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	58
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	40–60
Book storage	70–80	40–50

Spray type dehumidifiers used to eliminate SO_2. 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	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.%
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.

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

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 syrups	80	40
Glandular products	78 to 80	5 to 10
Ampule manufacturing	80	35
Gelatin capsules	78	40 to 50
Capsule storage	75	35 to 40
Micro-analysis	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

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 ½ 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
Developing Room	70–75	60
Storage Room	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
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.