

Load
cooling, 287, 322, 747
design, 5, 281
factor, 481
heating, 261, 747
lighting, 327
maximum, 5, 422, 481
refrigeration, 287

M

Mach number, 74, 75
Machine vibration, 1042
Manometer, 6, 1244
Marine (see *ship heating, ventilating, air conditioning*)
Mass, 6
Mean radiant temperature, 119, 609, 981
Meter, meters, 78, 740
area, 78, 85, 740
condensate, 740
flow, 78, 85, 741
force, 78
head, 78, 83, 740
installation, 740
orifice, 79, 1248
selection, 740
velocity, 740
venturi, 1249
Metering, liquids, 78, 740
Micromanometers, 1245
Micron, 6
Mist, 152
Moist air, 25
properties of, 25
saturation, 26
specific volume, 32
Moisture, 217, 1152, 1159
content, 1152, 1154, 1160
in building construction, 217
load, 329, 962
loss per person, 122, 328
movement in materials, 220
permeability, 224
regain, 1152
transmission, 220
Mol, 6
Molecular force of water, 219
Monofluorochloromethane
913, 917
Motor, motors, 282, 328, 993
alternating current, 997
capacitor type, 1000
classification, 996
control, 1004, 1007
control equipment for, 1004
current limitation, 1005
design limits, 994
drives, 994
electric, 993
enclosures, 1009
glossary, 1008
heat generated by, 282
hermetically enclosed, 1002
incremental limitation, 1005
multi-speed, 999, 1006
polyphase, 997
rating, 1006
repulsion induction, 1001
selection, 993
single phase, 1000
speed characteristics, 996
speed classification, 1009
speed ranges, 994
split phase, 1001
squirrel cage, 997, 1004
starting methods, 1004
synchronous, 998, 1005
wound rotor, 998, 1005
Mountings, flexible, 1042

N

Natural draft, 441
towers, 877
Natural ventilation, 247
general rules, 253
heat removal, 249

Noise, noises, 1011, 1225
absorptive material, 1034
air conditioning system, 1011, 1225
air supply opening, 1026
apparatus for measuring, 1014
attenuation, 1013
control, 1011, 1016
controlling vibration, 1042
cross transmission between rooms, 1041
design room level, 1034
duct sound absorbers, 1028-1033
duct system attenuation, 1027
fans, 1022
general problem, 1014
grille, 1026
intakes, 784
kinds of, 1021
levels, 775, 1018, 1019, 1021
loudness, 1013
measurement, 1014
plate cells, 1031
plenum absorption, 1031
recommended levels, 1021
through building construction, 1021, 1041
transmitted through ducts, 1021, 1041
unit of measurement, 1011-1014
Nozzle flow, 75, 78
Nurseries for premature infants, 141
air conditioning equipment, 142
air conditioning requirements, 141

O

Odors, 111, 113, 148, 156
human body, 111

Oil burners, 391, 398
atomizing, 391, 398
boiler settings, 397
classification, 391, 398
combustion adjustments, 395
combustion efficiency, 396
combustion process, 394
commercial, 398
controls, 974
domestic, 391
furnace design, 397
gun type, 391
industrial, 398
measurement of efficiency of combustion, 396
mechanical draft, 391
operating requirements, 394
rotary type, 392, 398
vaporizing type, 393
Oil Fuel, 354
analysis, 358
caloric value, 357
classification of, 354, 355
combustion index, 360
combustion of, 359, 394
estimating consumption, 412, 475
heating of, 399
piping, 402
storage, 402
Oil storage tanks, 402
One-pipe system, 514, 568
gravity air-vent, 515, 535
hot water, 6, 568
steam, 6
supply riser, 6
unit heater connection, 514
vapor, 516

Opening, openings
air supply noises, 775
sealing of, 246
stacks, 253
types of, 252

Opening, openings (continued)
doors, 252
roof ventilators, 252
skylights, 252
vertical, 246
windows, 252

Operating rooms, 138
conditions, 139
reducing explosion hazard, 138
sterilization of air in, 140
Orifice
discharge, 75, 525
flow, 75
formulas, 77, 1248
heating systems, 522
Orsat apparatus, 1256
Outdoor air, 112, 113, 297, 325, 1182, 1183

Outlet, outlets
air noises, 1026
ceiling, 777
duct approaches, 781
location, 485, 778
perforated, 776, 778
performance, 773, 778
selection, 778
side outlets, 485
slotted, 777
sound absorbers, 1031
types, 485, 762
vaned, 774
wall outlets, 776
Outside temperature, 263, 291
Overhead distribution, 518, 1215
Overhead system, 6, 518, 1215
Owen jet dust collector, 153
Oxygen
chambers, 146
tents, 146
therapy, 145
Ozone, 113, 160

P

Panel heating, 6, 605
application methods, 605
calculation principles, 608-615
convection transfer, 610
design of panel, 610-630
electric, 608, 630, 1052-1054
embedded piping, 606, 607
hot water, 605, 616
installation, 630
output from surface, 605, 608
piping, 605
radiation transfer, 609
starting system, 607
steam, 605
warm air, 6, 505, 608
Panel radiator, 6
Particle size chart, 153
Perfect gas relationships, 27
Perforated ceilings, 778
Perforated outlets, 769, 778
Permeability, 221, 225
Permeance, 221, 224, 225
pH value, 429, 1066, 1070
Physical impurities in air, 113

Physiological principles, 111
acclimatization, 116
application to problems, 121
comfort chart, 126
effective temperature, 122
high temperature hazards, 117
thermal interchanges, 113
upper limits of heat, 119
Pipe coils, 597, 598, 631
heat emission, 597, 706-708
wall, 598

Pipe, piping, 673
application, 700-702
breeching, 427
capacity, 527, 528, 530-537, 561, 1197
coatings, 1085
coil connections, 552
coil output, 598

Index to Technical Data Section

Pipe, piping (continued)
cold water, 1197
color identification, 22
commercial dimensions, 674-677
conducts for, 730
connection to heating units, 552
cooling tower, 1208
corrosion, 1065, 1077
covering, 703
design, hot water system, 559
dimensions, 674-677
economical thickness insulation, 715
expansion, 694
fittings, 680-691
fitting equivalent, 529, 564, 565, 1198, 1204
flexibility, 694
forced circulation, 559
freezing, 720
friction loss, 560, 562, 563, 589, 1200-1202
gas, 409
hangers, 698
heat losses, 706-713
hot water heating systems, 559
hot water supply, 1214
inside dimensions, 674, 677
insulation, 703, 735
insulation prevent freezing, 720
low temperature insulation, 718
materials, 673, 1073
one-pipe forced circulation, 565
one-pipe gravity, 535
one-pipe vapor, 536
overhead distribution, 519, 1215
pressure loss, 69, 72
properties, 674-677, 696
sizes, 526, 559
cooling systems, 1206
forced circulation, 559-577
gas, 409
high pressure steam, 534-536
high temperature water, 537
hot water forced circulation, 559-564
hot water gravity circulation, 555
indirect heating units, 539
low pressure, 532, 533
one pipe riser, 530, 537
one pipe vapor, 536
orifice systems, 522
pressure drop, 528
tables for steam, 527-534
threading data, 679
two-pipe forced circulation, 565
two-pipe low pressure, 537
two-pipe riser, 530
two-pipe vapor systems, 537
vacuum systems, 538
water supply systems, 1197, 1200-1202
steam distribution, 530, 729
steam heating systems, 530-535
supports, 698
surface, 674-677
symbols for drawings, 17
tax, 423
threading practice, 679
tunnels, 732
underground insulations, 722
unit heater connections, 514, 554, 650
water supply, 1197
welding, 692
wrought-iron, 673
wrought-steel, 673
Plot tubes, 84, 1246
Plate cell, 1031
Plenum absorbers, 1031
Plenum chambers, 6
Pneumatic control systems, 966
Pollen, atmospheric, 163

Pollution of air, 151, 154
Polyphase motors, 997
Pond, 875
Potentiometer, 6, 1241
Power, 6
Precipitators, 843, 861
Precooling, 755
Premature infant nurseries, 140

Pressure
absolute, 6
atmospheric, 1
changes in ducts, 789, 801
dynamic, 6
gages, 6, 1243
loss, elbows, 503, 529, 564, 591, 1204
loss, water supply piping, 1200-1202
measurement, 1243
barometer, 1245
regulator, 539, 736
saturation, 7
static, 7
taps, 82
total, 7
vapor, 7
velocity, 7
Prime surface (see *Heating Surface*), 9

Process and product air conditioning, 1141
calculations, 1156
conditioning and drying, 1153
contaminant control, 156
control of chemical reactions, 1153
general requirements, 1141
humidities, 1142-1152
laboratories, 1156
machining tolerance, 1155
moisture content and regain, 1152
polished surfaces, 1156
process, 1141
temperatures, 1142-1152
Propeller fan, 825, 833
Protective coatings, 1085
Psychrometer, 7, 1253
Psychrometric chart, 51-53, 124
Psychrometry, 7

Pump, pumps
condensate return, 543
high temperature, 600
mechanical circulators, 575, 590
vacuum heating, 544
controls, 545
piston displacement, 545
Pyrometer, 7, 1243
optical, 1243
radiation, 1243

R

Radial flow fan, 825
Radiant drying, 1172
Radiant heating, (see *Panel Heating*)
Radiation, 7, 89
baseboard, 598
equation, 92
finned tube, 599
load, 423
ratings, 600
shape factor, 95
thermal, 7

Radiator, radiators, 7, 595-597
baseboard, 598
codes, 597, 600, 1261
concealed, 7, 603
connections, 552
correction factor, 602
direct, 7
effect of paint, 603
enclosed, 603
gas-fired, 407
heat emission of, 595

Radiator, radiators (continued)
output of, 595, 602
panel, 6
ratings, 600
recessed, 7, 599
tube, 7, 596
types of, 597
warm air, 407

Radioactive contaminants, 165

Railway air conditioning, 1181
air cleaning, 1182
air distribution, 1182
heating, 1181
humidity control, 1184
refrigeration, 1182
summer systems, 1182
temperature control, 1184
ventilation, 1183
winter systems, 1181
Reciprocating compressors, 938
Recording equipment, 970
Rectangular duct equivalents, 797-800
Reducing valves, 539, 737
Reflective insulation, 176, 178

Refrigerant, refrigerants, 7, 913
dichlorodifluoromethane, 914, 915
feeds, 898
monochlorodifluoromethane, 916, 917
monofluorotrichloromethane, 918
pipe size, 948
water, 926

Refrigeration, 911, 1182, 1186
absorption system, 926
accessories, 949
air cycle, 925
basic concepts, 911
complex cycles, 924
compressors, 937-942
condensers (see *Condensers*), 942
control, 945
coolers, 944
definitions, 911
discharge pressure, 922
equipment selection, 950
evaporators, 944
expansion valves, 945
float valves, 945
heat pump, 929-937
load, 287
mechanical, 911, 920, 1186, 1194
piping, 947
reverse cycle, 912, 929
ship, 1192
simple cycle, 919
steam jet, 925
subcooling, 923
suction, 922
superheating, 923
symbols for drawing, 17
theory, 911
ton of, 911
types of compressors (see *Compressors*), 937
vapor compression cycle, 919
water jacket, 923

Regain, 1142
control of, 1141
hygroscopic materials, 955
static, 810

Register, registers, (see *Grilles*), 484, 759, 777, 784
air noises, 1026
mechanical furnace systems, 484
noise, 775, 1026
selection, 484, 778