

Animal Air Conditioning (continued)
physiological reactions, 319, 322
body temperature, 319
growth and production, 320
heat dissipation, 319
heat production, 319
reproduction, 320

Automobile air conditioning, 213
air distribution, 215
capacity requirements, 214
components, 216
compressor drive, 217
compressors, 216
condensers, 217
evaporator, 217
controls, 218
cost, 216
effect on engine, 215
filters, 215
general design requirements, 213
humidity control, 215
life, 215
space limitations, 215
speed range, 214
styling, 216
temperature control, 215
types of units, 213
ventilation, 215

B

Bakeries
bakery products, 389
freezing, 389
retarding dough, 389
bread, 385-390
calculations, 386
conditions required, 385-389
cooling, 387
fermentation, 386
freezing, 388
mixing process, 385, 386
slicing and wrapping, 388
ingredient storage, 385

Beverage processes, 391-403

Brandy, 400
chill proofing, 400
refrigeration required, 400

Breweries, 391
chemical reactions, 391
fermentation, 392
flow diagram, 392
heat balance, 396
malt, 391
processing, 393
fermenting cellar, 394
finishing cellar, 395
Krausen cellar, 395
stock cellar, 395
wort cooling, 393
storage, 395
carbon dioxide collection, 395
carbon dioxide liquefaction, 395
carbon dioxide re-evaporation, 396
hop storage, 395
yeast culture room, 395

Building, buildings
refrigerated warehouse, 473-482

Bus air conditioning, 224
design considerations, 224
air distribution, 225
capacity requirements, 224
door operation, 225
equipment location, 225
drives, 225
electric motors, 226
main engine, 225
separate engine, 225
controls, 226

Butter
microbiology, 372

Butter manufacture, 367
churning temperatures, 369
continuous process, 370
chilling, 371
composition control, 370, 372
cream concentration, 371
crystallization, 372
destabilizing, 370
pasteurizing, 370
separating, 370
cream cooling, 368
heat liberated, 369
load, total refrigeration, 373
printing butter, 370
removal from churn, 370
storage, 372
deterioration, 373
washing butter, 369

Buttermilk, 366, 369

C

Candy manufacture, 379
air conditioning, 379
design conditions, 379-383
bar candy, 381
chocolate, 379
chocolate coating, 380
coating kettles or pans, 383
cold rooms, 382
cooling tunnels, 382
hard candy, 381
hot rooms, 382
packing rooms, 383
refrigeration plant, 384
storage, 383

Carbon dioxide storage, 403

Carbonated beverages, 401
carbon dioxide solution, 401
preparation, 401
syrup cooling, 403

Central station air conditioning, 1
air, outdoor, 6
control processes, 1
control requirements, 1
design limits, 7
equipment, 6
arrangement, 7
built-up, 7
factory assembled, 6
run-around coil, 8
selection, 6
psychrometric processes, 1
refrigeration equipment, 6
system requirements, 1
sizing, 8

Charts

air elimination, 90
aircraft air conditioning
design ambient moisture conditions, 223
typical cabin pressure, 228
typical design ambient temperatures, 227
concrete
theory of cooling aggregates, 722
cryogenic fluids
air, 696
helium, 692
hydrogen, 693
nitrogen, 694
oxygen, 695
drying time, 264
effective temperature chart, 847
elbow loss, 91, 125, 144
equilibrium moisture content
paper, 293
typical curves, 267
freezing of fish, 437-439
freezing of poultry, 456, 457
friction in pipes, 92, 97, 98, 121, 122, 124, 144
head due to temperature, 120
heat and moisture production
beef and dairy calves, 325
dairy cattle, 320, 324
hens, 327
sheep, 325
swine, 326, 327
heat stress index, 241
ice making
evaporator temperature and pressure, 705
freezing tank performance, 702
freezing time, can ice, 703
refrigeration load, 704
panel-air systems
convection coefficients, 46, 47
heat removed by cooled ceiling panel, 47
heat removed by radiation, 46
panel surface temperatures, 49
supply air dew point, 49
panel heating systems
convection heat loss, 150
edge loss, 152
estimating surface temperature, 151, 152
heat emission by radiation, 149
inside surface temperature, 151, 152
panel heat output, 149-152
psychrometric chart for drying, 268
rate of evaporation, 266
refrigerant line velocity
minimum to entrain oil, 239, 740, 742, 743
refrigerant piping
equivalent length of fittings, 733
flow rates, 734, 735
temperature equivalent of pressure drop, 728-731
skating rinks
heat transfer, 712
humidity effect, 712
service factors, 713
total heat flow, 713
snow melting
viscosity effect, 837, 840
textile process flow chart, 299
thermal conductivities
aluminum alloys, 698
commercial aluminum, 698
commercial copper, 698
foams, 698
good conductors, 698

Index to Technical Section

Charts (continued)
thermal conductivities (continued)
poor conductors, 686
powders, 688
selected materials, 698
water flow, 811-813
friction drop in pipes, 811-813
water heaters
operating cost, 822, 824
water service piping
pressure loss in fittings, 814
pressure loss in pipes, 811-813

Cheese manufacture, 374
cheddar, 374, 375
curing temperature, 375
flavor development, 375
moisture loss, 375
storage, 376
cheese drying rooms, 377
development of flavor, 374, 375
holding and storing, 374
load, refrigeration, 377
provolute, 376
process, 376
Rougeton or blue, 376
scoring cheese, 374
Swiss, 376
effect of temperature and humidity, 376
types of cheese, 374
freezing, 377
oil off, 377
storage temperature, 377
various types, 376

Citrus fruit storage, 509-526
coloring, 510, 511
color-adding, 511
maturity, 511
sweetening, 511
grapefruit storage, 512, 520
air conditioning equipment, 520
air distribution, 521, 522
load calculations, 522-525
respiration rates, 512
system design, 522
harvesting and handling, 509-511
grading, 510
greenspotting, 509
packing-houses, 509-510
picking, 509
rings, 509
sizing, 510
washing, 509-510
lemon storage, 511, 512, 520
air cleaning, 512
air conditioning equipment, 520
air distribution, 512, 521
load calculations, 522-525
relative humidity control, 511
respiration rates, 512
system design, 522
temperature control, 511
ventilation, 512
orange storage, 513-520
air distribution, 518
air supply nozzles, 521
cold storage, 515
ejector nozzles, 521-522
equipment, 517, 518
heat evaluation, 513
humidifying nozzles, 521
juice quality, 515
limiting factors, 516
load calculations, 518-520

Citrus fruit storage (continued)
orange storage (continued)
packed California, 513
packed Florida, 513
precooling, 513, 517
recommended conditions for, 515
relative humidity, 514
rind defects, 514, 516, 517
transportation, 525

Cold treatment of metals, 659-664

Commodity storage requirements, 483
cut flowers, 490
food, 484-486
miscellaneous products, 486-491
beer, 486
beets, 486
berries, 487
carrots, 488
cauliflower, 488
celery, 488
cucumbers, 488
honey, 488
lettuce, 489
maple syrup, 489
melons, 489
onions, 490
peaches, 490
peppers, 491
plums, 491
popcorn, 491
potatoes, 491
poultry, 491
pumpkins, 491
tomatoes, 491
vegetable seed, 491
nursery stock, 490
storage conditions, 490
perishable products, 484, 486
product density, 492

Concrete dams, 719-726
bin selection, 721, 722
compartmentation analysis, 722
for air blast cooling, 721-722
minimum requirements, 722
design conditions, 720, 721
aggregate cooling tests, 721, 722
assumed typical conditions, 721
inundation tanks, 721
design criteria, 720
heat removal, 721-723
air blast cooling, 722
chilled water, 722, 723
ice, 722, 723
load computations, 723
factors involved, 723
precooling, 719, 720
air blast, 719, 720
cement, sand cooling, 720
inundation of aggregates, 719
vacuum cooling, 720
selecting a system, 720
general considerations, 720

Control

aircraft temperature, 230
ammous systems, 775
animal environment, 322, 326
automobile, 215
automobile temperature, 215
central air conditioning, 1
heat pump systems, 57
induction unit systems, 22, 26

Control (continued)

industrial environment, 239
lemon storage, 511
locker plant temperature, 556
multistore buildings, 193
multi-stage system, 788
outdoor air, 16
panel heating system, 160
passenger car temperature, 222
refrigerator cars, 595
residential air conditioning, 183
retail store refrigeration, 633
school air conditioning, 212
shrinkage, 528
skating rink temperature, 714
snow melting, 840
stores, small, 188
supermarkets, 189, 190, 192
tank temperature, 527
test equipment, 651
truck and trailer temperature, 570
vacuum pump, 164
variety store, 188
warm air heating, 81

Cooling

aggregate cooling, 721, 722
bread, 385
evaporative, 17, 843
farms, 849, 850
gas turbine, 848
greenhouse, 851
industrial, 846
load, test equipment, 652
low temperature system, 645
motor, 848
process, 849
produce, 850
residential, 844
summer, 823

Cooling load, 187, 191

average load factors, 187
calculations, 187, 191
design conditions, 187, 188, 191
heat sources, 188, 191
lighting, 188, 191
outdoor air, 187, 189, 191
stores, department, 191
stores, small, 187
stores, variety, 188, 189
supermarkets, 190

Cryogenics, 679-700

fluid properties, 691-696
air, 696
helium, 692
hydrogen, 693
nitrogen, 694
oxygen, 695
helium liquefaction, 679-681, 691
procedures, 680, 681
properties of, 679, 680, 691
hydrogen liquefaction, 681, 683, 693
cycles, 681, 683
equipment, 683
problems, 681
properties of, 681, 693
low temperature measurement, 683-685
gas thermometer, 683
liquid-in-glass, 685
magnetic thermometer, 685
resistance thermometer, 684, 685
thermocouples, 683, 684
vapor pressure, 683