

corner in passing through the fence, and the heavier drops of water are thrown back, owing to their inertia. The louvers also restrict the flow of air, particularly at the higher wind velocities, and thus further reduce the possibility of water being carried off. The height of an effective fence should be equal to the height of the spray cloud. Louver boards are preferably of red gulf cypress or California redwood supported on cast-iron, steel or wood posts. Where building ordinances forbid the use of combustible materials, sheet metal is customarily used.

Algae formations may be a considerable nuisance in a spray pond. Such growths are killed by the periodic addition of potassium permanganate to the pond water. Addition of the dissolved chemical should be made until the water holds a faint pink color for at least 15 min.

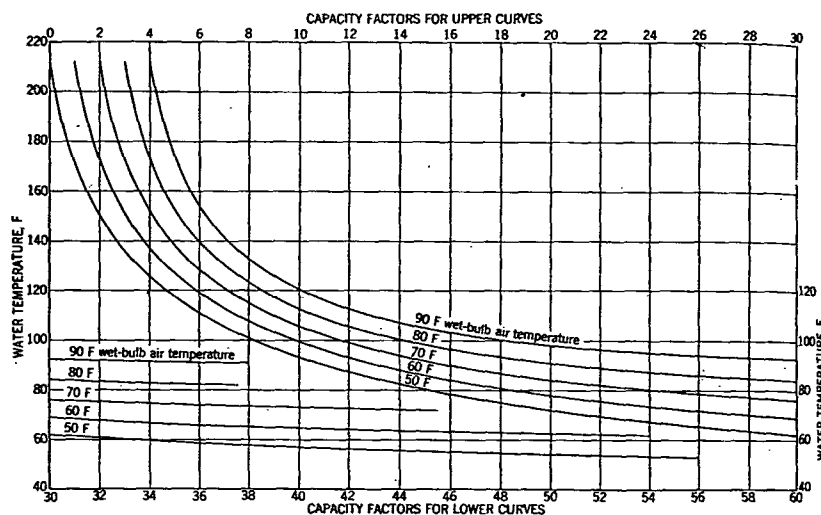


FIG. 4. NATURAL DRAFT COOLING TOWER DESIGN CURVES FOR DETERMINING CAPACITY FACTORS

Spray Cooling Towers

Where not more than 30,000 Btu per minute are to be dissipated, the spray cooling tower is a satisfactory apparatus. The word *tower* in this connection is somewhat of a misnomer as the apparatus is essentially a narrow spray pond with a high louver fence. As usually built, the nozzles spray down from the top of the structure and the distance from the center of the nozzle system to the fence on either side is not more than half the distance that the nozzles are elevated above the water basin. Heights range from 6 ft to 15 ft and the total width of a structure is not usually greater than its height. Spray cooling towers occupy less space on small jobs than spray ponds of equivalent capacities because the towers have a capacity of from 0.6 gpm to 1.5 gpm per square foot of tower area. The

louvers are continually wet, and so add to the surface of water exposed to the cooling air.

Natural Draft Deck Type Towers

In past years most of the atmospheric water cooling on refrigeration work has been done with natural draft deck type towers, which are also referred to as *wind* or *atmospheric* towers. These towers consist of heavy wooden or steel framework from 15 ft to 80 ft high and from 6 ft to 30 ft wide, having open horizontal lattice-work platforms or decks at regular intervals from top to bottom, and a catch basin at the foot. The hot water is distributed over the upper part of the structure by means of troughs, splash heads, or nozzles, and it drips from deck to deck down to the basin. The object of the decks is to arrest the fall of the water so as to present efficient cooling surfaces to the air, which passes through the tower parallel to the decks. The decks also add to the area of water

TABLE 3. NATURAL DRAFT SPRAY DISTRIBUTION COOLING TOWER DESIGN SIZES AND COEFFICIENTS

COEFFICIENT K (FORMULA 1)	NO. OF DECKS	DECK SPACING FT CENTERS	UNIT LENGTH FT	DECK WIDTH FT
2860	9	3	11.75	12.0
3430	11	3	11.75	12.0
3620	17	1.5	11.75	12.0
4390	21	1.5	11.75	12.0

surface exposed to the air, but since they furnish a resistance to air flow, too many decks are a detriment.

To prevent the loss of water on the leeward side of the tower, wide splash boards are attached at regular intervals from top to bottom. These boards or louvers extend outward and upward, and in most designs the top edge of each louver extends above the bottom edge of the one above it.

Efficiency of a deck tower is improved, within limits, by increased height, increased length, or increased width. The first two increase the area of water exposed to the wind, and the latter increases the time of contact of the air with the water.

A rating formula has been developed for determining the number of standard tower sections based upon the values given in Table 3 and the capacity factors obtained from Fig. 4 with estimated design water and air temperatures. The rating formula is,

$$N = \frac{Q(C_1 - C_2)}{K} \quad (1)$$

where

N = number standard tower sections required.

Q = quantity water circulated, gallons per minute.

C_1 = capacity factor corresponding to temperature water leaving tower.

C_2 = capacity factor corresponding to temperature water entering tower.

Example 1. It is desired to cool 1000 gpm of water from 100 to 80 F in a natural draft cooling tower utilizing spray distribution based upon an outside design wet-bulb air