

4123:1-5-992 Examples of local exhaust ventilation.

(A) Prints which appear in this rule are copied from "Industrial Ventilation, A Manual of Recommended Practice," of the "American Conference of Governmental Industrial Hygienists." They are identified with the name of the organization.

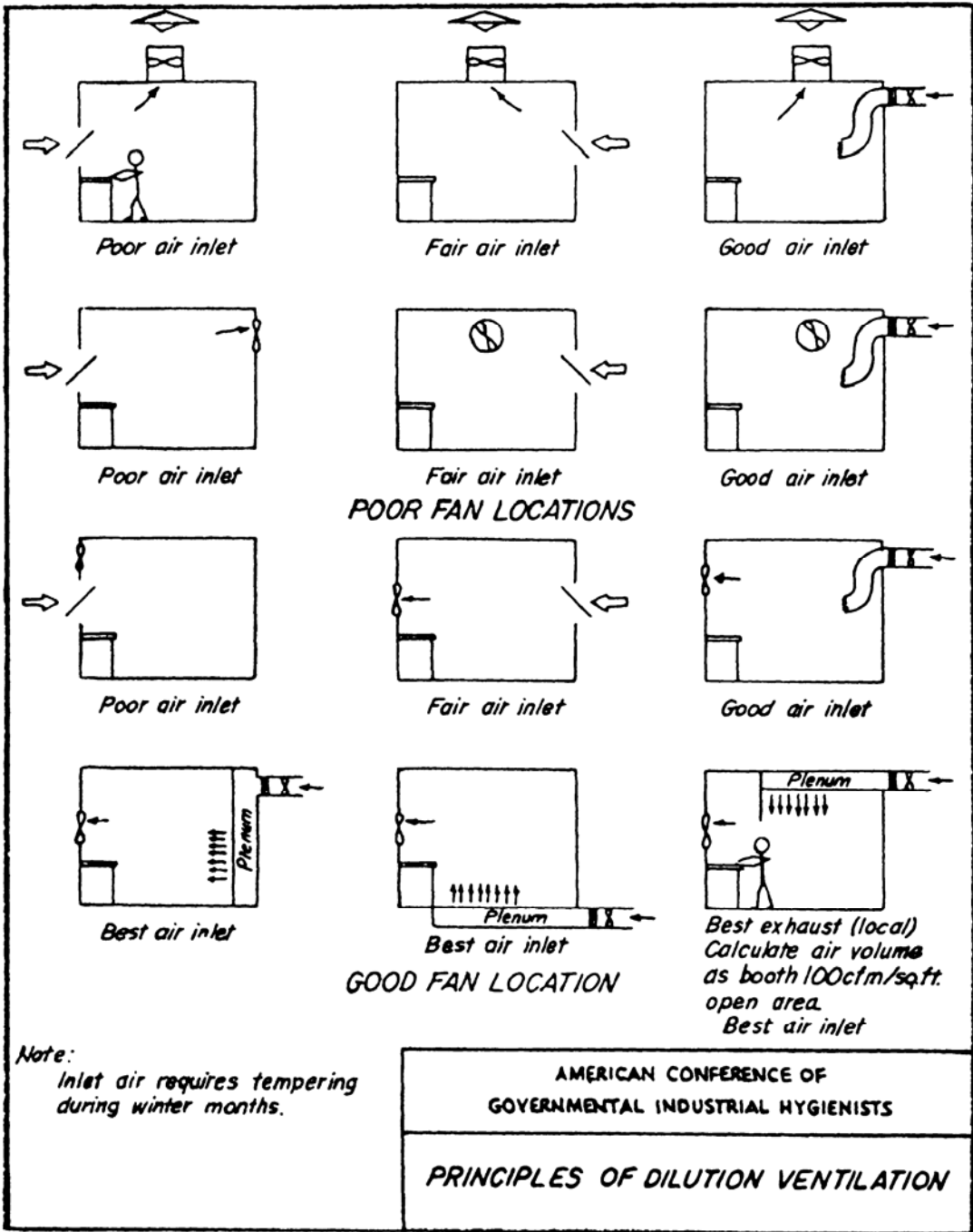
(B) Index.

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Effective: 1/1/86



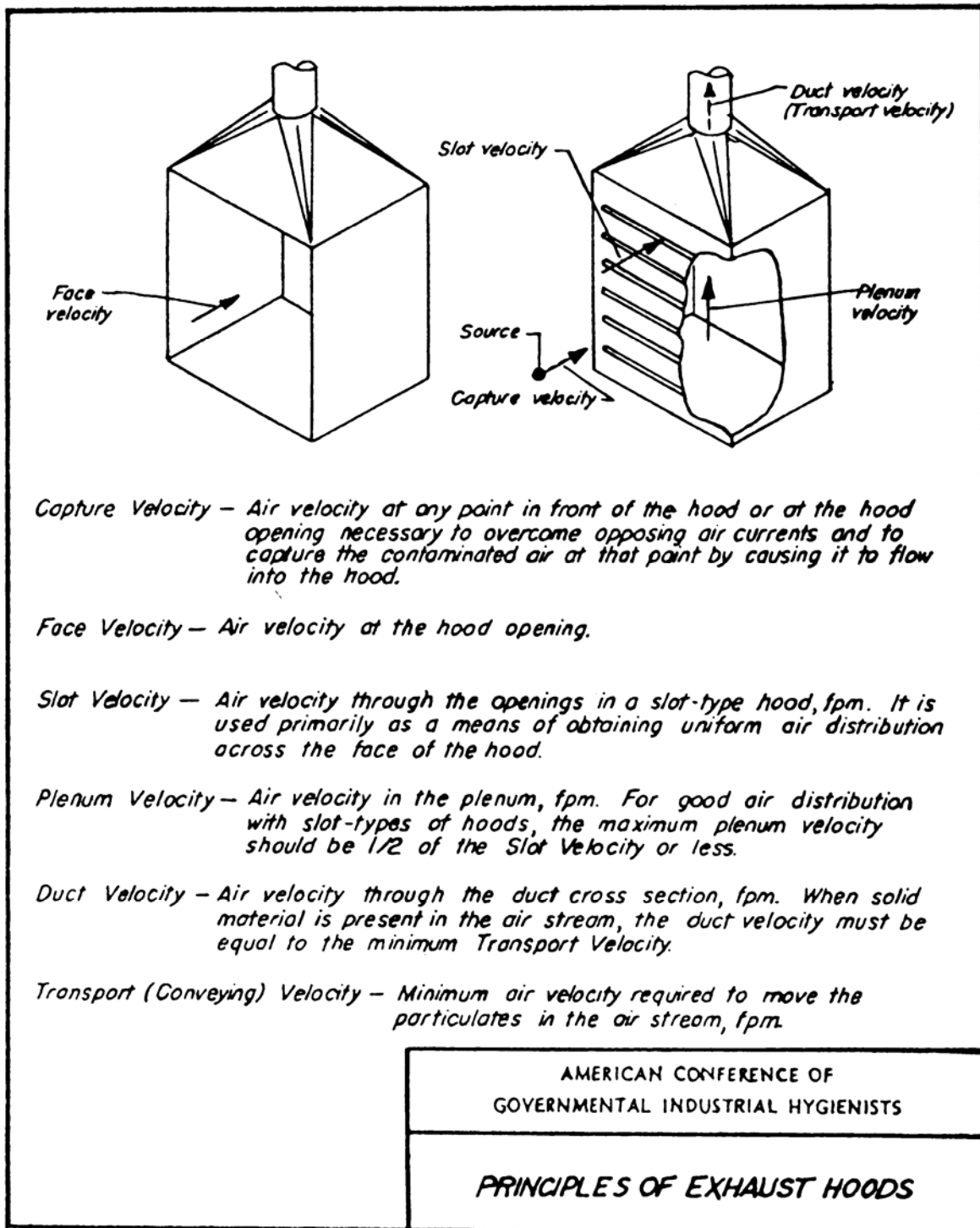


Figure:
Princip
les of
Exhaus
t
Hoods

Capture Velocity – Air velocity at any point in front of the hood or at the hood opening necessary to overcome opposing air currents and to capture the contaminated air at that point by causing it to flow into the hood.

Face Velocity – Air velocity at the hood opening.

Slot Velocity – Air velocity through the openings in a slot-type hood, fpm. It is used primarily as a means of obtaining uniform air distribution across the face of the hood.

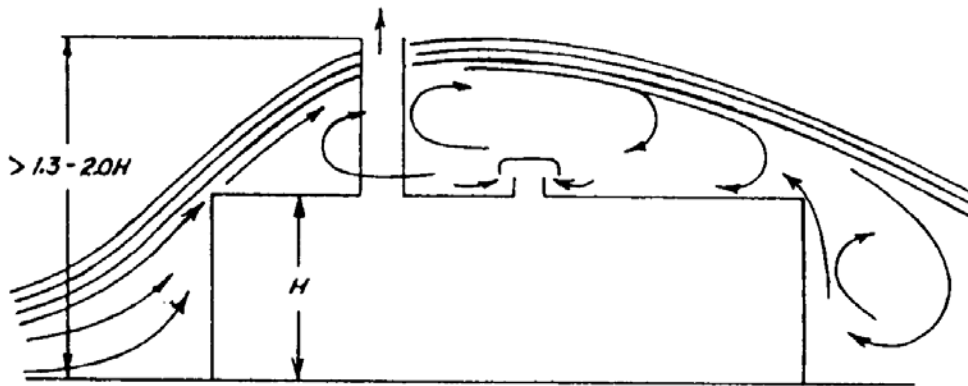
Plenum Velocity – Air velocity in the plenum, fpm. For good air distribution with slot-types of hoods, the maximum plenum velocity should be 1/2 of the Slot Velocity or less.

Duct Velocity – Air velocity through the duct cross section, fpm. When solid material is present in the air stream, the duct velocity must be equal to the minimum Transport Velocity.

Transport (Conveying) Velocity – Minimum air velocity required to move the particulates in the air stream, fpm.

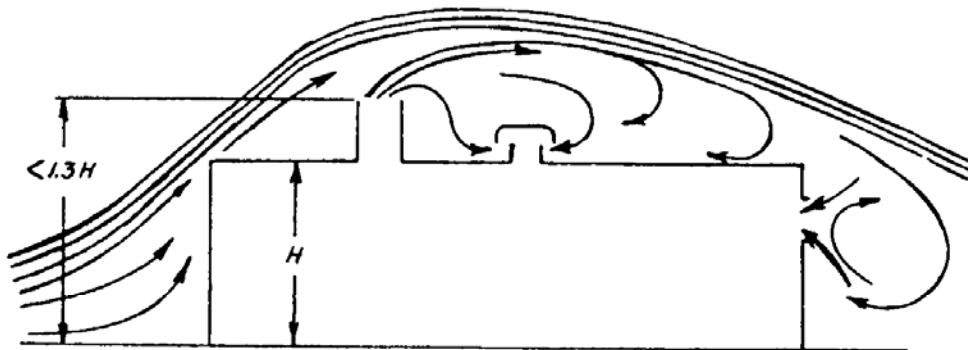
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PRINCIPLES OF EXHAUST HOODS



GOOD

*High discharge stack relative to building height,
air inlet on roof.*



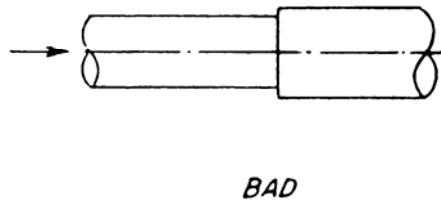
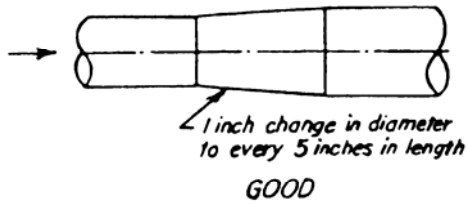
POOR

*Low discharge stack relative to building height,
air inlet on roof and wall.*

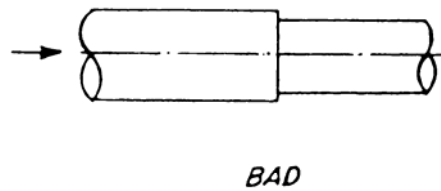
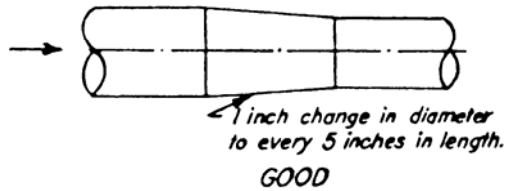
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BUILDING AIR INLETS AND OUTLETS

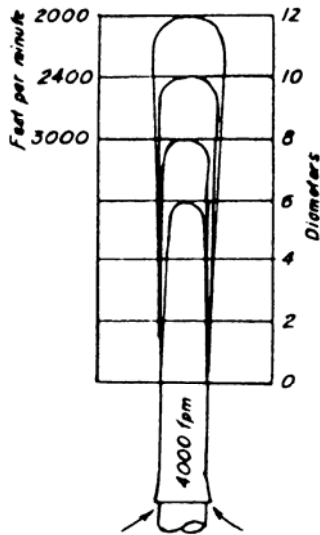
DUCT ENLARGEMENT



DUCT CONTRACTION



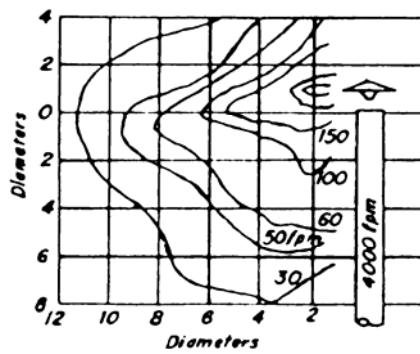
STACKHEAD



RIGHT

Vertical discharge cap throws upward where dilution will take place.

WEATHER CAP

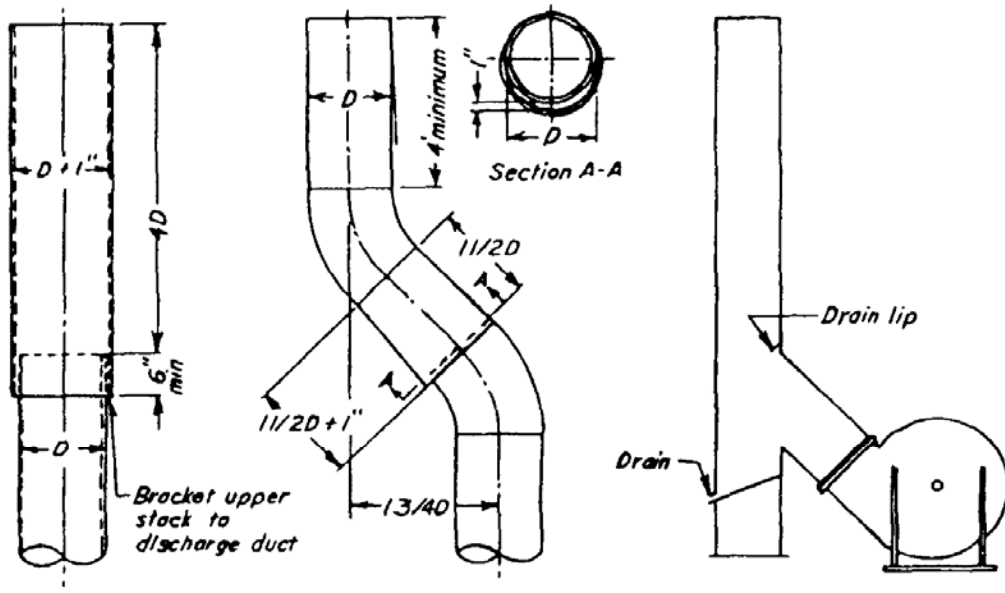


WRONG

Deflecting weather cap discharges downward.

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PRINCIPLES OF DUCT DESIGN



VERTICAL DISCHARGE
No loss

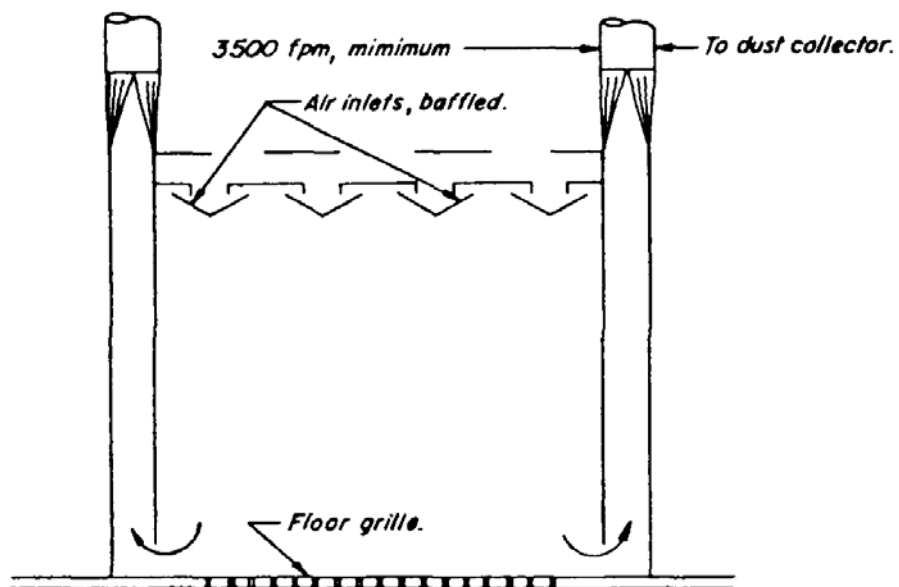
OFFSET ELBOWS
Calculate losses due to elbows

OFFSET STACK

1. Rain protection characteristics of these caps are superior to a deflecting cap located $0.75D$ from top of stack.
2. The length of upper stack is related to rain protection. Excessive additional distance may cause "Blowout" of effluent at the gap between upper and lower sections.

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STACKHEAD DESIGNS



SECTION THRU TYPICAL ROOM

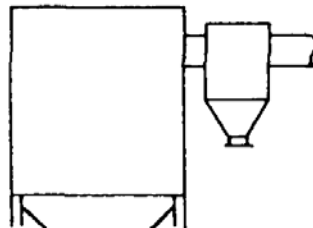
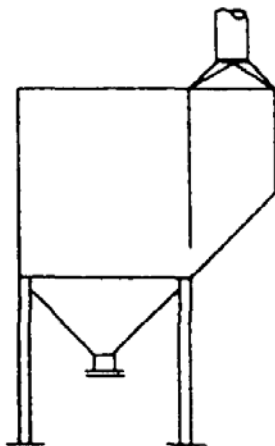
Rooms: 60-100 fpm downdraft; usual choice 80 fpm; or 100 fpm cross-draft. Operator in room requires Bureau of Mines approved abrasive blasting helmets.

Rotary tables: 200 cfm /sq ft of total openings (taken without curtains).

Cabinets: 20 air changes per minute.

At least 500 fpm inward velocity at all operating openings. Openings to be baffled.

Entry loss: 1 VP; or calculate from individual losses.

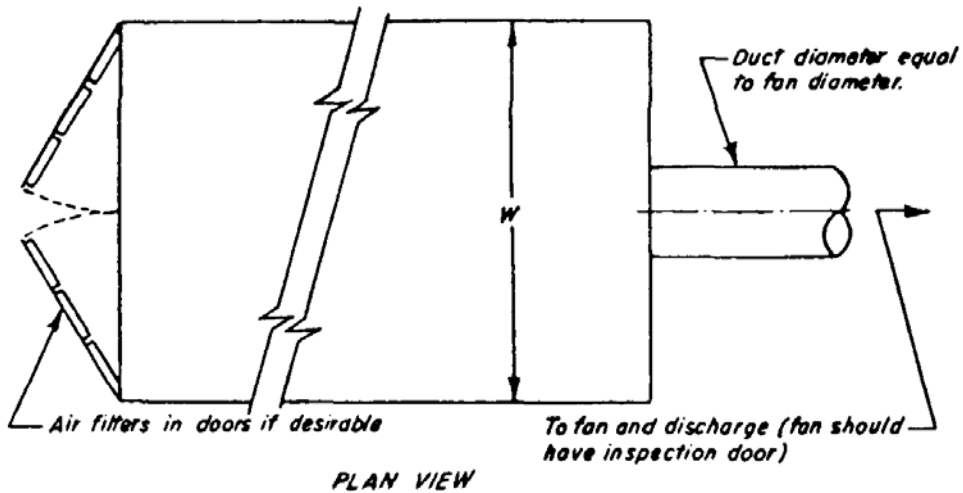


For small cabinets: Use rear plenum or trap to settle.

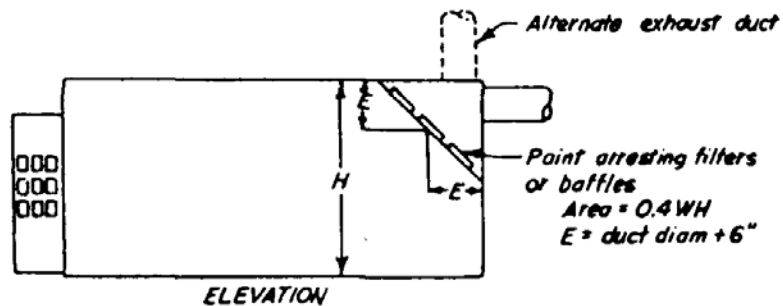
Trap loss: 1.5 VP

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**ABRASIVE BLASTING
VENTILATION**



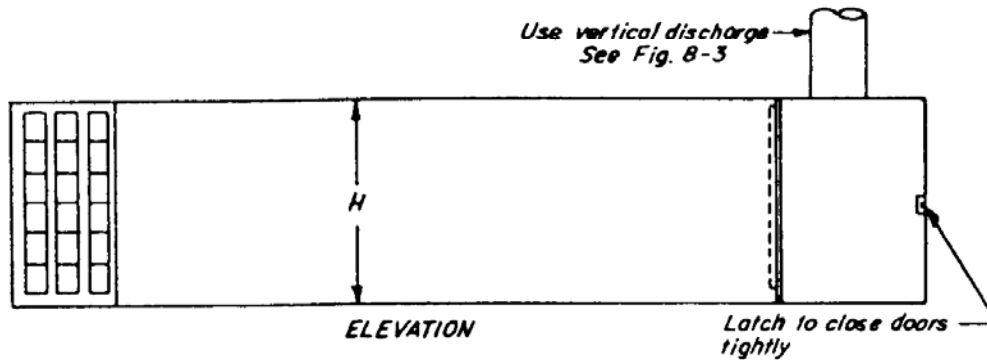
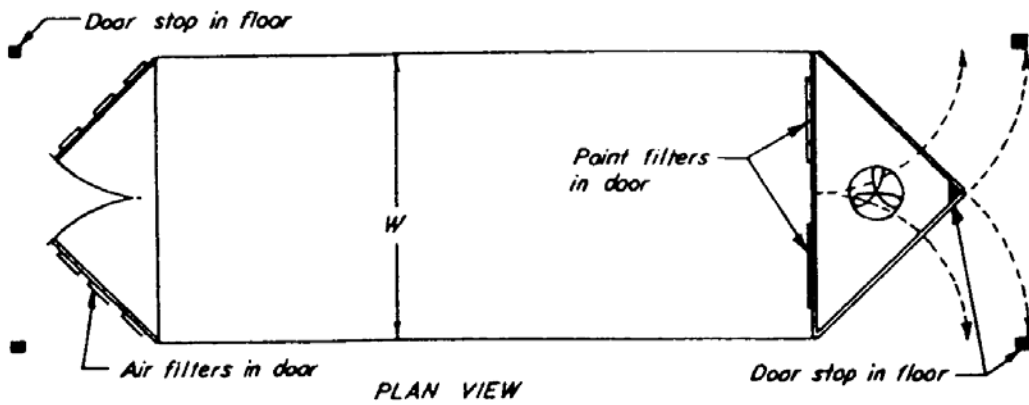
$Q = 100 \text{ cfm/sq ft}$ of cross-section area
 Entry loss = 0.50 VP plus resistance of each filter bank when dirty
 Duct velocity = 1000 - 3000 fpm
 Air filters to be sized for 275 cfm/sq ft of filter
 Paint filters: combustibility Class 2 or better
 size and number of filter for minimum area shown



Typical filter installation

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AUTO SPRAY PAINT BOOTH



$Q = 50 \text{ cfm/sq ft}$ of cross-sectional area
(when $W \times H$ is greater than 150 sq ft)

Entry loss = $0.50VP$ plus resistance of each filter bank when dirty

Duct velocity = $1000 - 3000 \text{ fpm}$

Air filters: Size for 275 cfm/sq ft of filters

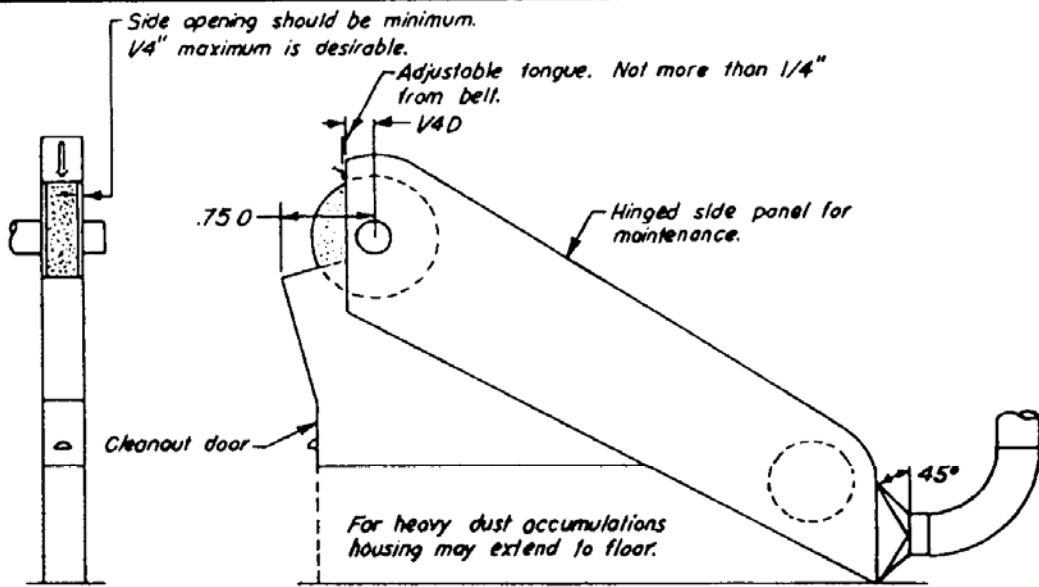
Paint filters: Combustibility Class 2 or better, consult mfr for size and number

Note:

Fan interlock with make-air supply and compressed air to spray gun is desirable

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LARGE DRIVE-THROUGH
SPRAY PAINT BOOTH



Belt width inches	Exhaust volume cfm	
	Good enclosure *	Poor enclosure
1 1/2	220	330
2	390	600
3	500	750
4	610	920
5	880	1300
6	1200	1600

* Hood as shown. No more than 25% of wheel
exposed.

Entry loss = 0.40 VP

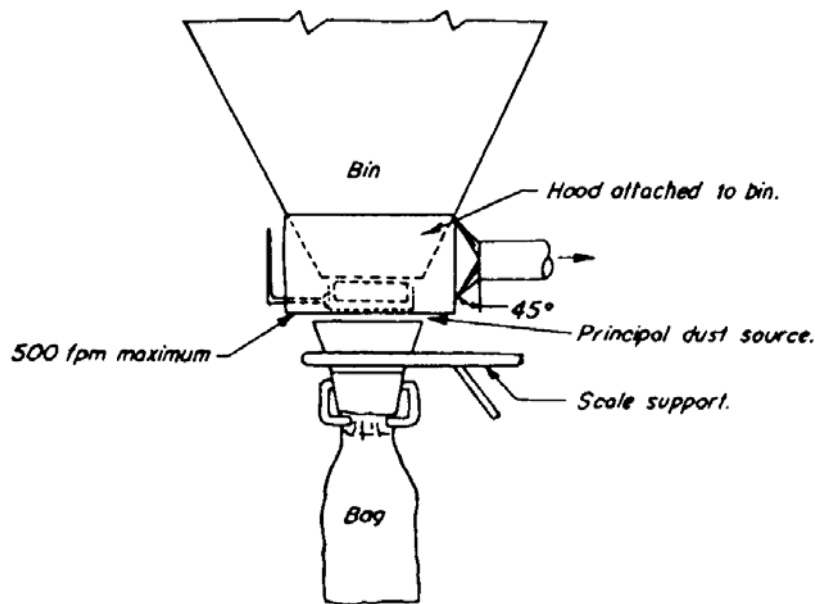
Duct velocity = 3500 fpm minimum

Note:

For titanium and magnesium eliminate hopper and use
5000 fpm through hood cross section.

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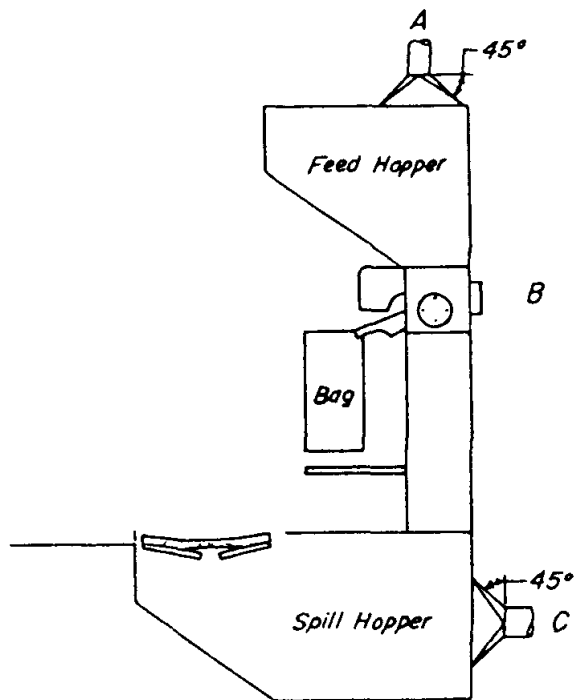
BACKSTAND IDLER POLISHING MACHINE



$Q = 400 - 500 \text{ cfm} - \text{non-toxic dust}$
 $1000 - 1500 \text{ cfm} - \text{toxic dust}$
 $\text{Duct velocity} = 3500 \text{ fpm minimum}$
 $\text{Entry loss} = 0.25 \text{ VP}$

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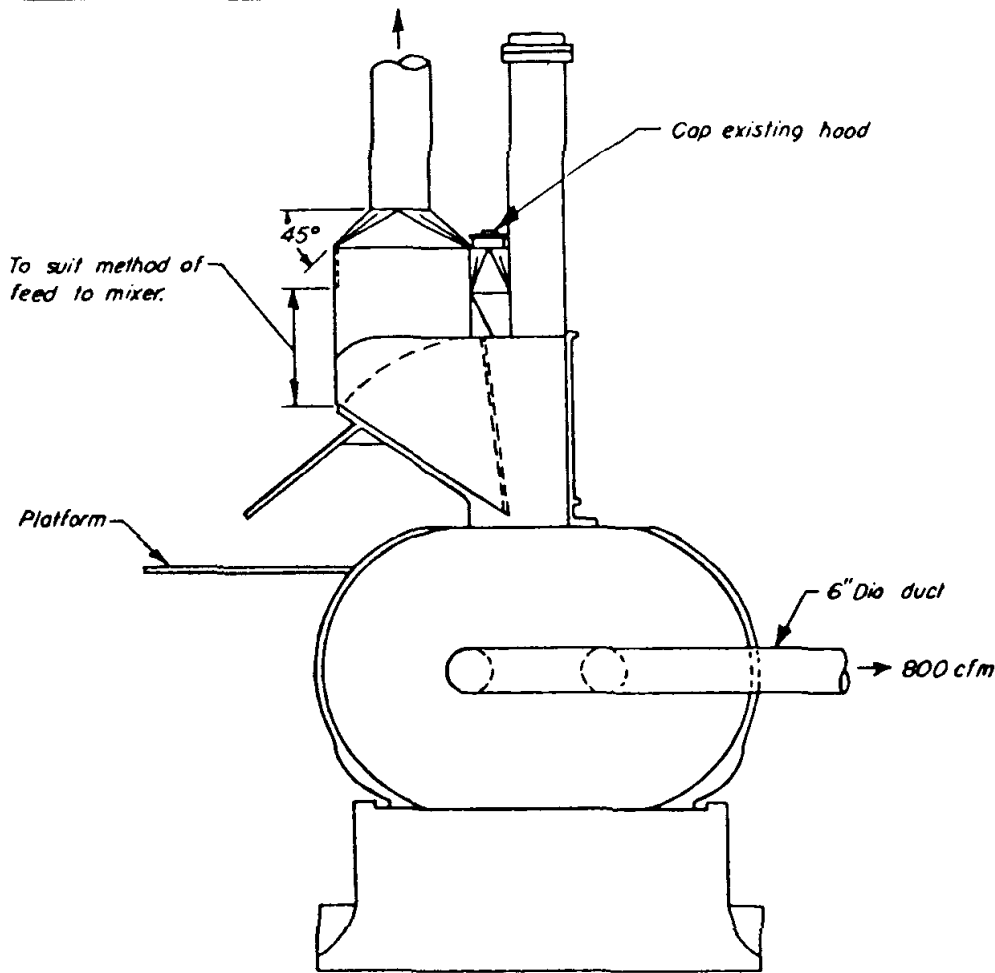
BAG FILLING



$Q = 500 \text{ cfm/filling tube}$
 $= 500 \text{ cfm at Feed Hopper}$
 $= 950 \text{ cfm at Spill Hopper}$
 Duct velocity = 3500 fpm minimum
 Branch entry loss = 0.25 VP (A & C)
 $= 1.00 \text{ VP at open end (B)}$

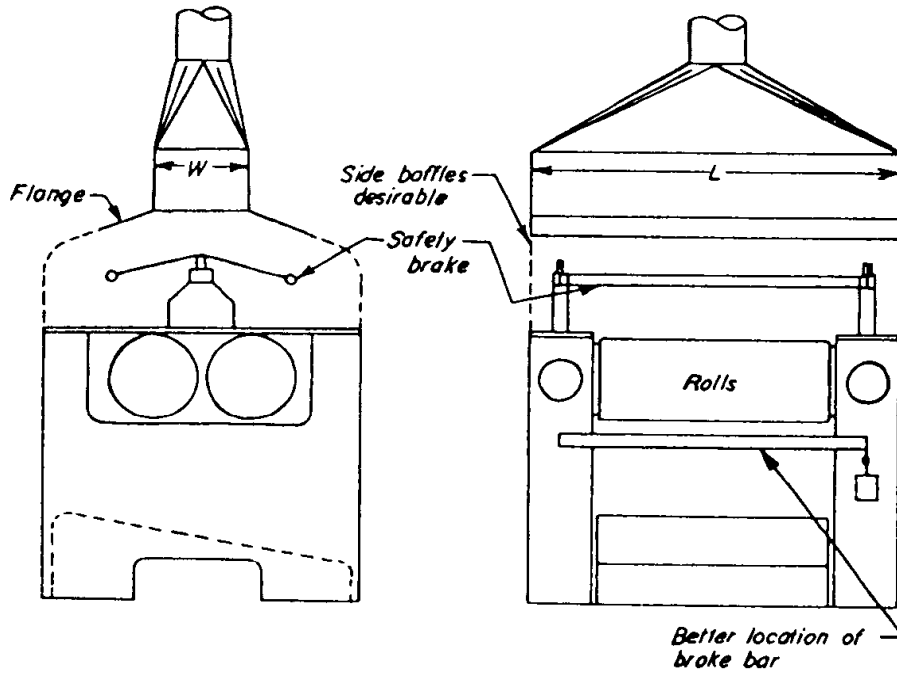
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BAG TUBE PACKER



$Q = 200-300 \text{ cfm/sq ft open face area.}$
 $500 \text{ cfm/ft of belt width if belt feeder used.}$
 $\text{Duct velocity} = 3500 \text{ fpm minimum.}$
 $\text{Entry loss} = 0.25 \text{ VP at hood}$
 $1.0 \text{ VP at trunnion}$

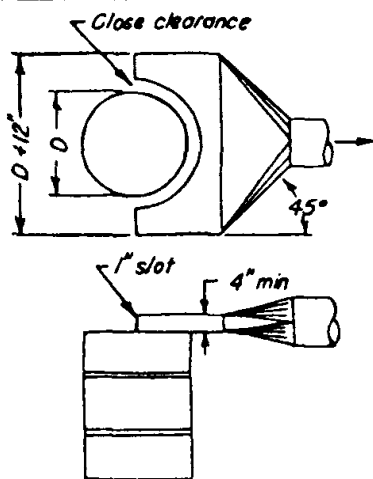
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BANBURY MIXER



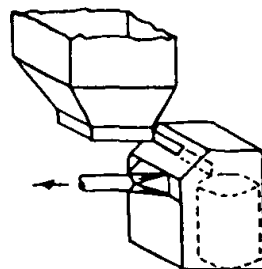
$Q = 125 \text{ cfm/sq ft hood area (125 WL)}$
 Duct velocity = 1000 - 3000 fpm
 Entry loss = 0.25 duct VP

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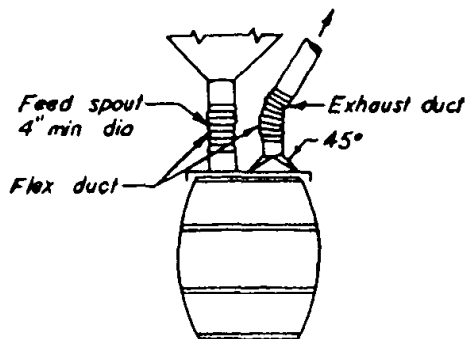
RUBBER CALENDER ROLLS



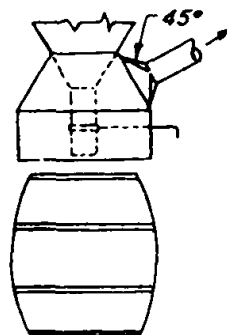
$Q = 100 \text{ cfm/sq ft barrel top min}$
 Duct velocity = 3500 minimum
 Entry loss = $0.25 \text{ VP} + 1.78 \text{ slot VP}$
 Manual loading.



$Q = 150 \text{ cfm/sq ft open face area}$
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.25 VP for 45° taper



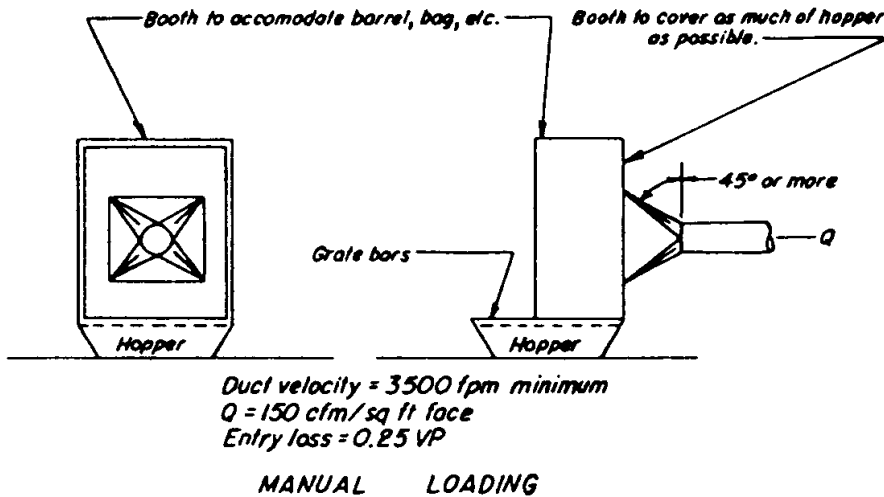
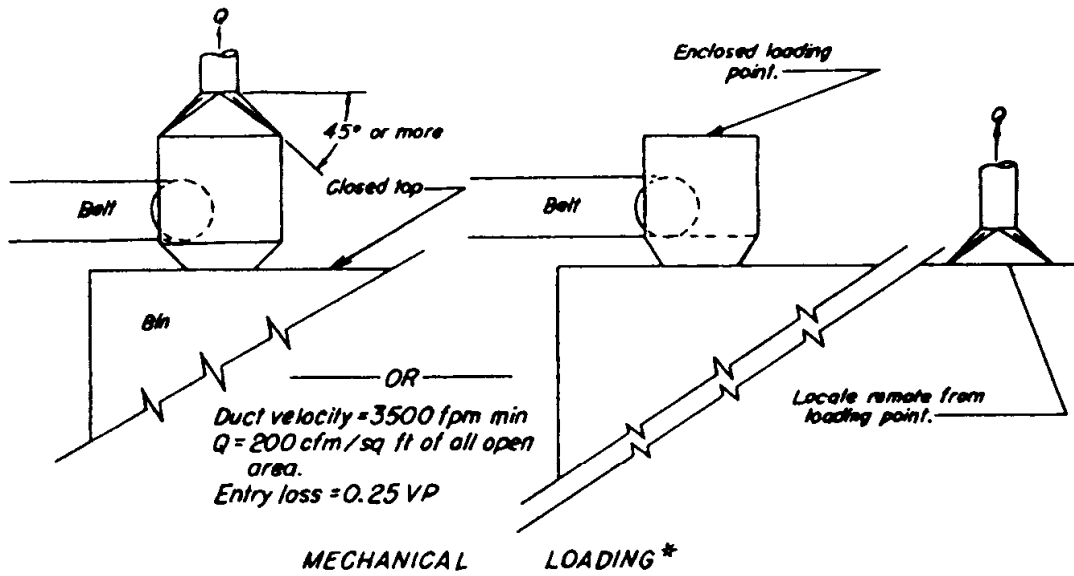
$Q = 50 \text{ cfm} \times \text{drum dia (ft)}$ for weighted lid
 $150 \text{ cfm} \times \text{drum dia (ft)}$ for loose lid
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.25 VP



$Q = 300-400 \text{ cfm}$
 Duct velocity = 3500 fpm min
 Entry loss = 0.25 VP

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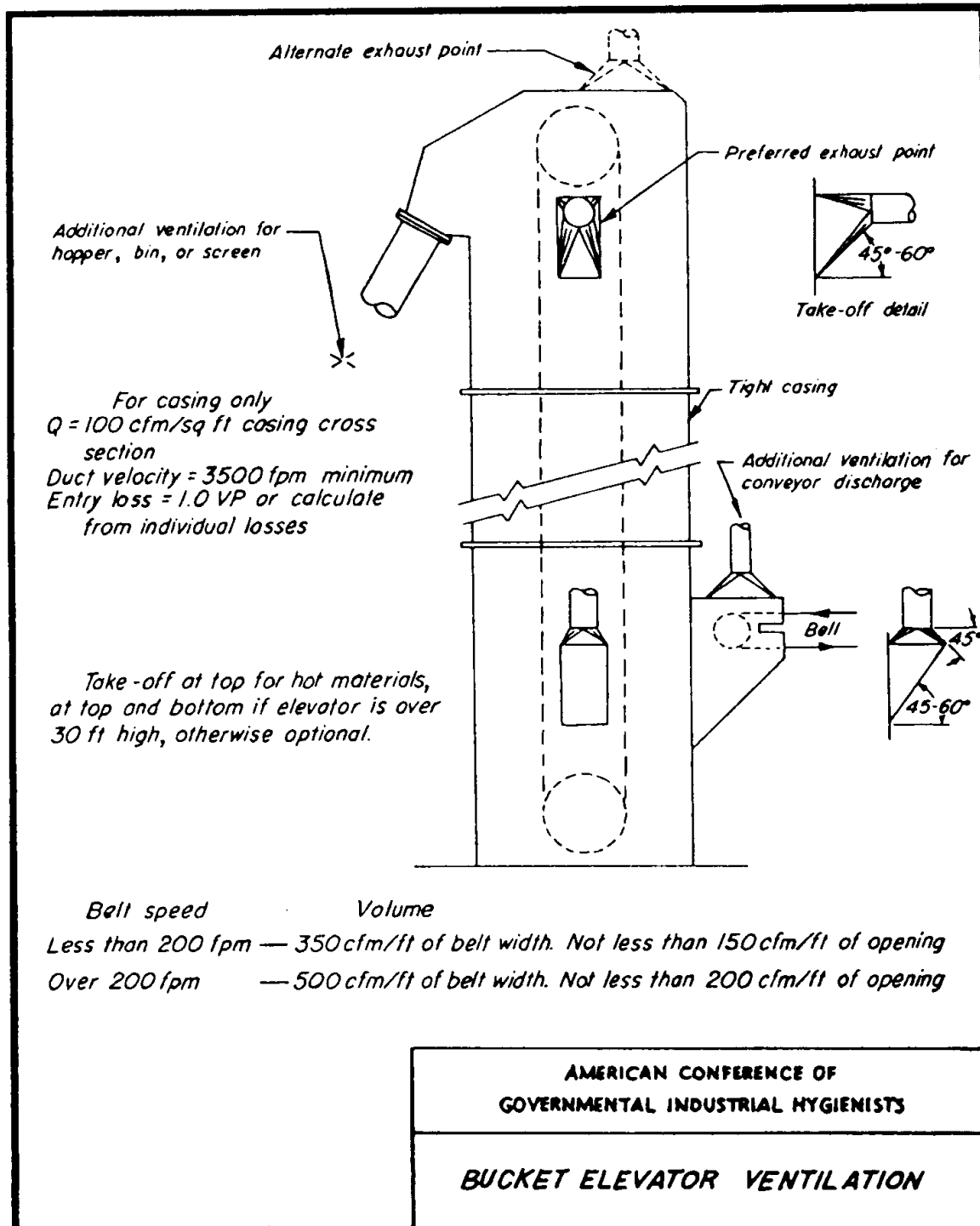
BARREL FILLING

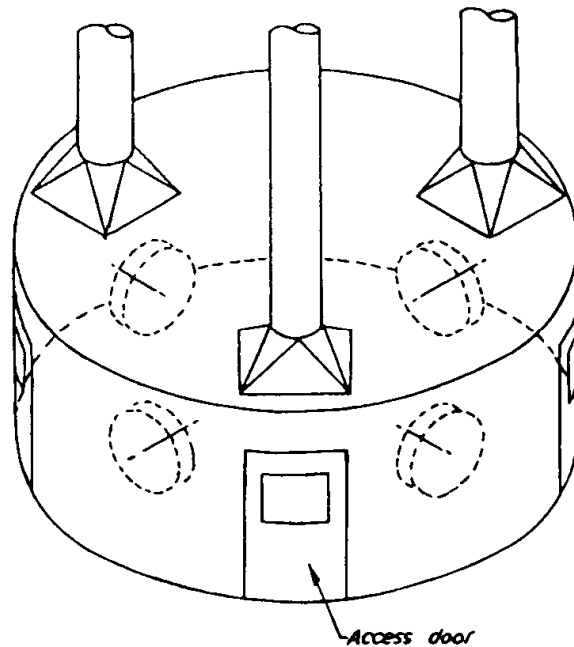


*BELT SPEED	VOLUME
Less than 200 fpm -	350 cfm/ft of belt width.
	Not less than 150 cfm/ft of opening.
Over 200 fpm -	500 cfm/ft of belt width.
	Not less than 200 cfm/ft of opening.

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BIN & HOPPER VENTILATION



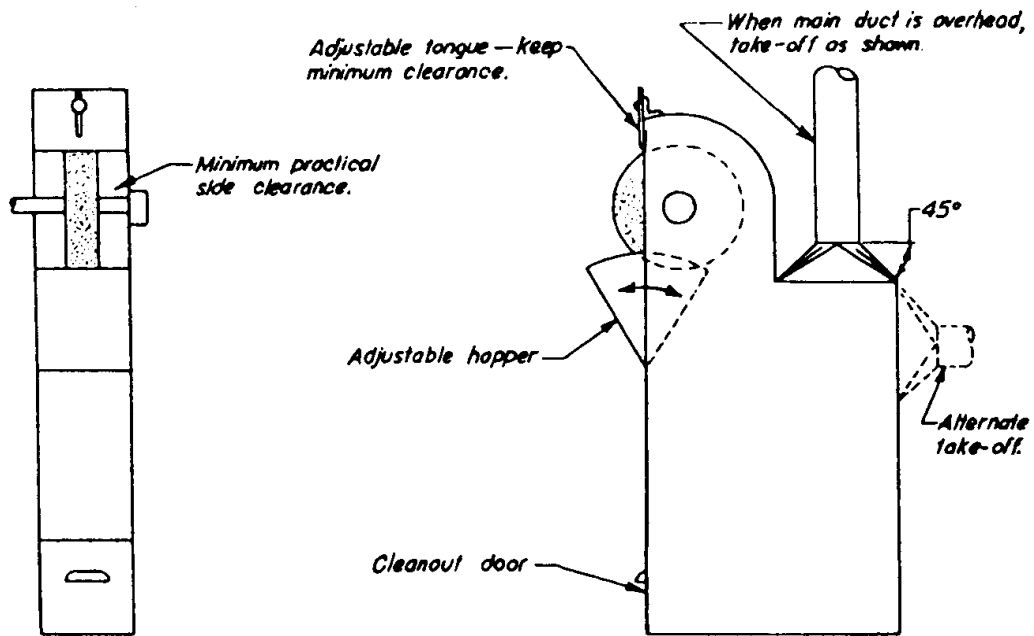


$Q = 500$ cfm/wheel, minimum
 Not less than 250 cfm/sq ft total open area
 Duct velocity = 3500 fpm minimum
 Entry loss = 1.78 slot VP plus 0.25 duct VP
 Use ammeters to gage wheel pressures

On small, 2 or 3 spindle machines, one take-off may be used
 Multiple take-offs desirable
 Provide automatic sprinklers or other fire protection. Consult
 Fire and Insurance Codes

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CIRCULAR AUTOMATIC BUFFING

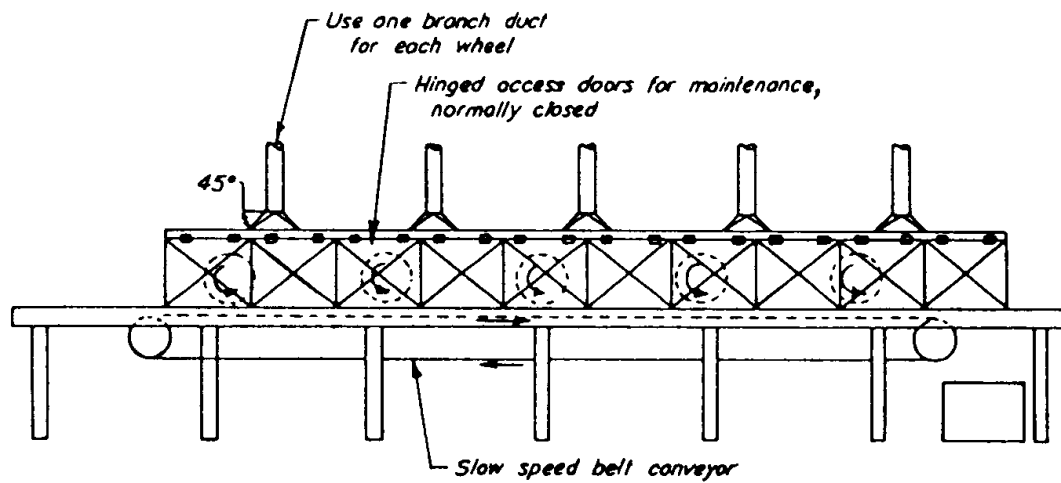


Wheel diam inches	Wheel width inches	Exhaust volume cfm
to 9	2	400
over 9 to 16	3	670
over 16 to 19	4	800
over 19 to 24	5	1100
over 24 to 30	6	1400
over 30 to 36	6	1800

Note: For wider wheels than listed, increase cfm with width
 Duct velocity = 4500 fpm minimum
 Entry loss = 0.40 VP

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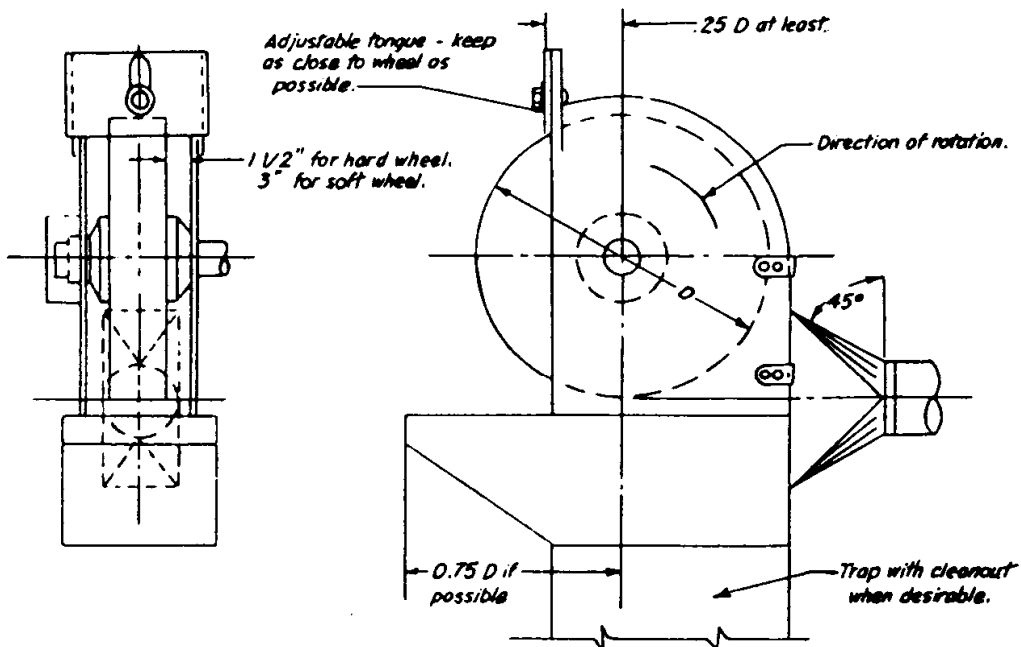
SOFT WHEEL BUFFING LATHE



Q = 500 cfm/wheel, minimum
Not less than 150 cfm/sqft total open area
Duct velocity = 4500 fpm minimum
Entry loss = 1.78 slot VP plus 0.25 duct VP
Use ammeters to gage wheel pressures
Wheel adjustments on outside of enclosure at the rear

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STRAIGHT LINE AUTOMATIC BUFFING



Minimum duct velocity : 4500 fpm branch.
3500 fpm main.

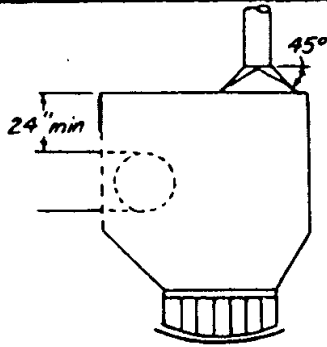
Entry loss : 0.65 VP for straight take-off.
0.40 VP for tapered take-off.

Wheel diam. inches	Wheel width * inches	Exhaust volume cfm	
		Good enclosure	Poor enclosure
to 9	2	300	400
over 9 to 16	3	500	670
over 16 to 19	4	610	800
over 19 to 24	5	740	1100
over 24 to 30	6	1040	1400
over 30 to 36	6	1175	1800

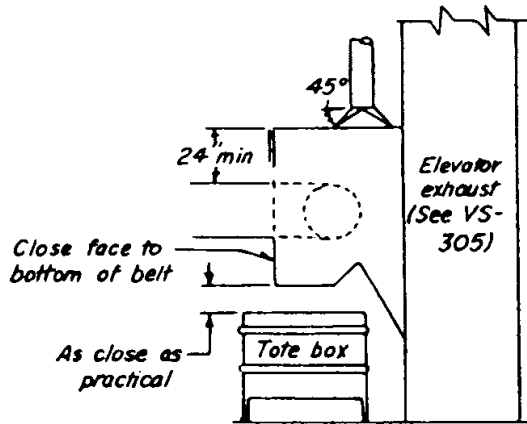
* In cases of extra wide wheels, use wheel width to determine exhaust volume.

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BUFFING AND POLISHING



1. Conveyor transfer less than 3' fall. For greater fall provide additional exhaust at lower belt. See 3 below.



2. Conveyor to elevator with magnetic separator.

DESIGN DATA

Transfer points:

Enclose to provide 150-200 fpm indraft at all openings.

Minimum $Q = 350 \text{ cfm/ft belt width}$ for belt speeds under 200 fpm
 $= 500 \text{ cfm/ft belt width}$ for belt speeds over 200 fpm and for magnetic separators

Duct velocity = 3500 fpm minimum
 Entry loss = 0.25VP

Conveyor belts:

Cover belt between transfer points

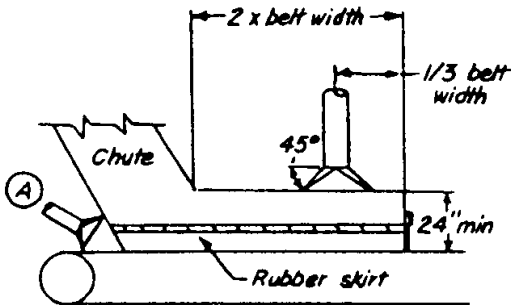
Exhaust at transfer points

Exhaust additional 350 cfm/ft of belt width at 30' intervals. Use 45° tapered connections.

Entry loss = 0.25 VP

Note:

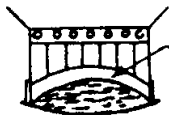
Dry, very dusty materials may require exhaust volumes 1.5 to 2.0 times stated values.



3. Chute to belt transfer and conveyor transfer, greater than 3' fall.

Use additional exhaust at (A) for dusty material as follows:

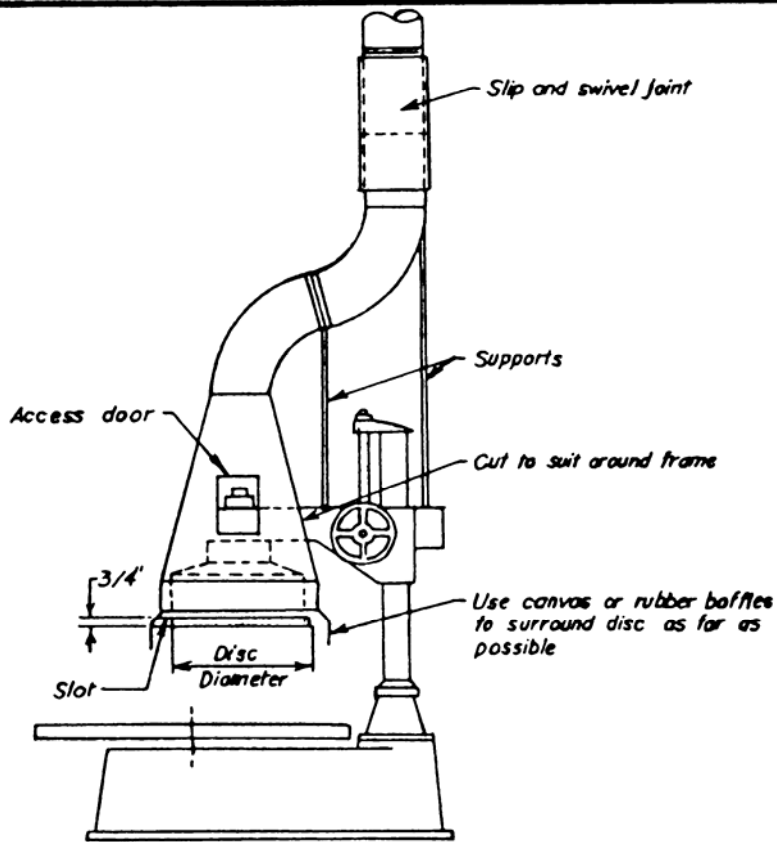
Belt width 12"-36", $Q = 700 \text{ cfm}$
 above 36", $Q = 1000 \text{ cfm}$



Detail of belt opening

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CONVEYOR BELT VENTILATION



Disc diameter	Duct diameter	cfm
up to 20"	6"	900
over 20" to 30"	8"	1600
over 30" to 53"	12"	3500
over 53" to 72"	16"	6300

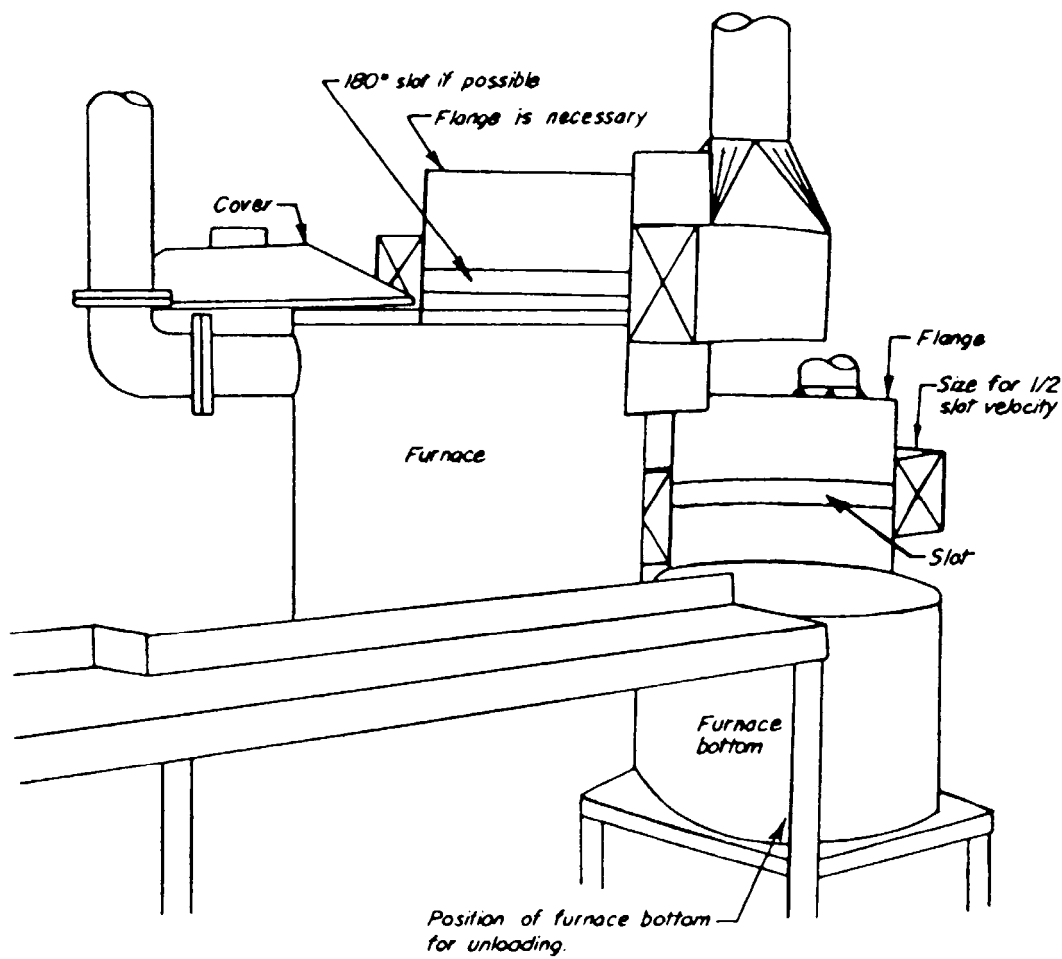
Minimum duct velocity = 4500 fpm branch
 3500 fpm main

Minimum slot velocity = 2000 fpm

Entry loss = 1.0 slot velocity pressure plus 0.40 duct VP

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CORE GRINDER

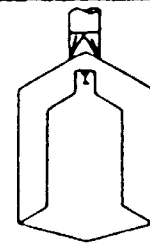


$Q = 175 \text{ cfm/sq ft}$ of furnace top with curved slot
 and flanges.
 Slot velocity = 2000 fpm
 Duct velocity = 3500 fpm
 Entry loss = $1.78 \text{ slot VP} + 0.25 \text{ duct VP}$

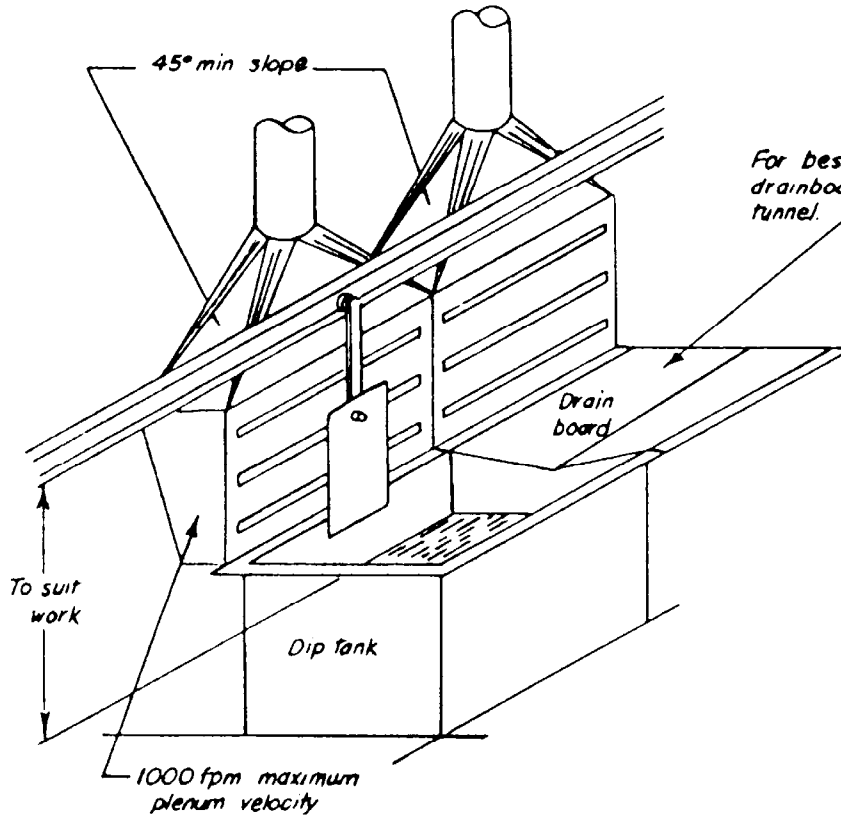
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CRUCIBLE MELTING FURNACE
 HIGH TOXICITY MATERIAL

Locate takeoffs 15' on center
 $Q = 50 \text{ cfm/sqft drain board area}$,
 but not less than 100 fpm indraft
 through openings
 Entry loss = 0.25 duct VP
 Duct velocity = 1 000 - 3000 fpm



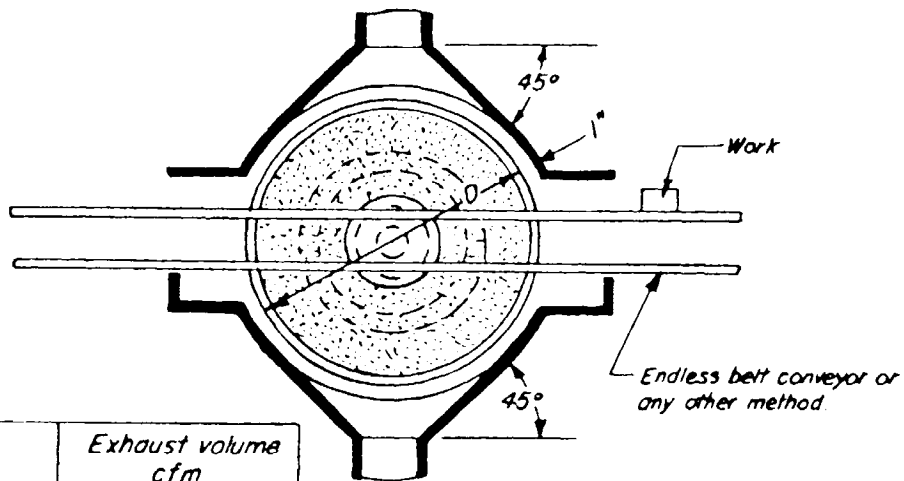
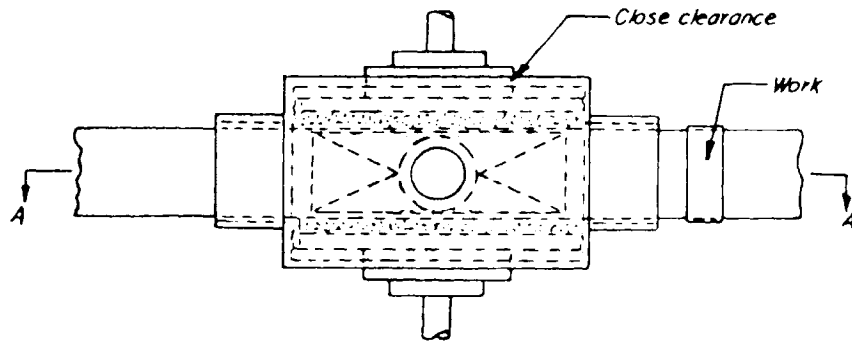
For best results enclose
 drainboard as a drying
 tunnel.



$Q = 125 \text{ cfm/sqft of tank and drainboard area}$
 Slot velocity = 2000 fpm
 Entry loss = 1.78 slot VP + 0.25 duct VP
 Duct velocity = 1 000 - 3000 fpm

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DIP TANK



Section A-A

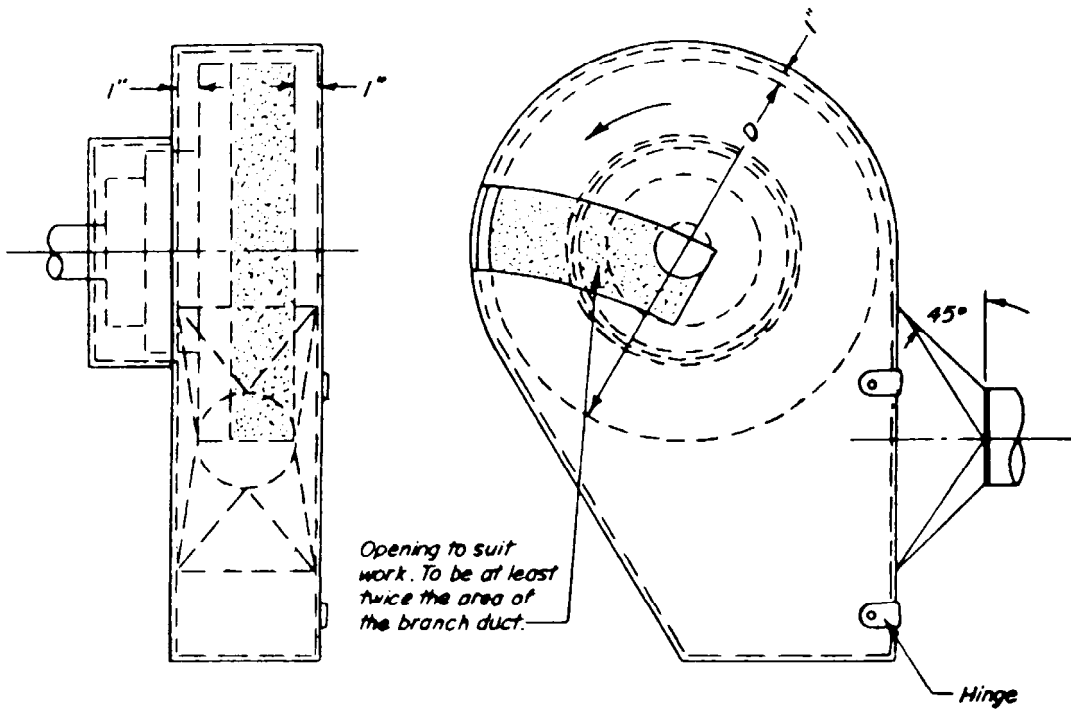
Disc diam. inches	Exhaust volume cfm
up to 19	610
over 19 to 25	880
over 25 to 30	1200
over 30 to 53	1770
over 53 to 72	6280

Note: Practically complete enclosure of discs with machine housing and exhaust from the housing is acceptable.

Minimum duct velocity =
4500 fpm branch,
3500 fpm main.
Entry loss = 0.65 velocity pressure for straight take-off.
= 0.45 velocity pressure for tapered take-off.

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HORIZONTAL DOUBLE-SPINDLE
DISC GRINDER



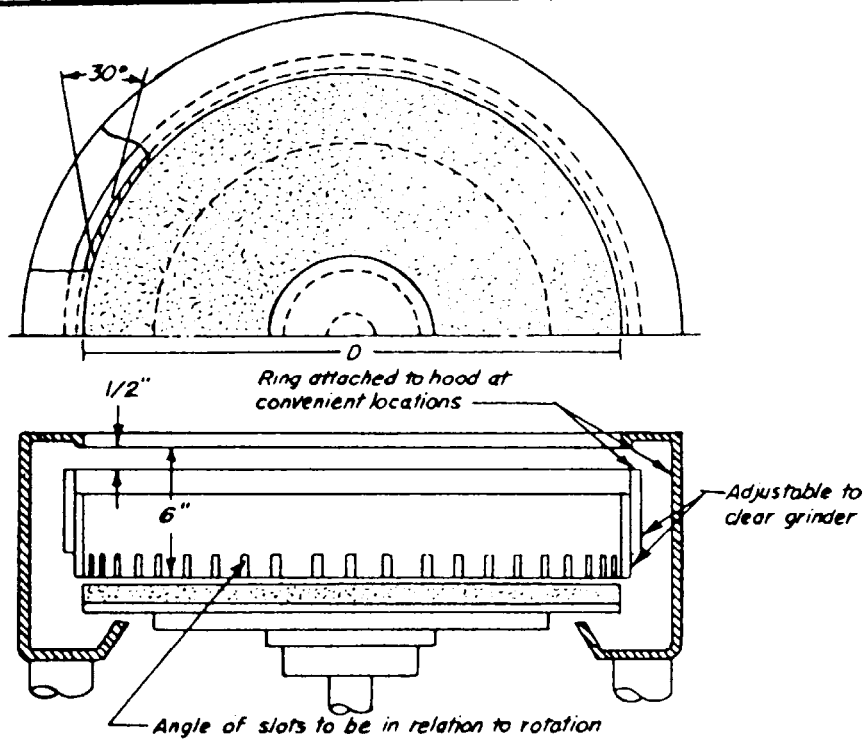
Disc diam., inches	Exhaust volume, cfm
Up to 12	220
over 12 to 19	390
over 19 to 30	610
over 30 to 36	880

Minimum duct velocity = 4500 fpm branch, 3500 fpm main.
 Entry loss = 0.65 VP for straight take-off.
 = 0.45 VP for tapered take-off.

Note: If best practical hood is a poor enclosure, increase exhaust volume accordingly.

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HORIZONTAL SINGLE-SPINDLE
 DISC GRINDER



Disc diam, inches	1/2 or more of disc covered		Disc not covered	
	No.*	Exhaust, cfm	No.*	Exhaust, cfm
up to 20	1	500	2	780
over 20 to 30	2	780	2	1480
over 30 to 53	2	1770	4	3530
over 53 to 72	2	3140	5	6010

* Number of exhaust outlets around periphery of hood; or equal distribution provided by other means.

Slot velocity = 2000 fpm

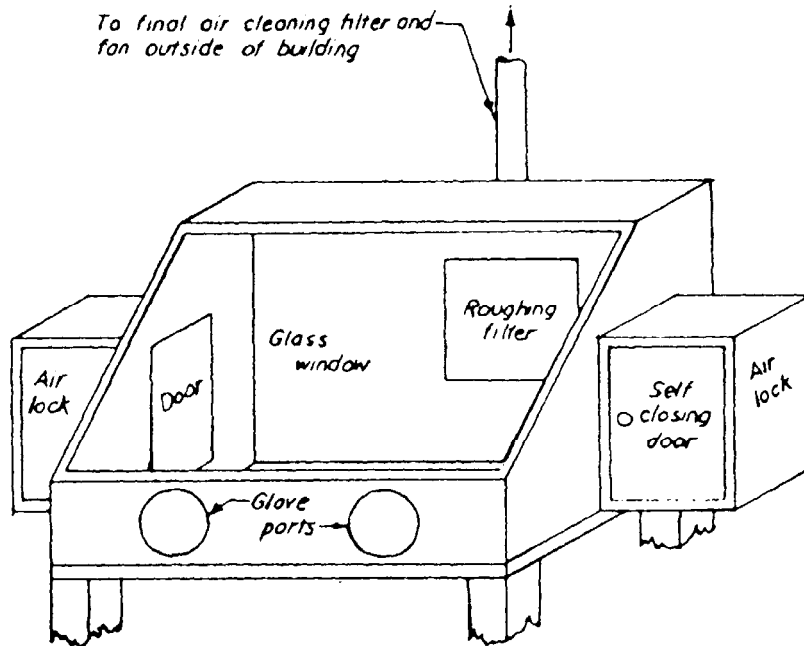
Duct velocity = 4500 fpm minimum in branch

3500 fpm minimum in main

Entry loss = 1.0 slot VP + 0.5 branch duct VP

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VERTICAL SPINDLE DISC
GRINDER



$Q = 50 \text{ cfm/sq ft}$ of open door area and $0.25'' \text{ SP}$ on a closed system.

Entry loss = 0.50 VP

Duct velocity = $2000-4000 \text{ fpm}$

Filters: 1. Inlet air filters in doors.

2. Roughing filter at exhaust connection to hood

3. Final air cleaning filter.

All facilities totally enclosed in hood. Exterior controls may be advisable.

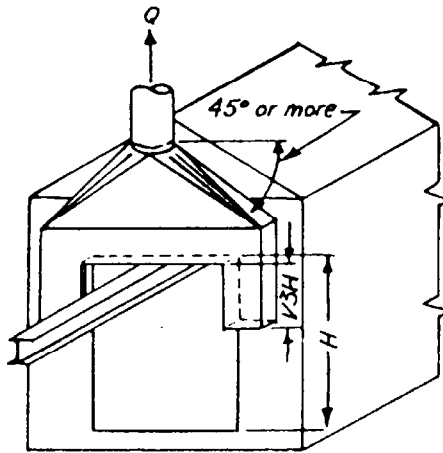
Arm length rubber gloves are sealed to glove port rings.

Strippable plastic on interior and air cleaner on exhaust outlet may be used to facilitate decontamination of the system.

Filter units may be installed in the doors to allow the air flow necessary for burners etc.

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DRY BOX OR GLOVE HOOD
FOR HIGH TOXICITY & RADIOACTIVE
MATERIALS

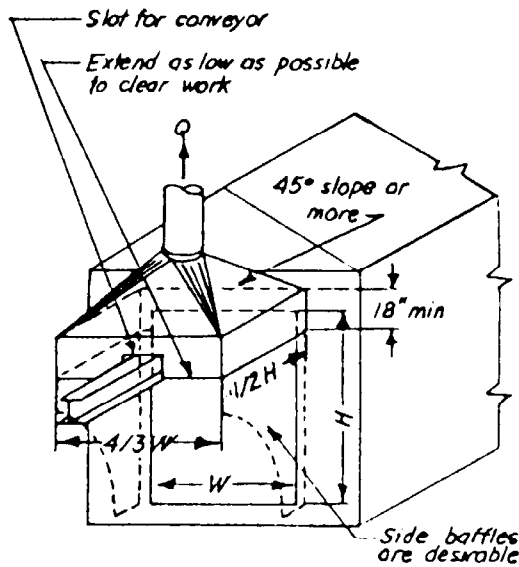


SLOT TYPE

$Q = 100 \text{ cfm/sq ft door plus } 1/2$
products of combustion
 Entry loss = 1.0 slot VP plus
 0.25 duct VP
 Duct velocity = 1000-3000 fpm

Size plenum for
 500 fpm maximum

Slot on three sides size for 1000 fpm
 Locate on inside or outside of door.



CANOPY TYPE

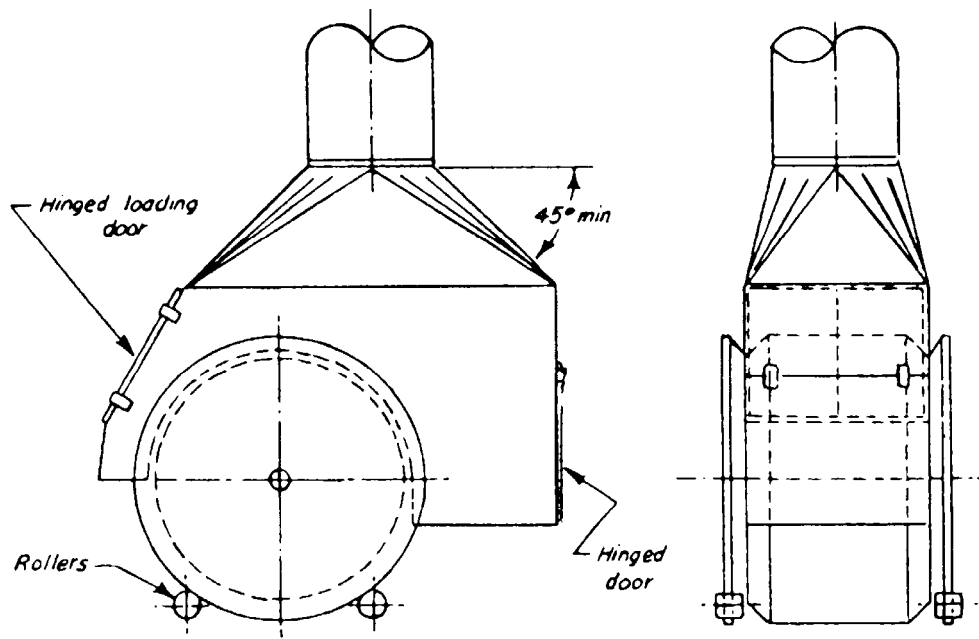
$Q = 200 \text{ cfm/sq ft of hood face}$
plus } 1/2 \text{ products of combustion}
 Entry loss = 0.25 VP
 Duct velocity = 1000-3000 fpm

Note:
 For dryers, include volume of
 water vapor liberated.

Note:
 Hoods at each end of oven. Reduce size of doors as
 much as possible. Separate vent must be added for products
 of combustion.

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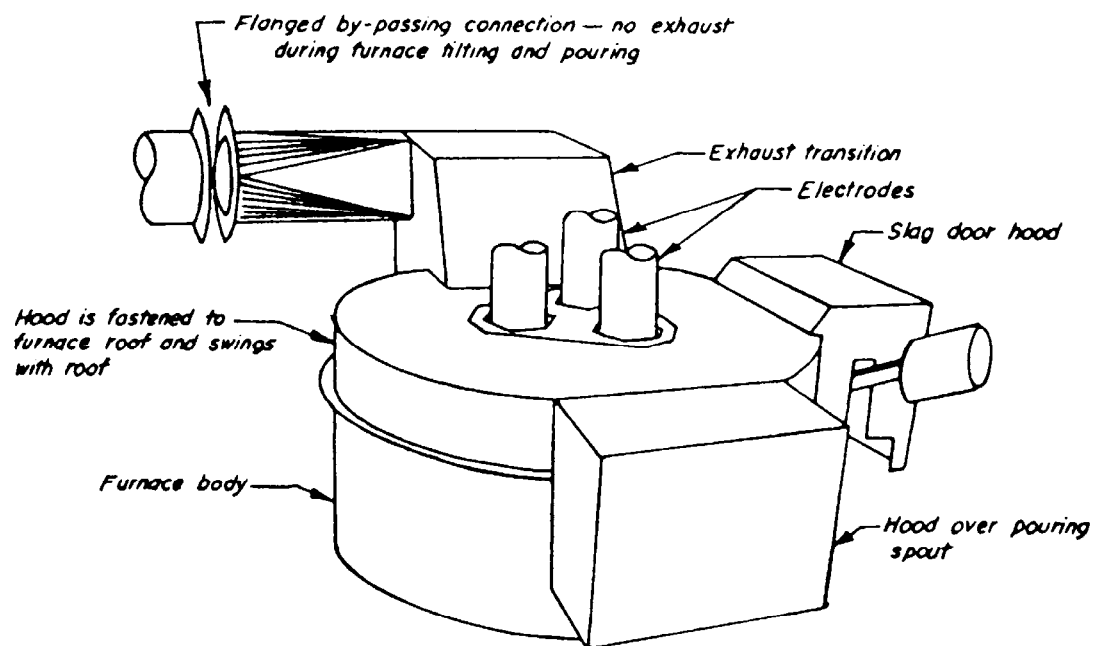
DRYING OVEN VENTILATION



$Q = 400 \text{ cfm/ft of opening}$
 Duct velocity = 1000-3500 fpm*
 Entry loss = 1.78 VP slot + 0.25 VP duct
 * For horizontal runs, transport velocity
 is necessary

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ELECTRIC ROCKING FURNACE



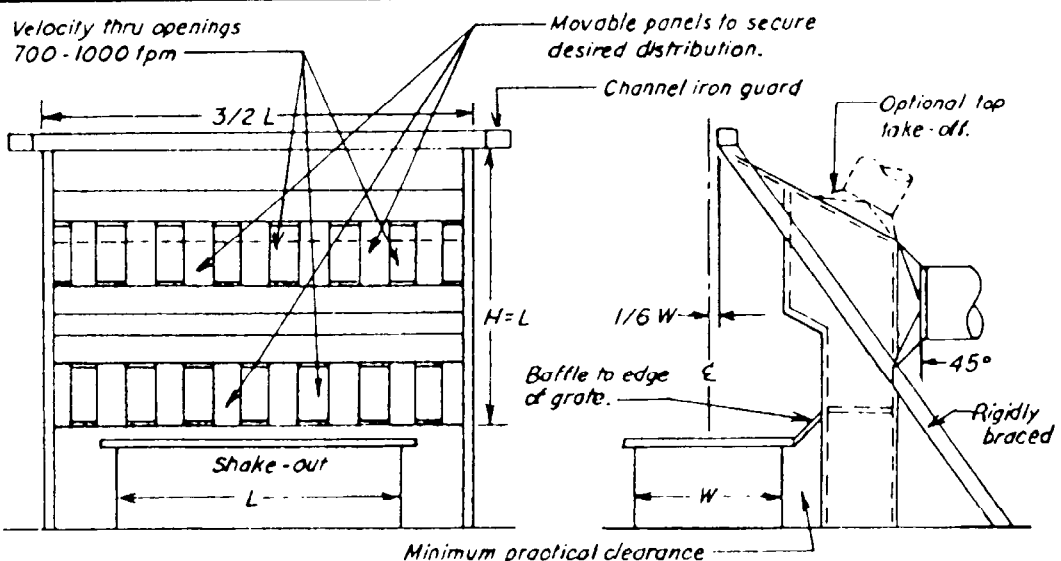
For Q , SP and operating temperature, consult manufacturers
 Approximate exhaust volume = 2500 cfm/ton of charge⁽¹⁾⁽²²⁾⁽²³⁾

Alternate designs:

1. Other exhaust designs utilize direct furnace roof tap. For details consult manufacturers.
2. Canopy hood exhaust can be utilized but requires large exhaust air volumes; $Q = 200$ cfm/sq ft of open area between furnace and lower edge of canopy.

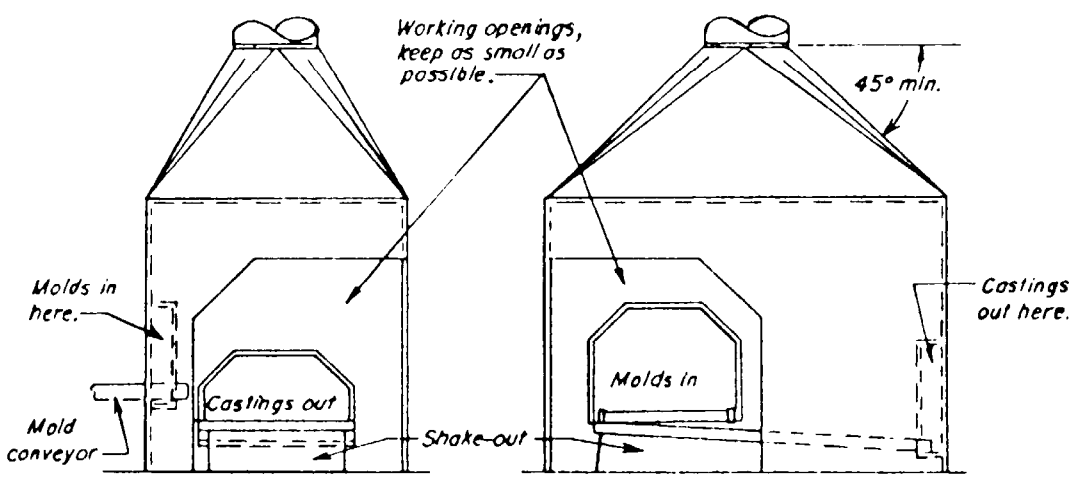
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HOOD FOR TOP ELECTRODE
 MELTING FURNACE



SIDE-DRAFT HOOD

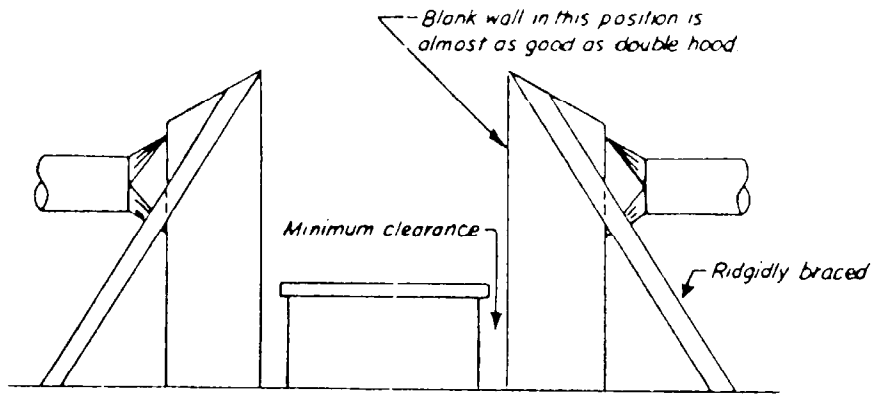
Duct velocity = 3500 fpm minimum.
Entry loss = 1.78 slot VP + 0.25 duct VP



ENCLOSING HOOD

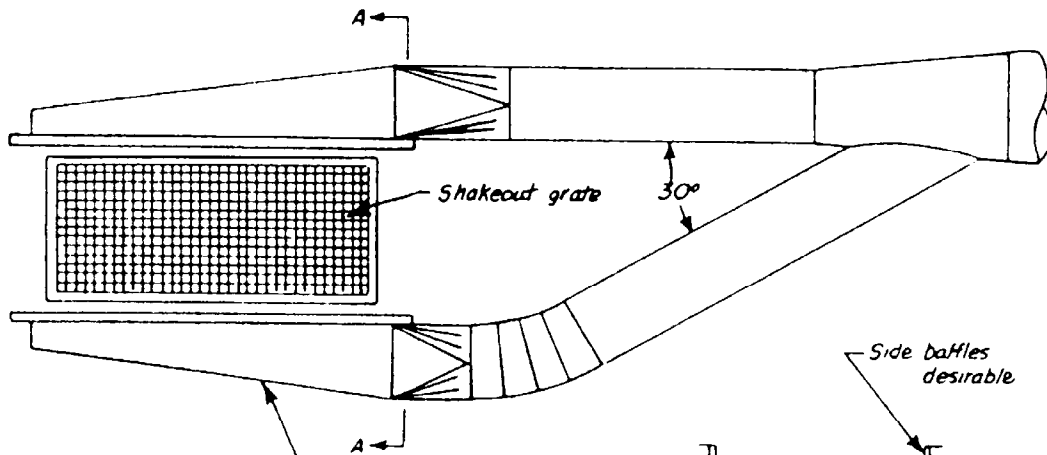
Provides best control with least volume.
Duct velocity = 3500 fpm minimum.
Entry loss = 0.25 VP

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<p>FOUNDRY SHAKEOUT</p>

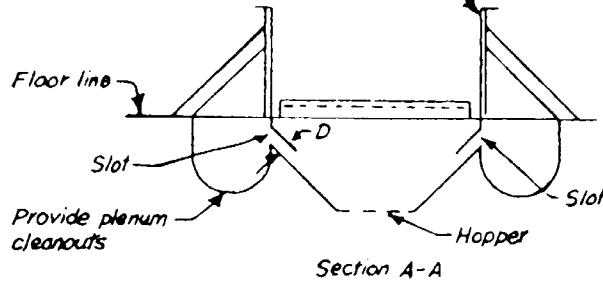


DOUBLE SIDE-DRAFT

Proportions same as single side-draft hood except for overhang.



Plenum chamber and slots full length of shakeout—in tunnel.



DOWNDRAFT HOOD

Slots sized for 1500 - 2000 fpm
 Duct velocity = 4000 fpm minimum
 Size D for 1000 fpm or less.
 Entry loss = 1.78 slot VP plus fittings
 For cool castings only
 Difficult to prevent plugging or excess
 fines removal

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FOUNDRY SHAKEOUT

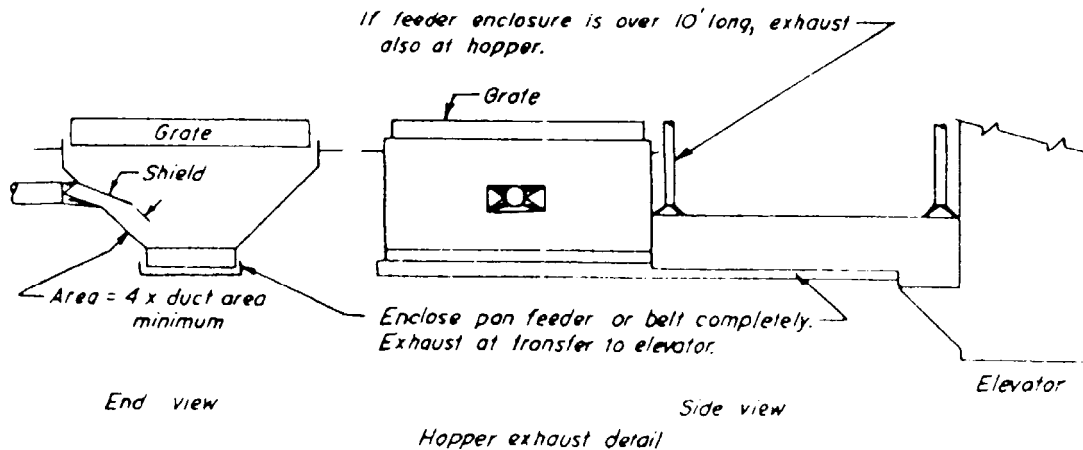
*Shakeout exhaust, minimum**

<i>Type of hood</i>	<i>Hot castings</i>	<i>Cool castings</i>
<i>Enclosing**</i>	<i>200 cfm/sq ft opening At least 200 cfm/sq ft grate area</i>	<i>200 cfm/sq ft opening At least 150 cfm/sq ft grate area</i>
<i>Enclosed two sides and 1/3 top area**</i>	<i>300 cfm/sq ft grate area</i>	<i>275 cfm/sq ft grate area</i>
<i>Side hood (as shown or equivalent)**</i>	<i>400-500 cfm/sq ft grate area</i>	<i>350-400 cfm/sq ft grate area</i>
<i>Double side hood**</i>	<i>400 cfm/sq ft grate area</i>	<i>300 cfm/sq ft grate area</i>
<i>Downdraft***</i>	<i>Not recommended 600 cfm/sq ft grate area</i>	<i>200-250 cfm/sq ft grate area</i>

- * Choose higher values when*
- (1) Castings are quite hot*
 - (2) Sand to metal ratio is low*
 - (3) Cross-drafts are high*

*** Shakeout hoppers require exhaust with 10% of the total exhaust volume.*

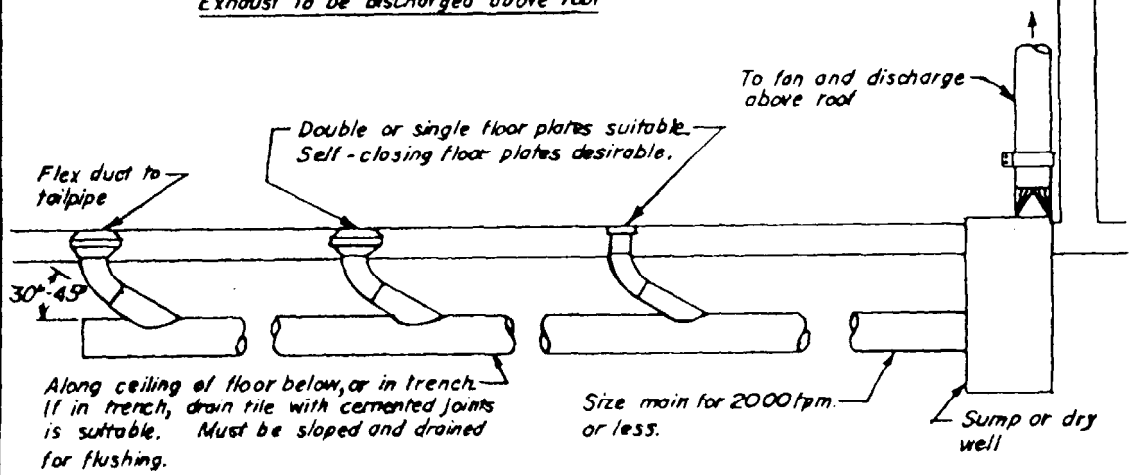
**** Grate area must be greater than flask area. If castings and sand completely cover grate, ventilation will not function.*



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FOUNDRY SHAKEOUT

Note: In ventilating a garage use either the overhead or under floor system.
Exhaust to be discharged above roof

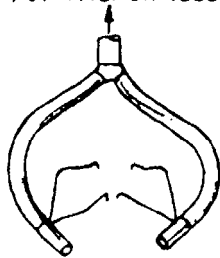


**UNDER FLOOR SYSTEM
 EXHAUST REQUIREMENTS ***

Type	cfm per vehicle	Flex duct ID (min)
Automobiles and trucks up to 200 hp	100	3"
Automobiles and trucks over 200 hp	200	4" * *
Diesel	400	4 1/2"

* On dynamometer test rolls
 Automobiles and light duty trucks = 2 x cfm above
 Heavy duty trucks = 1200 cfm minimum.

** 3" dia permissible for short runs with proper fan.
 For friction loss of flexible duct; consult manufacturers' data.



Use adapters on dual exhausts and special tailpipes.



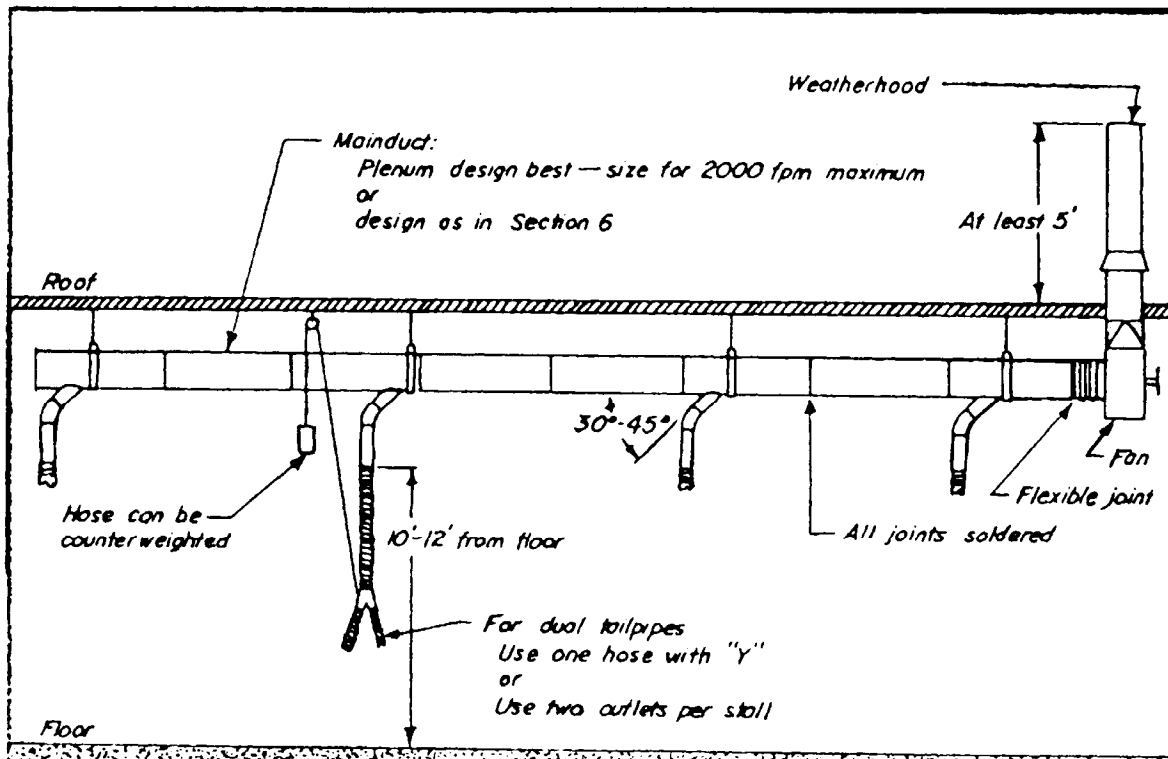
Dilution ventilation is necessary for cars
 In motion or idling outside of stalls.

DILUTION RATES:

5000 cfm/running automobile
 10,000 cfm (or more)/ truck.
 100 cfm/horsepower for diesel.

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**SERVICE GARAGE VENTILATION
 UNDERFLOOR**



Vehicle horsepower	cfm/vehicle	Flexible duct diam	Branch connection
Up to 200 hp	100	3"	4"
Over 200 hp	200	4"	4"
Diesel	400	4 1/2"	6"

On dynamometer test rolls

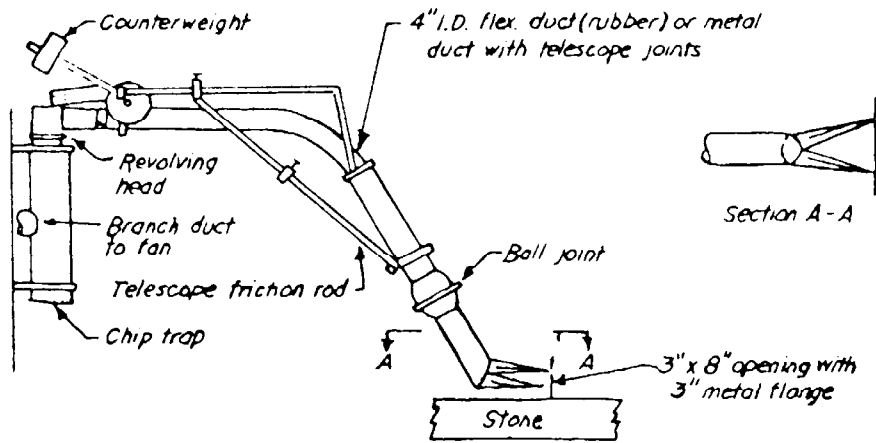
Automobiles and light duty trucks = 2 x cfm above

Heavy duty trucks = 1200 cfm minimum

For friction loss of flexible duct, consult manufacturers' data

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**SERVICE GARAGE VENTILATION
OVERHEAD**

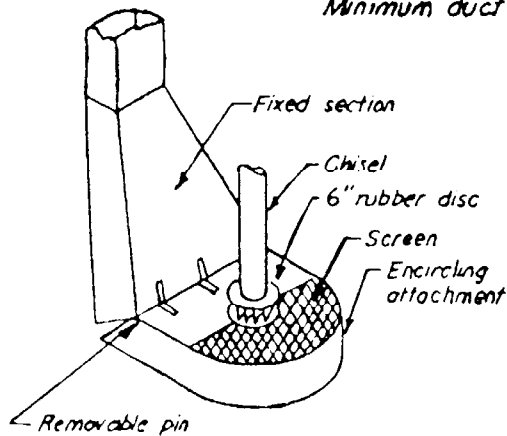


PNEUMATIC HAND TOOLS

*Q = 540 cfm, tool 10" max distance from hood.
 Resistance of unit = 8" wg at branch duct connection
 Minimum duct velocity = 4000 fpm*

*Note:
 Work may be done in a booth similar to spray booth; face velocity = 200 fpm
 See VS-101*

Abrasive blasting to be done in a room or cabinet; 500 fpm at all openings. See "Abrasive Blasting"



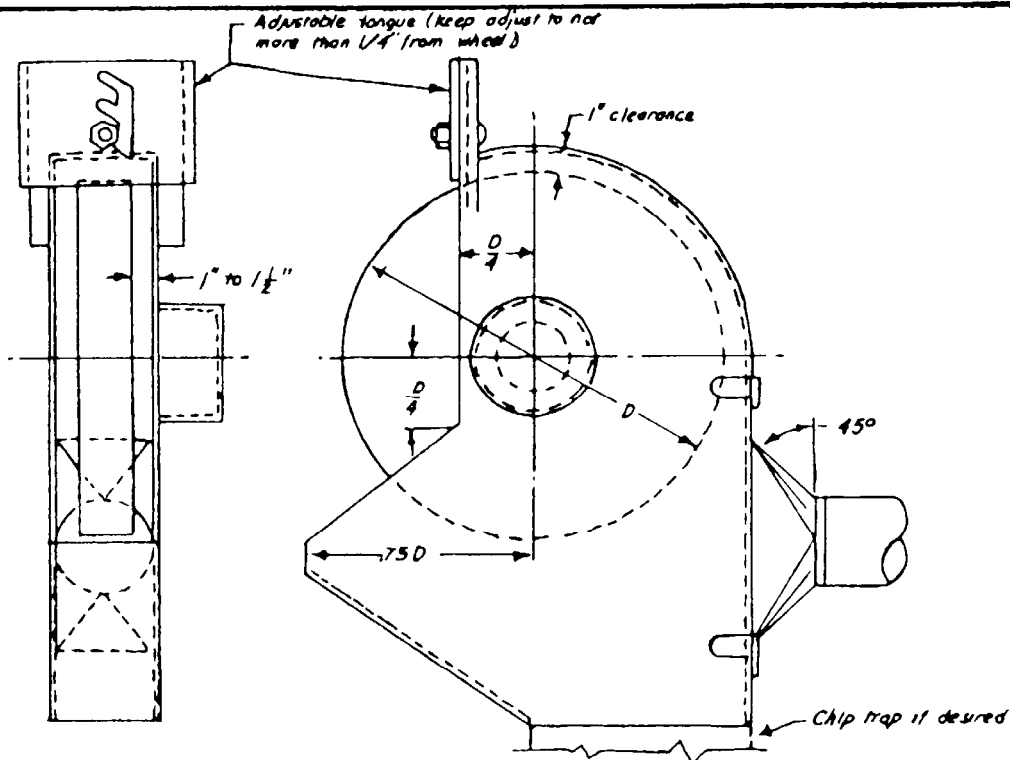
SURFACING MACHINE HOOD

<i>Tool diam</i>	<i>cfm</i>	<i>Branch diam</i>
<i>Up to 2-3/8"</i>	<i>500</i>	<i>4"</i>
<i>2-3/8" to 2-7/8"</i>	<i>1000</i>	<i>5-1/2"</i>

Entry loss = 1.0VP

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GRANITE CUTTING AND FINISHING



EXHAUST VOLUME, CFM

Wheel diam inches	Wheel width inches	Good enclosure*	Poor enclosure
to 5	1	220	220
over 5 to 10	1 1/2	220	300
over 10 to 14	2	300	500
over 14 to 16	2	390	610
over 16 to 20	3	500	740
over 20 to 24	4	610	880
over 24 to 30	5	880	1200
over 30 to 36	6	1200	1570

* No more than 25% of wheel exposed.

Minimum duct velocity = 4500 fpm in branch

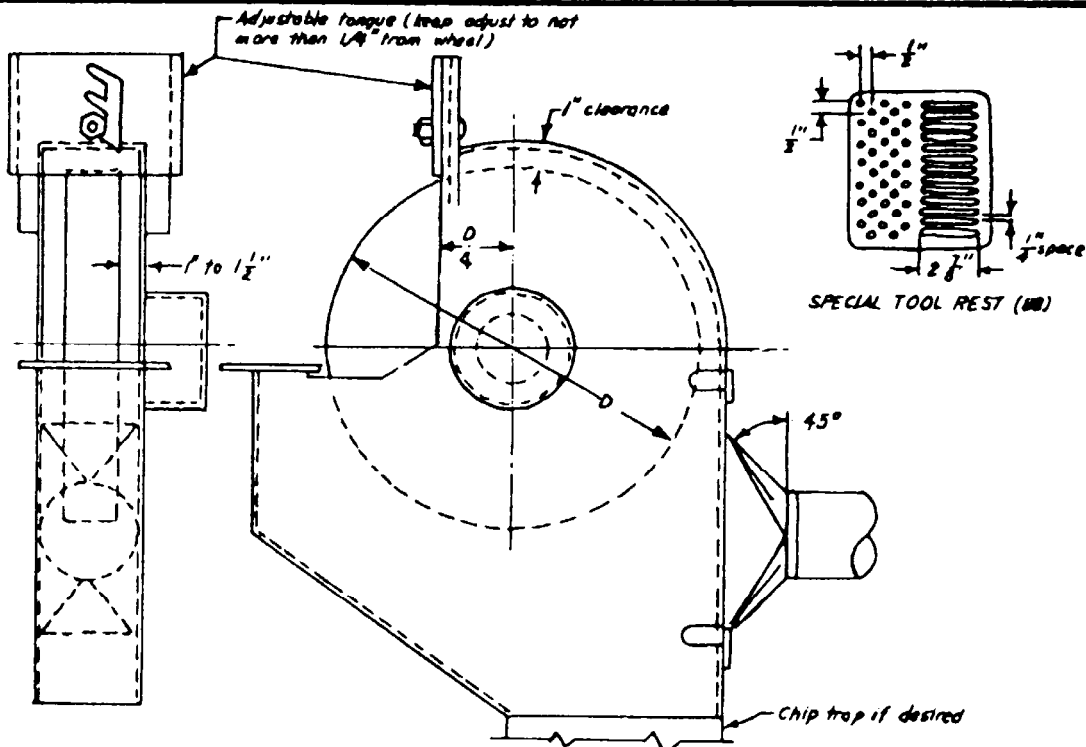
3500 fpm in main

Entry loss = 0.65 VP for straight takeoff

0.40 VP for tapered takeoff

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GRINDER WHEEL HOOD
SPEEDS BELOW 6500 sfm



EXHAUST VOLUME, CFM

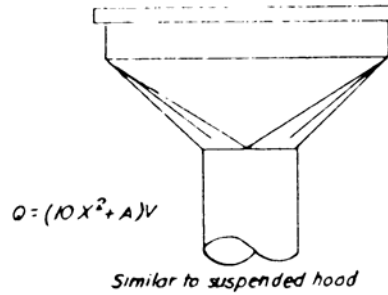
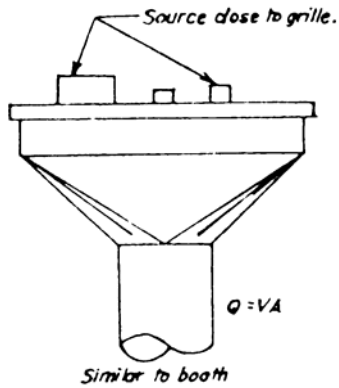
Wheel diam inches	Wheel width inches	Good enclosure *	Poor enclosure
to 5	1	220	390
over 5 to 10	1 1/2	390	610
over 10 to 14	2	500	740
over 14 to 16	2	610	880
over 16 to 20	3	740	1040
over 20 to 24	4	880	1200
over 24 to 30	5	1200	1570
over 30 to 36	6	1570	1990

* Special hood and tool rest as shown
 Minimum duct velocity = 4500 fpm in branch
 3500 fpm in main
 Entry loss = 0.65 VP for straight takeoff
 0.40 VP for tapered takeoff

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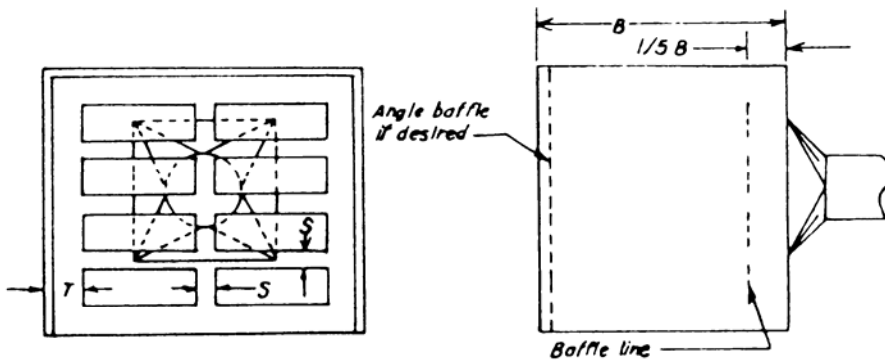
GRINDER WHEEL HOOD
 SPEEDS ABOVE 6500sfm

Source for
from grille.



DOWNDRAFT HOODS

Not recommended for hot or heat-producing operations if downdraft area is large, see "Capture Velocity" in this Section.



BOOTH - TYPE HOODS

$Q = AV$ (A = face area, sq. ft.; V = face velocity, fpm)

Baffles are optional for air distribution; not required if a water wall booth or if other means for distribution is provided.

S varies from 4 inches to 8 inches, depending on size of booth.

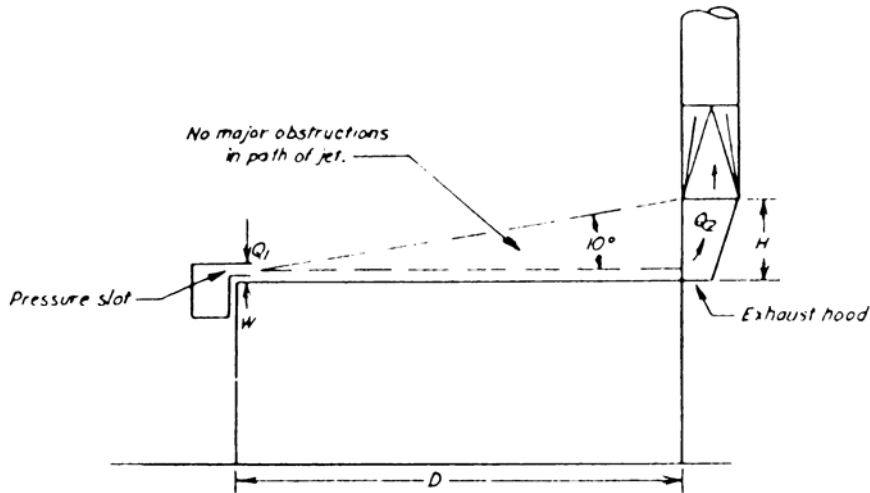
T varies from 6 inches to 12 inches, depending on size of booth.

Increase the number of panels with size of booth.

For booths 3 feet by 3 feet and smaller, provide one panel 6 inches larger than fan diameter.

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HOOD DESIGN DATA



PUSH PULL HOODS

Exhaust Hood

Quantity of air exhausted,
 $Q_2 = 100 \text{ to } 150 \text{ cfm /sq.ft. of tank area, depending on temperature of liquid, cross drafts, agitation, etc.}$

Hood height should be,
 $H = D \times \tan. 10^\circ.$
 $= 0.18D$

Pressure Slot

Quantity of air supplied,

$$Q_1 = \frac{1}{D \times E} \times Q_2$$

where; D = length of throw, feet
 E = entrainment factor.

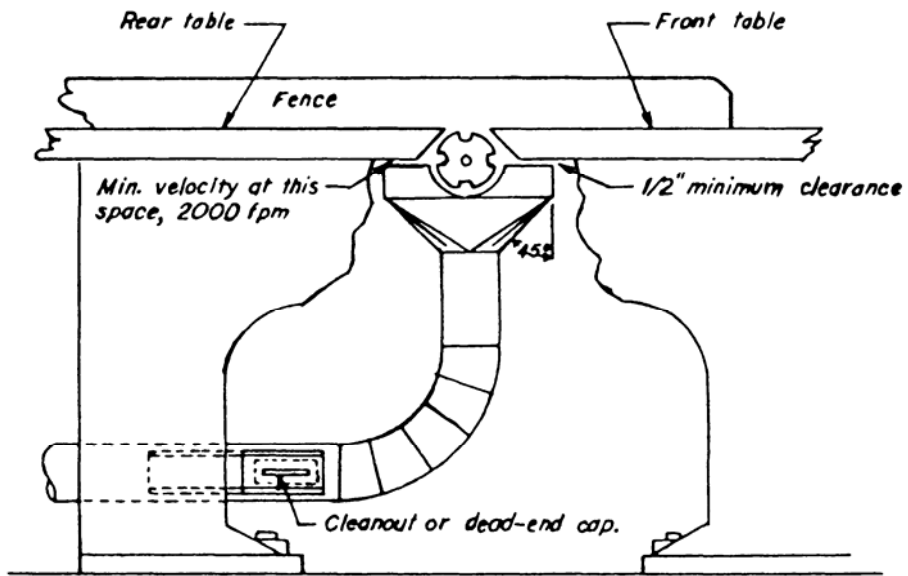
Throw length, D, feet	Entrainment factor, E
0 - 8	2.0
8 - 16	1.4
16 - 24	1.0
over 24	0.7

Slot width W should be designed for a velocity of 1000 to 2000 f.p.m.

Design such systems so they can be easily modified or adjusted to obtain desired results.

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HOOD DESIGN DATA

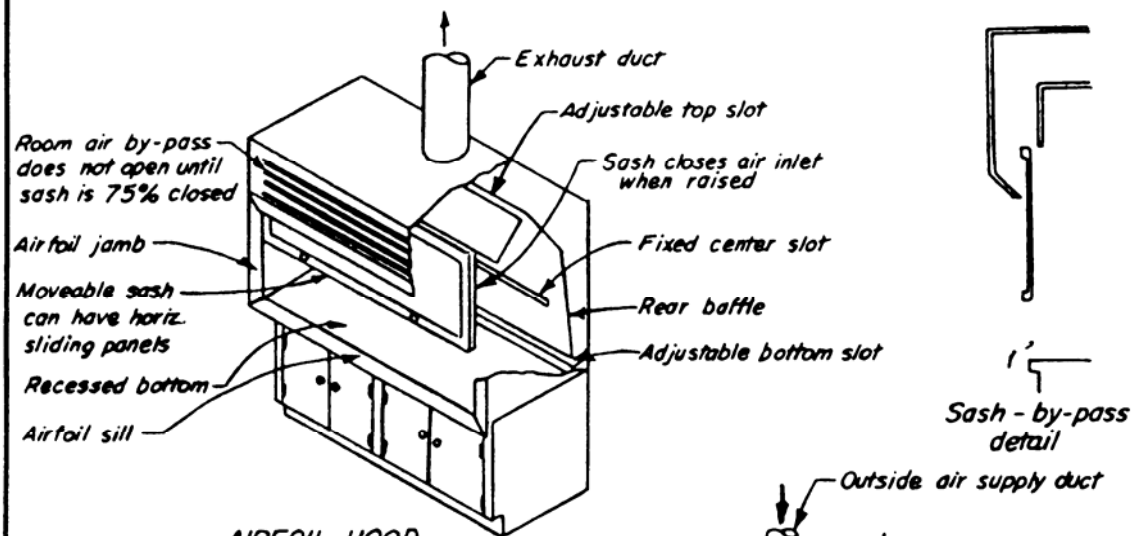


Knife length, inches	Exhaust volume, cfm
Up to 6 incl.	350
over 6 to 12 incl.	440
over 12 to 20 incl.	550
over 20	800

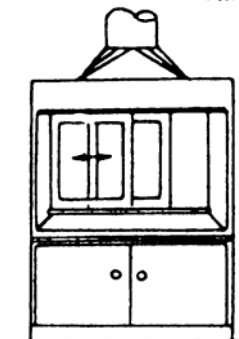
Duct velocity = 3500 fpm
 Entry loss = 1.0 slot VP + 0.25 duct VP

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JOINTERS

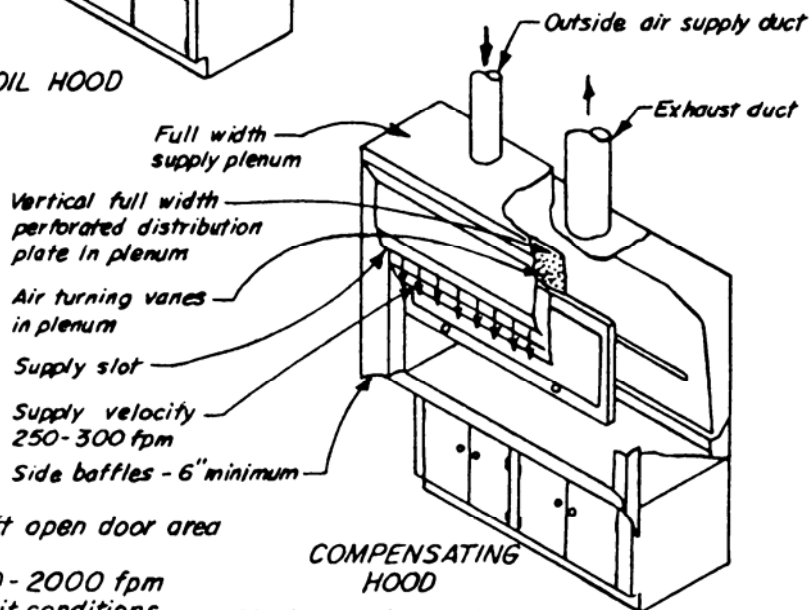


AIRFOIL HOOD



For air conservation use sliding sash

$Q = 100 - 150 \text{ cfm/sq ft open door area}$
 Entry loss = 0.5 VP
 Duct velocity = 1000 - 2000 fpm to suit conditions

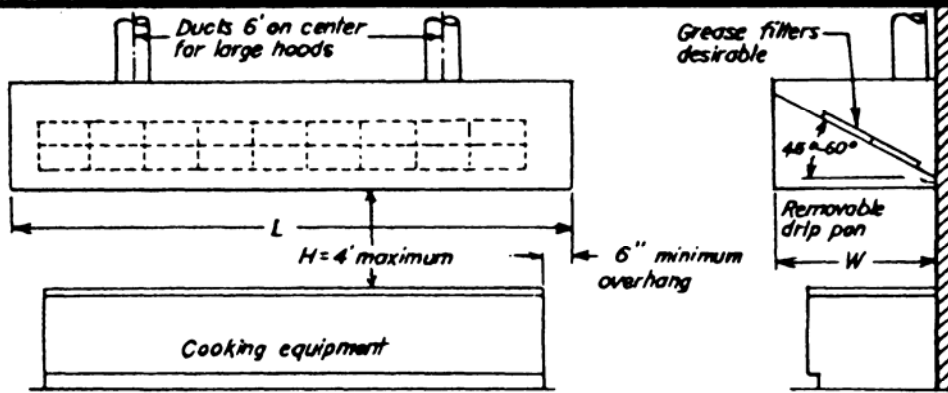


COMPENSATING HOOD

Maximum air supply volume = 50% exhaust volume

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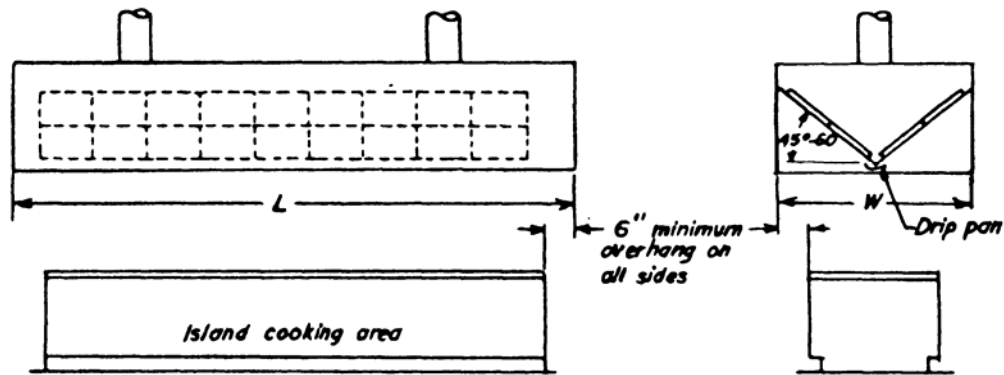
LABORATORY HOOD



HOOD AGAINST WALL

$Q = 80 \text{ cfm/sq. ft of hood area (80 WL)}$
 Not less than $50 \text{ cfm/sq. ft of face area (50 PH)}$
 Duct velocity = $1000 - 4000 \text{ fpm, to suit conditions}$
 Entry loss = $0.25(\text{filter resistance}) + 0.50 \text{ duct VP}$

$P = \text{perimeter of hood}$
 $= 2W + L$



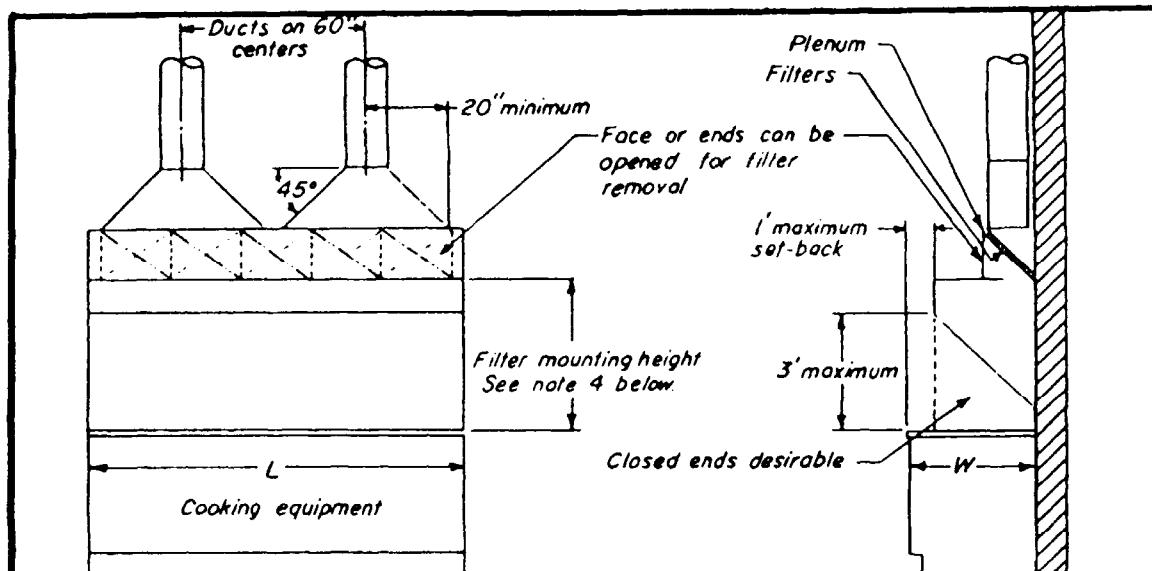
ISLAND TYPE HOOD

$Q = 125 \text{ cfm/sq. ft of hood area (125 WL)}$
 Not less than $50 \text{ cfm/sq. ft of face area (50 PH)}$
 Duct velocity = $1000 - 4000 \text{ fpm, to suit conditions}$
 Entry loss = $0.25(\text{filter resistance}) + 0.50 \text{ duct VP}$

$P = \text{perimeter of hood}$
 $= 2W + 2L$

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KITCHEN RANGE HOODS



LOW SIDE WALL HOOD

$Q = 200 \text{ cfm/lineal ft of cooking surface (200 L)}$
 Duct velocity = 1000-4000 fpm, to suit conditions
 Entry loss = $0.25''(\text{filters}) + 0.25 \text{ duct VP}$

NOTES FOR KITCHEN HOODS

Filters:

1. Select practical filter size.
2. Determine number of filters required from manufacturer's data.
(Usually: 2 cfm maximum exhaust for each sq in of filter area)
3. Install at 45°-60° to horizontal. Never horizontal.
4. Filter mounting height
 - a. No exposed cooking flame — $2\frac{1}{2}'$ minimum to lowest edge of filter.
 - b. Charcoal and similar fires — $4\frac{1}{2}'$ minimum to lowest edge of filter.
 - c. Other exposed fires — $3\frac{1}{2}'$ minimum to lowest edge of filter.
5. Shield filters from direct radiant heat.
6. Provide removable grease drip pan.
7. Clean pan and filters regularly.

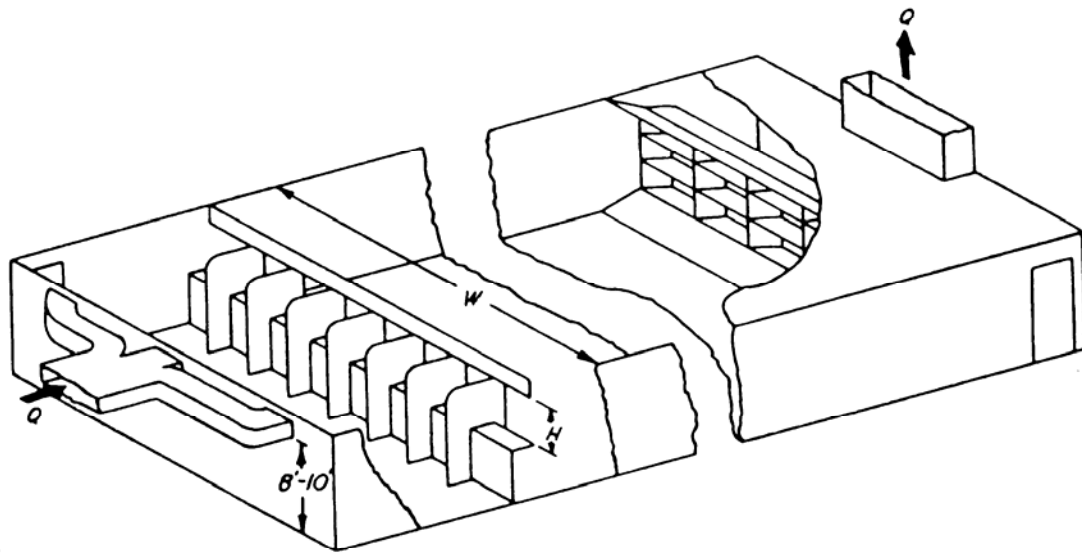
Fan:

Use upblast discharge fan. Downblast is not recommended.

Adjust fan specification
for expected exhaust air
temperature.

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KITCHEN RANGE HOOD



$Q = 50 HW$, but not less than 20 cfm/sq ft
of room cross sectional area

Notes:

Make-up air:

Minimum temperature = 70 F

Sidewall grilles:

Maximum grille velocity = 400 fpm

Discharge air downward

Ceiling diffusers:

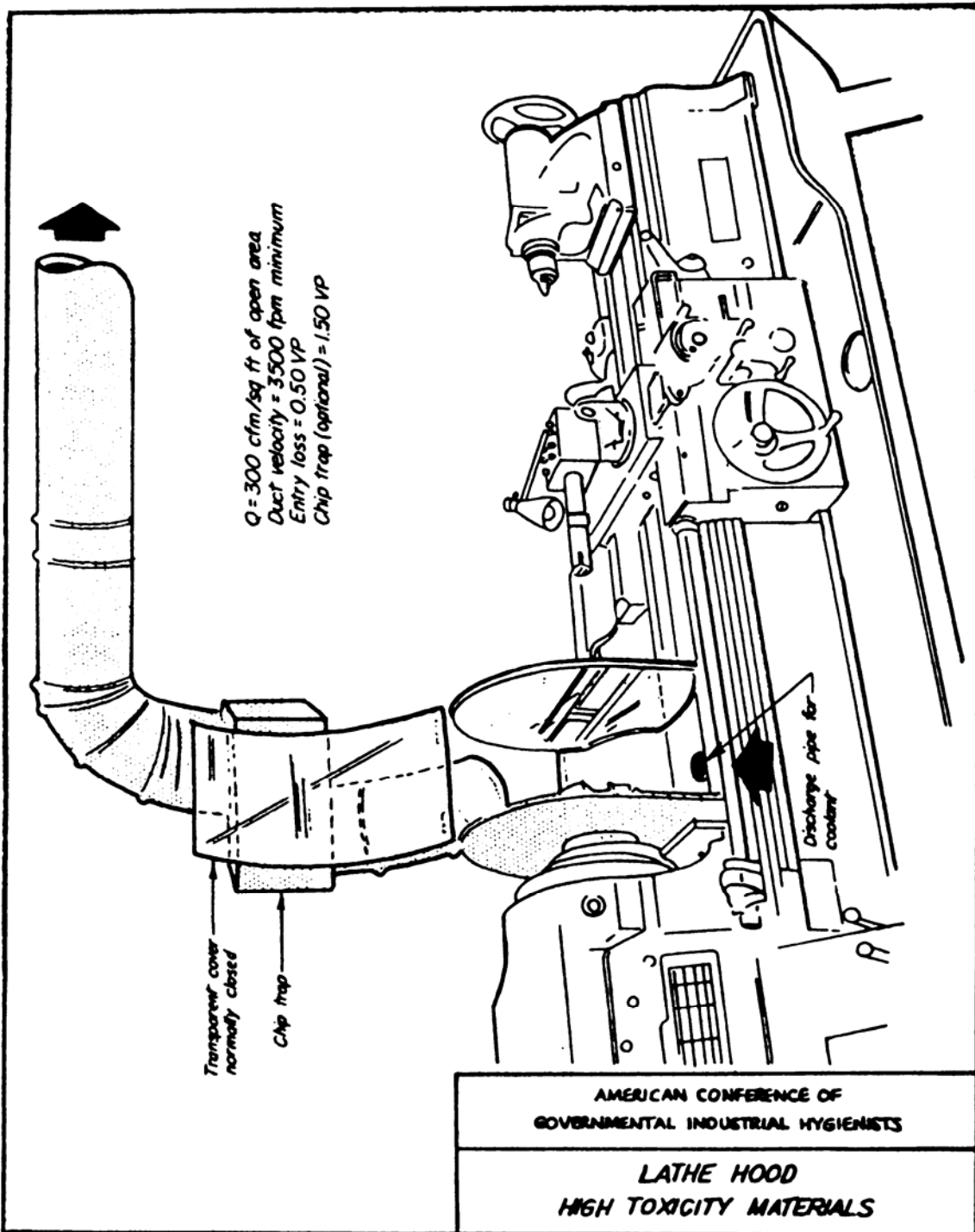
Size for uniform distribution

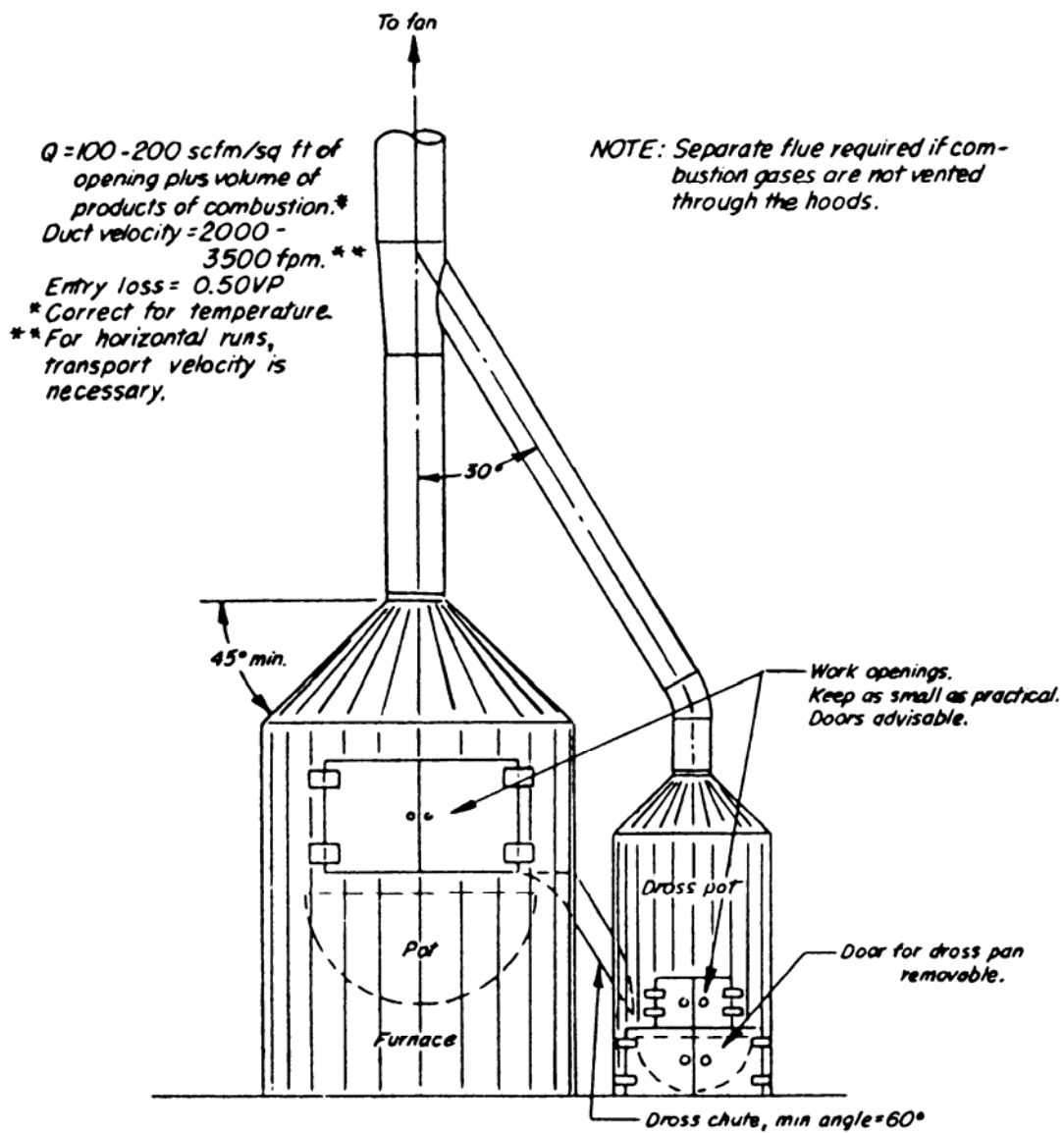
*Approved lead dust respirator is
necessary during clean-up*

*Acoustical material on walls, ceiling and thick fabric
on bench top are recommended*

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**INDOOR PISTOL AND SMALL BORE
RIFLE RANGE VENTILATION**

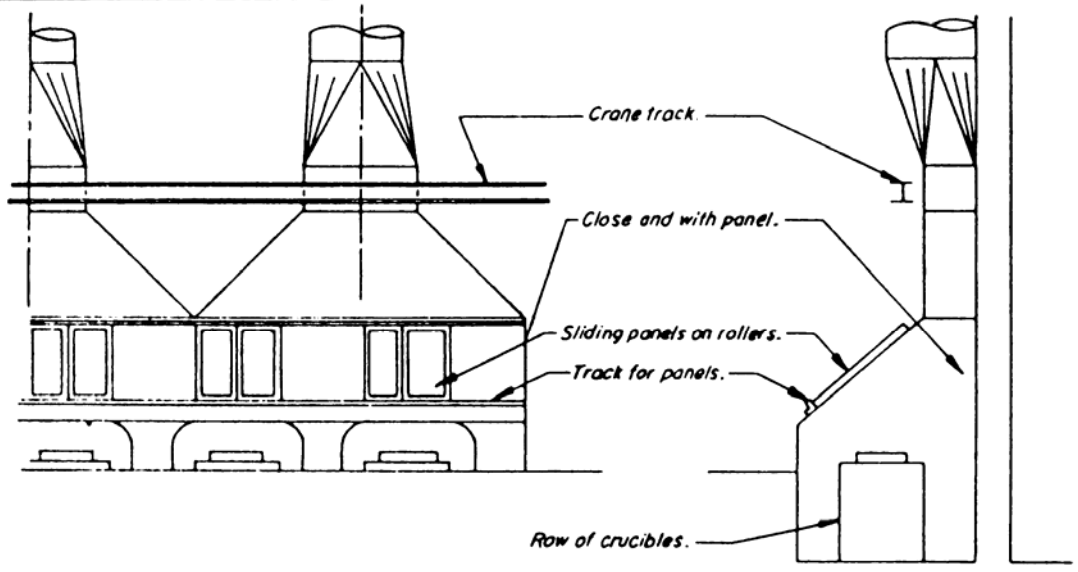




STATIONARY FURNACE OR MELTING POT

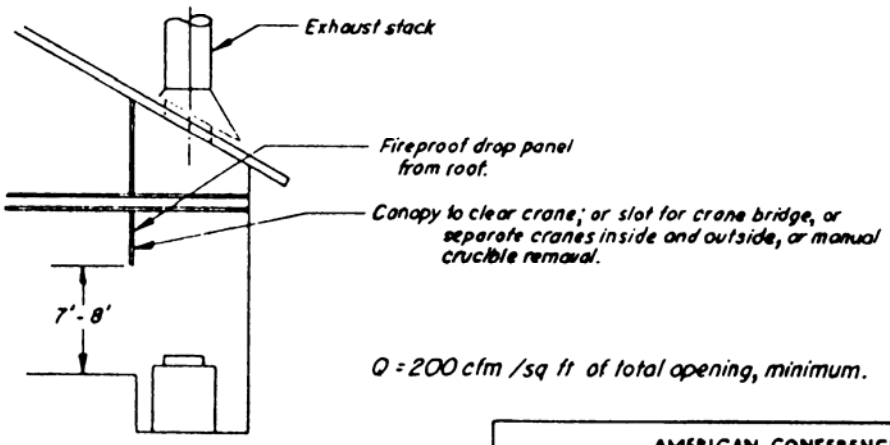
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MELTING POT & FURNACE
 NON-TILT



$Q = 200 \text{ scfm/sq ft}$ of opening including doors,
 plus products of combustion [⊗]
 Entry loss = 0.5VP.
 Duct velocity = 1000 - 3500 fpm ^{**}
[⊗] Correct for temperature.
^{**} For horizontal runs, transport velocity is
 necessary.

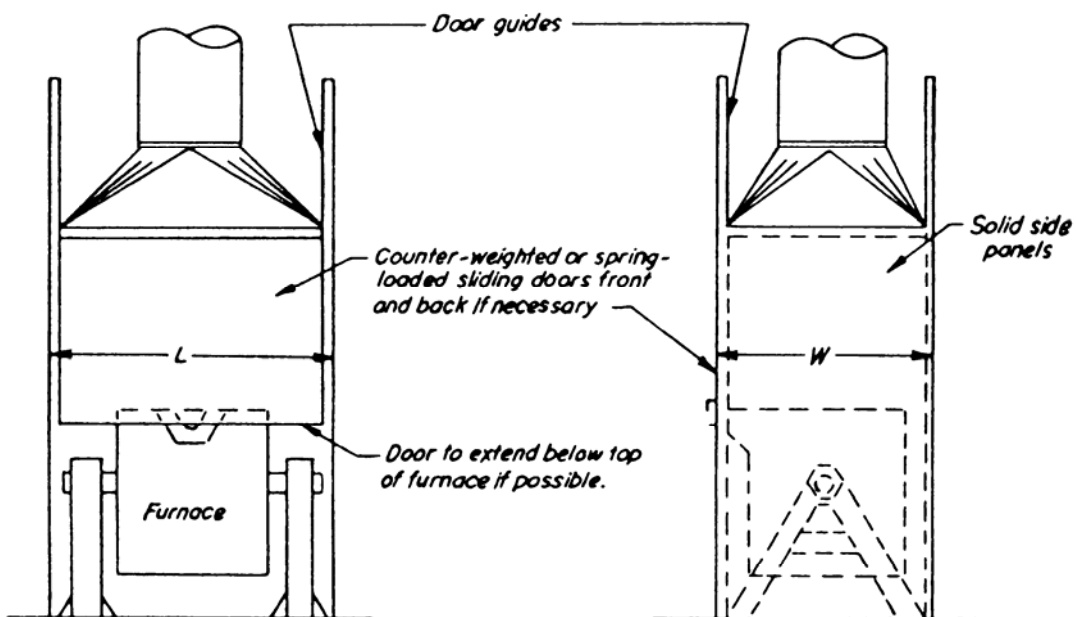
NOTE: Same principle of sliding or swing-
 ing doors is applied to individual
 furnace enclosures.



$Q = 200 \text{ cfm /sq ft}$ of total opening, minimum.

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**MELTING FURNACE
 CRUCIBLE NON-TILT**



$Q = 200 LW$; but not less than
 200 scfm/sq ft of all openings
 with doors open.*

Entry loss = 0.25 VP

Duct velocity = 1000 - 3500 fpm**†

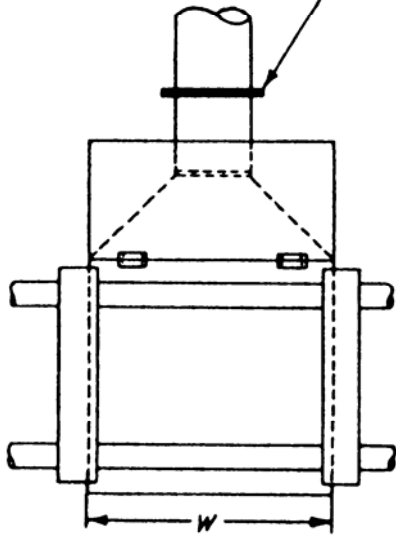
*Correct for temperature and
 combustion products.

**†For horizontal runs, transport
 velocity is necessary.

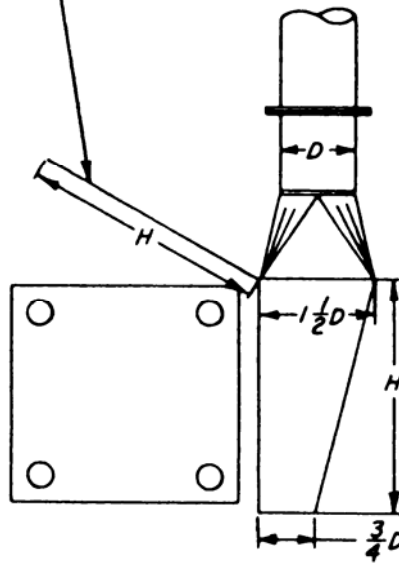
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MELTING FURNACE - TILTING

Flange type fitting for easy removal of hood (if necessary).



Hinged baffle for preventing short circuiting of air.



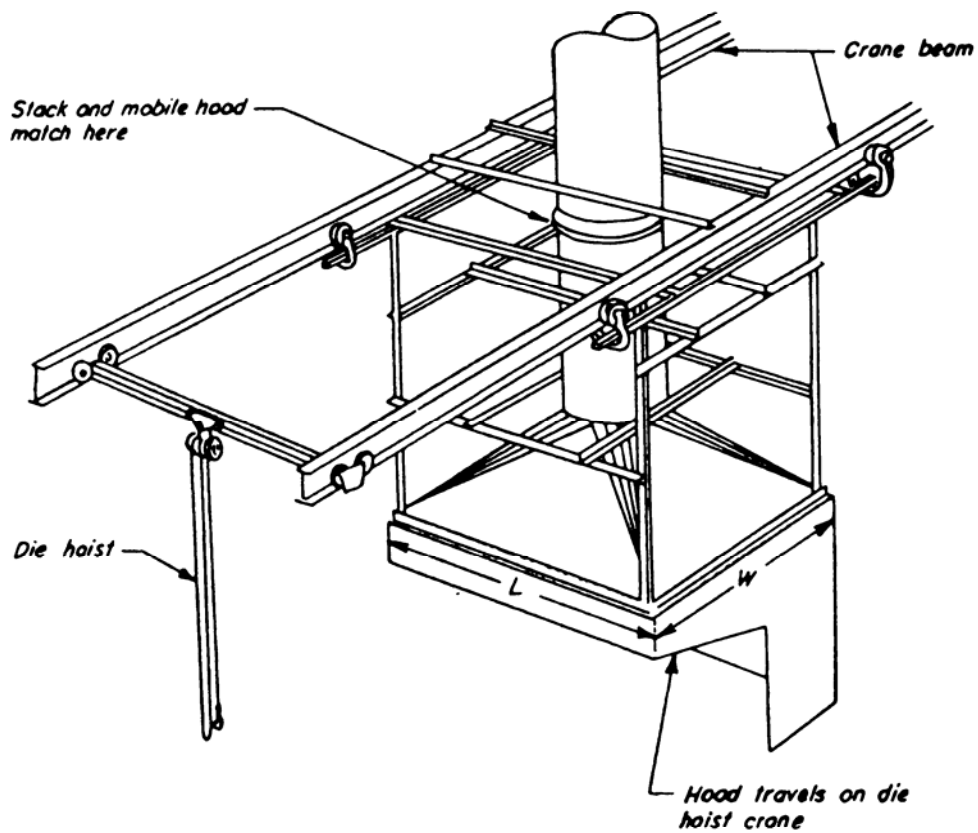
Note: Place hood as close to machine as possible. If more than 4 inches from back of machine, hinged side baffles should be used.

Note: Products of combustion require separate flue or may be vented into hood.

$Q = 300WH$
 Entry loss = 0.25 duct VP
 Duct velocity = 2500 - 3000 fpm

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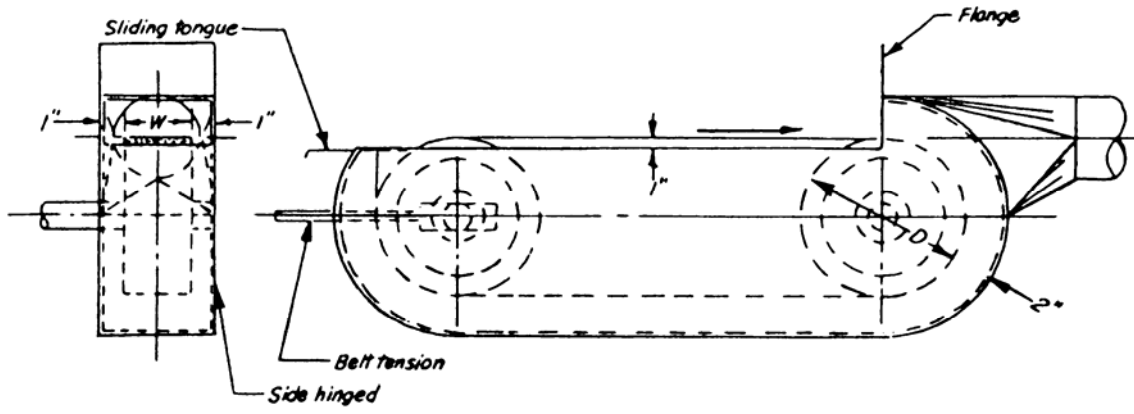
DIE CASTING HOOD



$Q = 300WL$
 Duct velocity = 1000 - 3000 fpm
 Entry loss = 0.25 duct VP

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DIE CASTING MACHINE OR
 MELTING FURNACE

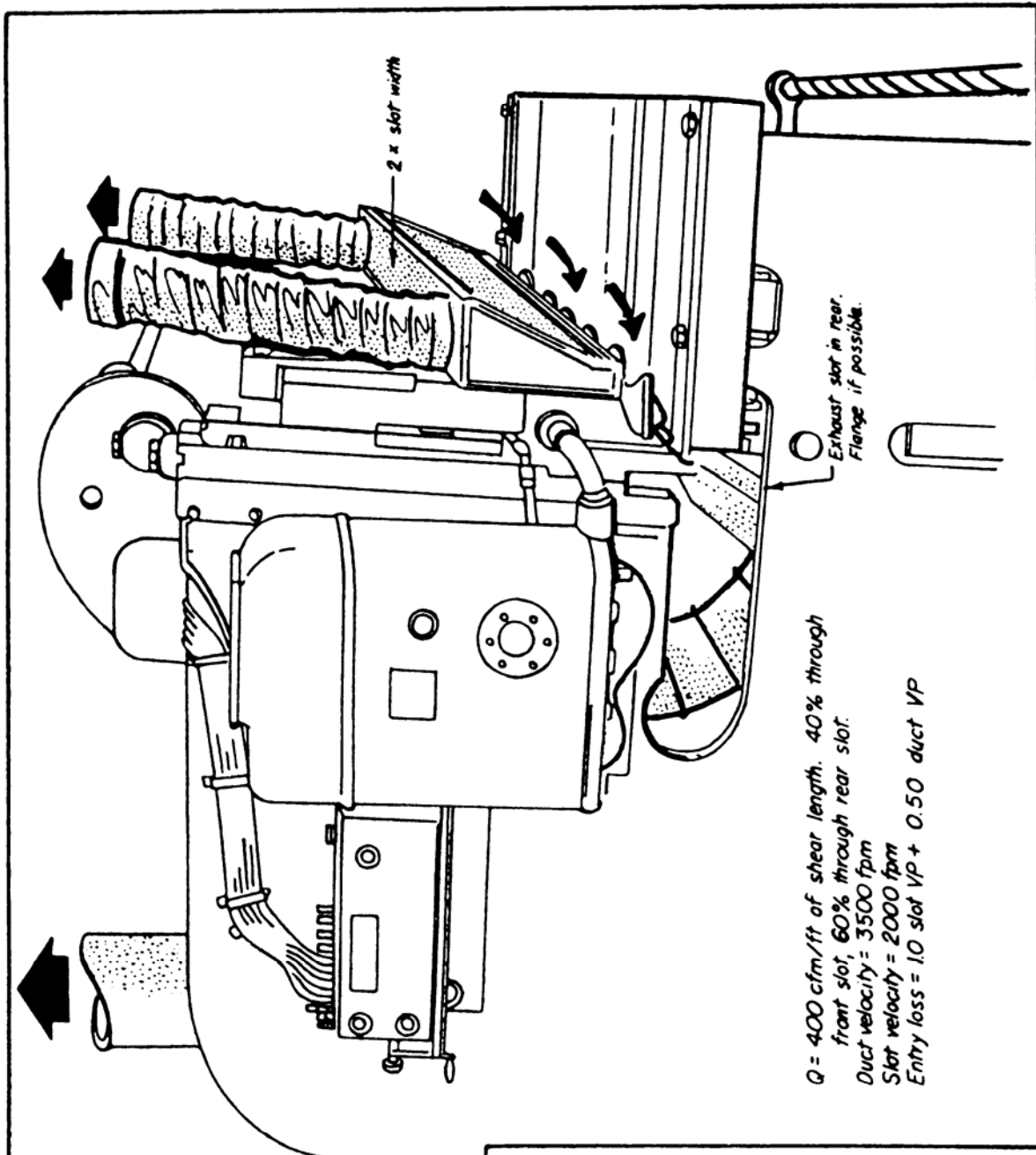


Belt width, inches	Exhaust volume, cfm
up to 3	220
3 to 5	300
5 to 7	390
7 to 9	500
9 to 11	610
11 to 13	740

Minimum duct velocity = 4500 fpm branch, 3500 fpm main.
 Entry loss = 0.65 velocity pressure for straight take-off.
 0.45 velocity pressure for tapered take-off.

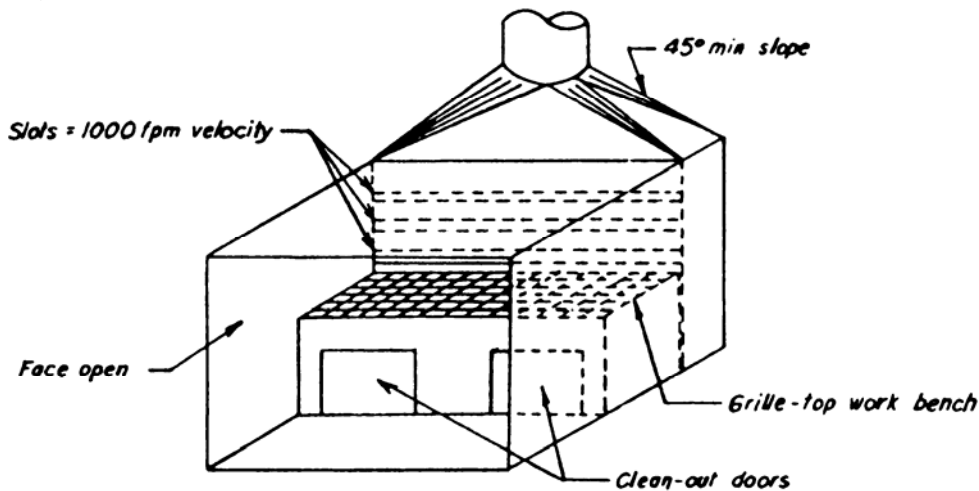
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METAL POLISHING BELT



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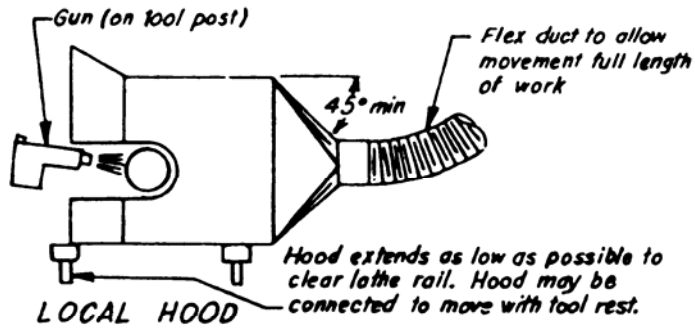
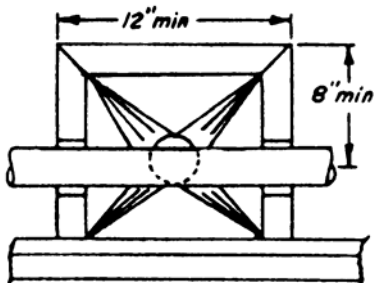
METAL SHEARS
HIGH TOXICITY MATERIALS



METALLIZING BOOTH

Non-toxic: $Q = 125 \text{ cfm/sq.ft. face area}$ Toxic: Provide approved air-supplied respirator. $Q = 200 \text{ cfm/sq.ft. face area}$

Duct velocity = 3000 fpm minimum
 Entry loss = $1.78 \text{ slot VP} + 0.25 \text{ duct VP}$
 Small lathe, etc., may be mounted in booth



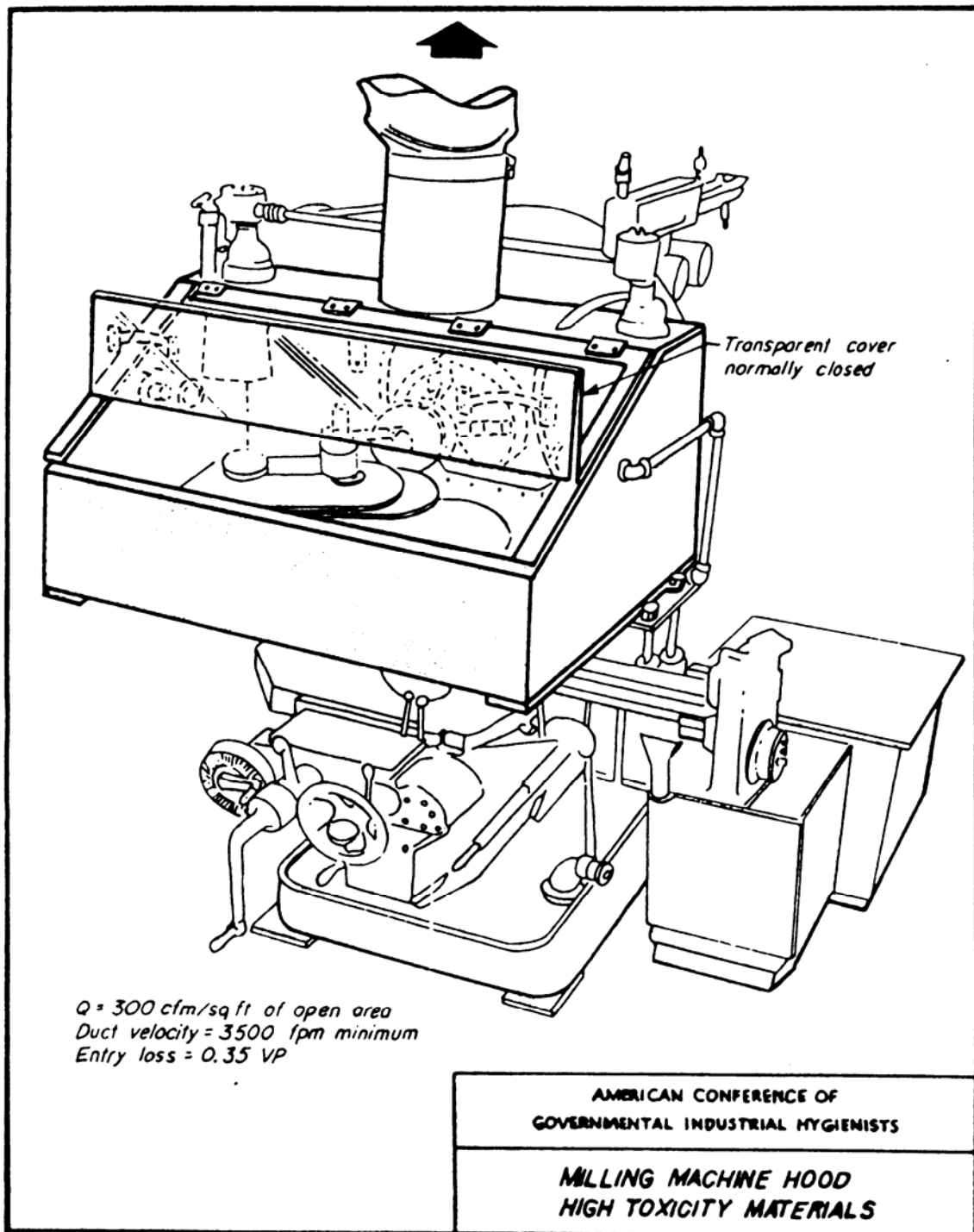
LOCAL HOOD

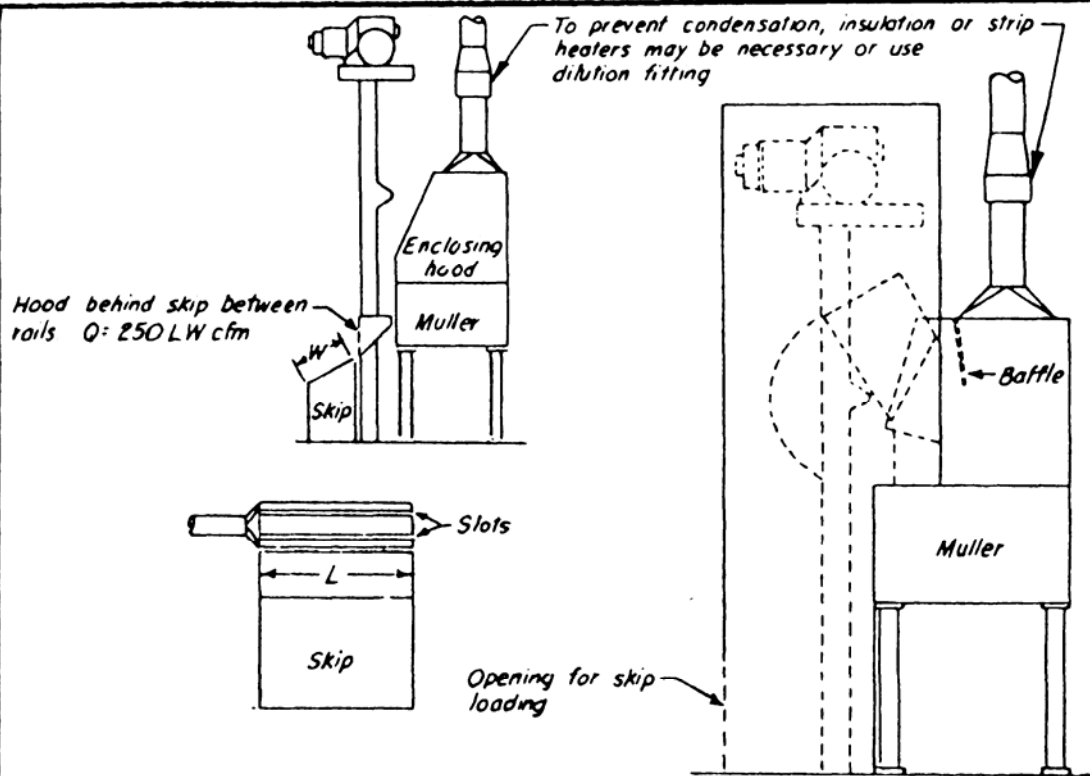
Note: Local hood not satisfactory for spraying toxic metals.

$Q = 200 \text{ cfm/sq.ft. face openings}$
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.25 VP

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METAL SPRAYING





$Q = 150 \text{ cfm/sq ft}$ through all openings but not less than:

Mixer diam, feet	Exhaust, cfm
4	750
6	900
7	1050
8	1200
10	1575

For Cooling Mullers, See VS-108

Other types of mixers: enclose as much as possible and provide 150 cfm/sq ft of remaining openings

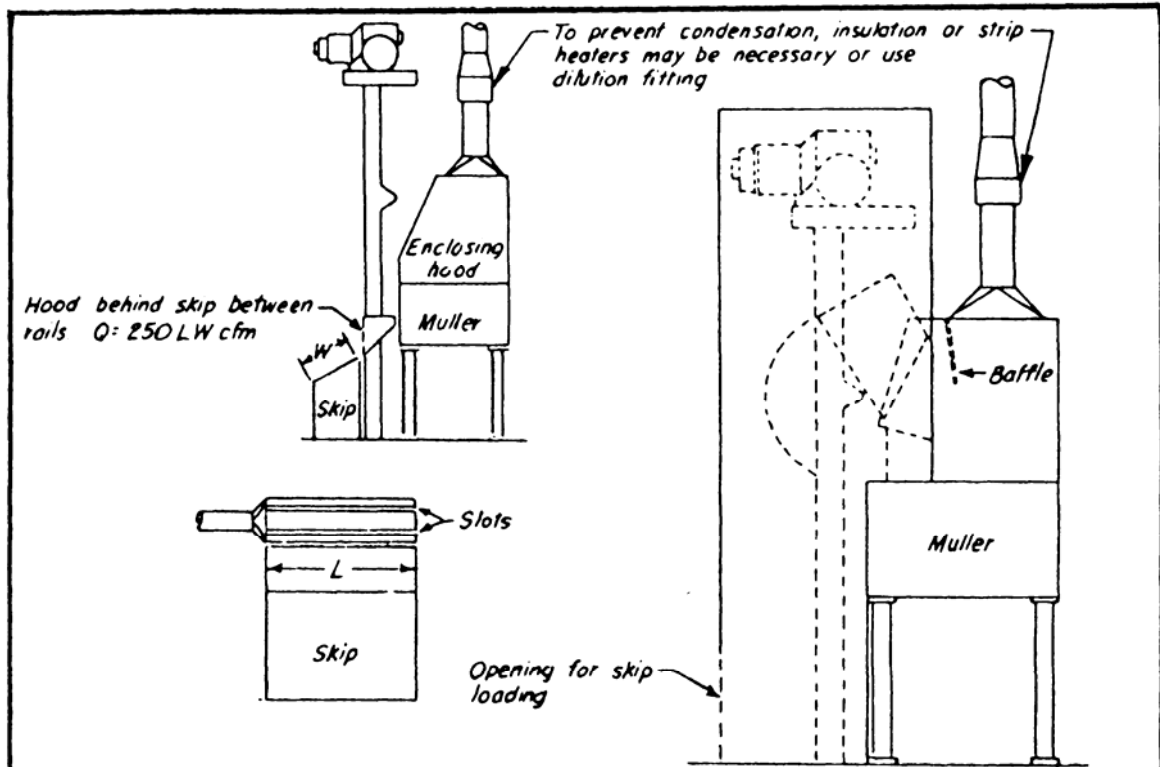
When flammable solvents are used in mixer, calculate minimum exhaust volume for dilution to 25% of the LEL

Duct velocity = 3500 fpm, min

Entry loss = 0.25 VP

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MIXER AND MULLER HOOD



$Q = 150 \text{ cfm/sq ft}$ through all openings but not less than:

Mixer diam, feet	Exhaust, cfm
4	750
6	900
7	1050
8	1200
10	1575

For Cooling Mullers, See VS-10B

Other types of mixers: enclose as much as possible and provide 150 cfm/sq ft of remaining openings

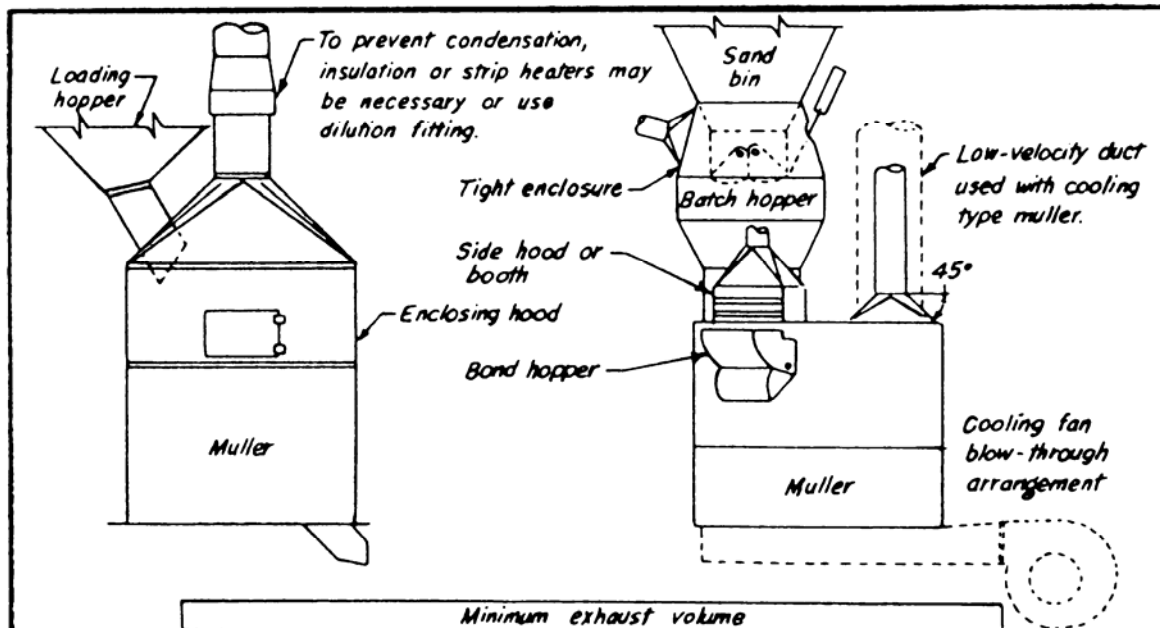
When flammable solvents are used in mixer, calculate minimum exhaust volume for dilution to 25% of the LEL

Duct velocity = 3500 fpm, min

Entry loss = 0.25VP

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MIXER AND MULLER HOOD



Location	Minimum exhaust volume		
	Muller type		
	No cooling	Blow-thru cooling	Draw-thru cooling
Batch hopper	Note 1	600	Note 1
Bond hopper	600	600	600
Muller:	Note 2	Note 3	Note 3
4' diameter	750	"	"
6' diameter	900	"	"
7' diameter	1050	"	"
8' diameter	1200	"	"
10' diameter	1575	"	"

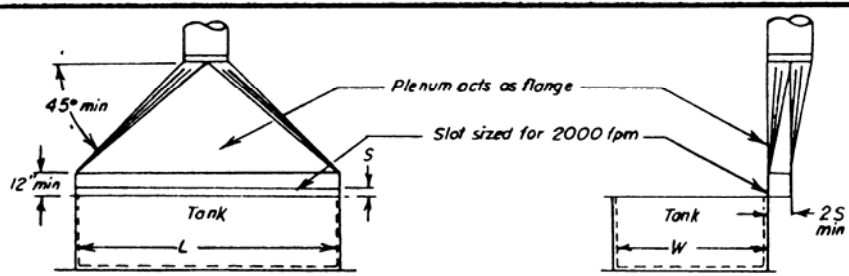
Duct velocity = 4500 fpm minimum
Entry loss = 0.25 VP

Notes:

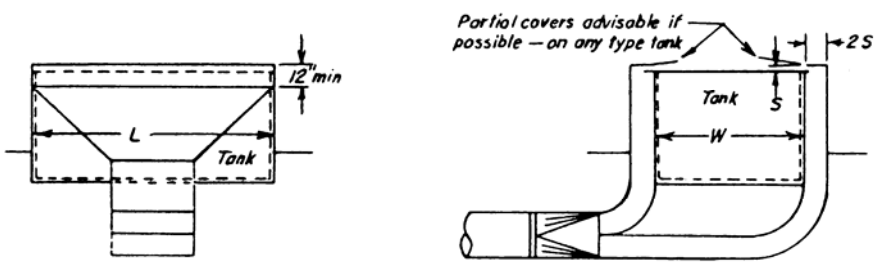
1. Batch hopper requires separate exhaust with blow-thru cooling. With other fan arrangement, (muller under suction) separate exhaust may not be required. (If skip hoist is used, see VS-107)
2. Maintain 150 fpm velocity through all openings in muller hood. Exhaust volume shown are the minimum to be used.
3. Cooling mullers do not require exhaust if maintained in dust tight condition. Blow-thru fan must be off during loading. If muller is not dust tight, exhaust as in note 2 plus cooling air volume.
4. When flammable solvents are used in mixer, calculate minimum exhaust volume for dilution to 25% of the LEL

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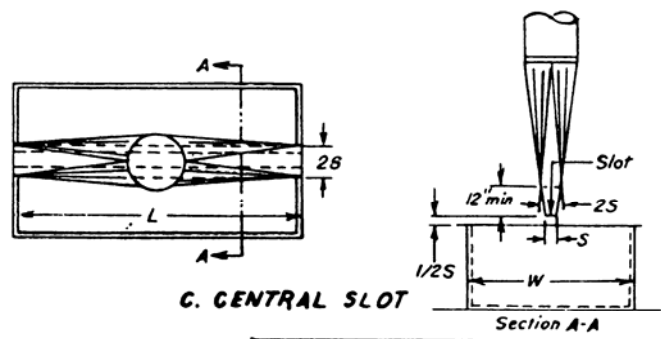
MIXER AND MULLER
VENTILATION



A. UPWARD PLENUM



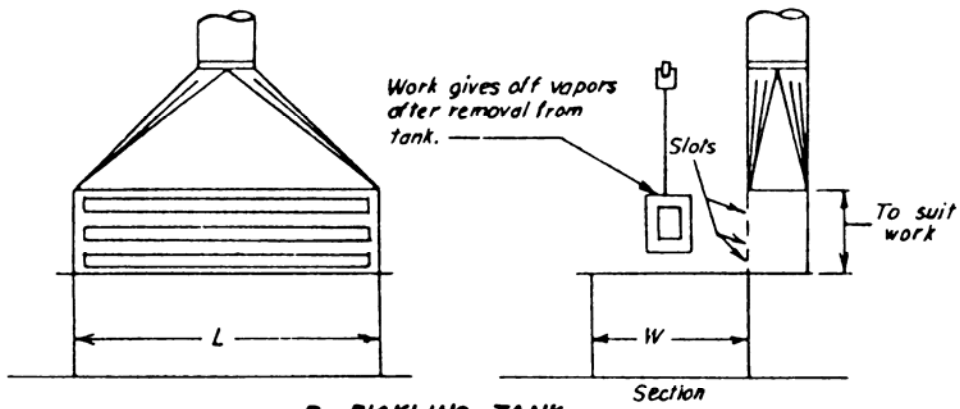
B. DOWNWARD PLENUM



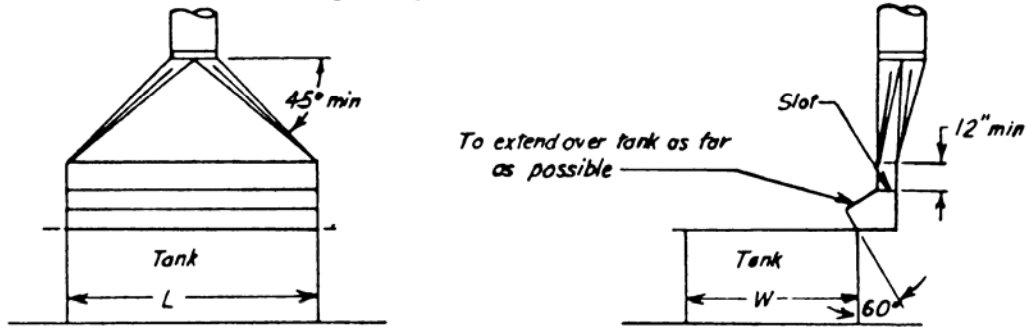
C. CENTRAL SLOT

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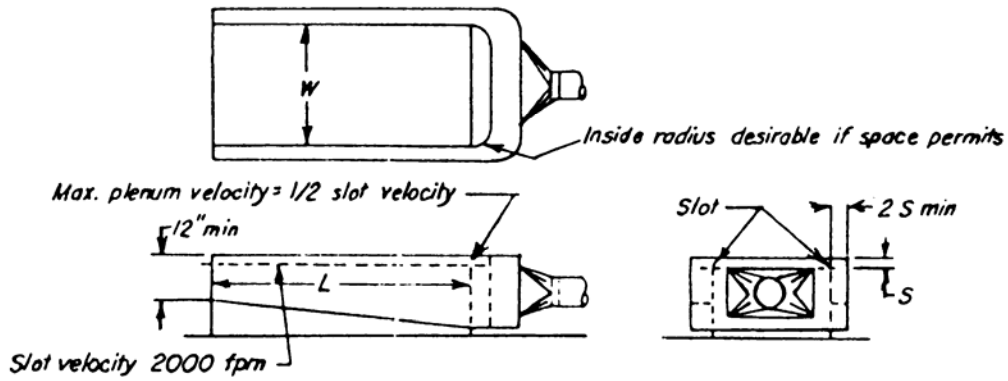
OPEN SURFACE TANKS



D. PICKLING TANK



E. SEMI-LATERAL



F. END TAKE-OFF

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OPEN SURFACE TANKS

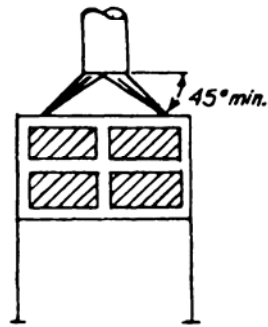
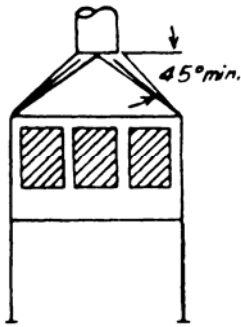
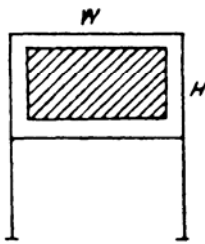
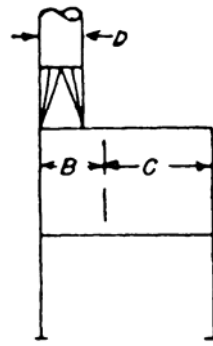
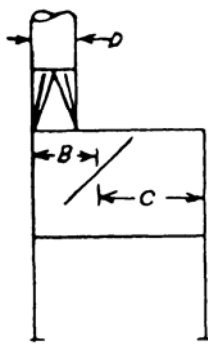
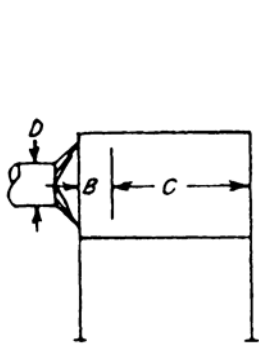
DESIGN DATA OPEN SURFACE TANKS

- A. Duct velocity = 2000 fpm minimum.
- B. Entry loss = 1.78 slot VP plus duct entry loss.
- C. Maximum plenum velocity = one-half slot velocity.
- D. Slot velocity = 2000 fpm unless distribution provided by well-designed fish-tail.
- E. Provide ample excess area at small end of plenum.
- F. If L exceeds 6 to 10 feet, multiple take-offs are advisable.
- G. If W = 20 inches, slot on one side suitable.
If W = 20 to 36 inches, slots on both sides desirable.
If W is much greater than 36 inches, slots on both sides are necessary unless all other conditions are optimum.
- H. Liquid level to be at least 6 inches below bottom of slot.
- I. Hood types A, C, D and E, are preferred--Plenum acts as baffle to room air currents.
- J. Provide enclosures or removable covers on tank if possible.
- K. Provide ductwork with clean-outs and drains, and corrosion resistant coating if necessary.

MINIMUM* EXHAUST VOLUME
OPEN SURFACE TANKS

Operation	CFM/sq. ft. of tank	Collector Recommended
Plating (Chrome, Cyanide solutions if needed).....	150	..... X
Anodizing.....	120	..... X
Pickling:		
Cold Acid.....	120	.....
Hot Acid.....	250	..... X
Nitric and Sulfuric Acids	250	..... X
Nitric and Hydrofluoric Acids	250	..... X
Cleaning:		
Caustic or Electrolytic-not boiling	200	.....
Caustic or Electrolytic-boiling	250	..... X
Bright Dip-strong Nitric Acid	250	..... X
Stripping:		
Concentrated Nitric Acid	250	..... X
Concentrated Nitric and Sulfuric Acids	250	..... X
Salts Baths (molten salt).....	120	..... X
Salt Solution (Parkerize, Bonderize, etc.):		
Not boiling	120	.....
Boiling	250	.....
Hot Water (if ventilation desired):		
Not boiling	120	.....
Boiling	250	.....

*** Values listed are the minimum satisfactory values under good plant conditions.**



1. Solid Baffle
 $B = 0.75D$
 Baffle area = $0.60WH$

2. Angular Baffle
 $B = D + 6"$
 Baffle area = $0.60WH$

3. Split Baffle or Filters
 $B = D + 6"$
 Baffles or filters = $0.75WH$
 Filter combustibility Class 2
 or better. Consult NBFU or
 insurance underwriters.

Design data—

Any combination of branch ducts and baffles may be used.

W = work size + 12"

H = work size + 12"

$C = 0.75W$ or H , whichever is larger.

$Q = 200$ cfm/sq.ft (200WH) — for face area up to 4 sq.ft.

= 150 cfm/sq.ft — for face area over 4 sq.ft.

Entry loss = Baffles: 1.78 slot VP + 0.50 duct VP

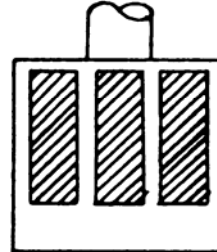
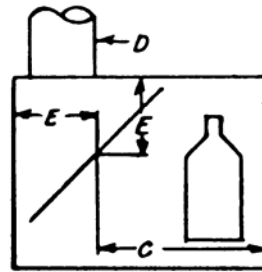
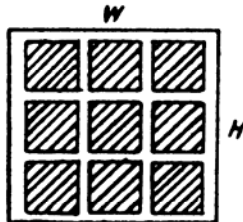
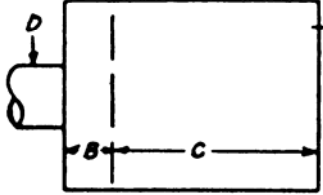
= Filters: Dirty filter resistance + 0.50 duct VP

Duct velocity = 1000 - 3000 fpm

Note: Baffle arrangements shown are for air distribution only. Filters and/or other air cleaning devices may be required to meet air pollution codes or local conditions.

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SMALL PAINT BOOTH



1. Split Baffle or Filters

$B = 0.75 D$

Baffle or filter area = $0.75 WH$

Filter combustibility Class 2 or better.

Consult AIA or insurance underwriters

2. Angular Baffle

$E = D + 6$

Baffle area = $0.40 WH$

DESIGN DATA

Any combination of duct connections and baffles may be used. Large, deep booths do not require baffles. Consult manufacturers for water-curtain designs. Use explosion proof fixtures and non-sparking fan. Electrostatic spray booth requires automatic high-voltage disconnects for conveyor failure, fan failure or grounding.

Walk-in booth

$W = \text{work size} + 6'$

$H = \text{work size} + 3'$ (minimum = 7')

$C = \text{work size} + 6'$

$Q = 100 \text{ cfm/sq.ft. booth cross section}$

May be 75 cfm/sq.ft. for very large, deep, booth. Operator may require approved respirator.

Entry loss = Baffles: 1.78 slot VP +

0.50 duct VP

= Filters: dirty filter resistance + 0.50 duct VP

Duct velocity = 1000 - 3000 fpm

Operator outside booth

$W = \text{work size} + 2'$

$H = \text{work size} + 2'$

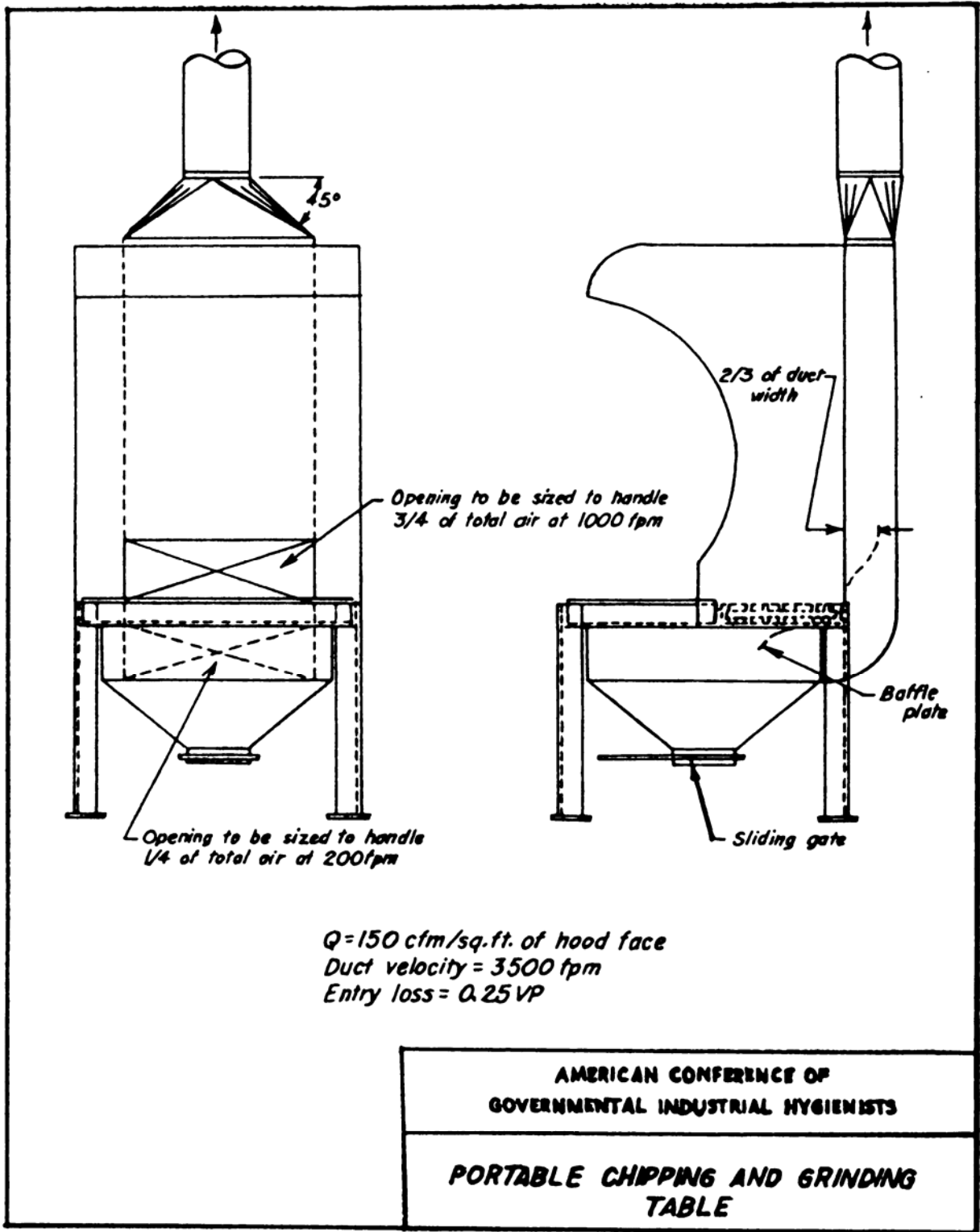
$C = 0.75 \times \text{larger front dimension}$

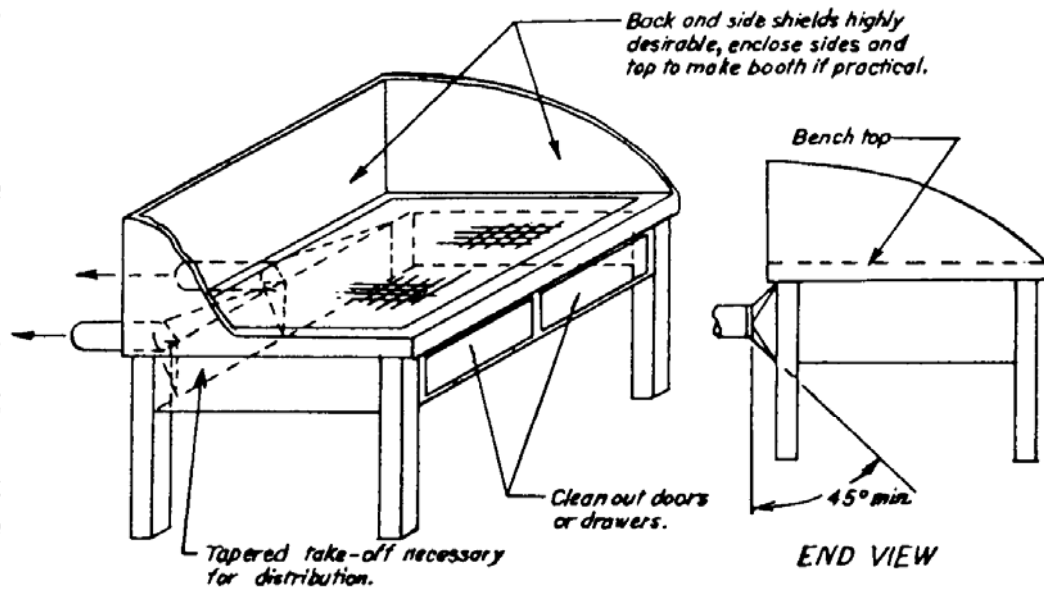
$Q = 100-150 \text{ cfm/sq.ft. of open area, including conveyor openings.}$

Note: Baffle arrangements shown are air distribution only. Filters and/or other air cleaning devices may be required to meet air pollution codes or local conditions.

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LARGE PAINT BOOTH





*Q = 150 - 250 cfm / sq. ft. of bench area.
 Minimum duct velocity = 3500 fpm
 Entry loss = 0.25 VP for tapered take-off.*

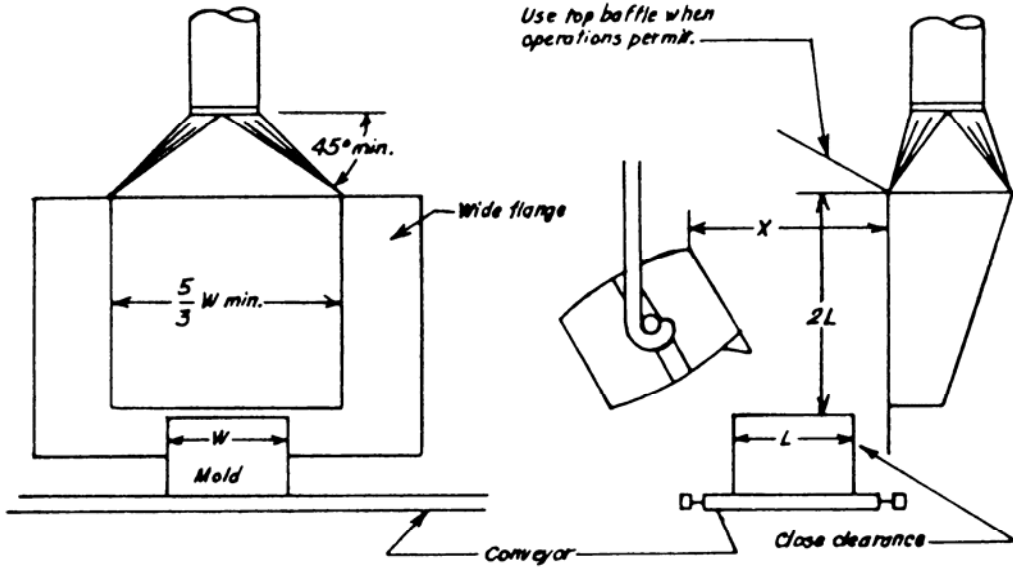
Grinding in booth, 100 fpm face velocity also suitable.

For downdraft grilles in floor: Q = 100 cfm / sq ft. of working area.

Provide equal distribution. Provide for cleanout.

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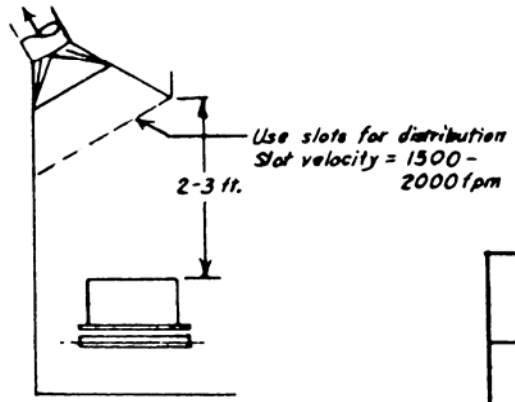
PORTABLE HAND GRINDING



SMALL MOLDS

Unflanged hood: $Q = 200 (10X^2 + \text{hood area})$.
 Flanged hood, reduce Q 25%
 Duct velocity = 2000 fpm
 Entry loss = 0.25VP (For slots, 1.78 slot VP + 0.25 duct VP).

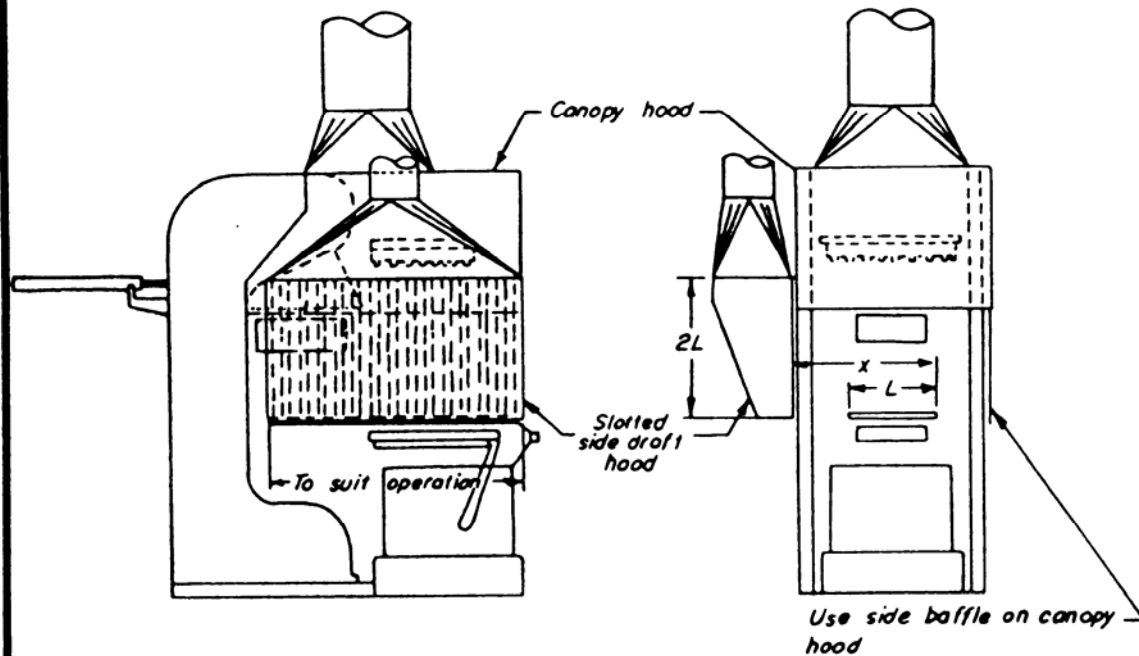
PARTIAL SIDE ENCLOSURE



$Q = 200 - 300 \text{ cfm/lin. ft. of hood.}$

NOTE:
 For large molds and ladles
 provide large side-draft hood
 similar to shakeout.
 $Q = 400 \text{ cfm/sq. ft. working area.}$

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POURING STATION



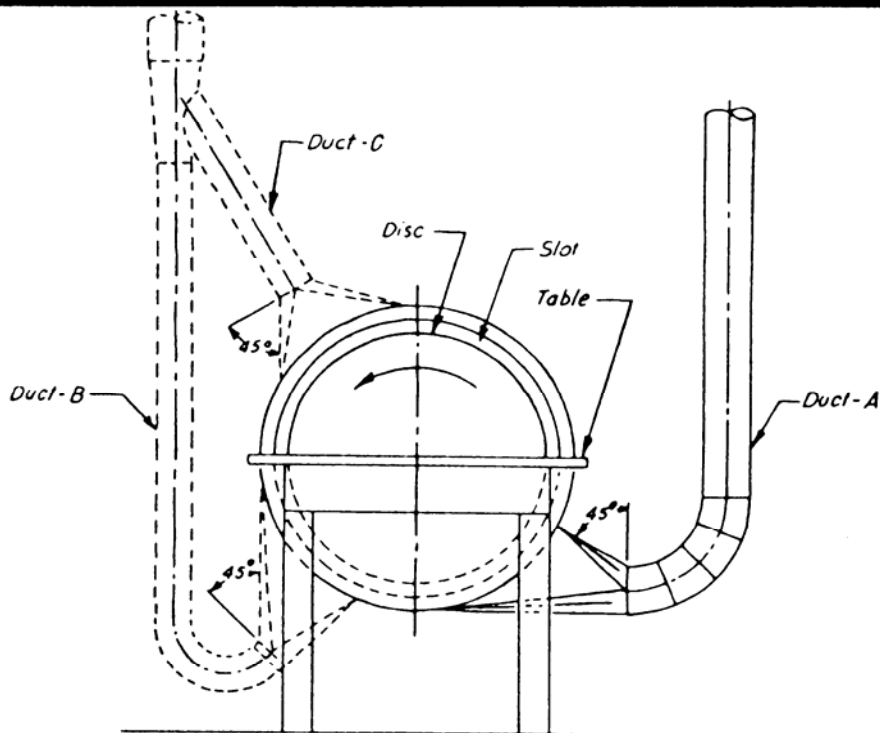
$Q = 250 \text{ cfm/sq ft canopy - single unit}$
 $150 \text{ cfm/sq ft canopy - double unit}$
 Entry loss = 0.25 VP for tapered take-off

Slotted side draft hoods required to remove
 smoke as hot cores emerge from machine.
 Capture velocity = 75 fpm minimum
 $Q = 75(10x^2 + \text{hood area})$
 Entry loss = 1.78 slot VP + 0.25 duct VP

Conveyor or cooling area require ventilation for
 large cores. Scrap conveyor or tote boxes may
 require ventilation also.

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SHELL CORE MOLDING



Disc diameter, inches	Total exhaust volume cfm	Applies to duct
Up to 12 incl.	350	A
over 12 to 18 incl.	440	A
over 18 to 26 incl.	550	A
over 26 to 32 incl.	700*	A-B
over 32 to 38 incl.	900*	A-B
over 38 to 48 incl.	1250**	A-B-C

* Two bottom branches.

** One top and two bottom branches.

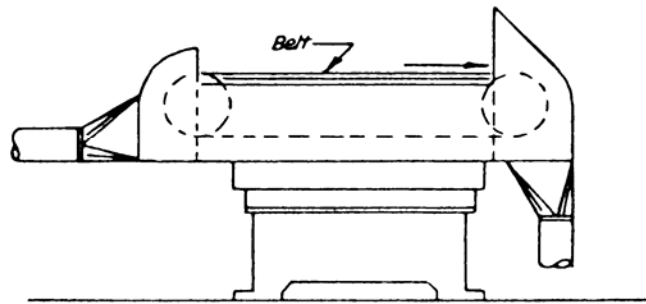
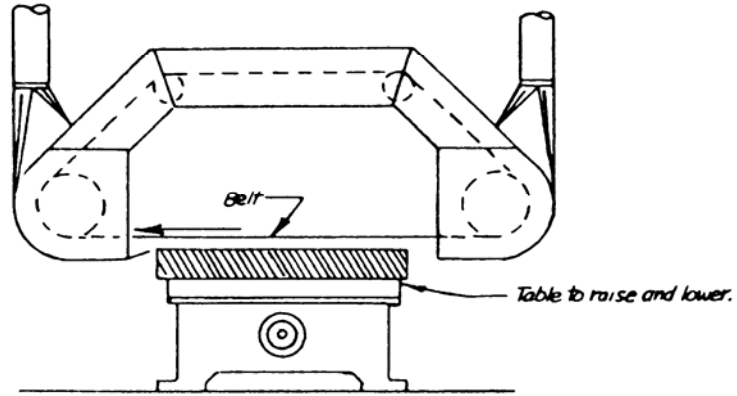
Duct velocity = 3500 fpm

Entry loss: Depends on hood design.

1.0 slot VP + 0.25 duct VP

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DISC SANDERS



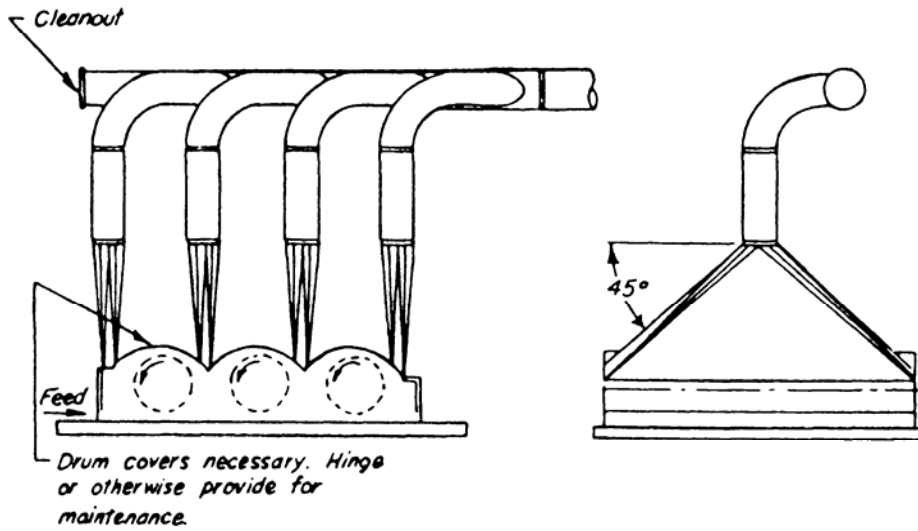
HORIZONTAL BELT SANDERS

Belt width, inches	Exhaust volume, cfm		
	Head end	Tail end	Total
Up to 6 incl.	440	350	790
over 6 to 9 incl.	550	350	900
over 9 to 14 incl	800	440	1240
over 14	1100	550	1650

Duct velocity = 3500 fpm
 Entry losses = 0.40 VP for tapered take-off

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HORIZONTAL BELT SANDERS



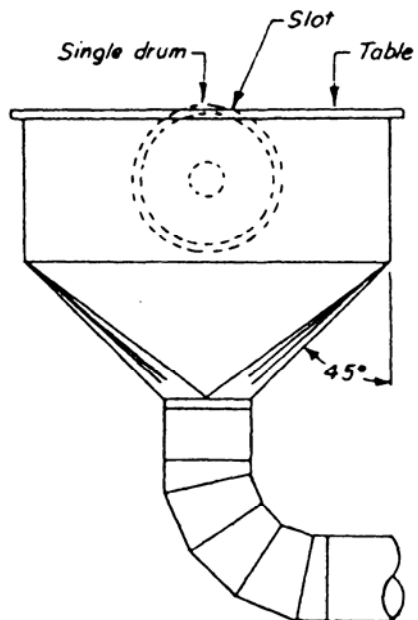
Exhaust Volumes

<i>Drum length, inches</i>	<i>Total exhaust for machine cfm/drum*</i>
<i>Up to 31"</i>	<i>550</i>
<i>31" to 49"</i>	<i>785</i>
<i>49" to 67"</i>	<i>1100</i>
<i>over 67"</i>	<i>1400</i>
<i>Brush rolls</i>	<i>350 cfm at brush</i>
<i>*One hood per drum is minimum Additional hood at feed side is desirable</i>	

*Duct velocity = 3500 fpm
Entry loss = 0.25 duct VP*

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MULTIPLE DRUM SANDER

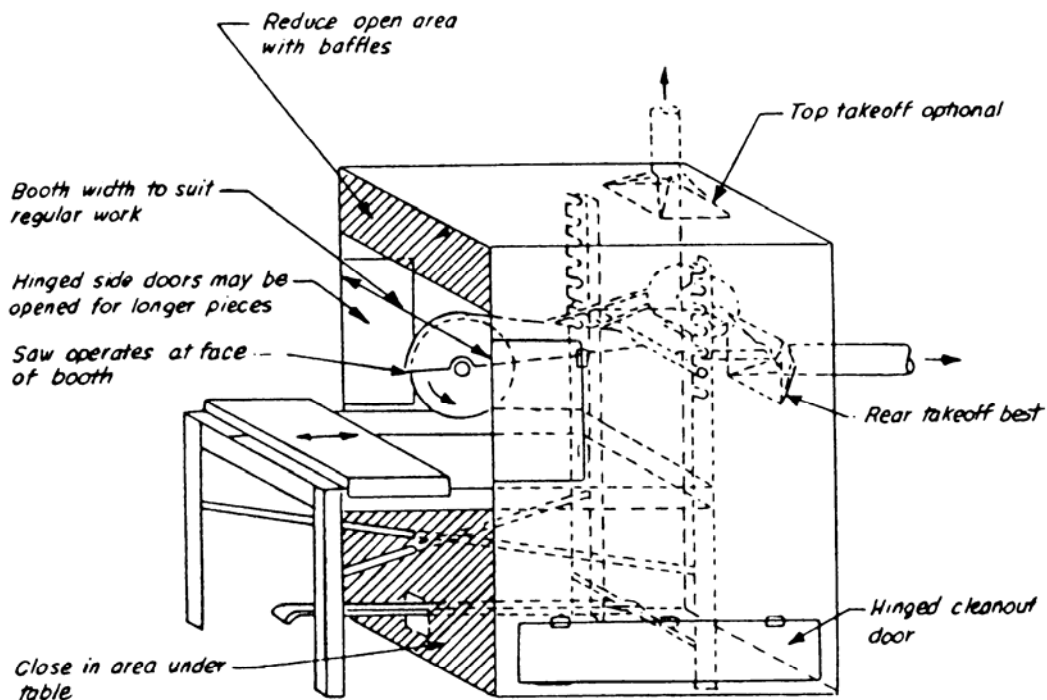


Drum surface, sq inches	Exhaust volume, cfm
Up to 200 incl. (and less than 10" dia.)	350
over 200 to 400 incl.	550
over 400 to 700 incl.	785
over 700 to 1400 incl.	1100
over 1400 to 2400 incl.	1400

Duct velocity = 3500 fpm
 Entry loss: Depends on hood design.
 1.78 slot VP plus 0.25 duct VP

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SINGLE DRUM SANDER



$Q = 250 \text{ cfm/sq ft}$ of open face area
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.50 VP no taper
 0.25 VP with taper

Stationary installation—

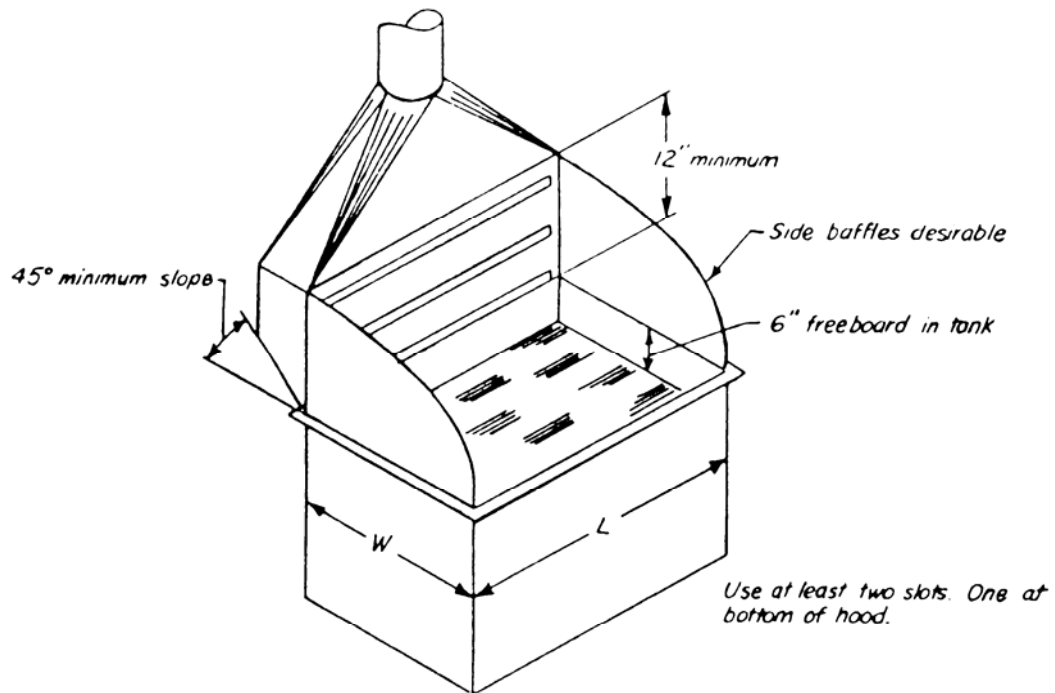
*Indoor and outdoor: Connect to exhaust system and dust collector
 Discharge outdoors*

Portable use—

*Indoor and outdoor: Use adequate unit collector and fan
 Outdoor only: Use adequate fan, discharge at least 10' above ground*

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ABRASIVE CUT-OFF SAW
 VENTILATION

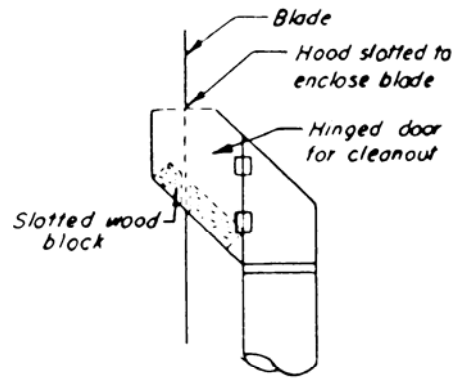
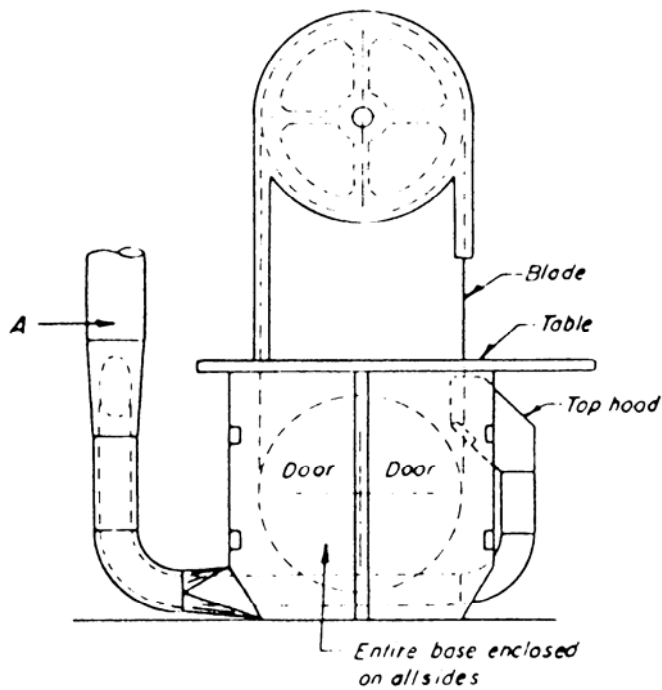


$Q = 150 \text{ cfm/sq ft of bed } (150LW)$
 Slot velocity = 2000 fpm
 Entry loss = $1.78 \text{ slot VP} + 0.25 \text{ duct VP}$
 Duct velocity = 2500 - 3000 fpm
 W not to exceed 36"

For circular beds or other hood designs,
 Free board must be maintained to prevent material carryout.

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FLUIDIZED BEDS



TOP HOOD DETAIL

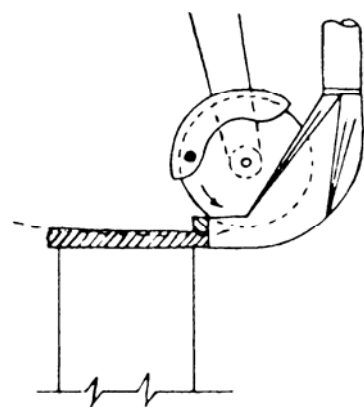
Blade width, inches	Exhaust volume, cfm		
	Bottom	Top	Total
Up to 2	350	350	700
over 2 to 3	350	550	900
over 3 to 4	550	800	1350
over 4 to 6	550	1100	1650
over 6 to 8	550	1400	1950

Duct velocity = 3500 fpm

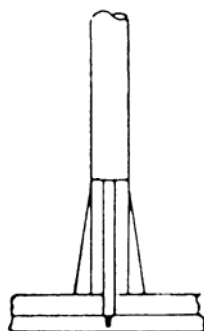
Entry loss = 1.75 VP in duct riser (Point A)

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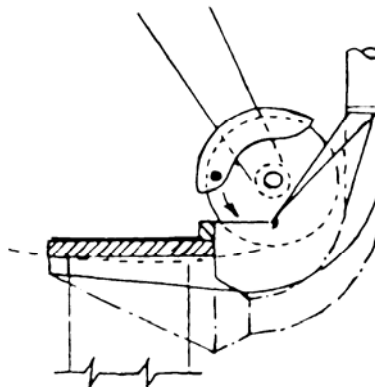
BAND SAW



TYPE HOOD WHERE TABLE IS NOT CUT THRU



FRONT VIEW OF HOOD



TYPE HOOD WHERE TABLE IS CUT THRU

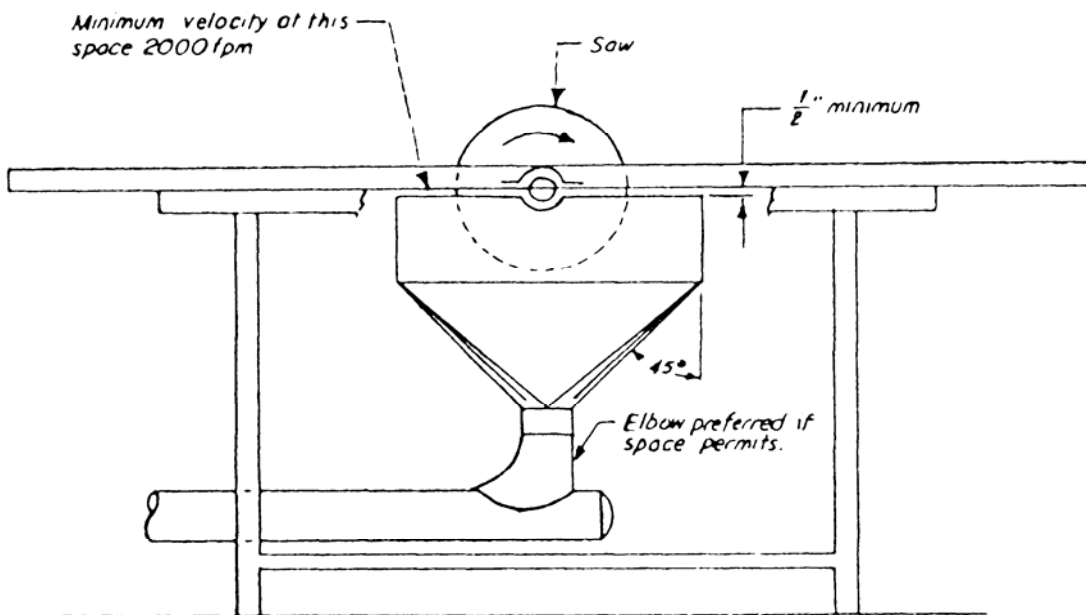
Saw diameter, inches	Exhaust volume, cfm
Up to 20 incl.	350
over 20	440

Duct velocity = 3500 fpm

Entry loss = 1.78 slot VP + 0.25 duct VP

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SWING SAWS



Table, rip, mitre and variety saws

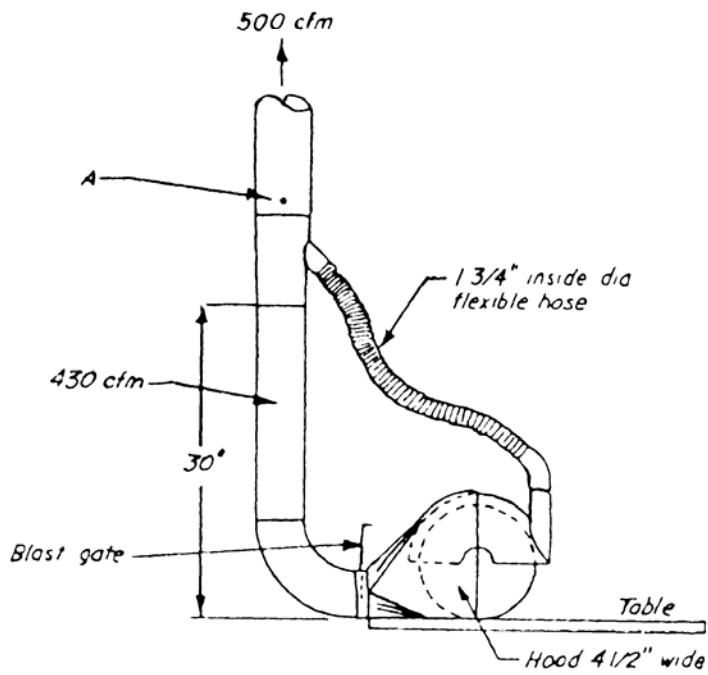
Saw diameter, inches	Exhaust volume, cfm
Up to 16 incl.	350
over 16 to 24 incl.	440
over 24	550
variety with dado	550

Duct velocity = 3500 fpm

Entry loss = 1.0 slot VP + 0.25 duct VP

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TABLE SAW

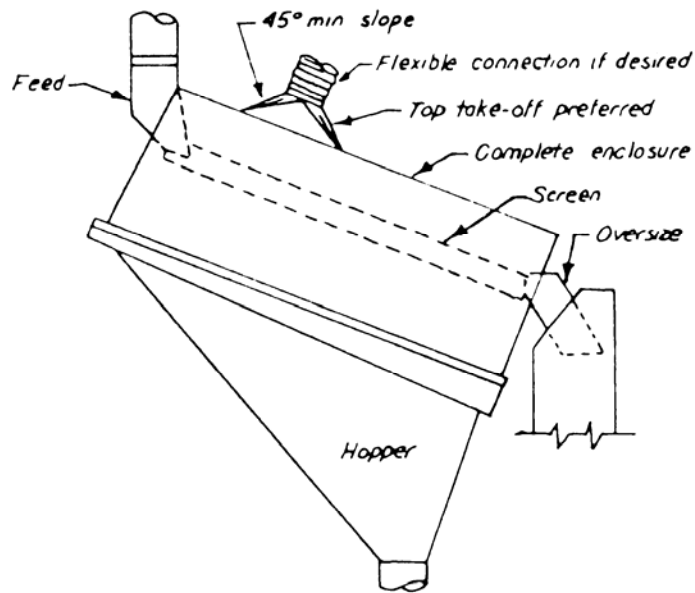


Duct velocity = 3500 fpm
 Entry loss = 3.5 VP in duct riser (Point A)

For booth enclosure, see VS-401

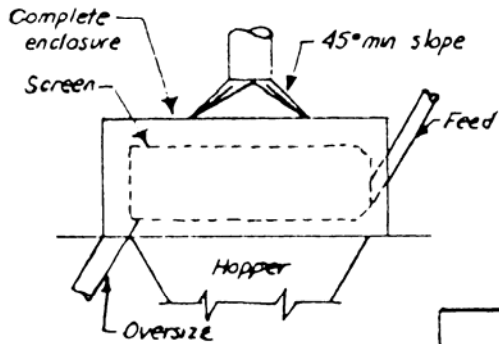
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RADIAL SAW



FLAT DECK SCREEN

$Q = 200 \text{ cfm/sq ft}$ through hood openings, but not less than 50 cfm/sq ft screen area. No increase for multiple decks
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.50VP

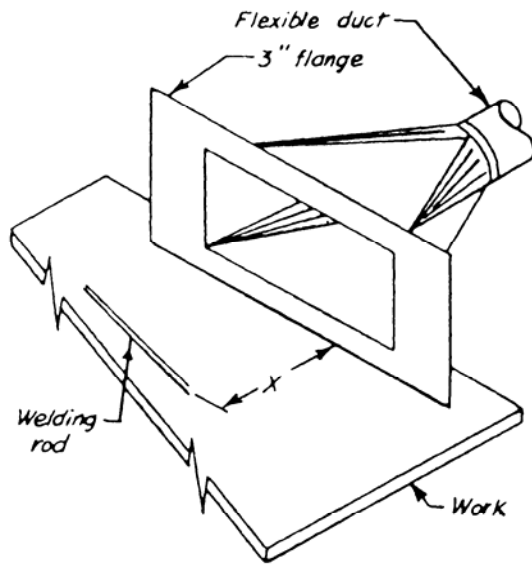
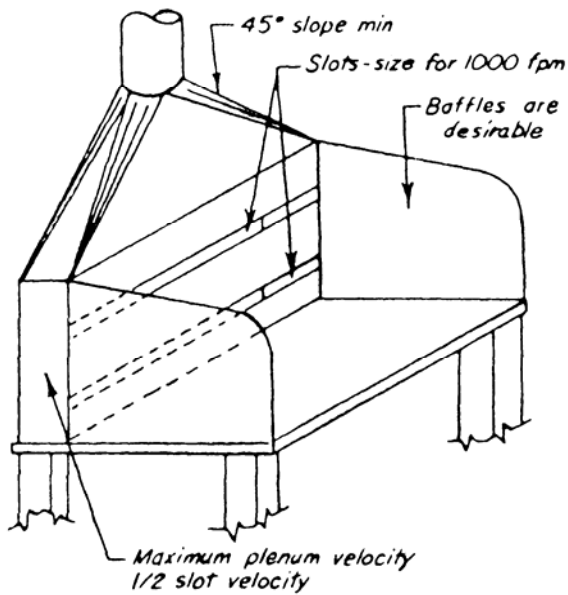


CYLINDRICAL SCREEN

$Q = 100 \text{ cfm/sq ft}$ circular cross section of screen; at least 400 cfm/sq ft of enclosure opening
 Duct velocity = 3500 fpm minimum
 Entry loss = 0.50VP

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SCREENS



$Q = 350 \text{ cfm/lineal ft of hood}$
 Hood length = required working space
 Bench width = 24" maximum
 Duct velocity = 1000 - 3000 fpm
 Entry loss = $1.78 \text{ slot VP} + 0.25 \text{ duct VP}$

PORTABLE EXHAUST

X, inches	cfm
6	250
9	400
12	1000

Face velocity = 1500 fpm
 Duct velocity = 3000 fpm minimum
 Entry loss = 0.25 duct VP

GENERAL VENTILATION, where local exhaust cannot be used:

Rod, diam	cfm/welder*
5/32	1000
3/16	1500
1/4	3500
3/8	4500

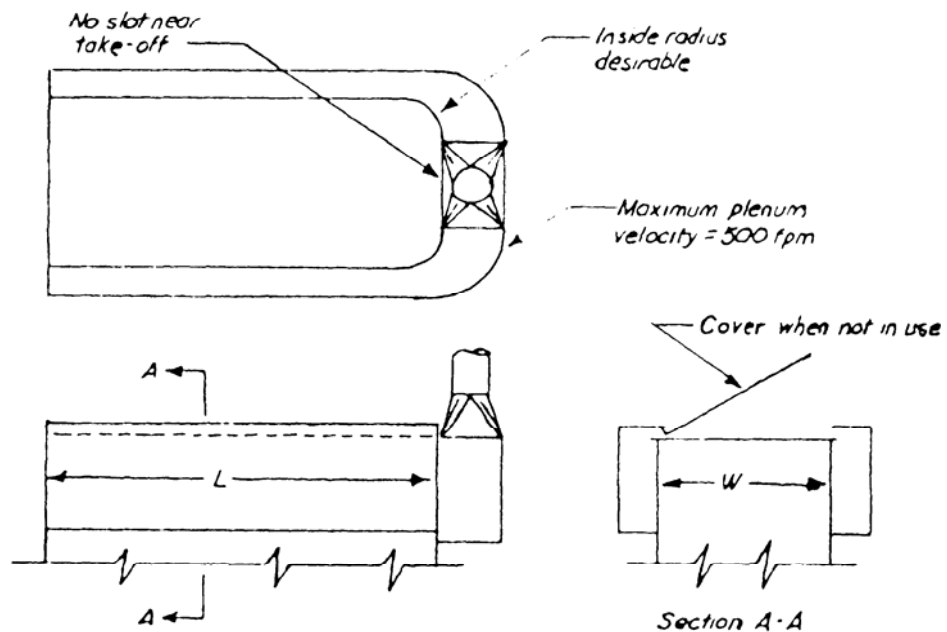
*For toxic materials higher airflows are necessary

OTHER TYPES OF HOODS

Booth.
 $Q = 100 \text{ cfm/sq ft of face opening}$
 See
 "Spray Painting"

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SOLDERING AND ARC WELDING



$$Q = 50LW$$

Slot velocity = 1000 fpm maximum

Entry loss = $1.78 \text{ slot VP} + 0.25 \text{ duct VP}$

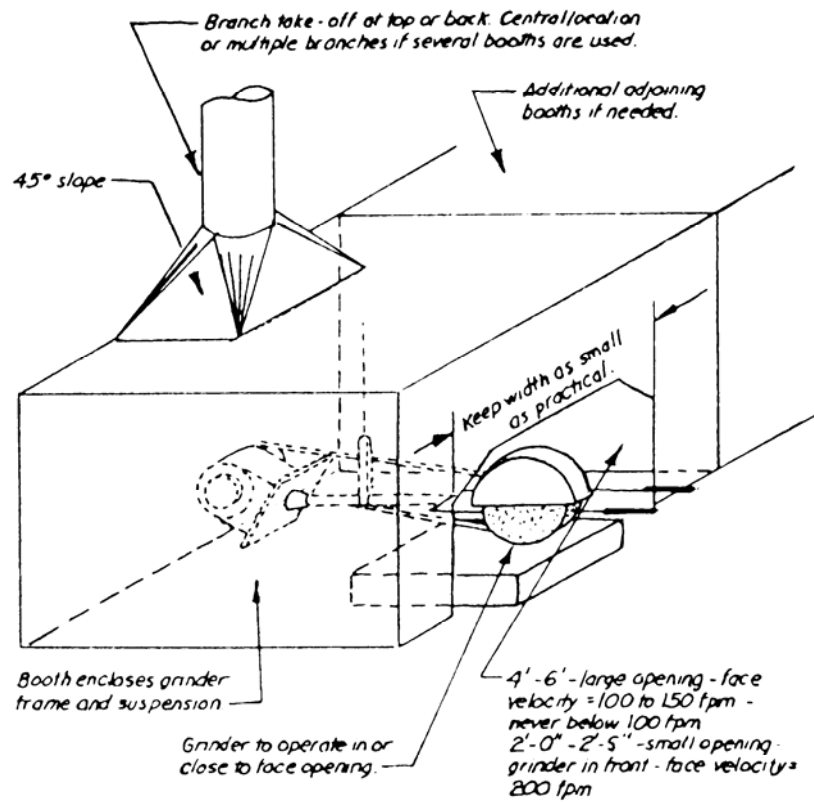
Duct velocity = 2500-3000 fpm

- Also provide:
1. Separate flue for combustion products if direct-fired unit.
 2. For cleaning operation, an air-line respirator is necessary.
 3. For pit units, the pit should be mechanically ventilated.

NOTE: Provide downdraft grille for parts that cannot be removed dry; $Q = 50 \text{ cfm /sq ft grille area}$.

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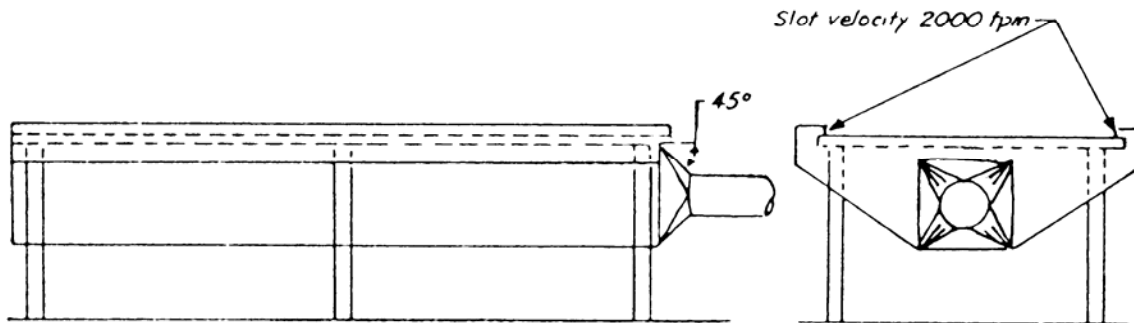
SOLVENT DEGREASING TANKS



Minimum duct velocity = 3000 fpm
 Entry loss = 0.5VP

NOTE: Small local exhaust hoods mounted behind grinder wheel may trap the stream of sparks, but are usually not effective in control of air-borne dust.

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SWING GRINDER

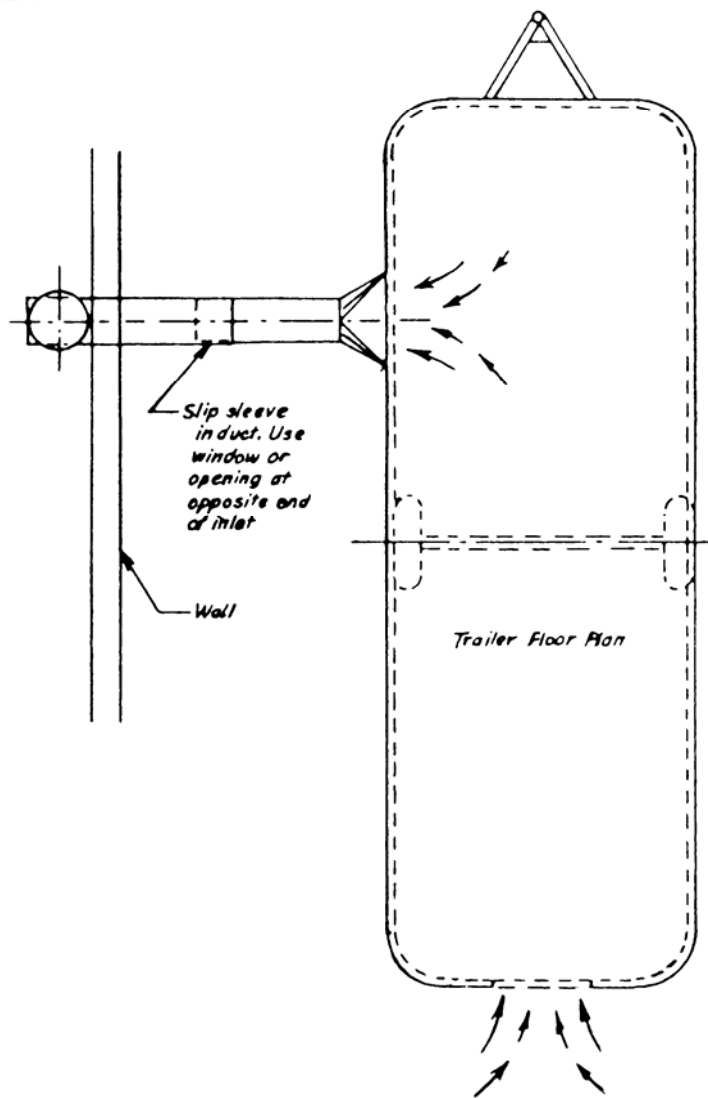


$Q = 50-100 \text{ cfm/sq ft of table top.}$
 $\text{Duct velocity} = 2500-3000 \text{ fpm}$
 $\text{Entry loss} = 1.78 \text{ slot VP} + 0.25 \text{ duct VP}$

*Note: See "Open Surface Tanks",
 for other suitable slot types. Air quantities may
 be calculated on dilution basis if data is available.
 Maximum plenum velocity = 1/2 slot velocity
 Large plenum essential for good distribution.*

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TABLE SLOT

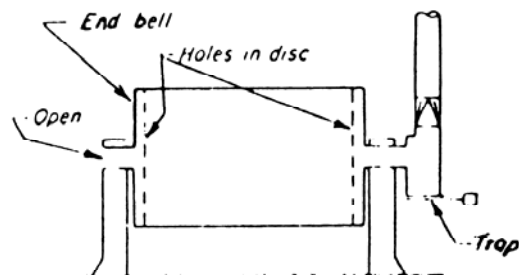


$Q = 50 \text{ cfm/sq ft of cross-sectional trailer area}$
 Entry loss = 0.25 VP
 Duct velocity = 1000 - 3000 fpm

NOTE: Operator must wear an air-supplied respirator

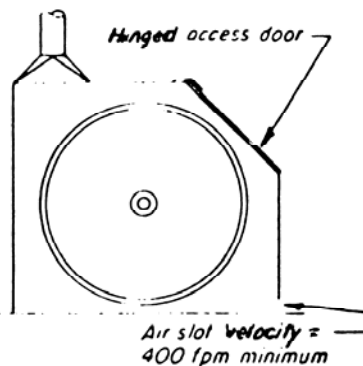
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TRAILER INTERIOR
 SPRAY PAINTING



SECTION THRU HOLLOW TRUNNION TUMBLER

Duct velocity = 5000 fpm
 Entry loss = 3.25" - 8.25" H₂O (depends on design*)



STAVE MILL (END SECTION)

Duct velocity = 3500 fpm minimum
 Entry loss varies with take-off 0.25 - 0.50VP

EXHAUST VOLUMES

Square mill side diam in.	Round mill I. D. in inches	cfm **	
		Trunnion	Stave
	Up to 24 incl.	430	800
Up to 24 incl.	24 - 30	680	900
25 - 30	31 - 36	980	980
31 - 36	37 - 42	1330	1330
37 - 42	43 - 48	1750	1750
43 - 48	49 - 54	2200	2200
49 - 54	55 - 60	2730	2730
55 - 60	61 - 66	3300	3300
61 - 66	67 - 72	3920	3920
67 - 72		4600	4600

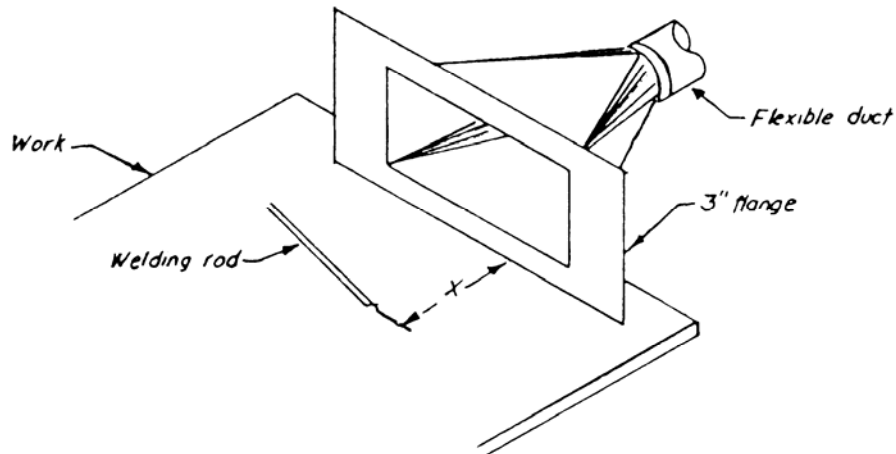
* Low-loss designs have large air inlet openings in end ball.

Holes in end discs are sized for velocities of 1250-1800 fpm

** For lengths over 70", increase cfm proportionately

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TUMBLING MILLS



PORTABLE EXHAUST

<i>X</i> , inches	cfm
6	250
9	400
12	1000

Face velocity = 1500 fpm

Duct velocity = 3000 fpm minimum

Entry loss = 0.50 VP

Also see "Granite Cutting" VS-906

OTHER TYPES OF HOODS

Sidedraft:
See "Soldering"

Booth:
Q=100 cfm/sq ft of face opening
See "Spray Painting" VS-603, VS-604
"Metal Spraying" VS-415

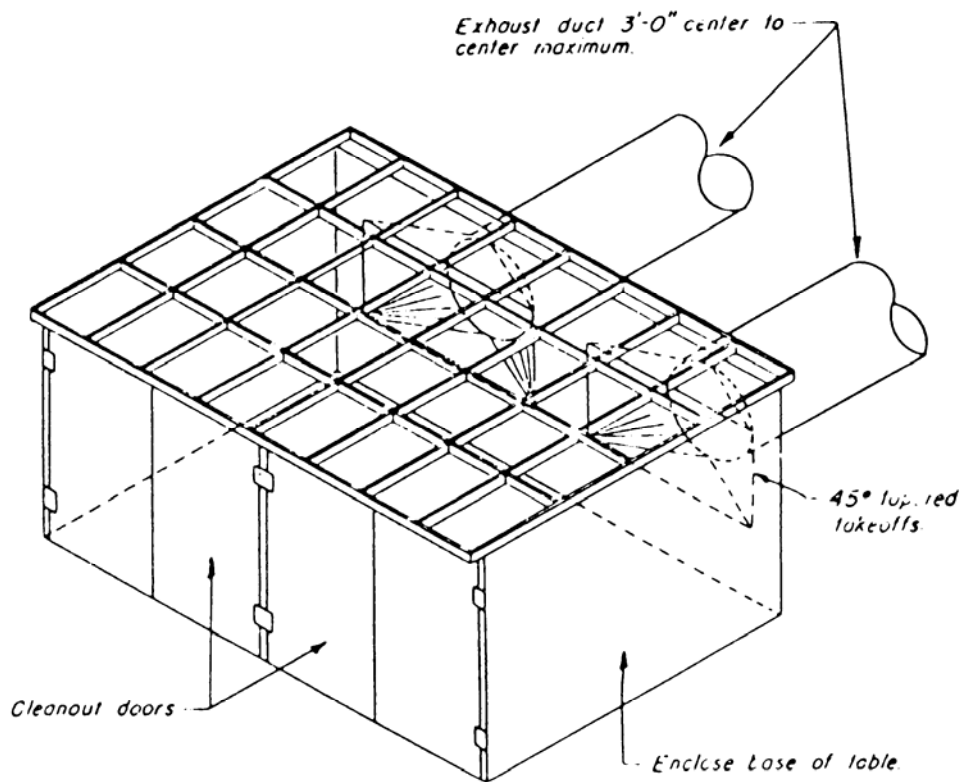
GENERAL VENTILATION, where local exhaust cannot be used:

Rod, diam	cfm/welder*
5/32	1000
3/16	1500
1/4	3500
3/8	4500

*For toxic materials higher airflows are necessary.

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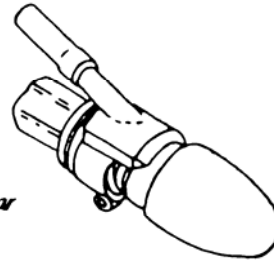
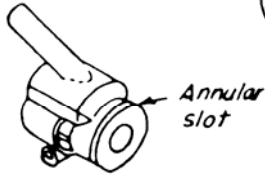
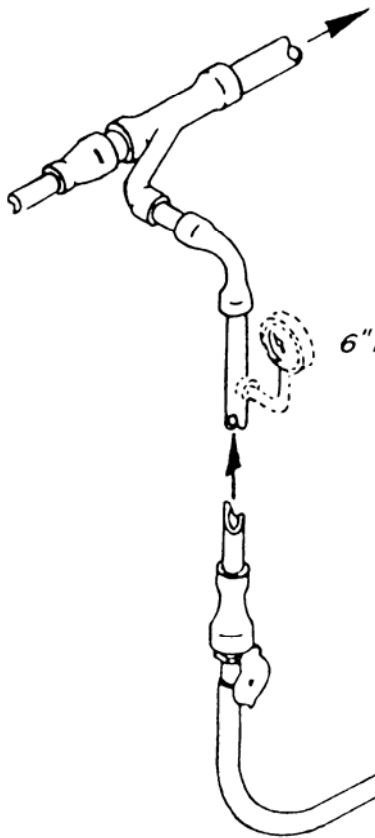
ARC WELDING



$Q = 150 \text{ cfm/sq ft}$ of gross table area
 Duct velocity = 2000-4000 fpm *
 Entry loss = 1.0 VP through grating
 0.25 duct VP - tapered takeoff
 * For horizontal runs, transport velocity is
 necessary

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TORCH CUTTING VENTILATION

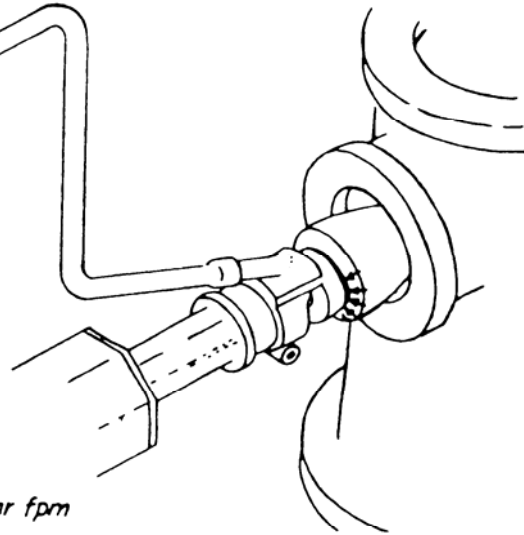


Cone wheel used for internal grinding on castings and dies

*Q = 10 to 40 cfm / inch dia
 Branch static pressure = 6" Hg to 12" Hg
 Slot velocity = 10,000 to 25,000 fpm
 Flexible hose = 5/8" to 1 1/2" ID
 Extension hose = Up to 8 ft long*

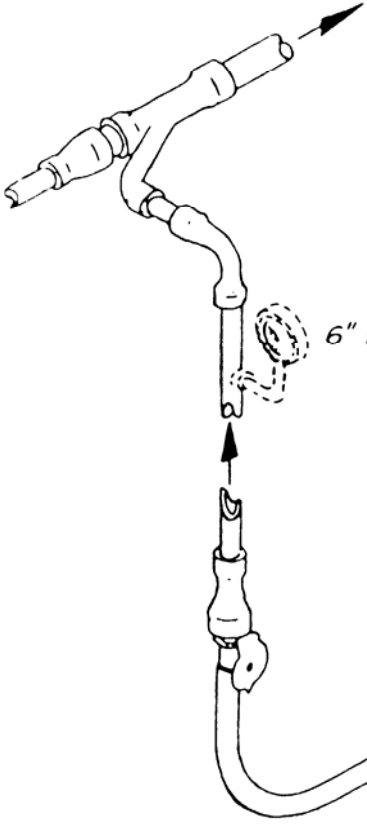
*Grinding wheel sizes = 1" to 3" dia
 1" to 4" long*

Peripheral speed = 6,000 to 10,000 linear fpm

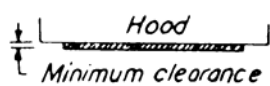
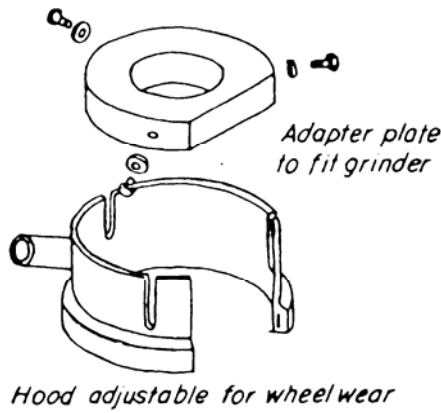


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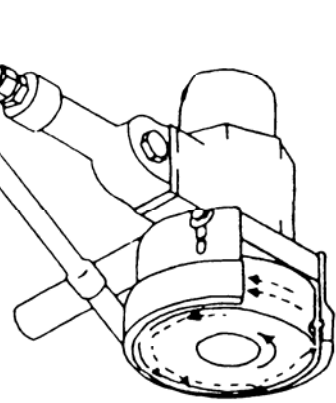
EXTRACTOR HEAD FOR CONE WHEELS
 AND MOUNTED POINTS



6" to 12" Hg

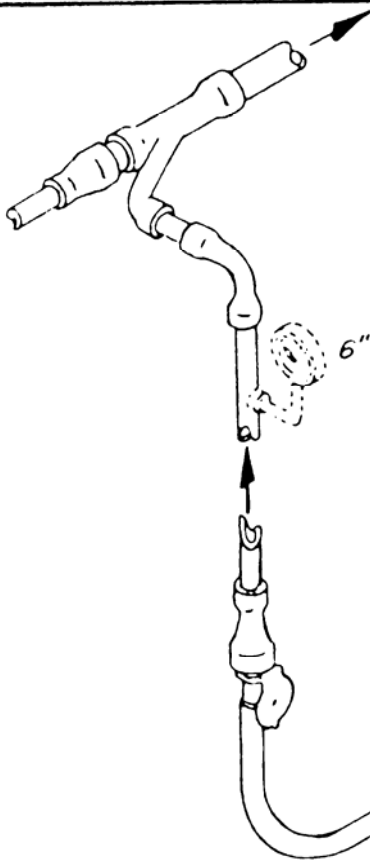


Q = 10-50 cfm/inch dia or width
Branch static pressure = 6" to 12" Hg
Slot velocity = 10,000 to 25,000 fpm
Flexible hose = 5/8" to 1 1/2" ID
Extension hose = Up to 8 ft long
Peripheral Speed = 6,000 to 10,000 linear fpm



Hood fitted to grinder

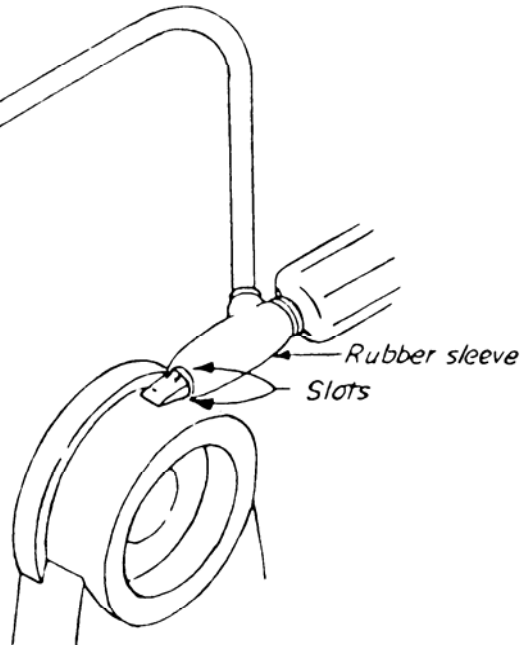
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 HOOD FOR CUP TYPE SURFACE
 GRINDERS AND WIRE BRUSHES



Dust is extracted through ports molded in the rubber sleeve, ports are on either side of the cutting edge of the chisel

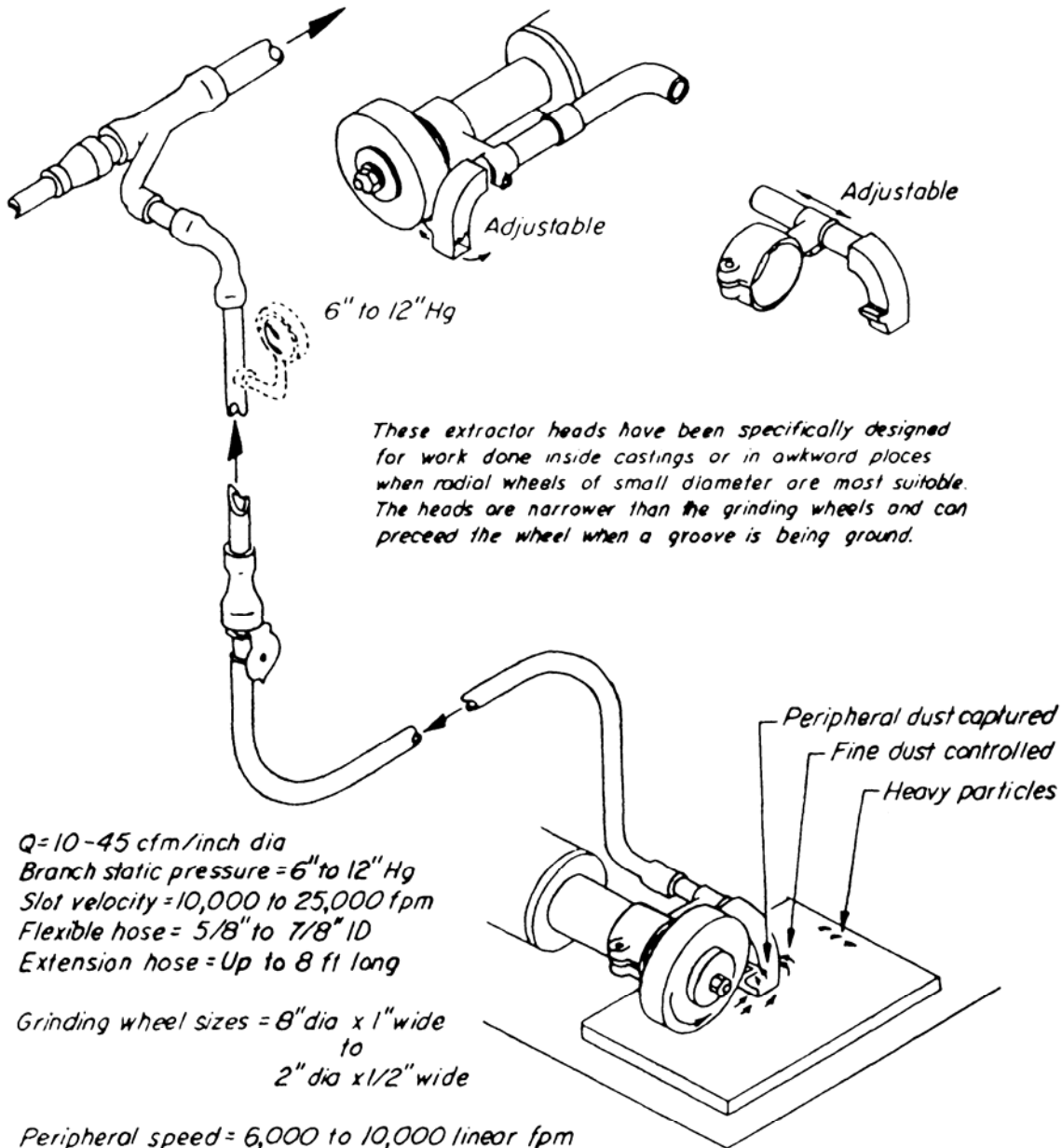
6" to 12" Hg

*Q = 8-60 cfm
 Branch static pressure = 6" to 12" Hg
 Slot velocity = 10,000 to 25,000 fpm
 Flexible hose = 3/8" to 1 1/2" ID
 Extension hose = Up to 8 ft long
 Chisel sizes = 13/16" octagonal
 7/8" octagonal
 7/8" hexagonal*



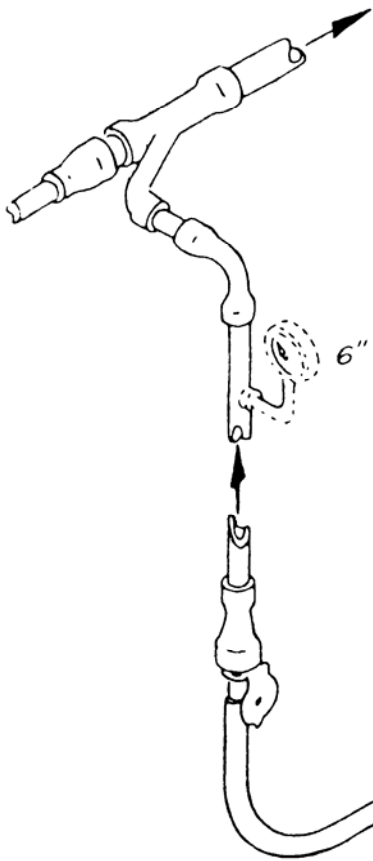
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PNEUMATIC CHISEL SLEEVE

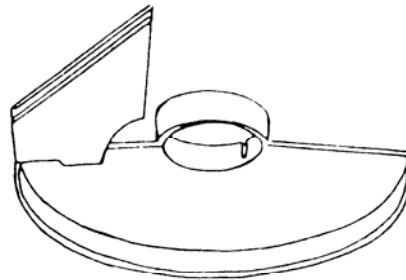


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EXTRACTOR HEAD FOR SMALL RADIAL
GRINDERS



6" to 12" Hg

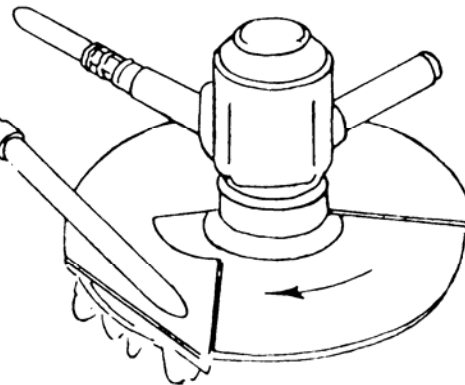


Bottom view of
extractor hood

$Q = 10 - 30$ cfm/inch dia
Branch static pressure = 6" to 12" Hg
Slot velocity = 10,000 to 25,000 fpm
Flexible hose = 5/8" to 1 1/2" ID
Extension hose = Up to 8 ft long

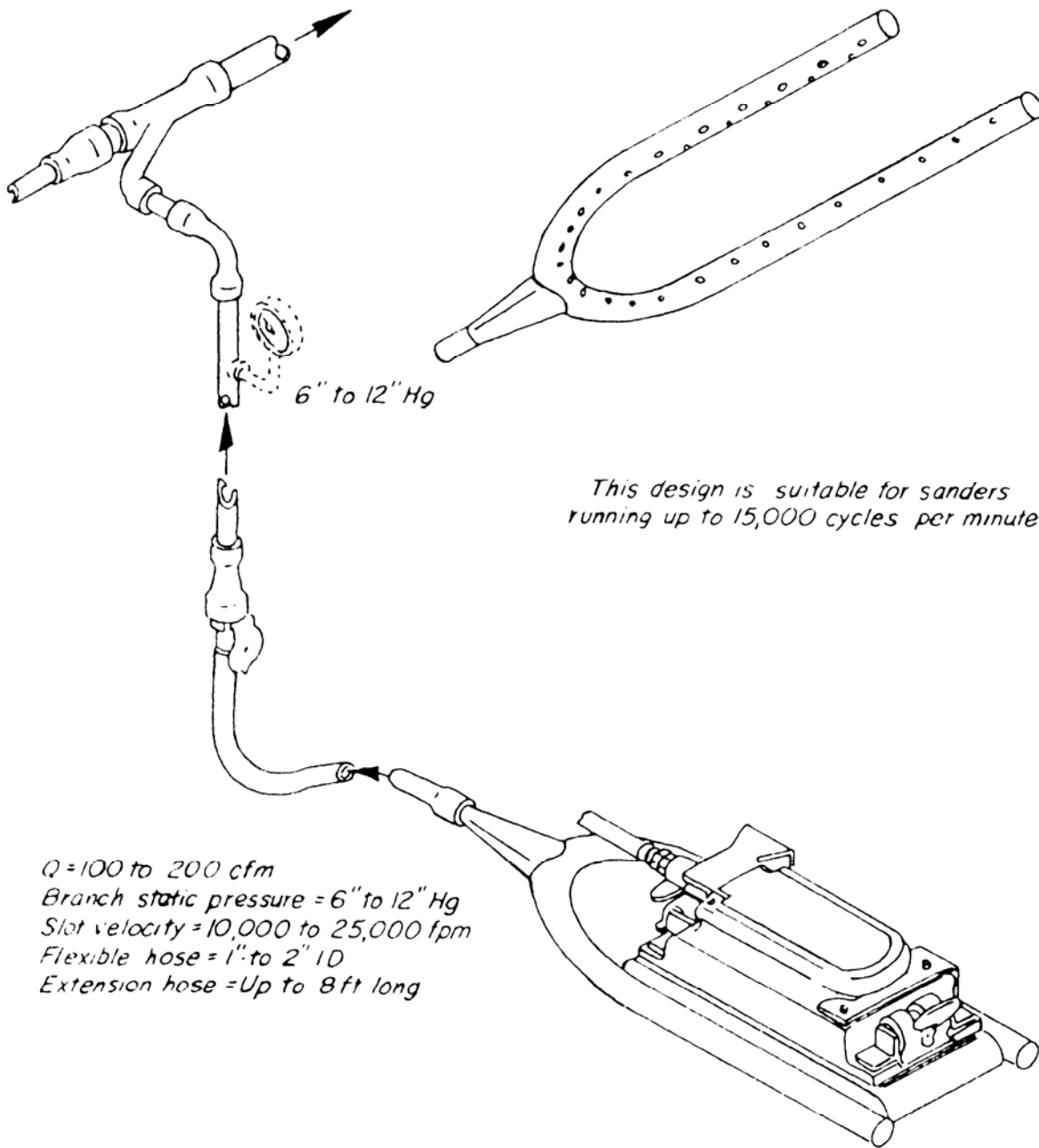
Sanding disc size = 5" to 9" dia

Peripheral speed = 4,500 - 14,000 linear fpm



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EXTRACTOR HOOD FOR DISC SANDER



This design is suitable for sanders running up to 15,000 cycles per minute

*Q = 100 to 200 cfm
 Branch static pressure = 6" to 12" Hg
 Slot velocity = 10,000 to 25,000 fpm
 Flexible hose = 1" to 2" ID
 Extension hose = Up to 8 ft long*

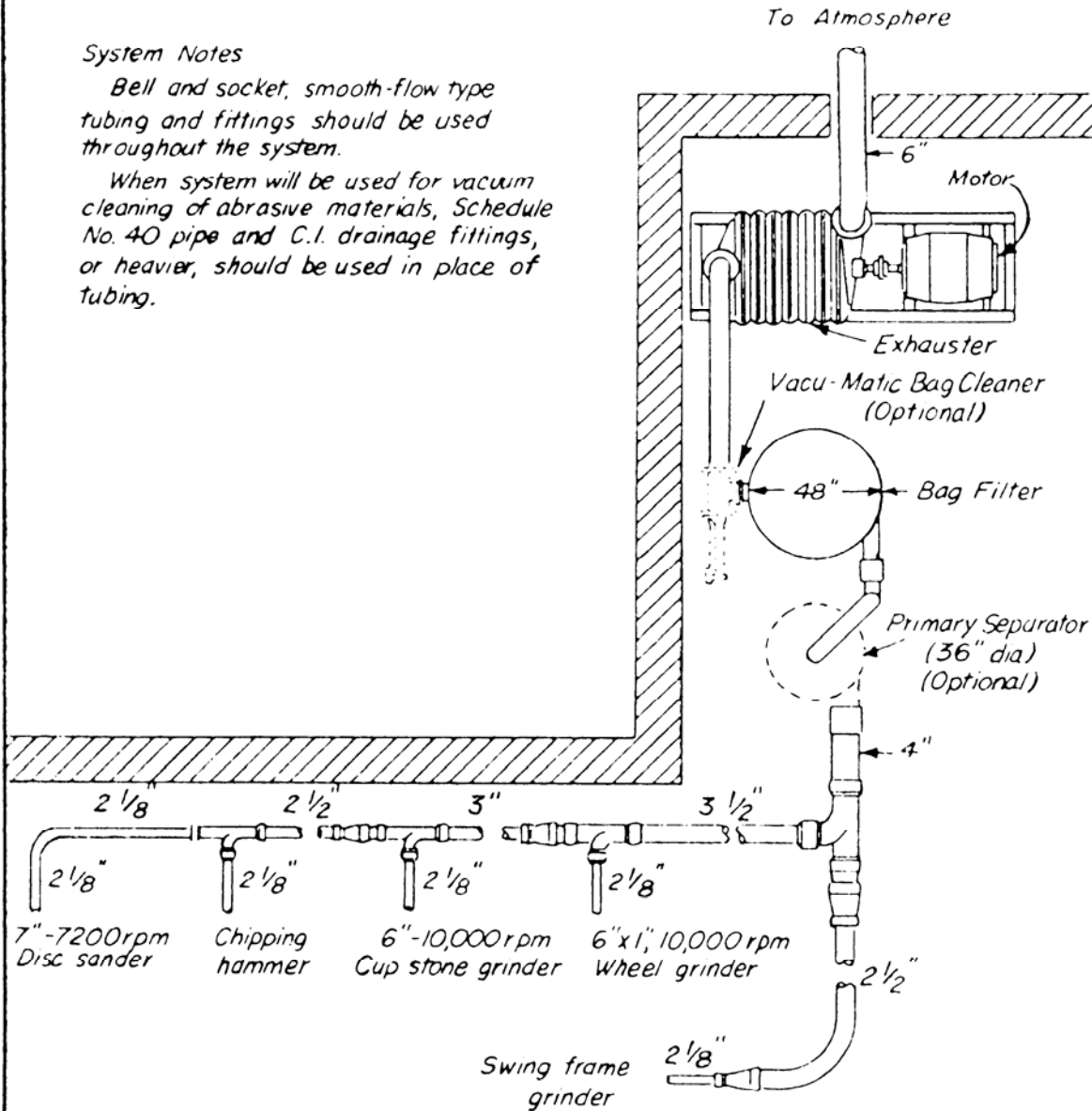
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EXTRACTOR TOOL FOR
 VIBRATORY SANDER

System Notes

Bell and socket, smooth-flow type tubing and fittings should be used throughout the system.

When system will be used for vacuum cleaning of abrasive materials, Schedule No. 40 pipe and C.I. drainage fittings, or heavier, should be used in place of tubing.



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**TYPICAL SYSTEM
LOW VOLUME HIGH VELOCITY**