

- 1 Air Sampling Introduction p. 1
- 1.1 Documentation p. 1
- 1.2 Sample Documentation p. 1
- 1.3 Competency for Sampling Technicians p. 2
- 1.4 Sampling Activity Hazard Analysis (AHA) p. 2
- 1.5 Security p. 2
- 1.5.1 Sample Containers--Laboratory p. 3
- 1.5.2 Sample Handling and Decontamination p. 3
- 1.5.3 Procedures for Packing and Shipping Low Concentration Samples p. 4
- 1.5.4 Procedures for Packing and Shipping Medium Concentration Samples p. 4
- 1.5.5 Chain-of-Custody Records p. 5
- 1.5.6 Mailing--Bulk and Air Samples p. 5
- 1.6 Equipment Precautions p. 6
- 1.6.1 Batteries p. 6
- 1.6.1.1 Alkaline Batteries p. 6
- 1.6.1.2 Rechargeable Nickel-Cadmium (Ni-Cad) Batteries p. 6
- 1.7 Adverse Temperature Effects p. 7
- 1.8 Explosive Atmospheres p. 7
- 1.9 Atmospheres Containing Carcinogens p. 7
- 2 Air Sampling Instrumentation Options p. 9
- 2.1 Volatile Organic Compounds p. 9
- 2.1.1 Photoionization Detector (PID) p. 9
- 2.1.1.1 Calibration p. 12
- 2.1.1.2 Maintenance p. 13
- 2.1.2 Infrared Analyzers p. 13
- 2.1.2.1 Calibration p. 14
- 2.1.2.2 Maintenance p. 14
- 2.1.3 Remote Collection p. 14
- 2.1.4 Oxygen/Combustible Gas Indicators (O₂/CGI)/Toxin Sensors p. 14
- 2.1.4.1 Remote Probes and Diffusion Grids p. 16
- 2.1.4.2 Calibration Alert and Documentation p. 17
- 2.1.4.3 Alarms p. 18
- 2.1.4.4 Recommendations for Oxygen/Combustible Gas Indicators p. 18
- 2.1.4.5 Relative Response p. 19
- 2.1.4.6 Relative Response and Toxic Atmosphere Data p. 19
- 2.1.4.7 Special Considerations p. 20
- 2.1.4.8 Calibration p. 20
- 2.1.4.9 Maintenance p. 20
- 2.1.5 Oxygen Meters p. 21
- 2.1.6 Solid Sorbent Tubes p. 21
- 2.1.6.1 Calibration Procedures p. 22
- 2.1.7 Vapor Badges p. 24
- 2.1.8 Detector Tubes p. 24
- 2.1.8.1 Performance Data p. 29
- 2.1.8.2 Leakage Test p. 29
- 2.1.8.3 Calibration Test p. 29

- 2.1.8.4 Special Considerations p. 30
- 2.1.9 Formaldehyde p. 31
- 2.2 Ozone Meter p. 32
- 2.2.1 Calibration p. 32
- 2.2.2 Maintenance p. 33
- 2.3 Toxic Gas Meters p. 33
- 2.3.1 Calibration p. 33
- 2.4 Semivolatile Organic Compounds (SVOC) p. 34
- 2.4.1 Polynuclear Aromatic Hydrocarbons p. 34
- 2.4.2 Polychlorinated Biphenyls and Creosote p. 36
- 2.4.3 Pesticides and PAHs--PUF p. 37
- 2.5 Acid Gases or Caustics p. 38
- 2.5.1 Impingers p. 38
- 2.5.2 Sorbent Tubes p. 38
- 2.5.3 Detectors p. 39
- 2.5.4 pH Litmus Paper or Meter p. 40
- 2.5.4.1 Calibration p. 40
- 2.6 Mercury Analyzer--Gold Film Analyzer p. 43
- 2.6.1 Jerome Mercury Analyzer p. 43
- 2.6.2 Survey Procedures p. 44
- 2.6.3 Precautions for Area Surveys p. 44
- 2.6.3.1 Calibration p. 44
- 2.6.3.2 Maintenance p. 44
- 2.7 Particulates--Sampled by Filtration/Impaction p. 44
- 2.8 Gravimetric Filter Weighing Procedure p. 45
- 2.9 Total Dust and Metal Fumes p. 46
- 2.10 Respirable Dust p. 46
- 2.10.1 Cyclones p. 47
- 2.10.1.1 Silica Respirable Dust--Cyclone Collection p. 48
- 2.10.1.2 Cyclone Cleaning p. 48
- 2.11 Inhalable Dusts p. 50
- 2.12 Personnel Environmental Monitors (PEMs) p. 51
- 2.13 Welding Fumes p. 52
- 2.14 Asbestos p. 52
- 2.15 Direct-Reading Dust Monitors p. 60
- 2.15.1 Condensation Nuclei Counters (CNCs) p. 60
- 2.15.1.1 Calibration p. 61
- 2.15.1.2 Maintenance p. 62
- 2.15.1.3 Photodetection p. 62
- 2.15.1.4 Calibration p. 62
- 2.15.1.5 Maintenance p. 62
- 2.15.2 Diesel Particulate Matter (DPM) p. 63
- 2.16 Biologicals p. 65
- 2.16.1 General Sampling Protocols p. 66
- 2.16.2 Contact and Grab Sampling p. 67
- 2.16.3 Reuter Central Fugal System (RCS) p. 67

- 2.16.4 Exit Requirements p. 69
- 2.16.5 Static Placement Impingement p. 69
- 2.16.6 Bioaerosols p. 69
- 2.17 Radiation Monitors and Meters p. 70
- 2.17.1 Light Meter p. 70
- 2.17.1.1 Calibration p. 70
- 2.17.1.2 Maintenance p. 70
- 2.18 Ionizing Radiation p. 71
- 2.18.1 Ionization Detectors p. 71
- 2.18.1.1 Gas Proportional Detectors p. 71
- 2.18.1.2 Ion Chamber p. 71
- 2.18.1.3 GM Detector p. 72
- 2.18.2 Scintillation Detectors p. 72
- 2.18.3 Counting Efficiency p. 73
- 2.18.4 Monitoring for Radioactive Contamination p. 74
- 2.18.5 Daily Use Checks p. 75
- 2.18.6 Survey Instrument Calibration p. 75
- 2.19 Nonionizing Radiation p. 75
- 2.19.1 Guidance p. 76
- 2.19.2 Broadband Field Strength Meters p. 76
- 2.19.2.1 Calibration p. 77
- 2.19.2.2 Maintenance p. 77
- 3 Calibration Techniques p. 79
- 3.1 Calibration Requirements p. 79
- 3.1.1 Calibration Assurance p. 80
- 3.1.2 Decontamination p. 80
- 3.1.3 Maintenance p. 80
- 3.2 Manual Buret Bubble Meter Technique (Primary Calibration) p. 82
- 3.2.1 Bubble Meter Method p. 82
- 3.3 Electronic Flow Calibrators p. 83
- 3.3.1 Cleaning before Use p. 84
- 3.3.2 Leak Testing p. 85
- 3.3.3 Verification of Calibration p. 85
- 3.3.4 Shipping and Handling p. 86
- 3.3.5 Precautions and Warnings p. 86
- 3.4 Electronic Bubble Meter Method p. 86
- 3.5 Dry Flow Calibration p. 87
- 3.6 Precision Rotameter Method (Secondary) p. 87
- 3.6.1 Replacing the Bubble Meter with a Precision Rotameter p. 89
- 3.7 Span Gas p. 89
- 3.8 Bump Testing p. 90
- 4 Statistical Analysis and Relevance p. 91
- 4.1 Definitions p. 91
- 4.2 Example--Outline of Bulk Sampling QA/QC Procedure p. 92
- 4.3 Example--Outline of the NIOSH 7400 QA Procedure p. 96
- 4.3.1 Precision: Laboratory Uses a Precision of .45 p. 96

- 4.3.2 Precision: Laboratory Uses a Precision SR That Is Better Than .45 p. 96
- 4.3.3 Records to Be Kept in a QA/QC System p. 98
- 4.3.4 Field Monitoring Procedures--Air Sample p. 98
- 4.3.5 Calibration p. 98
- 4.3.6 Negative Air Pressure p. 99
- 4.3.7 Compressor p. 99
- 4.3.8 Recordkeeping and Sample Storage p. 99
- 4.4 Sampling and Analytical Errors p. 100
- 4.4.1 Determining SAEs p. 101
- 4.4.2 Environmental Variables p. 101
- 4.4.3 Confidence Limits p. 101
- 4.5 Sampling Methods p. 102
- 4.5.1 Full-Period, Continuous Single Sampling p. 102
- 4.5.2 Full-Period, Consecutive Sampling p. 102
- 4.5.3 Grab Sampling p. 102
- 4.6 Calculations p. 103
- 4.6.1 Calculation Method for a Full-Period, Continuous Single Sample p. 104
- 4.6.2 Sample Calculation for a Full-Period, Continuous Single Sample p. 104
- 4.6.3 Calculation Method for Full-Period Consecutive Sampling p. 104
- 4.6.4 Sample Calculation for Full-Period Consecutive Sampling p. 105
- 4.7 Grab Sampling p. 106
- 4.8 SAEs--Exposure to Chemical Mixtures p. 106
- 5 Chemical Risk Assessment p. 109
- 5.1 Baseline Risk Assessment p. 109
- 5.2 Conceptual Site Model p. 110
 - 5.2.1 Source Areas p. 110
 - 5.2.2 Possible Receptors p. 110
- 5.3 Chemicals of Potential Concern p. 110
- 5.4 Human Health BLRA Criteria p. 111
- 5.5 Toxicity Assessment p. 111
- 5.6 Toxicological Profiles p. 112
- 5.7 Uncertainties Related to Toxicity Information p. 112
- 5.8 Potentially Exposed Populations p. 113
 - 5.8.1 Exposure Pathways p. 113
 - 5.8.2 Sources p. 113
- 5.9 Environmental Fate and Transport of COPCs p. 114
- 5.10 Exposure Points and Exposure Routes p. 114
- 5.11 Complete Exposure Pathways Evaluated p. 114
- 5.12 Ecological Risk Assessment p. 114
- 5.13 Data Evaluation and Data Gaps p. 115
- 5.14 Uncertainties p. 116
 - 5.14.1 Uncertainties Related to Toxicity Information p. 116
 - 5.14.2 Uncertainties in the Exposure Assessment p. 116
- 5.15 Risk Characterization p. 117
- 5.16 Headspace Monitoring--Volatiles p. 117
- 5.17 O₂[subscript 2]/CGI p. 117

- 5.18 Industrial Monitoring--Process Safety Management p. 118
- 5.19 Bulk Samples p. 118
- 6 Biological Risk Assessment p. 119
- 6.1 Fungi, Molds, and Risk p. 121
- 6.1.1 What Is the Difference between Molds, Fungi, and Yeasts? p. 122
- 6.1.2 How Would I Become Exposed to Fungi That Would Create a Health Effect? p. 122
- 6.1.3 What Types of Molds Are Commonly Found Indoors? p. 122
- 6.1.4 Are Mold Counts Helpful? p. 122
- 6.1.5 What Can Happen with Mold-Caused Health Disorders? p. 123
- 6.2 Biological Agents and Fungi Types p. 123
- 6.2.1 Alternaria p. 123
- 6.2.2 Aureobasidium p. 124
- 6.2.3 Cladosporium p. 124
- 6.2.4 Rhodotorula p. 124
- 6.2.5 Stemphylium p. 124
- 6.2.6 Sterile Fungi p. 124
- 6.2.7 Yeast p. 125
- 6.3 Aspergillus p. 125
- 6.3.1 What Color Are These Molds? p. 125
- 6.3.2 How Is Aspergillus Spread? p. 125
- 6.3.3 How Does Aspergillus Grow/Amplify? p. 125
- 6.3.4 What Conditions Help Aspergillus Grow/Amplify? p. 125
- 6.3.5 Can Mold/Fungi Make You Sick? p. 126
- 6.3.6 What Are the Symptoms of Aspergillosis? p. 126
- 6.3.7 Does Aspergillus Cause Deterioration of Materials? p. 126
- 6.3.8 What Happens If Aspergillus Colonies Grow inside Construction Layers? p. 126
- 6.3.9 How Is Aspergillus Identified? p. 126
- 6.3.10 How Are Levels of Aspergillus Communicated? p. 127
- 6.3.11 Why Do Aspergillus Colonies Look Black? p. 127
- 6.3.12 What Will Biotesting of the Air Show? p. 127
- 6.3.13 What Can Be Done to Prevent Aspergillus Growth? p. 127
- 6.4 Penicillium p. 127
- 6.4.1 What Do Samples Look Like? p. 128
- 6.4.2 What Species of Penicillium Are Used to Produce Antibiotics? p. 128
- 6.4.3 What Other Fungi Grow Where Penicillium Grows? p. 128
- 6.4.4 If Penicillium Grows Everywhere, What Is the Concern? p. 128
- 6.4.5 How Does Penicillium Enter the Body? p. 128
- 6.4.6 Are There Particular Species of Penicillium about Which I Should Be Concerned? p. 128
- 6.5 Fungi and Disease p. 129
- 6.5.1 Blastomyces dermatitidis p. 129
- 6.5.2 Coccidioides immitis p. 129
- 6.5.3 Histoplasma capsulatum p. 130
- 6.5.4 Sporothrix schenckii p. 130

- 6.5.5 Pathogenic Members of the Genera *Epidermophyton*, *Microsporum*, and *Trichophyton* p. 130
- 6.5.6 Miscellaneous Molds p. 130
- 6.5.7 *Fusarium* p. 130
- 6.6 Fungi Control p. 131
 - 6.6.1 Ubiquitous Fungi p. 131
 - 6.6.2 Infection p. 131
 - 6.6.3 Immediate Worker Protection p. 131
 - 6.6.4 Decontamination p. 132
 - 6.6.5 Fungi and VOCs p. 132
 - 6.6.6 Controlling Fungi p. 132
- 6.7 Abatement p. 132
- 7 Indoor Air Quality and Environments p. 135
 - 7.1 Ventilation Design Guide p. 135
 - 7.2 Example Design Conditions Guidance p. 135
 - 7.2.1 Outside Design Conditions p. 136
 - 7.2.2 Inside Design Conditions p. 136
 - 7.3 Mechanical Room Layout Requirements p. 136
 - 7.4 Electrical Equipment/Panel Coordination p. 136
 - 7.5 General Piping Requirements p. 137
 - 7.6 Roof-Mounted Equipment p. 138
 - 7.7 Vibration Isolation/Equipment Pads p. 138
 - 7.8 Instrumentation p. 138
 - 7.9 Redundancy p. 138
 - 7.10 Exterior Heat Distribution System p. 139
 - 7.10.1 Determination of Existing Heat Distribution Systems p. 139
 - 7.10.2 Selection of Heat Distribution Systems p. 139
 - 7.10.2.1 AG Systems p. 139
 - 7.10.2.2 CST Systems p. 139
 - 7.10.2.3 Buried Conduit (preapproved type) p. 140
 - 7.10.2.4 Buried Conduit (not preapproved type) p. 140
 - 7.10.3 Design of Heat Distribution Systems p. 141
 - 7.10.4 Existing System Capacity p. 141
 - 7.10.5 General Design Considerations p. 141
 - 7.10.6 Identification p. 142
 - 7.11 Thermal Insulation of Mechanical Systems p. 143
 - 7.12 Plumbing System p. 143
 - 7.12.1 Piping Run p. 143
 - 7.12.1.1 Back-Siphonage p. 144
 - 7.13 Compressed Air System p. 145
 - 7.13.1 Compressor Selection and Analysis p. 146
 - 7.13.2 Compressor Capacity p. 146
 - 7.13.3 Compressor Location and Foundations p. 146
 - 7.13.4 Makeup Air p. 146
 - 7.13.5 Compressed Air Outlets p. 147
 - 7.13.6 Refrigerated Dryer p. 147

- 7.14 Air Supply and Distribution System p. 147
- 7.14.1 Basic Design Principles p. 147
- 7.14.2 Temperature Settings p. 147
- 7.14.3 Air-Conditioning Loads p. 148
- 7.14.4 Infiltration p. 148
- 7.14.5 Outdoor Air Intakes p. 148
- 7.14.6 Filtration p. 148
- 7.14.7 Economizer Cycle p. 148
- 7.15 Ductwork Design p. 148
- 7.15.1 Variable Air Volume (VAV) Systems p. 149
- 7.15.2 Special Criteria for Humid Areas p. 149
- 7.15.3 Evaporative Cooling p. 150
- 7.16 Ventilation and Exhaust Systems p. 150
- 7.16.1 Supply and Exhaust Fans p. 150
- 7.16.2 General Items p. 151
- 7.17 Testing, Adjusting, and Balancing of HVAC Systems p. 152
- 7.18 Ventilation Adequacy p. 152
- 7.19 Laboratory Fume Hood Performance Criteria p. 152
- 7.20 Flow Hoods p. 153
- 7.20.1 Calibration p. 153
- 7.20.2 Maintenance p. 153
- 7.21 Thermoanemometers p. 153
- 7.21.1 Calibration p. 153
- 7.21.2 Maintenance p. 153
- 7.22 Other Velometers p. 153
- 8 Area Monitoring and Contingency Planning p. 155
- 8.1 Area of Influence Perimeter p. 155
- 8.1.1 Evaluation of Hazardous Waste/Chemical Risk Sites p. 155
- 8.1.2 Off-Site Characterization before Site Entry p. 155
- 8.1.2.1 Interview/Records Research p. 156
- 8.1.3 On-Site Survey p. 156
- 8.1.3.1 PotentialIDLH Conditions p. 157
- 8.1.3.2 Perimeter Reconnaissance p. 157
- 8.1.3.3 On-Site Survey p. 158
- 8.1.4 Chemical Hazard Monitoring p. 160
- 8.1.4.1 Skin and Dermal Hazards p. 160
- 8.1.4.2 Potential Eye Irritation p. 161
- 8.1.4.3 Explosion and Flammability Ranges p. 161
- 8.1.5 Monitoring p. 161
- 8.1.6 Field Logbook Entries p. 162
- 8.1.7 Radiation Monitoring p. 163
- 8.1.7.1 Area Monitoring p. 163
- 8.1.7.2 Contamination Surveys p. 163
- 8.1.7.3 Exposure Rate Surveys p. 164
- 8.1.7.4 Personnel Monitoring p. 164
- 8.2 Evacuation Zones p. 166

- 8.2.1 Emergency Equipment Locations p. 166
- 8.2.2 Site Security and Control p. 167
- 8.2.3 Incident/Accident Report p. 167
- 8.3 Site Work Zone p. 168
- 8.3.1 Integrated Sampling Example p. 168
- 8.3.2 Field QA and QC Example p. 169
- 8.3.3 Invasive Work Sampling Example p. 169
- 8.3.4 Sampling and Initial Site Work Hazard Analysis Example p. 170
- 8.3.4.1 Perimeter Monitoring p. 170
- 8.3.4.2 Air Sampling and Monitoring Example p. 170
- 8.3.4.3 Water Sampling Example p. 171
- 8.3.4.4 Surface Soil/Sediment Sampling Example p. 171
- 8.4 Radiation Sites p. 172
- 8.4.1 Atomic Structure p. 172
- 8.4.2 Radioactive Decay p. 172
- 8.4.3 Activity p. 172
- 8.4.4 Decay Law p. 173
- 8.4.5 Half-Life p. 173
- 8.4.6 Types of Ionizing Radiation p. 174
- 8.4.6.1 Alpha Particles p. 175
- 8.4.6.2 Beta Particles p. 175
- 8.4.6.3 Gamma Rays p. 175
- 8.4.6.4 X-rays p. 175
- 8.4.7 Rules of Thumb p. 175
- 8.4.8 Excitation/Ionization p. 175
- 8.4.9 Characteristics of Different Types of Ionizing Radiation p. 176
- 8.4.10 Exposure (roentgen) p. 176
- 8.4.11 Absorbed Dose (rad) p. 177
- 8.4.12 Dose Equivalent (rem) p. 177
- 8.4.13 Effective Dose Equivalent p. 178
- 8.4.14 Biological Effects of Ionizing Radiation p. 178
- 8.4.14.1 Radiosensitivity p. 178
- 8.4.15 Human Health Effects p. 179
- 8.4.15.1 Stochastic Effects p. 179
- 8.4.15.2 Nonstochastic Effects p. 180
- 8.4.16 Determinants of Dose p. 180
- 8.4.16.1 External Exposures p. 180
- 8.4.16.2 Internal Exposures p. 181
- 8.4.17 Sources of Exposure p. 181
- 8.4.17.1 Occupational Exposure p. 181
- 8.4.17.2 Nonoccupational Exposure p. 181
- 8.4.18 Exposure Limits p. 182
- 8.4.19 Basis of Recent Guidelines p. 182
- 8.4.20 Regulatory Limits for Occupational Exposure p. 182
- 8.4.21 Recommended Exposure Limits for Pregnant Workers p. 183
- 8.4.22 Radiation Risk p. 184

- 8.4.23 Philosophy of Current Radiation Safety Practice p. 184
- 8.4.23.1 Internal Radiation Protection p. 184
- 8.4.23.2 Protection against Ingestion p. 185
- 8.4.23.3 Protection against Inhalation p. 185
- 8.4.23.4 Protection against Absorption p. 185
- 8.4.24 External Radiation Protection p. 185
- 8.4.25 Minimizing Exposure Time p. 186
- 8.4.26 Maximizing Distance from Source p. 186
- 8.4.27 Shielding the Source p. 187
- 8.4.28 Emergency Procedures p. 188
- 8.4.28.1 Personal Contamination p. 188
- 8.4.28.2 Minor Spills (Microcurie Quantities of Most Nuclides) p. 188
- 8.4.28.3 For Major Spills (Millicurie Quantities of Most Nuclides) p. 189
- 9 Microcircuitry and Remote Monitoring p. 191
- 9.1 Continuous IAQ Monitoring in Buildings p. 191
- 9.1.1 IAQ Evaluations p. 192
- 9.1.1.1 Characterization for IAQ Assessment p. 193
- 9.1.1.2 Source Assessment and Remediation p. 193
- 9.1.1.3 IAQ Risk Assessment p. 194
- 9.2 Industrial/Remediation Process Monitoring p. 194
- 9.2.1 Process Safety Management Example Scope of Work p. 194
- 9.2.2 Provide List for Hazard and Operability Study p. 195
- 9.2.3 Process Hazard Analysis p. 195
- 9.2.3.1 Hazard and Operability Study p. 196
- 9.2.3.2 Failure Modes and Effects Analysis (FMEA) p. 196
- 9.2.3.3 Fault Tree Analysis p. 196
- 9.2.4 Design Analysis p. 196
- 9.2.4.1 Site Safety and Health Plans p. 196
- 9.2.4.2 Health and Safety Design Analysis (HSDA) p. 197
- 9.2.4.3 Drawings p. 197
- 9.2.4.4 Specifications p. 197
- 9.2.4.5 Design Analysis Example--Wastewater Treatment p. 198
- 10 Occupational Health--Air Monitoring Strategies p. 203
- 10.1 Exposure Measurements p. 204
- 10.2 STEL Sampling p. 204
- 10.3 Exposure Fluctuations p. 205
- 10.4 Air-Sampling Pump User Operation p. 205
- 10.4.1 Pump Donning p. 205
- 10.4.2 Pump Checking p. 205
- 10.4.3 Pump Doffing p. 205
- 10.5 Air Sampling--Asbestos p. 208
- 10.5.1 Sampling Prior to Asbestos Work p. 209
- 10.5.2 Sampling during Asbestos Abatement Work p. 210
- 10.5.3 Sampling after Final Cleanup (Clearance Sampling) p. 210
- 10.5.4 NIOSH Method p. 210
- 10.5.5 Air Sampling Documentation p. 211

- 10.5.6 Asbestos Exposure Monitoring (29 CFR 1910.1001 and 29 CFR 1926.1101) p. 212
- 10.5.7 Initial Monitoring p. 213
- 10.5.8 Historical Documentation for Initial Monitoring p. 213
- 10.5.9 Objective Data for Initial Monitoring p. 213
- 10.6 Crystalline Silica Samples Analyzed by X-Ray Diffraction (XRD) p. 213
- 10.6.1 Air Samples p. 213
- 10.6.1.1 Laboratory Results for Air Samples p. 214
- 10.6.2 Bulk Samples p. 215
- 10.6.3 Sample Calculations for Crystalline Silica Exposures p. 216
- 10.6.4 Sample Calculation for Silica Exposure p. 216
- 10.7 Metals-Welding p. 217
- 10.8 General Technique for Wipe Sampling p. 217
- 10.8.1 Filter Media and Solvents p. 217
- 10.8.2 Wipe Sampling Procedures p. 218
- 10.8.3 Special Technique for Wipe Sampling with Acids and Bases p. 219
- 10.8.4 Direct-Reading Instruments p. 219
- 10.8.5 Aromatic Amines p. 219
- 10.8.6 Special Considerations p. 219
- 10.8.6.1 Fluorescent Screening for Carcinogenic Aromatic Amines p. 219
- 10.8.6.2 Alternate Screening Methods for Aromatic Amines p. 220
- 11 Monitoring for Toxicological Risk p. 221
- 11.1 Types of Sampling p. 221
- 11.1.1 Long-Term Samples p. 221
- 11.1.2 Short-Term Samples p. 222
- 11.1.3 Area Samples p. 222
- 11.1.4 Wipe Samples p. 222
- 11.2 Quality Control p. 222
- 11.3 Exposure Evaluation Criteria p. 223
- 11.4 Examples of Chemicals That Require Monitoring p. 223
- 11.4.1 Carbon Monoxide (CO) p. 223
- 11.4.2 Hydrogen Sulfide (H₂S) p. 223
- 11.4.3 Sulfur Dioxide (SO₂) p. 224
- 11.4.4 Ammonia (NH₃) p. 224
- 11.4.5 Benzene p. 224
- 11.4.6 Hydrogen Cyanide or Hydrocyanic Acid (HCN) p. 224
- 11.4.7 Lead p. 224
- 11.4.8 Flammable Chemicals p. 226
- 11.4.9 Reactive Hazards--Oxidizers p. 227
- 11.4.10 Paint p. 227
- 11.4.11 Cleaning Supplies p. 227
- 11.4.12 Compressed Gases p. 227
- 11.5 Confined Space Monitoring p. 227
- 11.5.1 Entry Permits p. 228
- 11.5.2 Bump Testing p. 228
- 11.5.3 Monitoring for LEL and O₂ Levels p. 228

- 11.5.4 Isolation p. 229
- 11.5.5 Confined Space--Cautionary Statements p. 229
- 11.5.6 Stratified Atmospheres p. 229
- 11.6 Welding p. 229
- 11.6.1 Effects of Toxic Gases p. 230
- 11.6.2 Ventilation p. 230
- 11.6.3 Ventilation in Confined Spaces during Welding p. 231
- 11.6.4 Fume Avoidance p. 231
- 11.6.5 Light Rays p. 231
- 11.6.6 Infrared Rays p. 232
- 11.6.7 Noise p. 232
- 11.6.8 Gas Welding and Cutting p. 232
- 12 Risk Communication and Environmental Monitoring p. 233
- 12.1 Federal Legislation p. 233
- 12.1.1 The Clean Air Act Amendments of 1990 (CAA90) p. 233
- 12.1.2 The Federal Water Pollution Control Act p. 234
- 12.1.3 Resource Conservation and Recovery Act (RCRA) of 1976 p. 234
- 12.1.4 State/Local Regulations p. 235
- 12.2 Key Compliance Requirements p. 235
- 12.2.1 Steam-Generating Units [greater than 29 MW (100 MBtu/h)] p. 235
- 12.2.2 Steam-Generating Units [2.9 MW (10 MBtu/h) to 29 MW] p. 235
- 12.2.3 Fuel-Burning Facilities p. 236
- 12.2.4 Stationary Gas Turbines p. 236
- 12.2.5 Municipal Waste Combustor p. 236
- 12.2.6 Incinerators p. 236
- 12.2.6.1 Sewage Sludge Incinerators p. 236
- 12.2.6.2 Beryllium Incinerators p. 236
- 12.2.6.3 Incineration of Sewage Sludge p. 237
- 12.2.7 Gasoline Dispensing p. 237
- 12.2.8 Rotogravure Printing Presses p. 237
- 12.2.9 Fugitive Emissions p. 237
- 12.2.10 Sulfuric and Nitric Acid Plants p. 238
- 12.2.11 CFCs and Halons p. 238
- 12.2.12 Degreasing Operations p. 238
- 12.3 Key Compliance Definitions p. 238
- 12.4 Community Relations p. 251
- 12.4.1 Notification p. 252
- 12.4.2 Fact Sheets p. 252
- 12.4.3 Explaining Air Monitoring to the General Public p. 252
- 12.4.4 Employee Education p. 253
- 12.4.5 Public Accessibility p. 253
- 12.4.6 Repository p. 253
- 12.4.7 Dialogue p. 254
- Glossary of Terms p. 255
- Index p. 265