Index

accent lighting, 225
accessibility, 235–301
characteristics of specific users, 236–240
controls, 270–272
design considerations, generally, 240–250
electrical and heating, 286–287
generally, 10, 235
grab bars, 272–278, 293–294
grooming center, 250–263
no-threshold showers, 282–284
seats and transfer areas, 279–282
storage and accessories, 255–258, 285, 295–299
surround, 282
toileting center, 287–300
Uniform Federal Accessibility Standards, 19
universal design versus, 235–236
ventilation, 286–287, 299–300
accessories
accessibility and, 258–261, 276, 277, 285
for clothes closets, 316
mold growth and, 90
toilet paper holders, 197, 198, 299
access panels, 58, 59, 183, 192
Activities in the Bathroom (form 3), 120, 121–124
activity design trends, 36–38. See also user characteristics
adjacency matrix, 354
aging, of population, 26–27
air conditioning, 211–212
air injection technology (Danze), 79
Air Resources Board (California), 83
ambient lighting, 225
American National Standards Institute (ANSI), 19, 84, 108, 154
American Radiator and Standard Sanitary Corporation, 10
American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), 84
Americans with Disabilities Act (ADA), 106, 109
American Tree Farm System (ATFS), 72
anthropometry, 92–99
antimicrobial finishes, 89
assessing needs. See needs assessment
Associate Kitchen and Bath Designer (AKBD), 154
Association of Home Appliance Manufacturers (AHAM), 84
balance, of users, 239–240
basement bathrooms, 60
Basics of Bathroom Design . . . and Beyond, The (Cheever), 154
bathing and showering center (accessibility)
clear floor space, 263–270
flooring, 285
grab bars, 272–278
lighting, ventilation, electrical, and heating, 286–287
no-threshold showers, 45–46, 189–190, 264–270, 282–284
seats and transfer areas, 279–282
storage and accessories, 285
surround, 282
See also accessibility; bathtubs; showers
bathroom history, 1–12
early civilizations and the bath, 1–3
generally, 1
human factors research studies, 10–12
(See also human factors)
Middle Ages, 3
nineteenth century to present day, 5–10
seventeenth and eighteenth centuries, 3–5
See also design trends
bathroom planning, 145–201
bathing/showering center, 176–193
center concept of, 152–154
generally, 145, 154–158
grooming center, 158–176
toileting center, 193–200
types and locations of bathrooms, 145–152
Bathroom Planning Guidelines and Access Standards (National Kitchen & Bath Association)
access design considerations, 240
based on ICC (ANSI), 108
for bathing and showering center, 193, 286
Bathroom Planning Checklists—Guidelines, 368–370, 369–370
for entry and circulation, 248
color and theme, 28–30
consumer preferences, 27
by decade, 13–24
fixtures, 31–34
furniture, 32, 35
location, 38–40
multicultural influences, 31, 34
space use, 28
storage, 40–41
sustainable, 35
dexterity, of users, 239–240
dimensioned design drawing, 351, 356, 359–365
diversity, of population, 26
doors
accessibility and, 241–250, 282–283
bathroom planning, 155–156, 157
for clothes closets, 317
Door Measurements (form 9), 137, 140
infrastructure considerations, 49–55
See also showers
double-entry bathrooms, 39, 41
drain pipes, 58–60
dressing areas, 318
drinking water standards, 74
dryer venting, 325–326
dryer venting, 325–326
earth closets, 6
Ecolabel (European Union), 72
ejector toilets, 60, 61
electrical considerations
accessibility, 261, 286–287, 299–300
electric water heaters, 218–219
infrastructure considerations, 44
laundry equipment, 325
mechanical planning, 203–205
universal design, 103
electronics
accessibility, 297
electronic sensor controls and accessibility, 254–255
types of, in bathrooms, 38, 39, 40–41, 205, 207
elevation design templates, 351, 356, 359–365
earth closets, 6
Ecolabel (European Union), 72
ejector toilets, 60, 61
electrical considerations
accessibility, 261, 286–287, 299–300
electric water heaters, 218–219
infrastructure considerations, 44
laundry equipment, 325
mechanical planning, 203–205
universal design, 103
electronics
accessibility, 297
electronic sensor controls and accessibility, 254–255
types of, in bathrooms, 38, 39, 40–41, 205, 207
elevation design templates, 351, 356, 359–365
energy efficiency
lighting, 221–222
water heaters, 219, 220
windows, 53–54
EnergyGuide labels
lighting, 221–222
water heaters, 219, 220
Energy Recovery Ventilation (ERV), 217
EnergyStar (EPA, DoE), 77, 322
entry. See circulation; doors; no-threshold showers
environmental and sustainability considerations, 65–90
air quality, 81–84
air quality and moisture, 85–90
choosing sustainable products, 66–67
energy issues and building codes, 73
generally, 65–66
graywater, 80–81
green building programs, 68–70
laundry, 322–325
sustainable certification programs, 71–73
water, efficient and sustainable use, 75–79
water leaks, 80
water quality, 73–75
WaterSense, 79–80, 81
erogofitting, 11
ergonomic design, 100–107
European Union, 72
evaluation, of design, 365–367, 371–373
 evaporative cooling, 211–212
exercise areas
Assessment for Exercise Area (form 15), 331–332
equipment for, 332–333
generally, 330
location of, 332
mechanical and structural requirements, 334
space planning for, 334–335
exfoliation, 340
facials, 340
Fair Housing Act Accessibility Guidelines, 108
Fair Housing Laws, 20
fan systems, 213–217. See also ventilation
faucets
accessibility and water conservation, 257
bathing/showering center planning, 183, 184, 191–192, 193
environmental and sustainability considerations, 78–79, 80
grooming center planning, 166–169, 170, 171
universal design, 101, 102, 105
fiber optics, 230
fireplaces, 347–348
first hour rating (FHR), 219
fixtures
current design trends, 31–34
Fixture Measurements (form 10), 137, 141
infrastructure considerations, 48, 57–58
wall-mounted, 48
See also bathroom planning
flood lamps, 228
floors/floor space
bathing/showering center planning, 181, 187
grooming center planning, 161–162
infrastructure considerations, 44–47
toileting center planning, 195, 196–197
fluorescent lighting, 229
flush toilets, early, 7. See also bathroom history
food preparation
home spas, 346–347
outpost kitchen areas, 38–39, 40
Forest Management Certification (Forest Stewardship Council), 72
framing materials, for windows, 54
functional anthropometry, 94–99
furniture
design trends, 32, 35
wall-mounted, 48
gas
laundry equipment, 325
water heaters, 219
gender
clothes closets and, 309
functional anthropometry and, 94, 99
(See also bathroom planning)
general lighting, 225
germ theory, 5–6
Getting to Know Your Client (form 1), 113, 114–117
GFCl
mechanical planning, 203–204, 206
universal design, 103
glazing, 183, 191, 282–283
grab bars
accessibility in bathing and showering center, 272–278
bathroom planning for, 185–186, 192
infrastructure considerations, 48
toileting center, 293–294
graywater, 80–81
Great Bath (Bath, England), 2
green building practices
defined, 66
programs for, 68–70
See also environmental and sustainability considerations
Greenguard Environmental Institute (GEI), 82
grooming center, 158–176
accessibility, 250–263
cabinets, 172, 173
counter edges, 166, 170
faucets, 166–169, 170, 171
floor clearance, 161–162
grooming center (continued)
generally, 158–160
lavatory clearance, 162, 163, 164, 165, 169, 170
lavatory height, 162–164, 165, 166, 167, 168
lighting, 226
medicine cabinets, 173–175
mirrors, 175
seated vanity, 161, 164–166
side clearance, 160, 162
storage, 169–173, 174
towels, 176
gymnasium, defined, 2
halogen lamps, 228, 229
hard water, 74–75
Harvard University, 26
health and wellness
bathrooms for, 38
molds, moisture, and, 87–88 (See also environmental and sustainability considerations)
See also home spas
Health Canada, 65
hearing, of users, 237
heating accessibility, 286–287
mechanical planning, 205–211
water heaters, 60–61, 218–220
Heat Recovery Ventilation (HRV), 217
heat therapy, 337, 339
height ranges, of users, 95–99, 240, 241
Henry Dreyfuss and Associates, 11
Herculaneum (ancient Rome), 2
history of bathrooms. See bathroom history
holders, toilet paper, 197, 198, 299
home spas
floor space, 346
generally, 335–336
location of, 336–337
seating and refreshments, 346–347
storage, 347
supplies and equipment, 341–346
uses, 337–341
utilities and infrastructure, 346
hooks, for clothing, 313
Hoover, Herbert, 10
hot tubs, 342
household growth/composition, bathroom trends and, 25–26
human body and interhuman engineering, 11
Human Dimension & Interior Space: A Source Book of Design Reference Standards (Panero, Zelnik), 11, 92
human factors, 91–110
access codes, laws, standards, 108–110
anthropometry, 92–99
ergonomic and universal design, 100–107
generally, 91
research studies, 10–12
Humanscale (Tilley), 11
humidity. See moisture
hydrotherapy, 337, 339
incandescent lighting, 228–229
indoor plumbing, advent of, 7–8
infrastructure considerations, 43–64
building codes, 43–44
doors and windows, 49–55
generally, 43
noise, 61–64
plumbing, 55–61
structural issues, 44–49
insulation, for walls, 49
International Building Code, 108, 109, 154
International Code Council (ICC)
International Residential Code (IRC) and, 73
National Green Building Standards and, 68–70
International Residential Code (IRC)
bathroom planning and access design, 154
environmental and sustainability considerations, 73
graywater, 81
infrastructure considerations, 43
ventilation requirements, 88
interviews. See client interviews
iron bacteria, 75
ironing, 315, 329
jobsite assessment
generally, 134
Joint Center for Housing Studies, Harvard University, 26
Kira, Alexander, 10
knee space, 106, 250–254
Kohler, 15
latrines, 3
laundry areas
dryer venting, 325–326
environmental and sustainability considerations, 322–325
equipment for, 322
floor infrastructure considerations, 46–47
ironing, 315, 329
moving laundry, 326–328
space planning for, 326
storage, 328–329
types of use for, 321
utility service requirements, 325
lavatories
clearance of, 162, 163, 164, 165, 169, 170
height of, 162–164, 165, 166, 167, 168
pedestal lavatory design trends, 23
See also grooming center
“lavette,” 17
Leadership in Energy and Environmental Design (LEED) (United States Green Building Council), 68–70
Lead Renovation, Repair, and Painting Rule, 84
leaks, water, 80
lighting accessibility, 242, 261, 286–287, 291, 299–300
artificial, 223–226
for clothes closets, 318
controls, 231–232
definitions, 227
EnergyGuide labels, 221–222
for home spas, 340, 346
lamps, 226–230
lamps, comparison, 230
light emitting diode (LED), 229–230
lighting fixtures, 230–232
mechanical planning, generally, 220
natural or daylighting, 222–223
safety, 232–234
linen closets
generally, 318–319
Linen Closet Storage Inventory (form 14), 320
load-bearing walls, 47
location trends
design trends, 38–40
needs assessment and home location, 117
types and locations of bathrooms, 145–152
low-voltage lighting, 232
Mace, Ron, 100
make-up air, 216–217
massage, 341, 346
Maximum Contaminant Levels (MCLs), 74
INDEX 437

McDonough Braungart Design Chemistry, 71, 72
Measure of Man and Woman: Human Factors in Design, The (Tilley), 11
Measures of Man (Tilley), 11
mechanical planning, 203–234
cooling, 211–212
electrical planning, 203–205
generally, 203
heating, 205–211
lighting, 220–234
ventilation, 212–217
water heating, 218–220

mechanical planning, 203–234
cooling, 211–212
electrical planning, 203–205
generally, 203
heating, 205–211
lighting, 220–234
ventilation, 212–217
water heating, 218–220

medicine cabinets, 173–175. See also grooming center

meditation
bathrooms for, 37
home spas for, 340

mirrors
grooming center planning, 175
lighting of, 233 (See also lighting)
mobility
aids, 96, 97–98
reach ranges, 94, 95–99, 314, 315
of users, 239
See also accessibility; user characteristics

moisture
clothes closets and, 304
indoor air quality and, 85–90
infrastructure considerations, 49
molds and health, 87–88
preventing problems, 88–89
molds, 87–88
multicultural design trends, 31, 34
multipurpose space, bathrooms as, 39

National Building Code (NBC) (Canadian Codes Center of the Institute for Research in Construction), 109–110
National Center for Injury Prevention and Control, 100
National Electric Code (NEC), 203
National Fenestration Rating Council (NFRC), 53–54
National Green Building Standards (National Association of Home Builders, International Code Council), 68–70
National Institute on Disability and Rehabilitation Research (NIDRR), 12
National Institute on Disability and Rehabilitation Research (NIDRR) (U.S. Department of Education), 100
National Kitchen & Bath Association (NKBA), 154
Bathroom Design Survey Form, 113
electrical planning, 206
See also Bathroom Planning Guidelines and Access Standards (National Kitchen & Bath Association)
natural lighting, 222–223
Natural Resources Canada, 65, 68
needs assessment, 111–144
Activities in the Bathroom (form 3), 120, 121–124
client interviews, 112–113, 117, 118
client preparation, 142
design process, generally, 111–112
design readiness, 142–143
Dimensions of Mechanical Devices (form 7), 137, 138
Door Measurements (form 9), 137, 140
Fixture Measurements (form 10), 137, 141
Getting to Know Your Client (form 1), 113, 114–117
Getting to Know Your Client's Home (form 2), 118, 119
home location and, 117
home type and, 117
jobsite assessment, generally, 134
Jobsite Inspection (form 6), 134, 135–136
Storage in the Bathroom (form 4), 125, 126–130
Window Measurements (form 8), 137, 139
Your Client's Bathroom Preferences (form 5), 131, 132–133
See also user characteristics
New York City, early bathroom facilities in, 6
noise, infrastructure considerations, 61–64
North Carolina State University, 12, 91, 100, 283
no-threshold showers, 45–46, 189–190, 264–270, 282–284
Numi, 297

olfactory impairment, of users, 238
on-demand water heaters, 218
outdoor bathrooms, 152
outpost kitchen areas, 38–39, 40
Panero, Julius, 11, 92
parabolic aluminized reflector (PAR) lamps, 229
perception, of users, 238–239
Pew Research Center, 25
physical characteristics, of users, 239–240
plumbing
access panels, 58, 59, 183, 192
building codes, 43–44
codes, 10
drain pipes, 58–60
indoor plumbing, advent of, 7–8
infrastructure considerations, 55–61
shut-off valves, concealed, 58, 59, 183, 192
trench-style drains, 268, 284
See also water
pocket doors, 49, 244
population trends, 24–27
Primary Drinking Water Standards, 74
privacy
bathroom planning for, 148–150
moveable privacy wall, 246
natural lighting and, 223
noise and, 61–64
social areas of homes and bathroom planning, 151–152
toileting and accessibility, 295
privacy, 4–5
Programme for the Endorsement of Forest Certification (PEFC), 72
Prototype Anthropometric Database, 12

range-of-joint motion, 96–99
reach ranges, 94, 95–99, 314, 315
receptacles, electrical, 204–205
reclaimed, certified, 72–73
recycling
certification programs, 72–73
water, 80
reflector lamps, 229
refrigerated cooling, 211–212
relationship matrix, 354
renovation hazards, 83–84
repurposed, certified, 73
Residential Rehabilitation Assistance Program (RRAP-D), 110
R-2000 (Natural Resources Canada), 68
Rocky Mountain Institute, 66
roll-in showers, 189–190, 267–270
Roman baths, 2
room outline, 356–358

“safe harbors,” 108–109
safety, lighting, 232–234
salvaged, certified, 72
sanitation, history of, 1, 3, 5–6, 8
saunas, 338–340, 343, 345
Scientific Certification Systems, 71

seating
accessibility in bathing and showering center, 279–282
grooming center planning and seated vanity, 161, 164–166
in home spas, 346–347
shower seats, 192, 194
Secondary Drinking Water Standards, 74
Secondary Maximum Contaminant Levels (SMCLs), 74
sensory characteristics, of users, 237–238
Seven Principles of Universal Design (Center for Universal Design, North Carolina State University), 12, 91, 100, 283
sewer systems, history of, 6
shelving, recessed, 185
showers
accessibility to, 264–270, 272, 273, 278–284
advent of, 8
current trends, 32, 35, 36
environmental and sustainability considerations, 78, 80
no-threshold, 45–46, 189–190, 264–270, 282–284
planning bathing/showering center, 176–193
steam, 343, 344
universal design, 101, 102, 103
vichy shower, 343
shut-off valves, concealed, 58, 59, 183, 192
skylights, 55, 56, 223
sliding doors, 49, 50
soaking tubs, 343
social areas of homes, bathroom planning and, 151–152
solar heat gain coefficient (SHGC), 73
solar water heaters, 219
sound-insulating construction techniques, 62–64
source control, air quality and, 81, 82
space planning
clothes closets, 314, 315
design drawing and floor plans, 361–363
design trends, 28
early research, 11
exercise areas, 334–335
home spas, 346
lavatory areas, 326
See also accessibility, human factors
spa tubs, 342
spot lamps, 228
stacked washers/dryers, 324
stamina, of users, 239–240
standards
American National Standards Institute (ANSI), 19, 84, 108, 154
drinking water standards, 74
Human Dimension & Interior Space: A Source Book of Design Reference Standards (Panero, Zelnik), 11, 92
human factors and universal design, 108–110
National Green Building Standards (National Association of Home Builders, International Code Council), 68–70
National Kitchen & Bath Association (NKBA), 154
R-2000 (Natural Resources Canada), 68
Uniform Federal Accessibility Standards, 19, 108
U.S. Bureau of Standards, 10
See also accessibility, Bathroom Planning Guidelines and Access Standards (National Kitchen & Bath Association); building codes; universal design
State of the Nation’s Housing (Joint Center for Housing Studies, Harvard University), 26
State University of New York (SUNY) Buffalo, 12, 105
stature. See height ranges, of users
steam bathtubs, 343
steps, bathtubs and, 182
storage
accessibility, 255–258, 285, 295–299
bathing/showering center planning, 186, 192
clothes closets inventories, 304
design trends, 40–41
grooming center planning, 169–173, 174
home spas, 347
laundry areas, 328–329
Storage in the Bathroom (form 4), 125, 126–130
storage principles for clothes closets, 310–311 (See also clothes closets)
toileting center planning, 199, 200
strength, of users, 239–240
structural issues, infrastructure considerations, 44–49
structural (static) anthropometry, 92–93
surrounds, for showers, 190, 282
Survey of Income and Program Participation (SIPP) (U.S. Census Bureau), 100
sustainable design
bathroom planning for, 152
building issues, 65–66 (See also environmental and sustainability considerations)
choosing sustainable products, 66–67
generally, 35
tactile impairment, of users, 238
tank water heaters, 218
task lighting, 225
technology, in bathrooms. See electronics tempered glass, 191
thalassotherapy, 338
themes, design trends, 28–30, 31
tier rankings (Consortium for Energy Efficiency), 322
Tilley, Alvin, 11
timers, 103
Time-Saver Standards for Housing and Residential Development (DeChiara, Panero, Zelnik), 11
toilets
accessibility to toileting center, 287–300
environmental and sustainability considerations, 77–78, 80, 81
fixture selection for accessibility, 289–293
flush toilets, history of, 7
planning toileting center, 193–200
universal design, 104
urinals, 194, 200
See also bidets
towels
bathing/showering center planning, 177, 186, 192
grooming center planning, 176
mold growth and towel bars, 90
storage needs assessment, 125
toileting center planning, 200
towel warmers, 210–211
Trace Research and Development Center, University of Wisconsin-Madison, 12
trench-style drains, 268, 284
trends. See design trends; user characteristics
tube fluorescent lighting, 229
Turkish bath, 3
U-factors, 73
uneven walls, 48
Uniform Federal Accessibility Standards, 19, 108
United States, population growth in, 24
United States Green Building Council, 68–70
universal design
accessibility versus, 235–236
Center for Universal Design, North Carolina State University, 12, 91, 100, 283
definitions, 106–107
ergyonics and, 100–107
generally, 33
myths about, 107
See also Bathroom Planning Guidelines and Access Standards (National Kitchen & Bath Association)
Universal Design: Creating Inclusive Environments, 105
University of Wisconsin-Madison, 12
urinals, 194, 200
U.S. Bureau of Labor, 6
U.S. Bureau of Standards, 10
U.S. Census
  2010, 25, 26
  Survey of Income and Program Participation (SIPP), 100
U.S. Department of Education, 12, 100
U.S. Department of Energy (DoE)
  EnergyStar, 77, 322
  water heaters, 219
U.S. Department of Health, Education and Welfare, 11
U.S. Department of Housing and Urban Development (HUD), 108
U.S. Department of Justice, 109
U.S. Environmental Protection Agency (EPA), 65, 77, 79, 322
user characteristics
  accessibility and, 236–240
  anthropometry, 92–99
  demographic and population trends, 24–27
  household growth/composition and bathroom trends, 25–26
  user analysis, 352–354, 372
  See also client interviews
utility service, for laundry equipment, 325
ventilation
  accessibility, 286–287, 299–300
  air quality and, 82, 88
dryer venting, 325–326
  for home spas, 346
  mechanical planning, 212–217
  vent pipes, 58–60
vertical diagrams, 358–359, 364–365
vichy shower, 343
diffusion, 77
vision, of users, 237
visitors’ needs, bathroom planning for, 152, 153
vertical diagrams, 358–359
volatile organic compounds (VOCs), 82
walls, infrastructure considerations, 47–49
waste pipes, 58–60, 61
water
  damage and floor infrastructure considerations, 44–45
  efficient and sustainable use, 75–79
  graywater, 80–81
  history of access to, 4, 6, 8
  hot water, environmental and sustainability considerations, 76–77
  hot water, history, 4
  hot water heaters, 60–61, 218–220
  infrastructure considerations for plumbing, 55–61
  laundry and environment, 322–325
  leaks, 80
  See also environmental and sustainability considerations; moisture
water closets, 5
WaterSense, 80, 81
wet room, planning bathroom as, 270, 298
whirlpool tubs, 338, 341, 342
whole-house ventilation systems, 217
windows
  daylighting, 222–223
  infrastructure considerations, 49–55
  mechanical planning, 211, 212–213
  Window Measurements (form 8), 137, 139
wiring, 204. See also electrical considerations
wood products, certification, 72
Worksheet for Folded or Rolled Clothing (form 13), 312–313
World Bank, 26
xenon lamps, 228
yoga, 340
Your Client’s Bathroom Preferences (form 5), 131, 132–133
Zelnik, Martin, 11, 92