

INDEX

- Absorptance, 277
 Absorption, 277
 Active optics, 18–19
 “Adaptive refinement,” 77
 ADELINE, 83
 “After hours” lighting, 46
 Ambient lighting, 277
American Architectural Manufacturers Association (AAMA)
 Skylight Handbook, 75
 Angle of incidence, 277
 Aperture:
 location, 12, 15
 and penetration, 7
 See also Effective aperture
 Atriums, 20–21
 Automotive Industry Office/Warehouse, case study of,
 130–136
 Azimuth, 277

 Ballast, 4, 277
 Bilateral daylighting, 15, 17
 Blinding glare, 277
 Brightness:
 contrast, 4, 7
 definition, 277
 and room geometry, 13
 See also Illuminance
 BRS daylighting protractors, 52–54
 Building orientation and lumen method, 49–51

 CAD files and RADIANCE, 78–79
 Calculation methods, 49–55
 Candela, 277
 Ceilings, 8
 and penetration, 12
 and reflecting, 13
 and toplighting, 16–18
 Center for Building Performance and Diagnostics
 (CBPD), 2
 Circadian rhythms, 27
 Clear sky, 277
 Clerestories, 15–16, 277
 Climate:
 and atriums, 22
 impact, 5–6
 Clouds, *see* Sky conditions
 Cloudy sky, 277

 Coatings, 36–38
 Coefficient of utilization:
 definition of, 74, 277
 table, 50
 Collection systems, 18–20
 Commissioning procedure, 211–217
 Computer programs:
 list of, 83
 and modeling, 90–92
 RADIANCE, 75–79
 SUPERLITE, 79–80
 Contrast:
 brightness, 7
 ratio, 5
 Cooling costs, *see* Energy savings and costs
 Core daylighting, 18–20
 Cosine correction geometry, 89
 Cosine law of illumination, 89
 Costs, *see* Energy savings and costs
 Curtains and filtering, 8

 Daylight factor, 52–53
 and data analysis, 90
 and illuminance meters, 88
 Daylighting:
 saturation, 277
 types of, 14–20
 Daylighting controls, *see* Electric lighting controls
 Design, 3
 elements:
 exterior, 10–11
 interior, 13–14
 in-wall, 11–13
 options:
 atriums, 20–22
 clerestories, 15
 core daylighting, 18–20
 sidelighting, 14
 toplighting, 16–18
 process:
 diagram of, 3
 and other control systems, 9
 strategies, 6–9
 tools, 49–92
 variables:
 external obstruction, 6
 sky conditions, 5–6

- Diffuse:
 - definition of, 278
 - reflection, 13, 278
 - transmission, 278
- Dimming controls, 44
- Direct beam:
 - illumination, 7, 18
 - modeling, 85
 - sidelighting, 14
- Directionally selective materials, 39
- Disability glare, 278
- Discomfort glare, 278
- Distribution systems, 19–20
- DOE-2:
 - description of, 80–81
 - modeling and, 90–92
- Domed diffuser, 89
- Draperies, *see* Filters, daylight
- Dynamic glazing, 40–41

- Effective aperture (EA), 7
 - definition of, 12–13, 278
 - graphs, 61–63
 - and skylight calculations, 60, 64
- Electric lighting controls:
 - and energy management systems (EMSs), 43–48
 - and simulation programs, 91
- Electric lighting schedules, 90
- Electrochromic materials, 4
- Emission, 278
- Emissivity, *see* Low-emissivity coatings
- Energy management system (EMS) and electric lighting controls, 46–48
- Energy performance graphs, *see* end of individual case studies
- Energy savings and costs, 1
 - alternative determination, 227–235
 - case studies summarizing, 241–246
 - computer determination, 80–82
 - controls, 237–266
 - and electric lighting controls, 43–48
 - and modeling, 90–92
 - and skylighting, 54, 68–70
- ENSAR, 94
- Environmental issues, 2
- Equivalent room, 278
- Evergreen State College, case study of, 163–167
- Exposure and building perimeter, 6
- Exterior design, 10–11

- Fenestration:
 - complex, 79–80
 - definition of, 278
 - and design team, 2
 - types of, 15
 - uncontrolled, 8
- Fiber-optics and core daylighting, 19
- Filters, daylight, 8
 - venetian blinds, 14
 - See also* Obstructions, external
- Fins, *see* Louvers
- Footcandle, 278
- Footlambert, 278
- Fresnel panels, 19
- Full cosine correction, 89
- Full-load lighting hours, finding, 68, 71

- Gas fills, 38–39
- Glare:
 - definition of, 4–5
 - index, 5
 - and sidelighting, 14
 - tools to calculate, 80–82
 - types of, 278
- Glazing:
 - and BRS daylighting protractors, 52–54
 - characteristics of, 12
 - diagram, 9
 - materials, 33–42, 57, 225
 - multipaned, 36
 - and skylight design, 56–57
 - and toplighting, 18
- Griffith, Bill, 49–50
- Gross floor area, 56

- Heat transfer, tools to calculate, 80–82, 83
- Heliodon, 84
- Heschong Mahone study, 29–31
- Human comfort, 41–42

- Illuminance:
 - curve, 51
 - definition of, 4, 278
 - for major cities (tables), 258–266
 - meters, 88–89
 - and window height, 16
 - See also* Brightness
- Illuminating Engineering Society (IES), 50
- Industrial buildings, case studies of, 148–154
- Institutional buildings, case studies of, 155–201
- In-wall design, 11–13
- Iso-Lux contour, 90

- Johnson Center, case study of, 137–147

- Latitude, 279
- Light:
 - behavioral effects from, 1
 - definition of, 279
 - ducts, 19
 - guides, 19
 - intensity, 13
 - meters, 88–89
 - pipes, 19
 - schedule, 90
 - shelves, 10
 - wells, 58–59, 279
- Lighting costs, *see* Energy savings and costs
- Lighting power density (LPD), 56, 279
- Light-loss factor, 279

- Light power reduction summaries for major cities (tables), 247–257
- Light sensors, 44
See also Electric lighting controls
- Local area network (LAN) and energy management systems (EMSs), 46
- LOF method, 50
- Longitude, 279
- Louvers, 10–11
See also Filters, daylight
- Low-emissivity coatings, 36–37
- Low-Energy Super Store by Stop and Shop, case study of, 94–101
- Lumen:
definition of, 279
method, 49–52
- LUMEN-MICRO, 83
- Luminaire, 279
- Luminance:
definition of, 279
distribution, 80
- Luminous efficacy (LE), 279
- Luminous flux, 279
- Lux, 279
- Mary Ann Cofrin Hall, case study of, 168–178
- Mean spherical intensity, 279–280
- Melatonin, 27
- Metallic coatings, 37
- Mixed reflection, 280
- Modeling, 83–92
- Multi-Agency Library, case study of, 179–188
- Newport Coast Elementary School, case study of, 189–201
- Nike European Headquarters, case study of, 102–113
- Nondiffuse transmission, 12
- Obstructions, external:
impact of, 6–7
See also Filters, daylight
- Office buildings, case studies of, 102–147
- On/off controls, 43–44
evaluation using, 237–266
- Optical density, 280
- Overcast, 280
- Overhangs, 10
- Partial cosine correction, 89
- Passive optics, 19
- Penetration, 7
and aperture location, 12
and atriums, 21
and clerestories, 15
and window height, 14
- Perfect diffusion, 280
- Perimeter daylighting, 6, 237, 240
- Photocells, 88
- Photochromic materials, 40
- Point source, 280
- Pollution avoidance, 2–3
- Profile angle, 280
- Protractors, 52–53
- Pyrolitic coatings, 37
- Quantity of light, 280
- RADIANCE, 75–79
- Radiation, 280
- Ray tracing programs, 76
See also Computer programs
- Reflectance:
definition of, 280
direct, 278
testing, 87
- Reflection, 7
definition of, 280
mixed, 280
from room surfaces, 13
systems, 11
- REMO, Inc., case study of, 148–154
- Retail buildings, case studies of, 94–101
- Roller shades, 14
See also Shading
- Roof apertures, *see* Toplighting
- Roof monitors, 18
- Room brightness:
and reflection, 8
See also Brightness; Illuminance
- Room geometry and light intensity, 13
- Saturation, 7
- Seasonal affective disorder, 72
- Selection aspect ratio (SAR) and atriums, 21
- Shading:
controls, 13–14
definition of, 280
See also Filters, daylight
- Shading coefficient (SC), 34, 280
- Shadows, *see* Contrast, brightness
- Sidelighting, 14–16
and lumen method, 49–52
- Simulation programs, *see* Computer programs
- Site energy, 280
- Sky conditions:
and atriums, 20–21
and illumination levels, 5–6
lumen method and, 51
for major cities (graphs), 219–224
modeling and, 84–86
types of, 84–86
- Skylight efficacy:
calculation of, 59
definition of, 280
- Skylighting zones, map of, 58
- Skylights, 15–17
alternative calculations for, 54–75
area calculations for, 64–67
case study using, 150–153
economic evaluation of, 68–72
effective aperture for, 60–65

296 INDEX

- Skylights (*cont'd*)
 layout of, 66–67
 and modeling, 86–87
 necessary conditions for, 78
 quantity determination for, 64–65
 trial design for, 56–59
 See also Toplighting
- Skylight-to-floor ratio (SFR):
 definition of, 280
 determination of, 64
- Sky simulators, 83–84
- Solar coordinates:
 lumen method and, 51
 tools to calculate, 83
 types of, 280
- Source energy, 281
- Specular reflection, 13
- Sputtered coatings, 37
- Stepped controls, 43–44
- Sun position, impact of, 6
- SUPERLITE, 79–80
- Switching controls, 43–48
- Thermochromic materials, 40
- Tilt table, 86
- Tinted glazings, 36
- Tools:
 list of, 83
 models, 83–92
- Toplighting, 16–18
 See also Skylights
- Tracking systems, 11
 active optics and, 18–19
- Transmission, 281
- Transmission factor of a body, 281
- Transmittance:
 definition of, 281
 direct, 278
- Transportation systems, 18–19
- Trees, *see* Obstructions, external
- Uniform diffuser, 281
- Uniform ground, 281
- Uniform point source, 281
- United Gulf Bank, case study of, 114–123
- U-value, 35, 281
- Vegetation, *see* Filters, daylight
- Veiling reflection, 3, 281
- Venetian blinds, 14
 See also Filters, daylight
- Visible radiation, 281
- Visible transmittance (VT):
 definition of, 34
 and effective aperture, 12
 table, 35
- Vision, 24
- Walls and reflecting, 13
- Weather data, 219–224
- Web resources, 271–276
- Well factor (WF):
 calculation of, 58–59
 definition of, 281
- Well index, calculation of, 59
- Windows:
 location of, 7, 13
 vertical, 14
- Window to wall ratio (WWR) and effective aperture, 12
- Worksheets:
 blank, 203–209
 trial, 56–73
- Xilinx Development Center, case study of, 124–129
- Younkin Success Center, case study of, 155–162











