

TABLE 6.5.6.1 Energy Recovery Requirement

Zone	% Outdoor Air at Full Design Airflow Rate					
	≥30% and < 40%	≥40% and < 50%	≥50% and < 60%	≥60% and < 70%	≥70% and < 80%	≥80%
	Design Supply Fan Airflow Rate (cfm)					
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	≥5000	≥5000
1B, 2B, 5C	NR	NR	≥26000	≥12000	≥5000	≥4000
6B	≥11000	≥5500	≥4500	≥3500	≥2500	≥1500
1A, 2A, 3A, 4A, 5A, 6A	≥5500	≥4500	≥3500	≥2000	≥1000	>0
7,8	≥2500	≥1000	>0	>0	>0	>0

NR—Not required

6.5.7 Exhaust Systems

6.5.7.1 Kitchen Exhaust Systems

6.5.7.1.1 Replacement air introduced directly into the hood cavity of kitchen exhaust hoods shall not exceed 10% of the hood exhaust airflow rate.

6.5.7.1.2 Conditioned supply air delivered to any space with a kitchen hood shall not exceed the greater of:

- a. the supply flow required to meet the space heating or cooling load
- b. the hood exhaust flow minus the available transfer air from adjacent spaces. Available transfer air is that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces

6.5.7.1.3 If a kitchen/dining facility has a total kitchen hood exhaust airflow rate greater than 5,000 cfm then each hood shall have an exhaust rate that complies with Table 6.5.7.1.3. If a single hood, or hood section, is installed over appliances with different duty ratings, then the maximum allowable flow rate for the hood or hood section shall not exceed the Table 6.5.7.1.3 values for the highest appliance duty rating under the hood or hood section. Refer to ASHRAE Standard 154 for definitions of hood type, appliance duty, and net exhaust flow rate.

Exception: At least 75% of all the replacement air is transfer air that would otherwise be exhausted.

6.5.7.1.4 If a kitchen/dining facility has a total kitchen hood exhaust airflow rate greater than 5,000 cfm then it shall have one of the following:

- a. At least 50% of all replacement air is transfer air that would otherwise be exhausted.
- b. Demand ventilation system(s) on at least 75% of the exhaust air. Such systems shall be capable of at least 50% reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.

- c. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40% on at least 50% of the total exhaust airflow.

6.5.7.1.5 Performance Testing: An approved field test method shall be used to evaluate design air flow rates and demonstrate proper capture and containment performance of installed commercial kitchen exhaust systems. Where demand ventilation systems are utilized to meet 6.5.7.1.4, additional performance testing shall be required to demonstrate proper capture and containment at minimum airflow.

6.5.7.2 Laboratory Exhaust Systems. Buildings with laboratory exhaust systems having a total exhaust rate greater than 5000 cfm shall include at least one of the following features:

- a. VAV laboratory exhaust and room supply system capable of reducing exhaust and makeup air flow rates and/or incorporate a heat recovery system to precondition makeup air from laboratory exhaust that shall meet the following:

$$A + B \times (E/M) \geq 50\%$$

Where:

A = Percentage that the exhaust and makeup air flow rates can be reduced from design conditions.

B = Percentage *sensible recovery effectiveness*.

E = Exhaust airflow rate through the heat recovery device at *design conditions*

M = Makeup air flow rate of the *system at design conditions*.

- b. VAV laboratory exhaust and room supply systems that are required to have minimum circulation rates to comply with code or accreditation standards shall be capable of reducing *zone* exhaust and makeup air flow rates to the regulated minimum circulation values, or the minimum required to maintain pressurization relationship requirements. Non regulated *zones* shall be capable of reducing exhaust and makeup air flow rates to 50% of the zone design values, or the minimum required to maintain pressurization relationship requirements.

TABLE 6.5.7.1.3 Maximum Net Exhaust Flow Rate, CFM per Linear Foot of Hood Length

Type of Hood	Light Duty Equipment	Medium Duty Equipment	Heavy Duty Equipment	Extra Heavy Duty Equipment.
Wall-mounted canopy	140	210	280	385
Single island	280	350	420	490
Double island (per side)	175	210	280	385
Eyebrow	175	175	Not allowed	Not allowed
Backshelf/Pass-over	210	210	280	Not allowed

TABLE 6.5.9 Hot Gas Bypass Limitation

Rated Capacity	Maximum Hot Gas Bypass Capacity (% of Total Capacity)
≤240,000 Btu/h	50%
>240,000 Btu/h	25%

- c. Direct makeup (auxiliary) air supply equal to at least 75% of the exhaust air flow rate, heated no warmer than 2°F below room setpoint, cooled to no cooler than 3°F above room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.

6.5.8 Radiant Heating Systems

6.5.8.1 Heating Unenclosed Spaces. Radiant heating shall be used when heating is required for unenclosed spaces.

Exception: Loading docks equipped with air curtains.

6.5.8.2 Heating Enclosed Spaces. Radiant heating systems that are used as primary or supplemental enclosed space heating must be in conformance with the governing provisions of the standard, including, but not limited to, the following:

- a. Radiant hydronic ceiling or floor panels (used for heating or cooling).
- b. Combination or hybrid systems incorporating radiant heating (or cooling) panels.
- c. Radiant heating (or cooling) panels used in conjunction with other systems such as VAV or thermal storage systems.

6.5.9 Hot Gas Bypass Limitation. Cooling systems shall not use hot gas bypass or other evaporator pressure control systems unless the system is designed with multiple steps of unloading or continuous capacity modulation. The capacity of the hot gas bypass shall be limited as indicated in Table 6.5.9.

Exception: Unitary packaged systems with cooling capacities not greater than 90,000 Btu/h.

6.6 Alternative Compliance Path (Not Used)

6.7 Submittals

6.7.1 General. The *Authority having jurisdiction* may require submittal of compliance documentation and supplemental information in accord with Section 4.2.2 of this standard.

6.7.2 Completion Requirements. The following requirements are mandatory provisions and are necessary for compliance with the standard.

6.7.2.1 Drawings. Construction documents shall require that, within 90 days after the date of system acceptance, record drawings of the actual installation be provided to the building owner or the designated representative of the building owner. Record drawings shall include, as a minimum, the location and performance data on each piece of equipment, general configuration of duct and pipe distribution system including sizes, and the terminal air or water design flow rates.

6.7.2.2 Manuals. Construction documents shall require that an operating manual and a maintenance manual be provided to the building owner or the designated representative of the building owner within 90 days after the date of system acceptance. These manuals shall be in accordance with industry-accepted standards (see Informative Appendix E) and shall include, at a minimum, the following:

- a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
- b. Operation manuals and maintenance manuals for each piece of equipment and system requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
- c. Names and addresses of at least one *service agency*.
- d. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
- e. A complete narrative of how each system is intended to operate, including suggested setpoints.

6.7.2.3 System Balancing

6.7.2.3.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards (see Informative Appendix E). Construction documents shall require that a written balance report be provided to the building owner or the designated representative of the building owner for HVAC systems serving *zones* with a total conditioned area exceeding 5000 ft².

6.7.2.3.2 Air System Balancing. Air systems shall be balanced in a manner to first minimize throttling losses. Then,