

EXHAUST SYSTEMS, GENERAL & COMFORT VENTILATION

250 tons. Certainly no small unit heater spotted over this doorway will be able to solve the problem.

The following discussion of makeup air is taken directly from *Industrial Ventilation—A Manual of Recommended Practice*.*

Natural infiltration

The need for makeup air should not be based on "air change" figures since there is a great variation between new and old buildings, as well as differences in basic building types. A relatively old building with large sash areas is "open" and air leakage will be quite pronounced. On the other hand, a modern, windowless plant of masonry construction is practically air tight and the building will be truly "air starved" with appreciable exhaust ventilation. Between these two extremes it is difficult to apply engineering data to determine minimum volumes required. In general it is best to provide makeup to supply approximately the same volume of air as that exhausted.

Makeup air is important for the following reasons:

- 1 To ensure that exhaust hoods operate properly—A lack of makeup air creates a "negative pressure" condition which increases static pressure which the exhaust fans must overcome. This causes a reduction in exhaust volume and is particularly serious with low-pressure fans such as wall fans and roof exhausters.
- 2 To ensure the proper operation of natural stacks such as combustion flues and vents.
- 3 To eliminate high-velocity cross drafts through windows and shipping doors—These cross drafts not only interfere with proper operation of exhaust ventilation but may also disperse contaminated air from one section of the building into another. This is particularly important in the case of dusty operations where settled material may be dislodged from beams and ledges.
- 4 To eliminate cold drafts on workers—Drafts not only cause discomfort and reduced working efficiency but may also result in lower overall plant ambient temperatures from the existing heating equipment.
- 5 To eliminate differential pressure on doors.

It must be emphasized that makeup air will always enter the building, otherwise the exhaust fans cannot function. Further, this air will be heated eventually by inefficient mixing, while still producing all the disadvantages in air leakage and inefficient exhaust ventilation. It is more economical to introduce the air through makeup air heaters whereby its temperature and distribution can be controlled.

Application of makeup air

The fresh air intake should be located remote from any contaminating sources such as exhaust stacks or furnace exhausts. It is advisable to filter the fresh air to protect the equipment and provide maximum heat exchange efficiency. In the case of finned-coil heating units, filtering is necessary to prevent plugging.

The air supply system must be provided with a fan. Otherwise the room will still be under a negative pressure since the exhaust fans must pull the air through the resistances of the filters, coils and ductwork.

Makeup air sources should be located to provide cross ventilation. In this way the air can be "used twice." First, it will provide general ventilation of nuisance producing areas and finally, makeup air for the exhaust systems. This does not apply for spot cooling applications where the air will be introduced directly at the work station and may vary significantly from room temperature. The air distribution pattern must be engineered carefully to provide effective area coverage without excessive cross drafts which will interfere with the workers or the existing systems. Preferably, there should be convenient "two-season" control to afford changes in the makeup air pattern for summer and winter without closing off the outlets.

Makeup air should be introduced into the "living zone" of the plant, that is, below the 8 to 10 ft level. In this manner the air is used first by the people and best results of

*American Conference of Governmental Industrial Hygienists, Lansing, Mich. *Industrial Ventilation—A Manual of Recommended Practice*, 7th ed. pp. 7-1 and 7-2, 1962.