Subject Index

A

adhered (bonded) wood products, 59–61
adsorption, 2–3
adsorption isotherm, 48
aerated concrete, 48
aerobiology, bacteria, 82
air
  ambient, 111
  barrier systems, 18–19
  barriers, high-rise, 416
  distribution, 124
  infiltration and ventilation, 111–116
  leakage characteristics for building enclosure, assembly
  and materials, 19–21
air conditioning, residential buildings, 397–398
airtightness, 111
  data, 113
  tests, 31–32
ambient air, 111
apparent thermal conductivity, 39
architects
  and engineer role, quality, 496
  certificates, 570–571
arthropods, 82
assemblies, 18
assumed design responsibility, 568
ASTM standard guidelines and practices, 476–477
attics
  condensation, 197–198
  manufactured housing, 431–432
axial and radial system, wood, 54–56

B

bacteria, 74, 82
  aerobiology, 82
  and water temperature and light, 82
barrier systems, air, 18–19
basements, 108–109
  case studies, 197
  wall and below grade drainage systems, 25–26
bathrooms, 105
biocides for contamination prevention, 86
biological attack, 73
Boston Cap roof, 321
Brady Array, 144
British standards, 477
building envelopes
  airtightness, 113
  defined, 494
  high-rise buildings, 401–425
  quality design, 551–556
buildings
  airflow, 150–151
  components, 238–240
  enclosures, 229–242
  industry challenges, quality design, 497–498
  pressurization/depressurization, high-rise, 403–404

C

Canadian standards, 477
canopy connection to wall, 276
capacitance techniques, 146–147
capillary breaking layer, 25
capillary moisture content, 27, 34–35
capillary transport, 30–31
carbon, 144
carpenter ants, 75
case studies, 181–224
  attic condensation, 197–198
  basements, 197
crawl spaces, 193–196
  dehumidifiers, 192–193
  exterior moisture problems, 183
  exterior wall moisture problems, 183, 193–215
  indoor moisture problems, 181–182, 183–193
  inside exterior walls, 215–219
  moisture inside exterior walls, 215
  mold and mildew problems, 182–183
  roofing, 198–200
  siding, 200–201
  southern climates, 213–215
  weatherization, 189–190
cathedral ceilings, 322
cell wall, lumen, moisture, wood, 56
cell-to-cell connections, wood, 56
cladding design, high-rise buildings, 409–416
climate
  data sheets, 91–103
  new residential buildings, 343, 347–348
cockroaches, 82
codes, 486–488
cold climate
  issues, 124
  new residential buildings, 347–348
combustion appliances, residential buildings, 398
commercial buildings, 241
concentration decay method, 151
condensation of humid air on colder surfaces, 164–166
constant concentration method, 151–152
constant injection method, 152
constant volume terminal reheat, 125
combustion appliances, residential buildings, 398
commercial buildings, 241
canopy connection to wall, 276

Copyright © 2009 by ASTM International www.astm.org
water vapor, air, weather barriers/retarders, 471–472
writing specifications, 470–471
contractors failure, 567–568
cooling
coils, 120–124
of moist air and condensation, 11–12
cork, 49
crawl spaces, 166
case studies, 193–196
residential buildings, 394–396
creep, wood, 71–72
curtain wall, 290
foundation, 291
parapet, 293–297
spandrel, 292

deficiency/rework tracking guidelines, 558–565
dehumidifiers, 192–193
design
professional failure, 569
tools, 129–138
wind pressures, 404–407
developments during last decade, 589–590
dew cell, 142
dew point
hygrometers, 140–142
method, 130
dimensional changes, wood, 65–71
bonded wood products, 66–69
compression set shrinkage, 70–71
stability, 65–66
surface checking, 70
warp, 69–70
distribution, air, 124
driving forces, 112–113
driving rain, 91
dual duct, 125
duct systems, 432–433
Dunmore, 144
durability assessment, 594–598
effects on thermal insulating materials, 38–51
electrical resistance techniques, 145–146
electrolytic hygrometer, 145
enclosures, 18
energy codes, buildings, 488
envelope water leakage, high-rise buildings, 417–420
environmental barriers and driving forces, 583
environmental loads, new residential buildings, 343
European standards, 477
evaporation from wet surfaces, 105–106
exfiltration, 111
exhaust air, 111
expanded polystyrene, 46
experience-based design, 232–238
exterior climate

F
facilities contracting process, quality design, 498–503
failure to warn of known defects, 568–569
fastener performance, 72–73
fenestration, ASTM standards, 481–482
flooding basement, 108
floors
ASTM standards, 485
manufactured housing, 430
fog-type dew point meter, 142
foundations
new residential buildings, 360–362
residential buildings, 393–397
to wall, 251
Fourier’s law, 38–39
framed membrane roofing systems, 328–330
framed water-shedding roofing systems, 320–327
fresh air ventilation, manufactured housing, 433
fungus aerobiology, 82
fungus ecology, 81
fungus, 80
physiology, 80–81

G
Glaser diagram, 133
grain angle, wood, 56–57
ground, moisture source, 109
growth rings, wood, 56–57
gutters, residential buildings, 392

H
heartwood, 57–58
heat transfer mechanisms, dry insulating materials, 38–39
heat, air, and moisture (HAM) transport, 1
heating and cooling equipment, 118–128
heating of moist air, 11
high-rise buildings, 378–387
air barriers, 416
building envelope, 400–425
building pressurization/depressurization, 403–404
cladding design, 409–416
design wind pressures, 404–407
envelope water leakage, 417–420
humidification/dehumidification, 403
masonry cladding, 407
mechanical equipment performance, 402–403
plaza-deck waterproofing, 420–421
precipitation, 413
roof systems, 407
roofing and, 422–423
temperature, 412
ventilation, 403
wall systems, 407–409, 423–424
waterproofing and, 424–425
weather data, 414–415
wind effects, 382–387
wind forces, 413
historic buildings and preservation, 443–461
historic exteriors, 446–456
historic interiors, 456–461
moisture sources, 443–446
holistic approach to building design, 16–17
hot, humid climates, new residential buildings, 351–353
HUD regulations, manufactured housing, 435–437
human health effects, 82–86
human sources of moisture, residential buildings, 398
humidity ratio, 10–11
HVAC equipment, 124–125
hygric properties measurements, 35
hygrothermal characteristics measurement, 31–35
of materials, 16–35
hypersensitivity diseases, 82–83

I
ideal gas law, 10
identification of moisture sources, 161–167
IECC climate zone map, 489
improvements, roofs, 316–317
in-plant construction environment, manufactured housing, 433–434
indoor moisture problems, 181–182, 183–193
indoor sources of moisture, 104–108
infections, 83
infiltration, 111, 112–115
air, 111–116
manufactured housing, 433
measurement, 115
insects, 75
inside exterior walls, 215–219
inspection of work, 569–570
installation on site, manufactured housing, 434–435
institutional buildings, 241
interior sources, 161
interior steam leak in historical building, 174–175
interlocked grain, 57
interzone airflows, 116
investigation checklist, 168–169
ion exchange, 144

J
Jason, 144
juvenile wood, 58

K
Kieper diagram, 133–134
kitchens, 105

L
laboratory versus field testing, 157–158
laminated strand lumber, 59–61
leakage characteristics for building enclosure, assembly and materials
air, 19–21
legal considerations, 567–579
libraries and museums, 377
limiting material performance characteristics, 585–587
liquid penetration resistance (LPR) test method, 32–33
liquid transport, 6–7
loose-laid and mechanically attached membranes, 317–318
Lyman-alpha hygrometer, 142–144

M
makeup air, 111
managing quality, 508–515
manual design tools, 129–130
limitations, 134–135
manufactured housing, 429–441
attics, 431–432
duct systems, 432–433
floors, 430
fresh air ventilation, 433
HUV regulations, 435–437
in-plant construction environment, 433–434
infiltration control, 433
installation on site, 434–435
moisture dynamics, 429–434
mold, 441
recommendations, 438–440
remediation, 441
walls, 430–431
masonry cladding, high-rise buildings, 407
material characteristics
airflow control, 17–18
rain and ground water control, 21–27
materials, 18
mature wood, 58
measurement
basics, 153
in solid materials, 145–147
techniques and instrumentation, 140–158
mechanical, 144–145
mechanical equipment performance, high-rise buildings, 402–403
mechanical ventilation, 111, 115–116
metal roofing, 318
microbes, 73
microbial growth prevention, 84
mildew
case study, 571–574
problems, 182–183
mineral fibers, 49
mites, 82
mixed climates, new residential buildings, 348–351
modeling heat, air and moisture transport, 9
moist material measurement, 43–44
moisture, 61–65
caused by building envelope problems, 161–179
content of air, 90
control issues, quality design, 494–495
from occupancy, 166
in service, 64–65
inside exterior walls, 215
manufactured housing, 429–434
new residential buildings, 344–347
retention curve, 30
sources, 104–110
transfer to heat transfer, 40–42
transport control, 27–31
transport equations, 4
moisture-originated damage, 592–594
further needs, 603
recent developments, 598–603
molds, 73–74
case study, 571–574
manufactured housing, 441
new residential buildings, 343–344
problems, 182–183
multifamily housing in northwest, 173–174
multiple trace techniques, 153
multizone, 125

N

natatoriums, 378
natural durability, 57–58
natural ventilation, 111, 115
need for quality design, 495
neutron thermalization methods, 147
new commercial buildings, 365–389
design, 365–368
institutional buildings, 376–377
predicting moisture performance, 368–376
new high-rise buildings, 365–389
new institutional buildings, 376–377
new residential buildings, 343–362
climate dependence, 343
cold climates, 347–348
environmental loads, 343
foundation assemblies, 360–362
hot, humid climates, 351–353
mixed climates, 349–351
moisture control practices, 344–347
roof assemblies, 359–360
surface mold, 343–344
wall assemblies, 353–359
North American industry guidelines, 478

O

open water surface, 107
organisms, 80
organizations, for standards, 556–557
oriented strand board, 59–61
outdoor air, 111
outdoor sources, 108–109
overhang section, 275
overhanging sloped roof, 278
owner’s role, quality design, 495–496

P

parapets, 241–249
to wall junction, 253–261
partnering, quality design, 498
people, moisture source, 104–105
performance analysis, 584–585
performance evaluation, design process and, 587–588
perlite, 47
phase changes, 3
phenolic foam, 48
piezoelectric crystal, 144
plans and programs for quality control, 530–535
plants, moisture source, 105
plaza-deck waterproofing, high-rise buildings, 420–421
plumbing, residential buildings, 397
plywood, 59–61
polyurethane foam, 47
polyvinylchloride foam, 46
poor workmanship, 568
poroelasticity, 600
precipitation, high-rise buildings, 413
process-generated moisture, 128
properties of moist air, 10
psychrometric calculations, 9–10
psychrometric chart, 11–12
punch-out list, 546
punched window, 264–268, 269–275

Q

qualitative leak location, 155–156
quality design
architect and engineer role, 496
building envelope commissioning, 551–556
building industry challenges, 497–499
construction contract documents, 515–519
construction management firm role, 496
construction project documents, 547–551
construction project meetings, 527–530
construction project plan, 535–547
construction project team, 519–527
deficiency/rework tracking guidelines, 558–565
facilities contracting process, 498–503
in building envelope, 493–566
managing quality, 508–515
moisture control issues, 494–495
need for, 495  
owner’s role, 495–496  
partnering, 498  
plans and programs for quality control, 530–535  
quality concepts, 503–508  
subcontractors, 497  
success tips, 557–558

R

rain leakage, 107, 163–164  
re-roofing, 330–333  
reaction wood, 58  
recreational sports and entertainment buildings, 377–378  
reheat, 122–124  
system control, 128  
relative humidity, 10  
relative humidity measurement, 140–145  
remediation  
manufactured housing, 441  
mold, 86  
air conditioning, 397–398  
combustion appliances, 398  
crawl spaces, 394–396  
foundations, 393–397  
gutters, 392  
human sources of moisture, 398  
plumbing, 397  
roof, 390–392  
slab, 396  
sump pump, 397  
surrounding soil, 393  
ventilation, 398  
walls, 392–393  
water from indoors, 397–398  
water from outdoors, 390–392  
windows, 393  
return air, 111  
rising damp, 167  
roofs, 313–321  
ASTM standards, 480  
case studies, 198–200  
high-rise buildings, 407  
new residential buildings, 359–360  
residential buildings, 390–392  
to wall connection, 249–250

S

sapwood, 57–58  
saturation vapor pressure, 10  
siding, 200–201  
simultaneous heat and mass transfer models, 39–40  
skylights  
head at wall, 289  
ridge, 288  
sill, 282–284, 286–287  
sill to curtainwall, 279  
sill to roof, 281  
slab, residential buildings, 396  
sliding snow and ice, roofs, 326  
sling psychrometers, 140  
slope of grain, 57  
sloped glazing, 275  
software for heat, air, moisture (HAM) transport, 135–138  
sorption isotherm (equilibrium moisture content in hygroscopic range), 29–30  
southern climates, 213–215  
spatial climate, 88–89  
spiral grain, 57  
stains, 74  
standard practices and protocols, 177–179  
steady state measurements, 43  
storage of moisture and energy changes, 8–9  
strength, wood, 71  
structural connector, 277  
structural penetrations, 275  
subcontractors, quality design, 497  
sump pump, residential buildings, 397  
sun, 90  
supply air, 111  
surface condensation on windows, 12–13  
surrounding soil, residential buildings, 393  
system selection, 125–129

T

temperature, 90  
high-rise buildings, 412  
terminology, moisture control, 473–476  
termites, 75  
tests, 168  
airtightness, 31–32  
thermal conductivity, 45  
of wet insulating material, 42–43  
techniques, 147  
thermal moisture diffusivity, 8  
thermal performance of moist insulation, 49–50  
thermodynamic states of moisture, 1–2  
thin film polymer, 145  
time scale of exterior conditions, 89–90  
toxicoses, 83–84  
trace gas measurement techniques, 152–153  
transfer air, 111  
transient heat flow measurements, 43  
transport of moisture, 3–4

U

ultrasonic techniques, 147  
urea formaldehyde foam, 47

V

vapor transport, 4–6  
vapor traps, roofs, 315–316  
variable air volume (VAV), reheat, 125
ventilation, 111, 115
air, 111–116
high-rise buildings, 403
requirements, 116
residential buildings, 398
roofs, 315–316
vermiculite, 48

W

walls
and below grade drainage systems, 25–26
ASTM standards, 481–482
drainage systems, 24
high-rise buildings, 407–409, 423–424
manufactured housing, 430–431
new residential buildings, 353–359
residential buildings, 392–393
to window details, 252–256
to window isometric details, 263
water leakage through, 149–150
with vapor retarder, 130–131
without vapor retarder, 131–132
warm and humid climate, 169–170
water, 1
absorption coefficient, 7–8, 26–27, 34
access limitation, 84–86
bacteria and, 82
leakage through walls, 149–150
residential buildings, 390–392, 397–398
water resistive barrier (WRB), 22
classification, 22
performance, 22–23
testing, 32–34
water vapor
permeance and permeability, 5, 28–29
transmission, 32
transmission tests, 147–149
water vapor retarder, 27–28
water-shedding roofing, 318–320
waterproofing and high-rise buildings, 424–425
weather data, high-rise buildings, 414–415
weatherization, 189–190
weeping holes and flashings, 24–25
wet basements, 166
wet insulation, 335–337
wind, 90–91
high-rise buildings, 382–387, 413
windows
residential buildings, 393
surface condensation on, 12–13
wood
composition materials, 60–61
decay, 74
structure, 54–58
wood-boring beetles, 75