

Refrigeration (continued)

reverse cycle, 808, 827
 ship, 1041
 simple cycle, 820
 steam jet, 821
 subcooling, 818
 suction, 817
 superheating, 818
 symbols for drawing, 17
 theory, 807
 ton of, 8, 807
 types of compressors (see Compressors), 829-832
 vapor compression cycle, 814
 water jacket, 818

Regain, 970

control of, 970
 hygroscopic materials, 972
 static, 706

Register, registers, (see Grilles)

449, 451, 460, 662
 air supply noises, 901
 mechanical furnace systems, 460
 noises, 901
 selection, 449, 460, 674
 Reheat, 848, 857
 Relative humidity, 5, 25, 52, 1081
 measurement of, 1081
 Relief valve, 538
 Repulsion induction motors, 874, 879

Residence

control systems, 858
 air conditioning, 860
 coal-fired heating plant, 858
 domestic hot water supply, 1063
 cooling methods, 477
 gravity furnace systems, 449
 heat loss problems, 261
 hot water heating system, 821
 mechanical furnace system, 459
 steam heating system, 479
 Resistance thermometers, 1072
 Resistors, 909
 Return
 grille, 451, 904
 mains, 8, 479, 499, 501, 523-526
 openings, 451, 680
 Reverse cycle refrigeration, 808, 827
 Reversed return system, 8, 528

Roof, roofs

heat flow through, 173, 193-196, 276-282
 time lag of solar radiation, 298
 ventilators, 230

Room

air motion, 663, 670
 control, 859
 coolers, 589, 595, 599
 cross transmission noise, 904
 latent heat, 300
 noise level, 891
 operating, 138
 sensible heat, 300
 Rotary dryer, 1022
 Rotary oil burner, 364
 Run-around system, 657

S
Sanitary ventilation, 132

Saturated air, 1, 25, 29
 Saturation
 degree of, 8, 29
 pressure, 7

Scale, 927

cause and prevention, 927
 closed systems, 933
 heating systems, 934
 high temperature, 934
 open systems, 934
 Secondary air, 326, 343, 376
 Sectional boiler, 384

Sensible cooling, 656

Sensible heat, 263, 272, 302, 304, 660
 gain, 263, 297-307
 loss, 254
 Sheet metal gages, 713

Ship heating, ventilation, air conditioning, 1038

air conditioning, 1038
 design conditions, 1039
 factors affecting design, 1038
 general consideration, 1038
 heating, 1039
 insulation of hull, 1038
 ducts, 1039
 refrigeration, 1041
 requirements for space, 1041
 bakery, 1040
 bath, 1040
 cargo, 1041
 food handling, 1040
 galley, 1040
 laundry, 1040
 living, 1040
 machinery, 1039
 shower, 1040
 storeroom, 1041
 toilet, 1040
 washroom, 1040
 systems, typical, 1042
 ventilating, 1039

Silica gel, 847

Silicon dioxide, 847
 Single phase motors, 878
 Slime, 935
 cause and prevention, 929, 935, 937
 formers, 935
 Slotted outlets, 665
 Sludge, 827
 cause and prevention, 931
 Smoke, 8, 154, 324
 abatement, 154, 322
 density measurements, 1085
 Smokeless arch, 8
 Smokeless combustion, 324

Snow melting, 563

circulating medium, 568
 design, 564
 draining, 569
 drifting snow, 569
 heat from slab, 567
 heating requirements, 564
 installation, 568
 internal corrosion, 569
 pumping head, 565
 safety, 568
 slab construction, 569
 snowfall, 566

Solar constant, 8, 272

Solar heat, 272
 absorbed by glass, 286
 altitude, 273
 calculation tables, 273-275, 289-294
 through shaded windows, 296, 297
 time lag, 298
 transmission of, 272
 through glass, 286
 through roofs, 278
 through walls, 280

Solar heat gain, 272

basic principles, 272
 design for figured rolled glass, 293
 design for flat glass, 287
 design for glass block, 295
 deviation from design, 295
 shading glass, 296
 Solar radiation, 272
 absorption of, 272
 magnitude, 272
 Solar water heater, 1065
 Sol-Air temperature, 277
 Sonic agglomerators, 754

Soot, 151, 324, 352

Sorbents, 845
 absorbents, 845, 846
 adsorbents, 845

Sound (see Noise), 887

absorbers, 896, 899
 apparatus for measuring, 889
 attenuation, 890, 895
 control, 887, 905
 cross transmission between rooms, 904
 general problem, 888
 duct absorbers, 896, 898
 intensity, 887
 isolation, 893
 levels, 651, 888, 892
 measurement, 888
 outlet absorbers, 901
 pressure, 887
 unit, 887

Space heaters, 404

design, 405
 rating, 404
 Split systems, 8
 Splitter dampers, 678

Spray

apparatus, 757
 booths, 757
 cooling, 981
 cooling ponds, 765
 cooling towers, 767
 dehumidifier, 651, 761
 distribution, 763
 dryer, 1023
 equipment, 757
 generation, 763
 humidifiers, 759, 763, 764
 unit air conditioner, 593
 Spread, air distribution, 663, 668
 Square foot of heating surface, 8
 Squeeze dampers, 604
 Squirrel-cage induction motor, 874, 875, 882

Stack, stacks, 217, 231, 409, 449

height, 8, 233
 wall, 449, 452
 smoke, 409

Standard, standards, 1089

air distribution, 661
 atmosphere, 63
 Standard air, 1
 Static
 electricity elimination, 974
 pressure, 7, 699, 723
 regain, 706
 Steady flow, energy equation, 24, 67

Steam, 8

coils, 785, 792
 distribution piping, 489, 637
 estimating consumption, 443, 645
 flow, 491, 492
 flow measurement, 78, 643
 heated equipment, 305
 heating systems, 479
 condensate return, 479
 connections to units, 518
 control valves, 519
 corrosion, 634
 drips, 515
 flash leg, 516
 gravity one-pipe air-vent, 480
 gravity return, 479
 Hartford return, 481
 high pressure steam, 483
 low pressure steam, 483
 mechanical return, 479
 one-pipe, 480
 orifice, 488
 piping for, 489
 sub-atmospheric, 487
 two pipe, 482
 vacuum, 488
 vapor, 484
 jet type system, 821

Index to Technical Data Section

Steam (continued)

metres, 78, 643
 panel heating, 551
 pipe capacities, 492-501
 properties, 32, 49
 rates, 845
 reducing valves, 504
 requirements, 443, 645
 runoff, 481
 superheated, 8
 tables, 32, 49
 traps, 510
 valves, 519
 velocity, 493
 Steel boilers, 384
 Sterilization of air, 132

Stoker, stokers, 355

classification of, 355
 combustion adjustments, 360
 combustion process, 357
 controls, 363
 furnace design, 361
 mechanical, 355
 overfeed flat grate, 359
 overfeed inclined grate, 357
 sizing and ratings, 362
 underfeed, 358
 Sub-atmospheric systems, 487
 Summer air conditioning system, 263, 477, 647
 Summer comfort, 127, 128
 Superheated steam, 8
 Supply mains, 8
 Supply openings, 460, 662, 673, 901, 1031
 measurement of velocities, 1079
 Supports, pipe, 609

Surface

condensation, 202, 630
 conductance, 3, 170, 179
 coefficients, 92, 170, 628
 external pipe, 623
 heating, 9
 extended, 9
 temperature, 198, 403, 559, 1071
 Suspended unit heater, 574

Symbols, 12, 13, 14

air conditioning, 21
 for drawings, 17
 heating, 18
 piping, 17
 ventilating, 19

T
Tables

air changes, 222
 air conditioning temperatures and humidities, 960-970
 air duct size, 452
 air leakage, 218, 220, 221
 air requirements, 113
 air, volume of, 32
 allowable concentration
 gases, vapors, 158
 dust, fumes, 160, 161
 altitude, pressure and temperature, 63
 analytical solutions for heat conduction, 107
 anthracite size, 322
 atmospheric gas, 631
 atmospheric impurities, 153, 931
 attenuation
 between grille and room, 897
 data, lining board, 899
 in straight ducts, 895
 of branches, 896
 of elbows, 896
 of plate absorber, 900
 azimuth angle, 275
 black body radiation, 96
 boiler ratings, 386, 387, 389
 bonnet pressure, 475
 building load factors, 448
 calorific value, 320, 321, 331, 336

Tables (continued)

capacity constants, unit heaters, 577
 capture velocities, 982
 carbon dioxide maximum, 347
 cast-iron boiler rating, 389
 ceiling temperature, 248
 chimney draft, 423
 circular equivalents of rectangular ducts, 690
 classification of
 coals, 321
 motors, 874
 water, 928
 climatic conditions, 241, 267
 coal analyses, 320
 coal classification, 321
 codes, 1089
 coil capacity balance, 795
 combustible elements and compounds, 344
 combustion rates, 392
 comfort ranges, 123
 condenser design data, 780
 conductance, 93, 170, 180
 air space, 170, 180
 conduction problem solution, 101, 107
 conductivity materials, 91, 170, 175, 176, 180
 convection conductances, 93
 conversion equations, 15
 conveying velocity, 682-692
 cooling coil arrangements, 794
 cooling tower pipe size, 1054
 copper elbow equivalents, 523
 copper tube capacity, 526
 copper tube surface, 623
 correction factors
 steam radiator, 546
 water radiator, 546
 unit heaters, 577
 corrosion resistance, 996
 cost of air conditioning, 950
 decibel scale, 889
 degree-days for cities, 437
 design dry- and wet-bulb temperatures, 241, 264, 267, 277, 960, 1039
 design humidity, 960-970
 dew-point, fuels, 352
 draft in chimneys, 423
 draft requirements of appliances, 424
 duct attenuation, 895
 duct combinations, 463, 464
 duct joints, 712
 duct sizing, 452, 453, 455, 456, 464, 471, 472
 duct velocity, 702
 duct weight, 713, 714, 983
 dust concentration, 155
 elbow attenuation, 896
 elbow equivalent, 523, 1052
 emissivity factors, 5
 end reflection, 900
 environmental conditions, limits, 118
 equivalent length of fittings, 453, 468, 495, 1053
 equivalent temperature differentials, 278, 280
 exhaust pipes for machines, 988, 990
 exhaust velocities, 982, 984-987
 expansion tank sizes, 536
 fan outlet velocity, 734
 fan speed, 734
 fitting allowance, 443, 468, 495
 fitting dimensions, 611-614
 fixture flow, 1046
 fixture units, 1046
 flammability of gases and vapors, 162
 flanged fittings surface, 624
 flue gas dewpoint, 350
 free convection, 94
 friction loss, pipe, 376, 492, 498-501, 524, 526
 friction valves and fittings, 454, 495, 523
 fuel consumption, 442, 443

Tables (continued)

fuel oil properties, 330
 fumes, concentration, 160
 gas piping capacity, 376
 gaseous fuel properties, 336
 glass absorptance, 286
 glass transmittance, 286
 graphical symbols, 17
 heat absorbed, cooling water, 775
 heat conductance, 93, 101, 171-175
 heat equivalents, 257
 heat flow walls and roofs, 186-196, 278-282
 heat gain
 appliances, 304
 glass, 289, 291
 glass blocks, 292, 293, 294
 insulated cold pipes, 631
 heat loss
 bare copper pipe, 622
 bare steel pipe, 542, 622
 basement, 251
 pipe coils, 542
 radiation, 96
 heat transmission coefficients, 186
 building construction, 186-197, 282
 doors, 197
 glass, 197
 roofs, 194, 282
 walls, 186
 water heaters, 1062
 hot water demand, 1055, 1056, 1058
 hot water pipe sizes, 523-526, 1046-1050
 humidities, industrial air conditioning, 960-970
 incident angle, 274
 infiltration through outside doors, 222
 infiltration through walls, 218
 infiltration through windows, 220
 inflammability, gases, 162
 inside temperatures, 247, 264
 inside temperatures, 247, 264, 960, 1039
 instantaneous solar heat gain, 289-294
 insulation conductivity, 624
 insulation factors, 624
 insulation thickness, 631, 633
 insulation to prevent freezing, 633
 insulation, underground, 635
 intake velocity, 679
 iron elbow equivalents, 523
 life of equipment, 951
 limits for contaminants, 158-163
 load factors, 448
 maintenance cost, 953
 maximum allowable concentrations
 dust, fumes, mists, 160
 dusts, 160, 161
 flammable gases, 162
 gases, 158
 vapors, 158
 metal gages for ducts, 712, 993
 meter performance, 1062
 minimum outdoor air requirements to remove odors, 113
 moisture content for materials, 972
 moisture regain, 972
 moisture transfer, 208
 motor classification, 874
 motor current, 875
 motor design limits, 872
 motor drive applications, 878
 motor horsepower, 872
 motor ratings, 880
 motor speed range, 872
 motor voltage, 872
 noise levels, 891
 oil fuel specifications, 330
 oil heat value, 331