

Fuels (continued)
classification, 271
grades, 271
handling, 809
heating value, 272
indexes, 273
properties, 271, 272
requirements, 271
sources, 272
storing, 809
viscosity, 809
solid, 269
analysis, 269
classification, 269

Furnes, 147

Furnaces, 819
commercial and industrial, 831
combustion equipment, 831
heat exchangers, 831
components, 829
blowers, 829
casing, 829
combustion equipment, 829
controls, 830
filters, 830
fuel considerations, 830
heat exchangers, 829
humidifiers, 830
motors, 829
electric, 831
forced air, 827
gravity, 829
ratings
coal, 831
gas, 831
oil, 831

G

Gage
Bourdon, 248
draft, 248
electronic discharge, 246
McLeod, 246
Pirani, 246

Gas

burners, 810
central systems, 810
combustion, 814
commercial and industrial, 812
controls, 815
conversion, 811
domestic, 810
floor furnace, 811
pipe sizing, 813
space heaters, 812
vented wall furnace, 811
flammable, 150, 156
universal constant, 87, 88

Gas-fired equipment, 805
central heating systems, 810
boilers, 811
furnaces, 811
combustion process, 814
commercial and industrial, 812
atmospheric, 812
infrared heaters, 813
power burners, 812
control, 815
conversion burners, 811
domestic, 810
floor furnace, 811
pipe sizing, 813
space heaters, 812
circulators, 812
dust furnaces, 812
radiant, 812

Gas-fired equipment (continued)
room, 812
unit, 812
wall, 812

Gas, fuel, 273
classifications, 273
liquefied petroleum, 273
manufactured, 273
natural, 273
Glass
block, 510, 515
heat gain through, 500-515
Glossary, 951

Glycol, ethylene, 375
boiling point, 376
condensation temperature, 376
freezing point, 375
inhibition, 376
physical properties, 375
service considerations, 378
specific gravity, 377
specific heat, 378
thermal conductivity, 378
viscosity, 377

Glycol, propylene, 375
boiling point, 376
condensation temperature, 376
freezing point, 375
inhibition, 376
physical properties, 375
service considerations, 378
specific gravity, 377
specific heat, 378
thermal conductivity, 378
viscosity, 377

Grain, 127
drying rates, 129-131
moisture level, 127, 128, 134
oxygen supply, 127
storage, 127, 128, 133
temperature, 127, 133, 134

Grilles, 553
exhaust, 558
return, 558
accessory devices, 558
applications, 558
supply, 553
accessory devices, 558
applications, 558
special features, 555

H

Halocarbon coolants, 379
density, 379
safety, 380
specific heat, 380
thermal conductivity, 379
viscosity, 380

Hay
drying, 132
quality, 132

Heat

losses (pipe), 450-451
of fusion, 978, 980-982
food products, 980-982
liquids, 978
of vaporization, 978
transfer (flow), 417, 450-453
transmission coefficients, 417
Heat and mass transfer, simultaneous
cooling and dehumidifying coils, 86
direct-contact equipment, 83
enthalpy potential, 82

Heat capacity (specific heat), refrigerant, 284, 285

Heat-distributing units, 857
applications, 861
baseboard units, 858
convectors, 857
finned-tube units, 859
heat emission, 857
pipe coils, 857
radiators, 857
ratings, 860

Heat gain
appliances, 519-521
ceilings, 516
commercial, 487-525
fenestration (glass), 505, 524, 527
floors, 516
industrial, 487-525
infiltration, 516
instantaneous, 514
interior partitions, 516
latent, 487, 496, 528
lights, 518
moisture transfer, 519
motors, 518
outdoor air, 516
people, 518
residential, 525
sample calculations, 523
sensible, 526, 528
solar, 498
roofs, 498
walls, 498
windows, 500
total, 524, 528
ventilation, 516

Heat loss
basement, 480
calculations, 469-486
examples, 484-486
floor slab, 480
infiltration, 481
transmission, 481

Heat pumps, 941
components, 947
compressors, 947
controls, 949
heat transfer, 948
refrigeration, 948
fundamentals, 941
heat source and sinks, 943-946
air, 944
earth, 944
solar, 944
water, 944
heat storage, 949
performance characteristics, 946
system balance, 946
temperature levels, 946
types, 942, 943

Heat stress, 101
effect of clothing, 104
human tolerance, 106
measurement, 107
Belding-Hatch Index, 109-111
effective temperature index, 107
predicted 4-hr sweat rate, 109
Robinson Index of physiological effect, 108
wet-bulb globe temperature index, 109-111

Heat transfer
boiling, 59
flooded evaporators, 60

Index to Technical Section

Heat transfer (continued)
calculations, 523-525
coefficients, 505
condensing, 62
inside tubes, 63
outside tubes, 63
conduction, 49
steady-state equations, 51
convection, 55-59
forced, 57
natural, 55
extended surface, 65
fin efficiency, 55
fenestration areas, 500, 514
overall, 68
mean temperature difference, 69
resistance method, 68
radiation, 51
absorptivity, 52
actual, 52
angle factor, 53, 54
black body, 61
diffuse, 53
emissivity, 52
energy exchange calculation, 53
gray body, 52
through insulation, 70
transient flow, 71
walls and roofs, 498

Heat transfer coefficients
boiling, 60, 61
condensing, 64
conduction, 51
finned tubes, 67
forced convection, 56
natural convection, 55
overall, 68

Heat transmission, 417
coefficients, 417
ceilings, 436-442
doors, 448
effect of wind velocity, 448
floors, 436-442
light transmitting partitions, 447
overall, 417
partitions, 434, 435
roofs, 439-443
skylights, 447
walls, 428-435
windows, 447

Heaters, unit, 851
application, 852
classification, 852
control, 855
heating medium, 853
location, 854
maintenance, 856
piping connections, 855
ratings, 854
sound level, 854
types, 852, 853

Heating
boilers, 819
cast-iron, 819
connections and fittings, 825
design considerations, 820
efficiency, 823
erection, operation, and maintenance, 826
rating, 820
test codes, 820
selection, 824
space limitations, 825
steel, 819
coils, 613
applications, 614
construction, 613

Heating (continued)
design, 613
flow arrangements, 614
heat transfer, 615
performance, 616
ratings, 615
selection, 615
steam, 613
water, 613
furnaces, 827
commercial and industrial, 831
components, 829
electric, 831
forced air, 827
gravity, 829
ratings, 831
gas burners, 810
central systems, 810
combustion, 814
commercial and industrial, 812
controls, 815-817
conversion, 811
domestic, 810
floor furnace, 811
pipe sizing, 813
space heaters, 812
vented wall furnace, 811
oil burners, 806-810
combustion, 807, 808
commercial, 808
controls, 815
domestic, 806
forced draft type, 806
gun type, 806
industrial draft, 806
industrial, 808
rotary, 807
vaporizing, 807
space heaters, 832
construction requirements, 833
controls, 827, 823
efficiencies, 833
floor, 832
gas, 832
oil, 832
performance requirements, 833
room, 832
sealed combustion systems, 833
solid-fuel, 832
wall, 832
unit heaters, 851
application, 852
classification, 852
control, 855
heating medium, 853
location, 854
maintenance, 856
piping connections, 855
ratings, 854
sound level, 854
types, 852, 853
unit ventilators, 847
air capacity ratings, 847
application, 849
classification, 847
control, 849
exhaust vents, 850
heating capacity ratings, 849
heating capacity requirements, 848
location, 850
window downdraft prevention, 850
year-round, 851

Heating load, 469
calculations, 469-486
auxiliary heat sources, 483
design conditions, 469-478
examples, 484-486
general procedure, 469
infiltration heat loss, 481

Heating load (continued)
transmission heat loss, 481
weather data, 469-477
wind speeds, 482

Hospitals, 137
air conditioning, 137
airborne infection control, 138
allergic disorders, 142
maintenance of air conditioning, 144
nurseries, 141
odors, 144
operating room, 140
patient rooms, 142
pollutants, 143
therapy, 143

Human body, 101
effective temperature, 107, 108
environmental conditions and comfort, 109
heat acclimatization, 105
heat stress, 107, 110
high temperature hazards, 104
low temperature hazards, 104
metabolic rates, 104, 108, 109
odors, 101, 102
physiological effect, 108
predicted 4-hr sweat rate, 109
thermal interchanges, 102
upper limits of heat, 106

Humidification, 593
air washers, 595
industrial, 601, 602
calculations, 602
types, 601
residential, 600
calculations, 600
controls, 601
sizing, 600
types, 600

Humidifiers, 593
industrial, 601, 602
calculations, 602
types, 601
residential, 600
calculations, 600
controls, 601
sizing, 600
types, 600

Humidity
measurement, 255
ratio, 29
relative, 29, 411, 412
sensing elements, 173
Hygrometers, 255

Ice, 923
compressed ice machines, 924
design requirements, 925
flaked ice machines, 924-926
clear ice, 924
specifications, 926
white ice, 924
ice cube, 923, 924, 927
clear ice, 923
solid ice, 924
specifications, 927
performance characteristics, 925
system design, 925
electrical, 928
pitfalls, 928
refrigeration, 925
storage bins, 928

and