

Author Index

A

Alevantis, L. E., 257
Allard, P. F., 73

B

Bayer, Charlene W., 234
Black, Marilyn S., 234
Brenner, F. Cecil, 199
Burge, Harriet, A., 35, 111

C

Cohen, M. A., 129
Colome, Steven D., 203

D

Darack, F., 178
Dudney, C. S., 129

F

Fortmann, Roy C., 287

G

Girman, John R., 244
Gorman, Richard W., 63
Greenberg, A., 178
Grot, Richard A., 35

H

Harkov, R., 178
Harper, J. P., 5, 129
Hawthorne, A. R., 129
Hodgson, Alfred T., 244

J

Jaakkola, Jouni, 51
Jones, Neville, 266

K

Kelty, S. P., 9
Kollander, Mel, 199
Koontz, Michael D., 148

L

Lawrance, Graham V., 266
Lebowitz, Michael D., 203
Levin, Hall, 99
Lewis, Robert G., 219
Lioy, P. J., 178, 203

M

Morey, Philip R., 80

N

Nagda, Niren L., 5, 148, 287

P

Persily, Andrew K., 35, 111
Phillips, T. J., 99
Psota-Kelty, L. A., 9

Q

Quackenboss, James J., 203

R

Rask, Dean R., 80
Rector, Harry E., 287

S

Seppänen, Olli, 51
Shields, H. C., 9
Sinclair, J. D., 9
Soczek, Mary Lou, 203
Spengler, J. D., 129

T

Traynor, Gregory W., 166
Turner, William A., 35, 111
Tyndall, R. L., 129

V

Vo-Dinh, T., 129

W

Waldman, J., 178
Wallace, Lance, 199, 219
Wallingford, Kenneth M., 63
Waters, John R., 266
Weschler, C. J., 9
White, Jim H., 185
Whitmore, Roy, 199
Woods, James E., 80

Subject Index

A

- Abbey School Sports Hall, 279
- Acetone, chromatographic scan, 239
- Acute respiratory health monitoring, 134–135
- Aerosol, 9
- Air
 - distribution system, 54
 - movement pathways, ventilation efficiency, 114–115
 - sampling rates, 12
- Airborne particles, 9
- Air-conditioning system. *See* HVAC
- Air exchange, 287
 - parameters, 152
- Air exchange rate, 121, 185
 - factors, 150
 - house, 173
 - measurement, 137
 - tracer gas decay method, 288
 - versus temperature difference, 45–46
- Airflows, interzonal, 288, 291–294
- Air handling units, 36
- Airtightness, 185
- Air-to-air heat exchanger, 148–149, 151, 159, 161
- ASHRAE Dust Spot rating, 13, 20, 26
- ASHRAE Standard 55-1981, 72, 87–88
- ASHRAE Standard 62-1981, 72, 87–88
- ASTM E 741-83, 44, 123, 257–258, 288
- Atomic absorption analysis, 29–30
- Aureobasidium*, 95–96

B

- Benzene, chromatographic scan, 238–239
- Benzo (*a*) pyrene, 178–184
 - activity questionnaire, 182
 - food, 182
 - home selection, 180
 - indoor/outdoor air sampling, 180
 - methods validation, 180–182
 - seasonal variation, 183
 - soils, 182
 - study area selection, 180
 - study design, 182–183
 - water, 181
- Bioaerosols, 48–49, 116, 125, 129, 141–142
 - data collection, 119–120
 - monitoring, 231
- Breakthrough volume
 - defined, 246
 - low boiling compounds, 247
- British Gas Maintenance Depot, 283
- Building illness syndrome. *See* Sick building syndrome
- Buildings, 2–3, 35–49
 - air distribution system, 36–38
 - air handling units, 36
 - air quality and ventilation rates, 58–59
 - bake out, 107–108
 - carbon monoxide, levels, 40
 - characteristics, 121–122
 - closeout procedure, 107–109
 - contractors, 76
 - construction closeout procedure, 99
 - current investigation, 42–49
 - bioaerosols, 48–49
 - indoor pollutant measurements, 47–48
 - inspection, 42–43
 - system airflows and ventilation effectiveness, 46–47
 - tracer gas decay tests, 43–46
 - description, 36–38
 - design professionals, 76
 - draft, 59, 61
 - envelope, 204–205
 - factors affecting air quality studies, 51–61
 - health and ventilation reduction, 57
 - health and temperature, 58
 - history of complaints, 35
 - indoor climate, 56–57
 - measurements, 55–56
 - investigation, 73, 203, 209
 - factors influencing, 74
 - see also* NIOSH investigations

Buildings—*Continued*

- maintenance problems, 43
- major findings, 38–39
- materials contamination, 70
- mechanical system, contaminant source, 118
- mechanisms for introduction of contaminants, 77–78
- microbiological contaminants, 41
- organizational interests, 75–77
- owners and managers, 76
- past investigations, 38–41
- performance, 35
- pre-occupancy evaluations, 107
- project and problem definition, 73–79
- recommendations, 40
- relief air system, 42–43
- sources of difficulty, 74
- statistical methods, 55–56
- study design, 53–55
- technical causes of problems, 73
- technical systems, 58–60
- time variation of air contamination, 78–79
- single cell, 266
 - multipoint sampling, 267
- see also* Diagnostics; specific buildings or types

C

- Calcium, 9
- California state office buildings, 99–109
 - air sampling data, 101
 - Bateson building, Sacramento, 100–102
 - California Energy Commission Building, Sacramento, 104–105
 - design flaws, 106
 - recommendations, 107
 - State Office Building, Long Beach, 102–104
- Canister collection systems, VOC, 266–227
- Carbon dioxide, 63
 - concentration, 48, 67, 88, 113–114
 - monitoring, 262–263
- Carbon monoxide, 219
 - concentration, 40, 48
 - GEOMET test houses, 155
 - electrochemical personal exposure monitors, 221
 - monitoring, 172, 221
- Carrier gas flow rate, electron capture detector, 271–272
- Chemical reactivity, 188
 - equivalent volumetric flow rate, 192

- Chemiluminescence, NO₂ monitoring, 222
- Coarse particles, 9
 - indoor and outdoor concentrations, 21–22
- Combustion-related sources, 115, 166–177, 205
 - broad, low-intensity field studies, 171
 - cross-sectional studies, 171, 177
 - emission rates, source strengths, and venting factors, 173–174
 - factors affecting usage patterns, 169–170
 - measurement techniques and protocols, 171–175
 - modeling, 168–171
 - reactivity rates and penetration factors, 174–175
 - samplers, 172–173
 - short-term concentrations, 175
 - source strength, 169, 171
 - source usage parameters, 173
 - types, 167–168
 - venting factor, 169
- Commercial buildings. *See* Buildings
- Consultation, 80, 82–83
 - flowchart, 84
- Consumer products, 234, 237
- Contaminant, 35, 99
 - assessment, 47–48, 55, 115
 - concentration, 185, 196
 - attenuation of differences, 196
 - change in, 251
 - factors affecting, 169–170
 - spatial average, 168–169
 - evaluations, 111
 - exposure-response relationship, 205
 - mechanisms for introduction, 77–78
 - sources, 115–116
 - outside, 116–117
 - time variation, 78–79
 - source strength. *See* Source strength
 - storage and release, 188
- Control strategies, 90
- Cooling towers, contaminant source, 117
- Courtaulds Engineering Workshop, 280
- Courtaulds Pattern Making Shop, 281
- Coventry Airport, 282

D

- Data
 - analysis, 214
 - evaluation, 213–215
 - flow and tracking, 213
 - quality, 18–19, 179

- Data collection, 19, 111–125
 - air movement pathways, 114–115
 - assessing ventilation rates, 113–114
 - bioaerosols, 119–120
 - building height, 118
 - building mechanical system, contaminant source, 118
 - computer-controlled, 264
 - contaminant assessment, 115
 - history of occupant complaints and building operation, 112–113
 - HVAC, preventive maintenance, 118
 - indoor contaminant sources, 115–116
 - mechanical systems, 114
 - outside contaminant sources, 116–117
 - tracer gas decay measurement, 120–124
 - Deposition velocity, 9
 - Design, 99
 - definition, 1
 - flaws, 106
 - original intent, 113
 - Diagnostics
 - consultation, 82–83
 - data acquisition, 84
 - determining appropriate instrumentation, 82
 - hypotheses, 85
 - interpreting results of measurements, 83
 - knowing what to measure, 82
 - predicting building performance, 83
 - protocols, 81–83
 - qualitative, 82, 85–91
 - chemical and physical agents, 86–88
 - control strategy analysis, 90
 - flowchart, 86
 - load analysis, 90
 - performance criteria, 85–89
 - problem and complaint characterization, 89
 - report, 90–91
 - simulation, 90–91
 - system boundaries, 89
 - quantitative, 82, 91–97
 - analysis, interpretation, and report, 95–97
 - flowchart, 92
 - human resource questionnaire, 93–95
 - informed consent notice, 94, 96
 - objective measures, 93
 - quality assurance and control, 93
 - site selection, 91–93
 - subjective measures, 93–95
 - Diffusive sampling, VOC, 29
 - Draft, 51
 - commercial and office buildings, 59, 61
 - Dust, monitoring, 231–232
- E**
- Electrochemical CO personal exposure monitors, 221
 - Electron capture detector
 - amplifier, 268–269
 - block diagram, 259–261
 - carrier gas flow rate, 271–272
 - column dimensions, 269, 271
 - current, 269–270
 - performance, 271
 - sample loop volume, 271
 - sampling and calibration valves, 259
 - six-channel design, 271, 273–274
 - system optimization, 269
 - EI
 - ventilation rates, 259–261
 - Emission rate, 234
 - combustion-related sources, 173–174
 - Energy conservation, 9, 99
 - Energy consumption, 148, 287
 - factors, 150
 - parameters, 152
 - Engineering analysis, 80
 - Environmental chamber, 234
 - Environmental chamber/gas chromatographic instrumental system, 235–236
 - Environmental inventories, 203
 - Environmental Inventory Questionnaire. *See* Questionnaires
 - Environmental parameters, 152
 - Epidemiology, 206–207
 - Evaluation criteria, 68
 - Exfiltration, 121
 - Exhaust systems, localized, contaminant source, 117
 - Exposure, 185
 - factors, current levels of knowledge, 206
 - multiple vector assessment, 179
- F**
- Fibers, 116
 - Field tests, 185
 - protocol, 194–195
 - Filters, preparation and weighing, 11
 - Filtration, 9
 - household, 187
 - Fine particles, 9
 - indoor and outdoor concentrations, 21–22
 - sources, 26

Food, benzo(*a*)pyrene. 182
 Formaldehyde, 129, 219
 concentrations, 103, 164
 measurements, 138–140
 monitoring, 224–225
 regression model, 164

G

Gas analyzer
 block diagram, 273
 calibration, 271, 275
 Gas chromatography, 219, 269, 289
 ventilation rates, 258
 Gaseous-pollutant concentration, 168
 Gaseous sample introduction system, 235–237
 GEOMET test houses, 148–165, 289
 closed-wall construction, 152
 critique and recommendations, 161–162
 data analysis and interpretation, 157–161
 data flow and use, 157
 experimental design, 149–151
 floor plans, 153, 290
 house model, 152–153
 models, 158
 objectives, 148
 occupancy simulations, 151
 post-retrofit monitoring, 149
 retrofit effect, 158–159
 semicontinuous measurements, 156
 Governmental agencies, 77

H

Halocarbon tracers, 291–294
 Harvard Six-Cities Study, 130
 Heating, *See* HVAC
 Hot water heating system, 54
 Human resource questionnaire, 93–95
 Humidity, 63, 68
 control, contaminant source, 118
 HVAC, 9, 51, 63, 111
 boundaries, 89–90
 capacities, 90
 evaluation, 65–68, 100
 malfunctions, 102
 mechanical systems, 114
 operation
 changes, 32
 indoor air effect, 13
 procedure implementation, 15
 parameters, 16–17
 status, 21

 variable air volume multizone, 99
 Hypersensitivity pneumonitis, 49, 69

I

Ill buildings, 51
 Indoor climate
 attributes, 94
 commercial and office buildings, 56–57
 identification, 204
 measurements, 55–56
 Indoor concentration, 21
 average, 20
 inorganic gases, 24–25, 27
 ionic species, 22, 26
 nonpolar organic compounds, 24, 27
 trace elements, 22–23, 27
 VOC, 22, 24–25, 27
 Infiltration, 81, 121, 148, 266, 287
 instrumentation, 257
 measurement, 257
 prediction model, 191
 rate, 279–283, 293
 seasonal frequency distribution, 158–159
 whole building, 282–283
 Informed consent notice, 94, 96
 Infra-red gas analysers, 267
 Inhaled particle monitors, 223
 Inorganic gases, 9
 indoor and outdoor concentrations, 24–25, 27
 Inspection, office building, 42–43
 Instrumentation, 4, 166, 219–232
 bioaerosol monitoring, 231
 CO monitoring, 221
 CO₂ monitoring, 262–263
 failures, 16
 formaldehyde monitoring, 224–225
 house dust monitoring, 231–232
 integration, survey studies, 212–213
 monitor development, 220
 NO₂ monitoring, 221–223
 PAH monitoring, 228
 pesticides and related SVOCs, 227–228
 positioning, 18
 radon monitoring, 230–231
 respirable particles, 223–224
 selection, 17–18, 82
 surveys, 211–213
 survey studies, 200
 ventilation, 257
 ventilation rates, 262–264
 VOC monitoring, 225–227
 see also specific devices

Integrative passive sampling devices, 221–223
 Interest groups, 75–77
 Interzone flows, 279–283
 Ionic compounds, 9
 Ionic species, indoor and outdoor concentrations, 22, 26

K

Kerosene heaters, 143–144
 Kingston-Harriman, Tennessee, multipollutant study, 129

L

Legionella, 141–142
 Loading docks, contaminant source, 117
 Long-term exposure prediction, 185–197
 analysis methodology, 193–194
 concentrations, 196
 equivalent ventilation, 196
 factors affecting modeling, 186–187
 field testing protocol, 194–195
 future work, 197
 hourly average concentration, 195
 model development, 188
 parametric forms, 189–191
 ventilation models, 191–193
 Wadden and Scheff single-sell model, 189
 removal mechanisms, 187–188
 sources, 195–196

M

Mass balance model, 9, 19–20, 28–30, 158, 166, 244
 systematic identification, 204
 two-zone case, 291–292
 VOC, 251, 253
 Mass spectrometry, 219
 Material suppliers, 76
 Measurement methods, 219
 Methodology, 4, 73
 Methods validation, 178
 multisorbent sampling technique, 246–248
 Methylene chloride, chromatographic scan, 239
 Microbiological agents, 88–89
 Microbiological contamination, 41, 70–71
 Microbiology, 111
 Microenvironmental survey, 178, 182
 Microorganisms, 129
 Mixing factor, 185, 191
 calculation, 194–195

Modeling, 148, 166, 185
 combustion-related sources, 168–171
 conceptual, 204
 GEOMET test houses, 158
 long-term exposure prediction, factors affecting, 186–187
 see also Mass-balance model
 Monitoring, 73
 Multiple exposures vector assessment, 179
 Multipollutant study, 129–147
 acute respiratory health monitoring, 134–135
 air exchange rate, measurement, 137
 bioaerosols, 141–142
 core air quality monitoring, 135–137
 energy use and weatherization characterization, 142–145
 formaldehyde, measurements, 138–140
 group classification code, 131
 Harvard Six-Cities Study, 130
 house construction and retrofit, 154
 kerosene heater, 143–144
 monitoring strategy, 154–156
 nitrogen dioxide, monitoring, 135–136
 PAHs, monitoring, 139–141
 parameters, 152, 162
 phases, 153–154
 post-study evaluation survey, 145–146
 protocols, 133–134, 154–156
 radon, measurements, 137–139
 respirable particles, monitoring, 136–137
 study design, 130–133
 supplemental air quality monitoring, 137–142
 water vapor, monitoring, 136–138
 weekly initial setups, 132
 Multisorbent sampling technique, 244–255
 application, 248–255
 laboratory and field evaluation, 246
 materials and methods, 245–246
 method validation, 246–248

N

National Ambient Air Quality Standards, 87–88, 198
 NIOSH investigations, 41
 building materials contamination, 70
 by building type, 69–70
 common health complaints, 70
 inadequate ventilation, 71–72
 indoor air quality questionnaire, 66–67
 inside contamination, 71
 methodology, 64–69

- NIOSH investigations—*Continued*
 additional site assessments, 68–69
 background assessments, 64–65
 evaluation criteria, 68
 initial site assessment, 65–68
 microbiological contamination, 70–71
 outside contamination, 71
 by problem type, 70–71
 by year, 69
- Nitrogen dioxide, 129, 219
 monitoring, 135–136, 221–223
- Nitrous oxide, as tracer gas, 266
- Non-dispersive infrared spectroscopic detection, 221
- Non-Occupational Pesticides Exposure Study, 227–228
- Nonpolar organic compounds, indoor and outdoor concentrations, 24, 27
- O**
- Objective measures, 93
- Odor recognition thresholds, 87, 98
- Office buildings. *See* Buildings
- Operating room, model for contaminant balance, 91
- Optical particle counters, 31–32
- Organic chemicals, 116
- Organizational interests, 75–77
- Outdoor concentrations, 21, 71
 inorganic gases, 24–25, 27
 ionic species, 22, 26
 nonpolar organic compounds, 24, 27
 trace elements, 22–23, 27
 VOC, 22, 24–25, 27
- Ozone, 115
- P**
- Palmes tube, 222
- Parametric forms, 189–191
- Parametrics, 185
- Parking lots, contaminant source, 117
- Particles
 fractionating, 29
 optical counters, 31–32
 source, 115
- Particulate organics, 9
- Particulate samples, characteristics, 12
- Pasila Office Center, 52–53
 air distribution system 54
 hot water heating system, 54
 indoor climate measurements, 55–56
 protocols
 sampling, 199–200
 statistical, 199
- Passive badges, 219
- Passive bubbler monitor, 224
- Passive sampling, 19, 133
 formaldehyde, 224–225
 NO₂, 221–223
 VOCs, 17, 226–227
- PCP, levels, 103, 106
- Penetration factor, 175
- Perfluorocarbon tracers, 288–289, 294–296
- Performance criteria, 80, 85–89
- Personal exposure monitors
 CO, 221
 respirable particles, 223–224
- Personal interviews, 65
- Personal monitors, 219
- Pesticides, 219
 monitoring, 227–228
- Phillipsburg, New Jersey, 180–181
- Pneumonitis, hypersensitivity, 49, 69
- Polyaromatic hydrocarbons, 219
- Polynuclear aromatic hydrocarbons, 129
 denuder-based samplers, 229–230
 monitoring, 139–141, 228–230
 sources, 228
- Polyurethane foam, 219, 227–228
 adsorbent cartridge, PAH monitoring, 228–229
- Power availability, sampling equipment, 16
- Prediction, 185
- Pre-occupancy evaluations, 107
- Probability distributions, 184
- Professional services, 76–77
- Protocol, 73, 80–83, 99
 combustion-related sources, 171–175
 definition, 1
 field tests, 194–195
 long-term exposure prediction, 194–195
 multipollutant study, 133–134, 154–156
 sampling, 199–200
 statistical, 199
 telephone office buildings, 16–19
- Proton-induced X-ray emission, 27, 30–31
- Q**
- Quality
 assurance, 93
 control, 93
- Questionnaires, 66–67, 203–210
 administration issues, 210–211
 assessment, 211
 comfort and psycho-social considerations, 209

design, 210–211
 development, 209–210
 effectiveness, 206
 logic of conceptualization, 210
 necessary information, 207–209
 reliability and validity, 207
 significant questions, 207–209
 standard, 209–210
 survey role, 206–207
 techniques of operationalization, 210

R

Radon, 116–117, 129, 219
 concentrations, 48
 measurements, 137–139
 monitoring, 230–231
 Reactivity, 185
 Reactivity rate, 174
 Regression model, formaldehyde, 164
 Relief air system, 42–43
 Removal mechanisms, 205
 Residential buildings, 3–4
 field studies, 129
 Respirable particles, 129
 monitoring, 136–137, 223–224
 sampling, 172
 Retrofit, 148
 effect, 158–159
 monitoring after, 149
 procedure, 154
 Roadways, contaminant source, 117
 Room temperature, 51, 63, 68
 distribution, 56–57
 draft sensation and, 61
 health and, 58
 performance criteria, 87–88

S

Sampling
 combustion-related sources, 172–173
 periods, 18
 program, California state office buildings,
 103
 protocols, 199–200
 site selection, 91–93
 sufficient material, 17
 Scandium-titride source, 259
 Semivolatile organic chemicals, monitoring,
 227–228
 Sick building syndrome, 51, 219
Aureobasidium, 95–96
 SBS-score, 55–57
 symptoms, 51–52, 69–70, 244, 246
 adjusted summation score, 58–60
 correlation with room temperature, 61
 passive smoking and, 61
 Simulation, 90–91
 Single-cell model, 187, 189
 Site assessment, 65–69
 Smoking
 environmental smoke, 208
 particle source, 115
 passive, SBS symptoms and, 61
 Soils, benzo(a)pyrene, 182
 Sorbents, 219
 Sorbent sampler, 244
 Sorbent tube samplers, VOC, 246
 Sources, 185
 inventories, 107
 Source strength, 169, 185, 244
 apparent specific, 251–253
 combustion-related sources, 171–174
 parametric response to step change, 190
 VOC, 249–250, 254
 Space heater
 source strengths, 171
 usage, 208
 Stack effect parameters, 192
 Standardization, 203
 State Office Building, Long Beach, 102–104
 Statistical protocols, 199
 Stuffy offices, 51
 Subjective measures, 93–95
 Sulfate, 9
 Sulfur hexafluoride
 calibration curve, 262–263
 concentrations, 155–156
 decay method, 293
 electron capture detector, 259–261, 268
 peaks
 height and base line, 269–270, 272
 various concentrations, 259, 261
 as tracer gas, 257–264, 266, 289
 tygon tubing, 262
 Surface sampling, 11–12
 Survey studies, 198–201, 203
 design considerations, 199
 evaluation, 213–215
 identification of factors, 203–207
 integration of instruments, 212–213
 issues, 200–201
 measurement methods and instruments,
 200
 microenvironmental, 178, 182
 monitoring instrument selection, 211–213
 post-study evaluation, 145–146
 recommendations, 201
 role of questionnaires, 206–207

Survey studies—*Continued*

- sampling protocols, 199–200
 - statistical protocols, 199
 - walk-through, 65
- Suspended particles, indoor and outdoor concentrations, 21–22

T

- Telephone office buildings, 9–33
- air sampling rates, 12
 - data collection and management procedures, 19
 - design variables affecting accuracy, 13
 - goal of study, 10, 28
 - implementation and protocols
 - adequate samples, 17
 - data quality assurance, 18–19
 - HVAC parameters, 16–17
 - instrument failure, 16
 - instrument positioning, 18
 - instrument selection, 17–18
 - power availability, 16
 - procedure development, 14
 - procedure implementation, 14–16
 - sampling periods, 18
 - unusual activities at sites, 17
 - weather effects, 16
 - indoor and outdoor concentrations
 - fine, coarse and total suspended particles, 21
 - inorganic gases, 24–25, 27
 - ionic species, 22, 26
 - nonpolar organic compounds, 24, 27
 - trace elements, 22–23, 27
 - VOC, 22, 24–25, 27
 - interpretation of results, 25–28
 - leakage rate, 30
 - model 30–31
 - development, 19–21
 - origin of study, 9–10
 - particulate samples, characteristics, 12
 - preparation and weighing of filters, 11
 - recommendations, 31–32
 - retrospective analysis, 28–31
 - sampling duration, 10
 - site selection, 13
 - study design, 10–13, 28–30
 - surface sampling, 11–12
 - volatile organic sampling, 12–13
- Tenants, 76
- Tenax-GC sorbent tubes, 219, 225–226
- Thermosorb cartridge, 222–223
- Threshold limit values, 87
- Tight office building syndrome, 51

- Toluene, chromatographic scan, 239
- Total exposure assessment methodology study, 198
- Total human environmental exposure study, 178
- Trace contaminants, exposure vectors, 179
- Trace elements, 9
 - indoor and outdoor concentrations, 22–23, 27
- Tracer gas decay method, 43–46, 111, 114, 120–124, 266–285
- air exchange
 - evaluation, 121–124
 - rates, 45–46, 288
 - airflows, 46–47, 124
 - air sampling, 44–45
 - automated measurement system, 44
 - block diagram, 274
 - building characteristics, 121–122
 - calibration, 271, 275–276
 - constant concentration, 287
 - data analysis, 277–278
 - effective volume, 123–124
 - future developments, 285
 - halocarbons, 291
 - infiltration rates, 279–283
 - injection system, 123, 277
 - constant injection, 287, 289
 - instrumentation, 122–123
 - interzone flows, 279–283
 - multiple, 287–296
 - calculations, 291–292
 - interzonal airflows, 288, 291–294
 - results, 292–296
 - multipoint, 267
 - oscillation due to time lags, 284–285
 - percent recirculation, 124
 - perfluorocarbon tracers, 288–289, 294–296
 - quantities of outside air delivered, 123
 - setup, 277
 - site calibration, 277
 - specification, 267–268
- Tracer gas dilution, 257, 275–276
- 1,1,1-Trichloroethane, 105

V

- Ventilation, 35, 63, 121, 185
- assessment, 111
 - effective, 185
 - effectiveness, 47, 187
 - efficiency, air movement pathways, 114–115
 - equivalent, 196

- inadequate, 71–72
 - instrumentation, 257
 - measurement, 257
 - mechanical, 121
 - models, 191–193
 - natural, 81, 121
 - reduction and health, 57
 - testing, 104
 - Ventilation rate, 51, 244, 257–264
 - across-the-envelope, 187
 - air quality and, 58–59
 - assessment, 113–114
 - calibration system, 262–263
 - codes and standards, 81
 - computer-controlled data acquisition system and driving software, 264
 - effective, 113–114, 191
 - electron capture detector, 259–261
 - equivalent, 185, 188
 - gas chromatograph, 258
 - instrumentation, 262–264
 - sampling system, 262
 - Venting factors, 174
 - Volatile organic chemicals, 4, 9, 219
 - adhesive, 243
 - chromatographic scan, 239, 241
 - source strength, 254–255
 - carpet, chromatographic scan, 239–240
 - collection on solid sorbents, 234
 - concentrations, 48, 105, 250–252
 - as function of ventilation rate, 250, 252–253
 - consumer product testing, 237
 - diffusive sampling, 29
 - environmental chamber/gas chromatographic instrumental system, 235–236
 - experimental procedure, 236–238
 - gaseous sample introduction system, 235–237
 - indoor and outdoor concentrations, 22, 24–25, 27, 248–250
 - low-boiling compounds
 - breakthrough volumes, 247
 - precision and accuracy, 247–248
 - mass-balance model, 251, 253
 - monitoring, 225–227
 - multisorbent sampling technique. *See* Multisorbent sampling technique
 - paint, chromatographic scan, 239, 242
 - passive sampling, 17, 226–227
 - retention times, 237–238
 - sampling, 12–13
 - valving diagram, 236–237
 - source strengths, 254
- W**
- Wadden and Scheff single-cell model, 189
 - Walk-through survey, 65
 - Water
 - benzo(a)pyrene, 181
 - vapor, monitoring, 136–138
 - Weather, effects on procedure implementation, 16
 - Weatherization, 142
 - Wind effect parameter, 192
- X**
- XAD-2 resin, 229