Velocity Head or Pressure: The head or pressure required to create the velocity of flow, that is, the head or pressure required to accelerate the mass from a state of rest to the velocity at the point measured.

Ventilation: Air change. *Natural Ventilation:* Air change produced by natural forces (wind and gravity) only. *Mechanical Ventilation:* Air change produced by mechanical means (fans and blowers).

Warm Air Heating System: A warm air heating plant consists of a heating unit (fuel-burning furnace) enclosed in a casing, from which the heated air is distributed to the various rooms of the building through ducts. If the motive head producing flow depends on the difference in weight between the heated air leaving the casing and the cooler air entering the bottom of the casing, it is termed a *gravity* system. A booster fan may, however, be used in conjunction with a gravity-designed system. If a fan is used to produce circulation and the system is designed especially for fan circulation, it is termed a *fan furnace* system or a *central fan furnace* system. A fan furnace system may include air washers, filters, etc.

Wet-Bulb Temperature: The lowest temperature which a water wetted body will attain when exposed to an air current. (This is the temperature of adiabatic saturation.)

Wet Return: That part of a return main of a steam heating system which is filled with water of condensation. (The wet return usually is below the level of the water line in the boiler, although not necessarily so.)

ABBREVIATIONS

British thermal unit	Btu	foot	ft
calorie	cal	gallon	gal
centigram	cg	gallons per minute	gpm
centimeter	cm	gallons per second	gps
centimeter-gram-second	cgs	horsepower	hp
cubic	cu	inch	in.
cubic foot	cu ft	meter	m
cubic feet per second	cfs	miles per hour	mph
cubic feet per minute	cfm	minute	min
degree	deg	ounce	oz
degree centigrade	C	parts per million	ppm
degree Fahrenheit	F	revolutions per minute	rpm
direct-current (as adjective)	d-c	revolutions per second	rps
feet per minute	fpm	square foot	sq ft
feet per second	fps	square inch	sq in.

Chapter 2

ESTIMATING HEAT LOSSES

Procedure to be Followed; Inside Temperatures; Outside Temperatures; Wind Movement; Heat Sources; Examples of Heat Loss Computations.

THE size of the heating plant required for a building is based on the maximum heat demand. This maximum heat demand depends on many factors, most of which are seldom, if ever, in equilibrium. These include the following:

1. Outside temperature. 2. Rain or snow. 3. Sunshine or cloudiness. 4. Wind velocity.	*Outside Conditions (The Weather)*
5. Heat transmission of exposed parts of building. 6. Infiltration of air through cracks, crevices and open doors and windows. 7. Heat capacity of materials. 8. Rate of absorption of solar radiation of exposed materials.	*Building Construction*
9. Inside temperatures. 10. Stratification of air. 11. Type of heating system. 12. Ventilation requirements. 13. Period and nature of occupancy. 14. Temperature regulation.	*Inside Conditions*

The *inside conditions* vary from time to time, the physical properties of the *building construction* may change with age, and the *outside conditions* are changing constantly. Just what the worst combination of all of these variable factors is likely to be in any particular case is therefore conjectural.

Because of the nature of the problem, extreme precision in estimating heat losses at any time is very unlikely. However, studies now in progress at the A.S.H.V.E. Research Laboratory will, it is hoped, increase the accuracy with which it is possible to combine all of the various factors involved to determine the maximum effect thereof. The data published in this and Chapters 3, 4, and 28 have been largely derived from the investigations at the A.S.H.V.E. Research Laboratory since it was established in 1919, and also at cooperating institutions. Studies of sun effect and heat capacity have been under way for about two years.

The procedure to be followed in determining the heat loss from any building can be divided into seven consecutive steps, as follows:

1. Determine on the inside air temperature, at the breathing line, which is to be maintained in the building during the coldest weather. (See Table 1, p. 10).