

Table 1 Temperatures and Humidities Applicable to Industrial Air Conditioning—(Continued)

Process	Temp. F	R.H.%
FLOOR COVERING		
Linoleum:		
Mechanical oxidizing of linseed oil.....	90 to 100	
Printing.....	80	
Stoving process.....	160 to 250	
Some operations are stabilized to prevent mold growth. Precise control of temperature is required for mechanical oxidizing of linseed oil. The rate of flow and the temperature of water in the jacket surrounding the tank must be controlled. Air filtration is recommended for the stoving process.		
FOUNDRIES*		
Core making.....	60 to 70	
Mold making:		
Bench work.....	60 to 70	
Floor work.....	55 to 65	
Pouring.....	40	
Shakeout.....	40 to 50	
Cleaning Room.....	55 to 65	
* Winter design room temp.		
The charging room is usually unheated. In core making fume-exhaust hoods are required for oven and for cooling areas adjacent to ovens. In mold making provide hoods at transfer points with wet collector dust removal system. Use 600 to 800 cfm per hood. Pouring rooms require two-speed powered roof ventilators. Design for minimum of two cfm per sq ft floor area at low speed. Shielding is required to control radiation from hot surfaces. Proper introduction of air will minimize preheat requirements. In shakeout room provide hoods with wet-collector dust-removal system. Exhaust 400 to 500 cfm per sq ft grate area. Roof ventilators are generally not effective. In cleaning room provide hoods for grinders and cleaning equipment with dry cyclones or bag-type collectors. Winter ventilation (preheated) is required to the extent of replacing exhausted air. Summer ventilation is usually supplemented by use of pedestal fans. Spot coolers are sometimes used in larger installations.		
FUR		
Drying.....	110	
Shock treatment.....	18 to 20	
Storage.....	40 to 50	55 to 65
Shock treatment, for eradication of any insect infestations, requires the lowering of the temperature to 18-20 F for 3 to 4 days, then raising it to 60-70 F for 2 days, then lowering it once again to 18-20 F for 2 days and raising it to the storage temperature. Furs remain pliable, oxidation is reduced, and color and luster are preserved when stored at 40 to 50 F. Mold growth is prevalent with humidities above 80 percent, while hair splitting is common where humidity is lower than 55 percent.		
GUM		
Manufacturing.....	77	33
Rolling.....	68	63
Stripping.....	72	53
Breaking.....	74	47
Wrapping.....	74	58
LEATHER		
Drying		
Storage, winter room temp.....	50 to 60	40 to 60
* Depends on tanning technique used.		

After leather is moistened in preparation for rolling and stretching, it is placed in an atmosphere held at room temperature with a relative humidity of 95 percent.

Leather is usually stored in warehouses without temperature and humidity control. However, it is necessary to keep humidity sufficiently low enough to avoid mildew, which will vary with the technique.

Air filtration is recommended for fine finish.

Process	Temp. F	R.H.%
LENSES (OPTICAL)		
Fusing.....	75	45
Grinding.....	80	80

The air must be free of dust and temperature and humidity held constant.

To acquire desired cleanliness of air a combination of impingement and electrostatic filters are used. Dust collectors are required for grinding operations.

LIBRARIES AND MUSEUMS—See Chapter 27

Process	Temp. F	R.H.%
MATCHES		
Manufacture.....	72 to 74	50
Drying.....	70 to 75	60
Storage.....	60 to 62	60

Water evaporated is 18 to 20 lb per million matches simultaneously with the setting of the glue.

The match machine will turn out about 750,000 matches per hour.

Process	Temp. F	R.H.%
MUSHROOMS		
Sweating-out period.....	120 to 140	
Spawn added.....	60 to 75	nearly sat.
Growing period.....	48 to 60	80
Storage.....	32 to 35	80 to 85

As spawn starts to grow, it is necessary to abruptly cool the mushroom house by 15 deg in a 12 hr period (approx.). Usually, this is the controlling factor in selection of refrigeration equipment, unless there is portable equipment available for such a purpose.

Ductwork is usually of wood, due to the deterioration of ferrous metals during sweating-out period.

Air filtration is essential in spawn rooms. Viscous filters are preferred, as mold spores are trapped in the viscous film. Odorless oil should be used.

Heat of emission is 4 Btu per (hr) (sq ft of growing surface).

Process	Temp. F	R.H.%
PAINT APPLICATION		
Lacquers:		
Air drying.....	70-90	60
Baking.....	180-300	
Oil Paints:		
Air drying.....	60-90	60
Paint Spraying.....	75	

Spray booths to have 100 fpm face velocity. Make-up air must be preheated. Ovens must have air removed to keep fumes below explosive concentration. Equipment must be explosion-proof throughout.

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Room or Process	Temp. F	R.H.%
PHARMACEUTICAL		
Powder storage (prior to mfg.).....	70 to 80	30 to 35
Manufactured powder storage and packing areas.....	75 to 80	15 to 35
Milling room.....	80	35
Tablet compressing.....	70 to 80	40
Tablet coating room.....	80	35
Effervescent tablets and powders.....	90	15
Hypodermic tablets.....	75 to 80	30
Colloids.....	70	30 to 50
Cough drops.....	80	40
Glandular products.....	78 to 80	5 to 10
Ampule manufacturing.....	80	35
Gelatin capsules.....	72 to 80*	35 to 40
Capsule storage.....	75	40 to 50
Micro-analysis.....	75 to 80	50
Biological manufacturing.....	80	35
Liver extracts.....	70 to 80	20 to 30
Serums.....	74 to 78	50
Animal rooms.....	75 to 80	40
Small animal rooms.....	75 to 78	47 to 48
* Depends on capsule size.		
Gelatin capsules require varying relative humidities, depending upon size of capsule. Penicillin incubation process requires holding temperature within 1/4 deg F, with temperatures and humidity rigidly controlled during all manufacturing phases. Ampule filling requires a 20 percent relative humidity when especially fine powders are used. Uncoated tablet manufacturing requires accurate control of temperature and relative humidity. Liver extracts require a low relative humidity after they are dried. Temperatures higher than 80 F will cause the extracts to deteriorate. Tablet coating requires temperature control of the air introduced to coating pans. Sterile conditions are essential in many pharmaceutical processes. Exhaust sufficient air to remove surplus material from tablet compressing machine. Air filtration is generally required, with positive air filtration in some areas.		
ANIMAL ROOMS IN PHARMACEUTICAL LABORATORIES		
In the following tabulation each of the items mentioned is equivalent in metabolism to one man:		
Quantity	Animal	Weight Each
672	White Mice	21 g
110	Rats	200 g
73	Rats	400 g
70	Guinea Pigs	410 g
21	Rabbits	2.6 kg
16	Cats	3.0 kg
16	Monkeys	3.0 kg
5	Dogs	14.0 kg
Dogs are generally the worst offenders as far as odor generation is concerned. Decontamination of exhaust air is recommended in populated areas. For good air quality conditions the following space per animal and total air circulation (all outdoor or decontaminated in recirculation) should be provided:		
Animal	cu ft	cfm
Mice	3	0.5
Rats	4	0.75
Guinea Pigs	6	1.0
Rabbits	10	1.9
Hamsters	8	1.5
Cats	35	10.0
Dogs	150	28.0
PHOTO MATERIAL—See Chapter 30		

Process	Temp. F	R.H.%
PHOTO STUDIO		
Dressing Room.....	74	40
Drying Room.....	75 to 80	50
Printing Room.....	70	70
Setting Room.....	72	65
Developing Room.....	70 to 75	60
Storage Room.....	60	45 to 55
Heat liberated during printing, enlarging, and drying processes is removed through an independent exhaust system, which also serves the lamp houses and dryer hoods. Dust control is essential, and absolute filtration is required in some areas.		
PLASTICS		
Manufacturing areas:		
Thermo setting molding compounds.....	80	25 to 30
Cellophane wrapping.....	75 to 80	45 to 65
Absolute filtration is required in some areas. Collection and removal of dust and fumes is essential.		
PLYWOOD		
Hot Pressing (resin).....	90	60
Cold Pressing.....	90	15 to 25
POULTRY RAISING		
Incubator.....	70-75	30-60
Brooder:		
1st week.....	70-75	60
2nd week.....	50-60	60
Battery room:		
Starling.....	70	70-75
Growing.....	50-60	50-60
Egg storage.....	45-60	70-80
Maximum ventilation is required for laying quarters during the summer months, while an attempt is made to maintain a temperature 10 deg above or below outdoor temperature during the winter, to minimize condensation on the exterior walls. This applies to houses not having forced ventilation systems.		
PRECISION MACHINING—See Chapter 24		
PRINTING—See Chapter 35		
RUBBER DIPPED GOODS		
Manufacture.....	90	
Cementing.....	80	25 to 30*
Dipping surgical articles.....	75 to 90	25 to 30*
Storage prior to manufacture.....	60 to 75	40 to 50*
Laboratory (ASTM Standard).....	73.4	50*
* Dewpoint of the air must be below the evaporation temperature of the solvent.		
Solvents used in manufacturing processes are usually explosive and toxic, requiring positive ventilation. Volume manufacturers usually install a solvent recovery system.		
TEA		
Packaging.....	65	65
Ideal moisture content is 5 to 6% for quality and weight. Low limit moisture content for quality is 4%.		