

TABLE 4. INDUCED-AIR-FLOW EQUIVALENT OF THE ENERGY IN FALLING, UNENCLOSED STREAMS OF PARTICLES
(For a solids flow rate R of 1 lb per sec and a specific gravity $z = 1$ referred to water.)

FALLING DISTANCE, s	STREAM AREA, SQ FT	AIR FLOW EQUIVALENT, CFM, (TO BE MULTIPLIED BY $(R/z)^{1/3}$)						
		PARTICLE SIZE, MILLIMETERS:						
		1	2	5	10	20	50	100
3 ft	1/2	450	350	220	180	150	80	65
	1	750	550	350	300	250	150	100
	2	1200	850	550	450	350	200	170
	4	1900	1400	850	700	600	350	250
	8	3000	2200	1400	1100	900	500	400
	15	4600	3300	2000	1700	1400	800	650
	25	6400	4600	3000	2500	2000	1000	900
	50	10000	7500	4700	4000	3200	1800	1400
6 ft	1/2			350	300	250	200	150
	1			600	500	350	300	200
	2			900	700	600	400	350
	4			1500	1200	900	700	500
	8			2300	1800	1500	1000	900
	15			3500	2800	2200	1500	1300
	25			5000	4000	3200	2300	1800
	50			8000	6000	5000	3700	3000
12 ft	1/2			560	450	350	270	220
	1			900	700	600	420	350
	2			1500	1100	900	700	550
	4			2300	1800	1500	1000	850
	8			3600	2900	2300	1700	1300
	15			5300	4200	3500	2600	2100
	25			7800	6000	5000	3600	2900
	50			—	10000	8000	6000	4700
20 ft	1/2			800	650	500	370	300
	1			1300	1000	800	600	500
	2			2000	1600	1300	960	760
	4			3300	2600	2000	1500	1200
	8			5000	4100	3200	2400	1900
	15			8000	6400	5000	3700	2900
	25			—	9000	7000	5000	4000
30 ft	1/2			1000	850	650	500	400
	1			1700	1400	1100	800	600
	2			2700	2100	1700	1300	1000
	4			4400	3500	2700	2000	1600
	8			6800	5400	4200	3200	2500
	15			10000	8200	6600	4800	4000
	25			—	—	9000	6800	5400

From *Plant and Process Ventilation* by W. C. L. Hemeon, The Industrial Press, New York (1955).

tion must be employed, the air flow toward the hood has to overcome the tendency of the heated air to rise and also must sweep it into the hood. Consequently, the required exhaust air flow is very much larger than for hoods that simply capture the upward flow of heated air. A combination of an exhaust hood with a positive jet of air blown across the top of the

TABLE 5. EXHAUST REQUIREMENTS²⁸ FOR GRINDING, POLISHING, BUFFING, SCRATCH BRUSHING ABRASIVE CUT-OFF WHEELS, GRINDING AND POLISHING BELTS
(Air Volume: 4500 fpm in all branches.) (2 in. water suction at average hood)

GRINDING OR CUT-OFF WHEELS				BUFFING, POLISHING, AND SCRATCH BRUSHING			
Wheel Diam, In.	Max. Width ^a , In.	Branch Diam, In.	CFM	Wheel Diam, In.	Max. Width ^a , In.	Branch Diam, In.	CFM
- 9	1 1/2	3	225	- 9	2	3 1/2	300
10-16	2	4	390	10-16	3	4 1/2	500
17-19	3	4 1/2	500	17-19	4	5	610
20-24	4	5	610	20-24	5	5 1/2	740
25-30	5	6	880	25-30	6	6 1/2	1040
31-36	6	7	1200				

HORIZONTAL SINGLE SPINDLE DISC GRINDERS			HORIZONTAL DOUBLE SPINDLE DISC GRINDERS			VERTICAL SINGLE SPINDLE DISC GRINDERS		
Wheel Diam, In.	Branch Diam, In.	CFM	Wheel Diam, In.	Branch Diam, In.	CFM	Wheel Diam, In.	Branch Diam, In.	CFM
-12	3	225	-19	1-5	610	-20	1-4 1/2	500
13-19	4	390	20-25	1-6	880	21-30	2-4	780
20-30	5	610	26-30	1-7	1200	31-33	2-6	1760
31-36	6	880	31-53	2-6	1760	54-72	2-8	3120
			54-72	4-8	6240			

GRINDING OR POLISHING BELTS:

To 3 in. wide—3 in. branch, add 1/2 in. to branch diameter for each 2 in. or fraction increase in belt width over 3 in.

^a Increase branch diameter 0.3 in., but not less than 1/2 in., for each 1 in. increase in width over dimension noted.

equipment and directed into the hood may be required above large pieces of equipment.

Hemeon has suggested¹⁸ design Equations 2 to 6 which follow for various types of hoods.

Equation 2 is suggested for estimating the flow of heated air rising from the top of a hot body:

$$q_0 = 29 \sqrt[3]{H_c A_p^2 l_b} \quad (2)$$

where

q_0 = air flow rate at upper limits of hot body, cubic feet per minute.

A_p = cross-sectional area of air stream at upper limits of hot body; square feet.

l_b = height of hot body, feet.

H_c = convective heat transfer rate, Btu per minute.

The area A_p may be approximated from the dimensions of the hot body. For horizontal rods, the width of the stream is practically the diameter of the rod. For vertical planes, the air stream appears to thicken at an angle of 4 to 5 deg with the plane. For horizontal planes, the area of the air stream may be taken as equal to the area of the plane itself.

In the case of horizontal plates, in the absence of better experimental information, l_b may be taken as equal to the horizontal diameter. Chapter 5 furnishes information which may be used in estimating the heat transfer rate H_c .

The flow rate, q_s , of heated air entering the hood after turbulent mixing