

2. Induced air flow caused by the thermal or stack effect from sources of extreme heat.
3. Exhaust volumes insufficient to dilute mixtures of combustible vapor and air to less than 20 percent of the lower explosive limit of the combustible.
4. Room air currents caused by cross drafts, spot cooling, motion of machinery or operators.
5. Local or State regulations may specify larger exhaust volumes for specific operations.

Exhaust volume requirements for many specific operations have been listed in Tables 2, 3, 4, and 5.

TABLE 3. EXHAUST REQUIREMENTS<sup>27</sup> 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*, In. | Branch Diam. In. | CFM  | Wheel Diam. In.                          | Max. Width*, In. | Branch Diam. In. | CFM  |
| - 9                        | 1½               | 3                | 225  | - 9                                      | 2                | 3½               | 300  |
| 10-16                      | 2                | 4                | 390  | 10-16                                    | 3                | 4½               | 500  |
| 17-19                      | 3                | 4½               | 500  | 17-19                                    | 4                | 5                | 610  |
| 20-24                      | 4                | 5                | 610  | 20-24                                    | 5                | 5½               | 740  |
| 25-30                      | 5                | 6                | 880  | 25-30                                    | 6                | 6½               | 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                                   | 1-4½             | 500  |
| 13-19                                   | 4                | 390 | 20-25                                   | 1-6              | 880  | 21-30                                 | 2-4              | 780  |
| 20-30                                   | 5                | 610 | 26-30                                   | 1-7              | 1200 | 31-53                                 | 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 ¼ in. to branch diameter for each 2 in. or fraction increase in belt width over 3 in.

\* Increase branch diameter 0.3 in., but not less than ¼ in., for each 1 in. increase in width over dimension noted.

### Duct System Design

The duct system will consist of branch ducts connected to a main duct which will convey the air from the hoods to the exhaust fan and the air cleaning equipment, if used. Round ducts should be used wherever possible. Their gage size and construction differ from air supply practice due to the rougher usage encountered, and in the case of dusts, to the abrasive effect. (See later section on Exhaust System Design and Construction Features.) Usual conveying velocities are shown in Table 6. Where solid contaminants are handled, recommended velocities must be maintained throughout the system to prevent material from settling in the ducts and obstructing the air flow. For conveying of solid particles, velocities shown in Table 6

include a reasonable factor of safety, and design velocities may therefore be adjusted to use commercial pipe sizes which are available generally in ½-in. diameter steps through 6-in. diameter and 1-in. steps through 16-in. diameter or larger with 2-in. diameter steps for large diameters. For contaminants that are not solids, conveying velocities are based on a balance between the higher resistance and lower first cost of smaller diameter ducts against higher first cost and lower resistance of larger diameter ducts.

TABLE 4. VENTILATION RATES FOR OPEN SURFACE TANKS

| PROCESS                                     | MINIMUM VENTILATION RATE CFM PER SQ FT HOOD OPENING |                |                  |                 | MINIMUM VENTILATION RATE CFM PER SQ FT TANK AREA LATERAL EXHAUST (NOTE 1) |     |               |     |              |     |
|---------------------------------------------|-----------------------------------------------------|----------------|------------------|-----------------|---------------------------------------------------------------------------|-----|---------------|-----|--------------|-----|
|                                             | Enclosing Hood                                      |                | Canopy Hood      |                 | W/L = Tank Width / Tank Length RATIO                                      |     |               |     |              |     |
|                                             | One Open Side                                       | Two Open Sides | Three Open Sides | Four Open Sides | W/L 0-0.24                                                                |     | W/L 0.25-0.49 |     | W/L 0.50-1.0 |     |
|                                             |                                                     |                |                  |                 | A                                                                         | B   | A             | B   | A            | B   |
| Plating                                     |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Chromium (Chromic Acid Mist)                | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Arsenic (Arsine)                            | 65                                                  | 90             | 100              | 150             | 90                                                                        | 130 | 110           | 150 | 130          | 170 |
| Hydrogen Cyanide                            | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Cadmium                                     | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Gold                                        | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Metal Cleaning (Pickling)                   |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Cold Acid                                   | 65                                                  | 90             | 100              | 150             | 90                                                                        | 130 | 110           | 150 | 130          | 170 |
| Hot Acid                                    | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Nitric and Sulphuric Acid                   | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Nitric and Hydrofluoric Acid                | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Metal Cleaning (Degreasing)                 |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Trichloroethylene                           | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Ethylene Dichloride                         | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Carbon Tetrachloride                        | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Metal Cleaning (Caustic or Electrolytic)    |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Not Boiling                                 | 65                                                  | 90             | 100              | 150             | 90                                                                        | 130 | 110           | 150 | 130          | 170 |
| Boiling                                     | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Bright Dip (Nitric Acid)                    | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Stripping                                   |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Concentrated Nitric Acid                    | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Conc. Nitric and Sulphuric Acid             | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Salt Baths (Molten Salt)                    | 50                                                  | 75             | 75               | 125             | 60                                                                        | 90  | 75            | 100 | 90           | 110 |
| Salt Solution (Parkerize, Bond-erize, etc.) |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Not Boiling                                 | 90                                                  | 90             | 100              | 150             | 90                                                                        | 130 | 110           | 150 | 130          | 170 |
| Boiling                                     | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |
| Hot Water (if vent. desired)                |                                                     |                |                  |                 |                                                                           |     |               |     |              |     |
| Not Boiling                                 | 50                                                  | 75             | 75               | 125             | 60                                                                        | 90  | 75            | 100 | 90           | 110 |
| Boiling                                     | 75                                                  | 100            | 125              | 175             | 125                                                                       | 175 | 150           | 200 | 175          | 225 |

Note 1—Column A refers to tank with hood along one side or two parallel sides when one hood is against a wall or a baffle running length of tank and as high as tank is wide; also to tanks with exhaust manifold along center line with  $\frac{W}{L}$  becoming tank width in W/L Ratio.

Column B refers to free standing tank with hood along one side or two parallel sides.

Main ducts connecting two or more branches are sized by the same procedure. The main should be designed for the total exhaust volume to be handled through all branch ducts.

Where exhaust systems handling solids are to provide for a substantial increase of future capacity, required conveying velocities can be maintained by:

1. Providing open end stub branches in main through which air will be admitted into system until future connection is made. The volume admitted into the main