

Consideration must also be given to the natural movement of the fumes. For those that are lighter than air the hood should be over or above the machine and where a heavy vapor or dust-laden air at ordinary temperature is to be removed, horizontal or floor connections are required. If it is attempted to remove heavy dust such as lead oxides by an overhead hood the conditions may be worse than if no exhaust were used at all, owing to the rising air current carrying the dust up through the breathing zones. The principle to keep in mind in all cases is to take advantage of the natural tendency of the material to move upward or downward.

In another class of operation the main object is to prevent the escape of dust into the surrounding atmosphere, the removal of some dust from the machine or enclosure being merely incidental. The dust creating apparatus is enclosed within a housing which is made as tight as practicable, and sufficient suction is applied to the enclosure to maintain an inward air leakage, thus preventing escape of the dust. While the exhaust system is only required to handle the air which leaks in through the crevices and openings in the enclosure, yet in many installations leakages are very high and great care is required to obtain satisfactory results with a system of this kind. The inward leakage principle is utilized for controlling dust in the operating of tumbling barrels, grinding, screening, elevating and similar processes.

Certain dust and fume producing operations are best carried on by isolating the process in a separate compartment or room and then applying general ventilation to this space. The compartment or room in which the work is performed should be as small as is consistent with convenience in handling the work. The ventilating system should be designed so that a strong current of clean air is drawn across the operator, and away from him toward the work, where the dust is picked up and carried from the room.

IMPORTANT REQUIREMENTS OF AN EFFICIENT EXHAUST AND COLLECTING SYSTEM.

It is impracticable to enumerate all of the requirements for an efficient exhaust and collecting system, however, among the more important there are the following:

1. Fans, collectors, hoods, and ducts should be of adequate size.
2. Air volume and velocities should be adequate for the work to be accomplished.
3. The exhaust hoods should not interfere with the operation of the machine or access to its working parts.
4. The system should not increase the fire hazard.
5. The system should not increase the dust explosion hazard.
6. Where power is expensive, should do the required work with a minimum power consumption.
7. In cold climates, should not remove any more air than necessary from the building.
8. Where power is comparatively cheap, first cost should be low, even if the power required to operate is slightly higher.

In designing an exhaust system certain quantities must be chosen arbitrarily by the engineer, and the success of the installation depends to a large degree upon his experience and the skill with which he chooses these arbitrary quantities. It is quite possible for an inexperienced designer to lay out a system which may figure out properly, but the general results are likely to be unsatisfactory.

The first step in designing systems employing hoods to trap the material is to determine the number and size connections for each individual machine. At this point the designer's past experience is of great value, as, while it is possible to set certain general standards, yet in actual practice the sizes are considerably affected by the local conditions which the



FIG. 70. HEAT AND VAPORS FROM IRONING OPERATIONS IN LAUNDRY REMOVED BY EXHAUST SYSTEM

layout man finds in the field, and he bases the pipe sizes and hoods on his judgment, being guided by his experience and the general practice.

The size of hoods and connections are determined by the size and type of machines or apparatus to be handled by the exhaust system, by the kind of material worked, by the duty of the machines and other local conditions. It is impracticable to lay down any general rules for determining size connections for the various types of machines and Tables 107 to 109, giving sizes as used in some of the common industries are only intended to serve as a general guide. Under certain favorable conditions smaller connections may be supplied.

Open bottom exhaust hoods of the canopy type, where it is impractical to enclose completely the point of origin of the dust or fumes, should extend over the machine or operation at least 6 in. in every direction if the hood is not elevated more than 2 ft. For each additional 2 ft. of elevation, the size of the hood should be increased 6 in. in all directions.

In systems employing inward air leakages the area of connections must be proportional to total leakage area in the enclosing housing.