

The temperature-controlling aquastat in a hot water storage tank ought to be no higher than the center of the tank, and possibly should be even closer to the bottom since water in a tank stratifies proportionally to the temperature. When hot water is removed, the cold water entering to replace it quickly reduces the temperature in the lower parts of the tank.

### SWIMMING POOL HEATING REQUIREMENTS

Swimming pools present a problem of hot water heating demand which is frequently overestimated. Few outdoor swimming pools require water heating, and in some cases they require the addition of cold water to regulate the temperature. The recirculation system of a swimming pool consists of the pumps, hair and lint catchers, and filters together with all necessary pipe connections to the inlets and outlets of the pool. The water heater, the sterilizing equipment and suction cleaner are usually installed or connected to the recirculation system and may be considered as integral parts of the system.

The recirculation system and all its component parts should be designed to provide the required volume of circulation so that the water turnover ratio is at least two times per day and where heavy loads are anticipated the turnover ratio should be increased to three times or more. Many states have regulations prescribing the circulation turnover.

The water heaters for swimming pools are usually instantaneous steam coil heaters. These heaters should be sized so that they will have sufficient capacity to heat the water delivered by the circulating pump 15 F per hour.

The water temperature in a pool is usually maintained at about 72 F. A few states have regulations prohibiting higher water temperatures than 70 F. The room temperature should be approximately 5 F higher, but not more than 8 F higher nor less than 2 F lower, than the water temperature.

**Example 11.** Assume a swimming pool 75 ft long, 30 ft wide with an average depth of 6 ft. If the water is to be heated from a temperature of 50 to 65 F, what capacity heater and steam consumption is required with a turnover ratio of two times per day?

Pool volume:  $75 \times 30 \times 6 \times 7.5 = 100,000$  gal.

With a turnover ratio of twice in 24 hr, the heating capacity is:  $\frac{100,000 \times 2}{24} = 8333$  gal per hour.

The steam consumption would be:  $\frac{8333 \times 8.33 (65 - 50)}{970} = 1080$  lb steam per hour.

Regulation of swimming pool temperatures is essential for successful operation and economy. It is therefore recommended that the steam supply to the heater be provided with a by-pass which may be used for pool filling and initial heating and that a smaller by-pass be installed with an automatic control valve having the capacity to heat the circulation water approximately 5 F per hour.

### Chapter 47

## TERMINOLOGY

*Glossary of Physical and Heating, Ventilating and Air Conditioning Terms Used in the Text, Standard Abbreviations, Conversion Equations, Drafting Symbols, Specific Heat Table*

**Absolute Humidity:** See *Humidity*.

**Absolute Pressure:** The pressure referred to that of a perfect vacuum. It is the sum of gage pressure and barometric pressure.

**Absolute Temperature:** A reading on the absolute temperature scale. Absolute temperature is obtained by adding 459.70 degrees to the Fahrenheit temperature.

**Absolute Zero:** The zero point on the absolute scale 459.70 F below the zero of the Fahrenheit scale.

**Acceleration:** The rate of change of velocity. In the fps system this is expressed in units of one foot per second.  $a = V \div t$ .

**Acceleration Due to Gravity:** The rate of gain in velocity of a freely falling body, the value of which varies with latitude and elevation. The international gravity standard has the value of 980.665 cm per second per second or 32.174 ft per second per second, which is the actual value of this acceleration at sea level and about 45 deg latitude.

**Adiabatic:** An adjective descriptive of a process in which no heat is added to or extracted from the system executing the process.

**Air Cleaner:** A device designed for the purpose of removing air-borne impurities such as dusts, fumes and smokes. (Air cleaners include air washers and air filters.)

**Air Conditioning:** The simultaneous control of all or at least the first three of those factors affecting both the physical and chemical conditions of the atmosphere within any structure. These factors include temperature, humidity, motion, distribution, dust, bacteria, odors and toxic gases, most of which affect in greater or lesser degree human health or comfort. (See *Comfort Air Conditioning*.)

**Air Washer:** An enclosure in which air is forced through a spray of water in order to cleanse, humidify, or dehumidify the air.

**Anemometer:** An instrument for measuring the velocity of moving air.

**Atmospheric Pressure:** The pressure indicated by a barometer. *Standard atmospheric pressure* is a pressure of 76 cm mercury (density 13.5951 grams per cubic centimeter, gravity 980.665 cm per second per second). It is equivalent to 14.6959 lb per square inch or 29.921 in. of mercury at 32 F.

**Baffle:** A plate or wall for deflecting gases or fluids.

**Blast:** This word was formerly used to denote forced air circulation, particularly in connection with central fan systems using steam or hot water as the heating medium. As applied in this sense, the word *blast* is now obsolete.

**Boiler:** A closed vessel in which steam is generated or in which water is heated.

**Boiler Heating Surface:** That portion of the surface of the heat-transfer apparatus in contact with the fluid being heated on one side and the gas or refractory being cooled on the other, in which the fluid being heated forms part of the circulating system; this surface shall be measured on the side receiving heat. This includes the boiler, water walls, water screens, and water floor. (A.S.M.E. Power Test Codes, Series 1929.)

**Boiler Horsepower:** The equivalent evaporation of 34.5 lb of water per hour from and at 212 F. This is equal to a heat output of  $970.3 \times 34.5 = 33,475$  Btu per hour.

**British Thermal Unit:** A unit of energy defined in terms of the international steam-table calorie through the convenient relation 1 Btu per pound per degree Fahrenheit = 1 cal per gram per degree Centigrade. It is approximately the quantity of heat required, to raise the temperature of 1 lb of liquid water from 63 to 64 F.