

FROM ASHRAE POCKET GUIDE

Cooling Load Check Figures

Classifications	Occupancy			Lights			Refrigeration			Air Quantities		
	Lo	Av	Hi	Lo	Av	Hi	Lo	Av	Hi	Lo	Av	Hi
Apartment, High Rise	325	175	100	1.0	2.0	4.0	450	400	350	0.8	1.2	1.7
Auditoriums, Churches, Theaters	15	11	6	1.0	2.0	3.0	400	250	90	—	—	—
Schools, Colleges, Universities	30	25	20	2.0	4.0	6.0	240	185	150	1.0	1.6	2.2
Factories	50	35	25	3.0†	4.5†	6.0†	240	150	90	—	—	—
Assembly Areas	200	150	100	9.0†	10.0†	12.0†	200	150	100	—	—	—
Light Manufacturing*	200	150	100	9.0†	10.0†	12.0†	200	150	100	—	—	—
Heavy Manufacturing*	200	250	300	15.0†	45.0†	60.0†	100	80	60	—	—	—
Hospitals	100	80	50	1.0	1.5	2.0	175	140	110	1.0	1.5	2.0
Hotels, Motels, Dormitories	200	150	100	1.0	1.5	2.0	350	300	220	1.0	1.40	1.85
Libraries and Museums	80	60	40	1.0	1.5	2.0	280	200	140	1.0	1.6	2.1
Office Buildings (General)	130	110	80	4.0	6.0†	9.0†	360	280	190	1.0	1.6	2.2
Private Offices	150	125	100	2.0	3.8	5.8	—	—	—	—	—	—
Stenographic Department	100	85	70	5.0†	7.5†	10.0†	—	—	—	—	—	—
Residential	600	400	200	1.0	2.0	3.0	600	500	380	0.8	1.2	1.6
Restaurants	600	360	200	0.7	1.5	2.0	400	300	200	0.7	1.1	1.4
Medium	17	15	13	1.5	2.0	3.0	700	550	400	0.8	1.2	1.6
Large	17	15	13	1.5	2.0	3.0	700	550	400	0.7	1.1	1.4

Shopping Centers, Department Stores and Specialty Shops	45	40	25	3.0†	5.0†	9.0†	240	160	105	1.5	2.6	4.2
Beauty and Barber Shops	30	25	20	2.0	3.0	4.0	340	285	225	—	—	—
Department stores	30	25	20	2.0	3.0	4.0	340	285	225	—	—	—
Main Floors	45	25	16	3.5	6.0†	9.0†	350	245	150	—	—	—
Upper Floors	75	55	40	2.0	2.5	3.5†	400	340	280	—	—	—
Dress Shops	50	40	30	1.0	2.0	4.0	345	280	185	0.9	1.2	1.6
Drug Stores	35	25	17	1.0	2.0	3.0	180	135	110	0.7	1.4	2.3
5c and 10c Stores	35	25	15	1.5	3.0	5.0	345	220	120	0.8	1.8	3.0
315	270	185	1.0	2.0	3.0	315	270	185	1.0	1.3	1.9	
300	220	150	3.0	3.0	3.0	300	220	150	3.0	3.0	3.0	
265	200	150	2.0	2.0	2.0	265	200	150	2.0	2.0	2.0	
240	240	240	2.0	2.0	2.0	240	240	240	2.0	2.0	2.0	
285	380	285	2.0	2.0	2.0	285	380	285	2.0	2.0	2.0	
330	400	330	1.5	1.5	1.5	330	400	330	1.5	1.5	1.5	
365	365	365	1.0	1.0	1.0	365	365	365	1.0	1.0	1.0	
375	375	375	1.0	1.0	1.0	375	375	375	1.0	1.0	1.0	

Refrigeration and air quantities for applications listed in this table of cooling load check figures are based on all-air system and normal outdoor air quantities for ventilation except as noted.

† Refrigeration loads are for entire application.

* Air quantities for heavy manufacturing areas are based on supplementary means to remove excessive heat.

TABLE 2
OUTDOOR AIR REQUIREMENTS FOR VENTILATION*
2.1 COMMERCIAL FACILITIES (offices, stores, shops, hotels, sports facilities)

Application	Estimated Maximum** Occupancy P/1000 ft ² or 100 m ²	Outdoor Air Requirements		Comments	
		cfm/ person	L/s person		
Dry Cleaners, Laundries				Dry-cleaning processes may require more air.	
Commercial laundry	10	25	13		
Commercial dry cleaner	30	30	15		
Storage, pick up	30	35	18		
Coin-operated laundries	20	15	8		
Coin-operated dry cleaner	20	15	8		
Food and Beverage Service					
Dining rooms	70	20	10		
Cafeteria, fast food	100	20	10		
Bars, cocktail lounges	100	30	15	Supplementary smoke-removal equipment may be required.	
Kitchens (cooking)	20	15	8	Makeup air for hood exhaust may require more ventilating air. The sum of the outdoor air and transfer air of acceptable quality from adjacent spaces shall be sufficient to provide an exhaust rate of not less than 1.5 cfm/ft ² (7.5 L/s-m ²).	
Garages, Repair, Service Stations					
Enclosed parking garage			1.50	7.5	Distribution among people must consider worker location and concentration of running engines; stands where engines are run must incorporate systems for positive engines exhaust withdrawal. Contaminant sensors may be used to control ventilation.
Auto repair rooms			1.50	7.5	
Hotels, Motels, Resorts, Dormitories					
Bedrooms			cfm/room	L/s-room	Independent of room size.
Living rooms			30	15	
Baths			30	15	
Lobbies	30	15	35	18	Installed capacity for intermittent use.
Conference rooms	50	20			
Assembly rooms	120	15			
Dormitory sleeping areas	20	15			See also food and beverage services, merchandising, barber and beauty shops, garages.
Gambling casinos	120	30	15		Supplementary smoke-removal equipment may be required.
Offices					
Office space	7	20	10		Some office equipment may require local exhaust.
Reception areas	60	15	8		
Telecommunication centers and data entry areas	60	20	10		
Conference rooms	50	20	10		
Public Spaces			cfm/ft ²	L/s-m ²	
Corridors and utilities			0.05	0.25	
Public restrooms, cfm/wc or cfm/urinal		50	25		Normally supplied by transfer air.
Locker and dressing rooms			0.5	2.5	Local mechanical exhaust with no recirculation recommended.
Smoking lounge	70	60	30		
Elevators			1.00	5.0	Normally supplied by transfer air.

* Table 2 prescribes supply rates of acceptable outdoor air required for acceptable indoor air quality. These values have been chosen to dilute human bioeffluents and other contaminants with an adequate margin of safety and to account for health variations among people and varied activity levels.

** Net occupiable space.

TABLE 2
OUTDOOR AIR REQUIREMENTS FOR VENTILATION* (Continued)
2.1 COMMERCIAL FACILITIES (offices, stores, shops, hotels, sports facilities)

Application	Estimated Maximum** Occupancy P/1000 ft ² or 100 m ²	Outdoor Air Requirements		Comments
		cfm/ person	L/s person	
Retail Stores, Sales Floors, and Show Room Floors				
Basement and street	30			0.30 1.50
Upper floors	20			0.20 1.00
Storage rooms	15			0.15 0.75
Dressing rooms				0.20 1.00
Malls and arcades	20			0.20 1.00
Shipping and receiving	10			0.15 0.75
Warehouses	5			0.05 0.25
Smoking lounge	70	60	30	
				Normally supplied by transfer air, local mechanical exhaust; exhaust with no recirculation recommended.
Specialty Shops				
Barber	25	15	8	
Beauty	25	25	13	
Reducing salons	20	15	8	
Florists	8	15	8	
				Ventilation to optimize plant growth may dictate requirements.
Clothiers, furniture				0.30 1.50
Hardware, drugs, fabric	8	15	8	
Supermarkets	8	15	8	
Pet shops				1.00 5.00
Sports and Amusement				
Spectator areas	150	15	8	
Game rooms	70	25	13	
Ice arenas (playing areas)				0.50 2.50
				When internal combustion engines are operated for maintenance of playing surfaces, increased ventilation rates may be required.
Swimming pools (pool and deck area)				
				0.50 2.50
				Higher values may be required for humidity control.
Playing floors (gymnasium)	30	20	10	
Ballrooms and discos	100	25	13	
Bowling alleys (seating areas)	70	25	13	
Theaters				
Ticket booths	60	20	10	
Lobbies	150	20	10	
Auditorium	150	15	8	
Stages, studios	70	15	8	
				Special ventilation will be needed to eliminate special stage effects (e.g., dry ice vapors, mists, etc.)
Transportation				
Waiting rooms	100	15	8	
Platforms	100	15	8	
Vehicles	150	15	8	
				Ventilation within vehicles may require special considerations.
Workrooms				
Meat processing	10	15	8	
				Spaces maintained at low temperatures (-10°F to +50°F, or -23°C to +10°C) are not covered by these requirements unless the occupancy is continuous. Ventilation from adjoining spaces is permissible. When the occupancy is intermittent, infiltration will normally exceed the ventilation requirement. (See Reference 18).

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TABLE 2
OUTDOOR AIR REQUIREMENTS FOR VENTILATION* (Continued)
2.1 COMMERCIAL FACILITIES (offices, stores, hotels, sports facilities)

Application	Estimated Maximum** Occupancy P/1000 ft ² or 100 m ²	Outdoor Air Requirements				Comments
		cfm/ person	L/s person	cfm/ft ²	L/s·m ²	
Photo studios	10	15	8			
Darkrooms	10			0.50	2.50	
Pharmacy	20	15	8			
Bank vaults	5	15	8			
Duplicating, printing				0.50	2.50	Installed equipment must incorporate positive exhaust and control (as required) of undesirable contaminants (toxic or otherwise).

2.2 INSTITUTIONAL FACILITIES

Education						
Classroom	50	15	8			
Laboratories	30	20	10			Special contaminant control systems may be required for processes or functions including laboratory animal occupancy.
Training shop	30	20	10			
Music rooms	50	15	8			
Libraries	20	15	8			
Locker rooms				0.50	2.50	
Corridors				0.10	0.50	
Auditoriums	150	15	8			
Smoking lounges	70	60	30			Normally supplied by transfer air. Local mechanical exhaust with no recirculation recommended.
Hospitals, Nursing and Convalescent Homes						
Patient rooms	10	25	13			Special requirements or codes and pressure relationships may determine minimum ventilation rates and filter efficiency. Procedures generating contaminants may require higher rates.
Medical procedure	20	15	8			
Operating rooms	20	30	15			
Recovery and ICU	20	15	8			
Autopsy rooms				0.50	2.50	Air shall not be recirculated into other spaces.
Physical therapy	20	15	8			
Correctional Facilities						
Cells	20	20	10			
Dining halls	100	15	8			
Guard stations	40	15	8			

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contain information on some unregulated pollutants. Finally, acceptable outdoor air quality should be evaluated using the definition for acceptable indoor air quality in Section 3.

6.1.2 Outdoor Air Treatment. If the outdoor air contaminant levels exceed the values given in 6.1.1 (Table 1), the air should be treated to control the offending contaminants. Air-cleaning systems suitable for the particle size encountered should be used. For removal of gases and vapors, appropriate air-cleaning systems should be used. Where the best available, demonstrated, and proven technology does not allow for the removal of contaminants, the amount of outdoor air may be reduced during periods of high contaminant levels, such as those generated by rush-hour traffic. The need to control offending contaminants may depend on local regulations that require specific control measures.

6.1.3 Ventilation Requirements. Indoor air quality shall be considered acceptable if the required rates of acceptable outdoor air in Table 2 are provided for the occupied space.

Exceptions:

1. Where unusual indoor contaminants or sources are present or anticipated, they shall be controlled at the source or the procedure of 6.2 shall be followed.
2. For those areas within industrial facilities not covered by Table 2, refer to TLVs—*Threshold Limit Values and Biological Exposure Indices for 1986-87*, American Conference of Governmental Industrial Hygienists (Reference 7, 23).

Table 2 lists the required ventilation rates in cfm (L/s) per person or cfm/ft² (L/s·m²) for a variety of indoor spaces. In most cases, the contamination produced is presumed to be in