prepared eleven schedules[2] for the kiln-drying of practically all kinds, types, and thicknesses of softwoods and hardwoods. The tables given in these schedules range from 105 to 200 F dry-bulb, and from 20 to 80 per cent relative humidity. As a rule, the softer the wood, the higher the average temperature used. The temperature and relative humidity in a lumber drying kiln are varied for all conditions, starting with a low dry-bulb and a high relative humidity when the green lumber, containing a large percentage of moisture, is started to dry. As the moisture content of the lumber decreases, the dry-bulb temperature of the kiln is increased, and the relative humidity reduced. It is noted, however, that perfect drying does not necessarily result from following a schedule, and that an operator must be trained to watch the condition of the stock in the kiln and to immediately apply a remedy if he sees things going wrong.

GREENHOUSES

Table 3 lists customary dry-bulb temperature ranges for different types of plants and flowers raised in greenhouses.

Table 3. Customary Temperatures for Different Types of Greenhouses

Type of House	Temperature Range Deg Fahr	Type of House	Temperature Range Deg Fahr
Carnation	45 to 55	Orchid, cool	50 to 55
Conservatory (general collection)	60 to 65	Palm, warm	60 to 65
Cool	45 to 50	Palm, cool	50 to 55
Cucumber	65 to 70	Propagating	55 to 60
Fern	60 to 65	Rose	55 to 60
Forcing	60 to 65	Sweet pea	45 to 50
General purpose	55 to 60	Tomato	65 to 70
Lettuce	40 to 45	Tropical	65 to 70
Orchid, warm	65 to 70	Violet	40 to 45

APPARATUS FOR INDUSTRIAL CONDITIONING

Apparatus for industrial air conditioning may be divided into two distinct groups, namely, (1) *humidifiers* for increasing the moisture content of the air and for producing cooling by evaporation and (2) *dehumidifiers* for removing moisture from the air and for producing cooling by contact with water or surfaces at a lower temperature than the air.

Strictly speaking, humidity control alone, whether it involves humidification or dehumidification, is not *air conditioning*. To be entitled to this classification according to the definition in Chapter 41, the process should include the *simultaneous control* of temperature, humidity and air motion.

Industrial humidifiers may be divided into the following general types, according to the method of operation:

1. *Direct*, which spray into the room.
2. *Indirect*, which introduce moistened air.
3. *Combined* direct and indirect.

[2] *Technical Note Number 175*, Forest Products Laboratory, U. S. Forest Service, Madison, Wis.

Spray Generation

Spray generation is obtained by (1) atomization, (2) impact, (3) hydraulic separation, and (4) mechanical separation.

Atomization involves the use of a compressed air jet to reduce the water particles to a fine spray. With the *impact* method, a jet of water under pressure impinges directly on the end of a small round wire. Where *hydraulic separation* is employed, a jet of water enters a cylindrical chamber and escapes through an axial port with a rapid rotation which causes it immediately to separate in a fine cone-shaped spray. In the *mechanical separation* process, water is thrown by centrifugal force from the surface of a rapidly revolving disc and separates into particles sufficiently small to be utilized in certain types of mechanical humidifiers.

Spray Distribution

Spray distribution is obtained by (1) air jet, (2) induction, and (3) fan propulsion.

The air jet which generates the spray in atomizers also carries the spray through a space sufficient for its distribution and evaporation, and this method of distribution is termed *air jet*. Where distribution is obtained by *induction*, the aspirating effect of an impact or centrifugal spray jet is utilized to induce a current of air to flow through a duct or casing, and this air current distributes the spray. *Fan propulsion* obviously consists of the utilization of fans to entrain and distribute the spray.

Industrial type direct humidifiers are commonly classified as (1) atomizing, (2) high-duty, (3) spray and (4) self-contained or centrifugal.

Atomizing Humidifiers

There are several types of atomizing humidifiers, all of which rely upon compressed air as the atomizing and distributing agency, similar to the familiar method used in ordinary nasal atomizers. Compressed air (ordinarily about 30 lb per square inch) is supplied from a centrally-located air compressor through pipe lines to the atomizing units. The air lines are usually horizontal and parallel to water lines which supply water by gravity from a float tank. The water in the tank is maintained at a constant level slightly lower than the outlets of the atomizers themselves and is drawn constantly to the atomizer by aspiration when compressed air is supplied. This aspiration ceases and the flow of water stops when the air supply is cut off. The water should not be supplied under pressure to atomizers because of the possibility of leakage, drip, or coarse spray which cannot be permitted when water is supplied by aspiration.

High-Duty Humidifiers

Water is supplied to high-duty humidifiers under high pressure (usually about 150 lb per square inch) through pipe lines from a centrally-located pumping unit. The spray-generating nozzle which is of the impact type is located in a cylindrical casing. A drainage pan provides for the collection and return of unevaporated water which flows through a return pipe to a filter tank, from which it is recirculated. A powerful air current is forced through the humidifier by means of a fan mounted above the unit.