall be expressed with three significant digits. (e.g., 3.35) This also applies to sensible coefficients of performance (SCOP) and adjusted sensible coefficients of performance (ASCOP).

#### 5.1.4 Standard Rating Conditions. The conditions of test for standard ratings shall include the following.

##### 5.1.4.1 Standard Cooling System Rating Temperatures. All indoor and outdoor conditions for testing are defined in Table 1. Also defined in Table 1 are the various fluid temperatures that may be used for heat rejection purposes.

##### 5.1.4.2 Voltage and Frequency. Nameplate voltages for 60 Hz shall be one or more of the following utilization voltages: 115, 200, 208, 230, 265, 460, and/or 575. Standard rating tests shall be performed at the unit nameplate rated voltages and frequency. For air conditioners with dual voltage ratings, standard rating tests shall be performed at both voltages or at the lower of the two voltages if only a single standard rating is to be published. If desired, 50 Hz ratings at 230 and/or 400 volts may be published using this standard, but are not required.

##### 5.1.4.3 Cooling Coil Air Quantity. Standard cooling system ratings shall be determined at a total air quantity (cooling coil plus bypass) delivered against at least the minimum external resistance required by Section 5.1.4.5, as outlined below.

Air quantities shall be expressed as cubic meters per hour (cmh) of standard air (density = 1.2 kg/m³). If desired, the cfm of standard air may also be expressed as defined in the 2005 ASHRAE Handbook—Fundamentals, Chapter 2 (e.g., 164.2 cmh [5800 cfm]).
Air conditioners shall be rated at those air quantities specified by the manufacturer while in the full cooling mode at conditions in Test A of Table 1. Once these conditions are established for this standard rating test, no further adjustment to the drive or circuit shall be made.

5.1.4.4 Condenser/Air-Cooled Fluidcooler Air Quantity. Standard ratings for units that are air-cooled, evaporative-cooled, or glycol-cooled with an air-cooled fluidcooler shall be determined at the condenser/air-cooled fluidcooler air quantity that is inherent to the air conditioner when operated with all the resistance elements associated with the inlet or discharge attachments that the manufacturer considers normal installation practice. If fan speed control, or partial fan operation in a multifan condenser, is utilized for condensing temperature control, it may be utilized in this test as defined by the manufacturer. Air quantities must be expressed as cm³ of standard air (density = 1.2 kg/m³). If desired, cfm of standard air may also be expressed as defined in the 2005 ASHRAE Handbook—Fundamentals, Chapter 2. Example: 164.2 cm³ (5800 cfm).

5.1.4.5 External Resistance, Duct Connected, Floor Plenum and Free Air Discharge. For the appropriate system configuration described below, power consumption kW shall be as measured at the input terminals to the unit(s) and shall include power to the condenser/air cooled fluidcooler units. Compressor and/or motor nameplate data shall not be used.