2. Determination of outside air requirements.
3. Determination of cooling load.
   a. Room sensible heat gain.
   b. Room latent heat gain.
   c. Room total heat gain.
   d. Grand total heat gain.
4. Determination of heating load.
   a. Room sensible heat loss.
   b. Room moisture loss.
   c. Humidification requirement.
   d. Total heating requirement.
5. Determination of apparatus dewpoint and dehumidified or humidified air quantity.
   a. Summer (full load and part load).
   b. Winter.
6. Supply air temperature difference and quantity.
   a. Summer.
   b. Winter.
7. Equipment selection.
8. Equipment layout.

The foregoing steps are merely typical. Many applications will require at least a preliminary investigation of some of the latter steps before proceeding with the earlier steps. A permanent record of all design assumptions and computations should be made and preserved for comparison with the performance of the installation.

CHAPTER 30

AIR DISTRIBUTION

Standards for Satisfactory Conditions, Definitions, Mechanics of Air Distribution, Outlet Performance, Types of Air Outlets, Outlet Location and Selection, Directional and Volume Control, Return and Exhaust Intakes, Specific Applications

CORRECT air distribution contributes as much or more to the success of a forced air heating, ventilating, cooling or air conditioning system as does any other single factor. An air conditioning system may deliver the required quantity of conditioned air and still fail to give satisfactory room conditions because of poor air distribution. The scope of the chapter is limited to the air distribution within the conditioned space. Reference is made to the distributing duct system only insofar as it affects the performance of the air distribution outlet. See Chapter 31 for information on air duct design.

STANDARDS FOR SATISFACTORY CONDITIONS

The object of air distribution is to create within the space the proper combination of room temperature, air motion and humidity, whether by cooling, heating or ventilating. The purpose to be accomplished determines the factors to be controlled. For instance, in many industrial applications it is necessary to maintain proper standards throughout a large portion of the space; sometimes almost throughout the entire enclosure. In these cases design room temperature, room air motion and humidity will depend entirely upon the requirements of the product and its manufacturing processes.

If, however, comfort of the occupants is the principal objective, consideration of the occupied zone (floor to 6 ft above floor level) is primarily required. In order to obtain comfort conditions within this zone, standard limits have been set up as acceptable *effective temperatures*. This term comprises air temperature, motion, humidity and their physiological effect on the surface of the human body. Any variation from accepted standards of one of these elements may result in discomfort to the occupants. The same effect may be caused by lack of uniformity of conditions within the space or by excessive fluctuation of conditions in the same part of the space. Such discomfort may arise due to excessive room air temperature variations (horizontally, vertically, or both), excessive air motion (draft), failure to deliver or distribute the air according to the load requirements at the different locations, or too rapid fluctuation of room temperature or air motion (gusts).

In addition the noise level created by the introduction of supply air should be kept within acceptable limits, and streaking or smudging of walls or ceilings should be prevented.

With reference to permissible room air motion it is not possible to establish a specific standard covering the entire complex problem of air distribution. Velocities less than 15 fpm generally cause a feeling of air stagnation, whereas velocities higher than 65 fpm will disturb loose paper sheets