

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

Process	Temp. F	R.H. %
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.

Process	Temp. F	R.H. %
GUM		
Manufacturing.....	77	33
Rolling.....	68	63
Stripping.....	72	53
Breaking.....	74	47
Wrapping.....	74	38

LEATHER		
Drying:		
Vegetable tanned.....	70	75
Chrome tanned.....	120	45
Storage.....	50-60	40-60

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 below 85 percent to avoid mildew.

Air filtration is recommended for toggle machines.

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

The air must be free of dust and temperature held constant. To acquire desired cleanliness of air a combination of impingement and electrostatic filters are used. Dust collectors are required for grinding operations.

Rooms	Temp. F	R.H. %
LIBRARIES AND MUSEUMS		
Museum.....	70-80	40-50
Book storage.....	70-80	40-50

Spray type dehumidifiers used to eliminate SO₂. Water treatment is essential to maintain between 8.5 and 9.0 pH.

Reheat is usually needed for refrigeration cycle due to the low sensible heat load.

In extremely cold weather a lower relative humidity is required to prevent condensation on walls.

Positive high and low limit relative humidity controls are used. Do not locate water or steam piping where leakage can cause damage.

LIBRARIES AND MUSEUMS (Concluded)**CHECK FIGURES FOR COOLING ESTIMATES**

	Low	Medium	High
Square feet floor area per person.....	40	60	80
Watts per sq ft of floor area.....	1	1	2
Room sensible heat, Btu per (hr) (sq ft).....	20	35	45
Grand total heat, Btu per (hr) (sq ft).....	30	51	75
Sensible heat factor.....	0.73	0.83	0.90
Cooling load per person, tons.....	0.12	0.23	0.40
cfm per sq ft of floor area.....	0.92	1.60	2.10

MALTING (BREWING)

Steeped 24 to 72 hr in 45 to 65 F water.

Germinated six days at 55 to 75 F.

Kilned at temperatures of 120 to 175 F.

MALTING (DISTILLING)

Germinated twenty days at 63 F.

Germination produces total heat of 16,000 Btu/bushel at varying rate depending upon grain and process.

Process	Temp. F	R.H. %
MATCHES		
Manufacture.....	72 to 74	50
Drying.....	70 to 75	40
Storage.....	60 to 62	50

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.

MUSHROOMS

Sweating-out period.....	120 to 140	
Spawn added.....	60 to 75	nearly sat.
Growing period.....	48 to 60	moderate
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. %
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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.....	70 to 80	40
Tablet compressing.....	80	35
Tablet coating room.....	90	15
Effervescent tablets and powders.....	75 to 80	30
Hypodermic tablets.....	70	30 to 50
Colloids.....	80	40
Cough syrups.....	78 to 80	5 to 10
Glular products.....	80	35
Ampule manufacturing.....	78	40 to 50
Gelatin capsules.....	75	35 to 40
Capsule storage.....	80	50
Micro-analysis.....	80	35
Biological manufacturing.....	70 to 80	20 to 30
Liver extracts.....	74 to 78	50
Serums.....	75 to 80	40
Animal rooms.....	75 to 78	47 to 48

Gelatin capsules require varying relative humidities, depending upon size of capsule. Moisture content should not exceed 0.25 g per cu ft. Various kinds of gelatin require different temperatures.

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, since low relative humidity causes formation of a hard outer layer, and high relative humidity retards drying at the proper rate.

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 the control of the temperatures of all ingredients and the temperature of air introduced to coating pans.

Sterile conditions are essential in many pharmaceutical processes. Provide suitable air exhaust 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	Animal	cu ft	cfm
Mice	3	0.5	Hamsters	8	1.5
Rats	4	0.75	Cats	35	10.0
Guinea Pigs	6	1.0	Dogs	150	28.0
Rabbits	10	1.9			

Process	Temp. F	R.H. %
PHOTO STUDIO		
Dressing Room.....	74	30-40
Drying Room.....	75-80	50
Printing Room.....	70	70
Setting Room.....	72	65
Storage Room.....	70-75	60
	60	45

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.

Process	Temp. F	R.H. %
PHOTO MATERIAL		
Drying.....	20-125	40-80
Cutting and Packing.....	65-75	40-60
Film Base and Paper Storage.....	70-75	40-65
Coated Paper and Film Storage.....	70-75	40-65
Safety Base Film Storage.....	60-80	45-50
Nitrate Film Storage.....	40-50	40-50

Spray water must have algae inhibitor. Positive dust control must be maintained and absolute filtration is essential.

In nitrate film area take proper precautions against fires.

Recirculated air used for film drying is passed through activated carbon filters.

Relative humidity for film storage should never exceed 60 percent with a minimum of 25 percent.

Process	Temp. F	R.H. %
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.

Process	Temp. F	R.H. %
PLYWOOD		
Hot Pressing (resin).....	90	60
Cold Pressing.....	90	15 to 25

Process	Temp. F	R.H. %
POULTRY RAISING		
Incubator.....	70-75	30-60
Brooder:		
1st week.....	70-75	60
2nd week.....	50-60	60
Battery room:		
Starting.....	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.