Contents

Preface		**xi**
Chapter 1	**The Foundations of Asbestos Management**	**1**
	What Is Asbestos?	1
	How Does Asbestos Cause Disease?	2
	Asbestos Use and Diseases Worldwide	6
	A Holistic Approach to Asbestos Control	7
	Asbestos Control: An Evolving Field	9
Sidebar 1.1	**Reflections on the Johnson Conferences**	**10**
	References	10
Chapter 2	**Baseline Surveys for Asbestos-Containing Materials**	**12**
	Baseline Surveys, AHERA Surveys, and OSHA	13
	Planning the Baseline Survey	15
	Defining the Scope of the Survey	16
	Conducting Fieldwork	22
	How Many Samples Should You Collect?	22
	What Doesn't Have to Be Sampled?	24
	Where Do You Take the Samples?	27
	How Do You Take the Samples?	28
	Sampling thermal system insulation	30
	Sampling surfacing materials	35
	Sampling friable miscellaneous materials	37
	Sampling non-friable miscellaneous materials	44
	Summary—Sample Collection	48
	Sample Documentation	48
	Analyzing the Bulk Samples	49
	Polarized Light Microscopy	50
	Beyond PLM	53

BK-AST-MNL23-140213-FM.indd 5 1/21/2015 6:02:44 PM

	Positive Stop	55
	Preparing a Report	57
Sidebar 2.1	**Qualifications**	**61**
Sidebar 2.2	**What's Under That Carpet?**	**61**
	References	64
Appendix 2A	**Health and Safety for Asbestos Surveys**	**65**
	Respirators and PPE for Asbestos Exposure	65
	References	69
Sidebar 2.3	**Inspecting Fire-Damaged Buildings**	**70**
	References	72
Appendix 2B	**Signs and Labels for Asbestos-Containing Materials**	**73**
	References	77
Appendix 2C	**Asbestos in Vermiculite Loose Fill Insulation**	**78**
	Where Does Vermiculite Come From?	78
	Where Does the Asbestos Come from?	79
	How Is Vermiculite Produced?	80
	Why Is Asbestos-Containing Vermiculite Hazardous?	80
	How Is Vermiculite Sampled and Analyzed for Asbestos?	83
	How Is Asbestos in Vermiculite Regulated?	84
	References	84
Chapter 3	**Naturally Occurring Asbestos**	**86**
	Asbestos Minerals	86
	Where Does Asbestos "Occur Naturally" in the United States?	87
	Case Studies of NOA	88
	The Golden State	88
	Virginia NOA: From Fairfax to Lynchburg	92
	DOT Meets NOA in North Carolina	96
	The Last Frontier	97
	Conclusion	99
	References	100
Appendix 3A	**Sampling and Analysis of Asbestos in Soil**	**101**
	Applications of Soil Analysis for Asbestos	101
	Limitations of Soil Analysis for Asbestos	101
	Methods Used for Asbestos in Soils	102
	EPA/600/R-93/116	102
	EPA Region 1 Method	103
	CARB Method 435	103
	ASTM D7521 Standard Test Method for Determination of Asbestos in Soil	104
	Examples of Using Soil Methods	106
	Libby Amphibole in Vermiculite-Rich Soils	106
	Soil in Housing Development	107
	References	108
Chapter 4	**Assessment of Asbestos-Containing Materials**	**109**
	The AHERA Assessment Protocol	110

	Examples of Using the AHERA Protocol	110
	Overcoming the Limitations of the AHERA Protocol	114
	The ASTM Assessment Protocols	115
	The ASTM Qualitative Assessment Protocol	116
	Current condition	116
	Potential for disturbance	123
	The ASTM Quantitative Assessment Protocol	127
	Other Assessment Methodologies	132
	References	133
Appendix 4A	**Exposure Assessments for ACMs**	**135**
	Regulatory Background	135
	Exposure Assessment Tests	137
	Exposure Assessment Sampling Data	137
	Applying Exposure Assessments	140
	Exposure Assessment Updates	141
	Conclusions	142
	References	142
Appendix 4B	**Asbestos in Settled Dust**	**143**
	Standards and Regulations for Asbestos in Settled Dust	143
	History of Asbestos in Settled Dust	143
	What Is Settled Dust, and Where Does It Come From?	144
	How Is Settled Dust Sampled?	145
	The Microvac Methods	145
	Wipe Sampling Method	149
	How Are Settled Dust Samples Analyzed?	149
	What Do Settled Dust Results Mean?	150
	Statistical Comparisons of Settled Dust Results	152
	Settled dust samples in school cafeterias	152
	Settled dust samples in power plant building	154
	How Does Settled Dust Become Airborne?	157
	Some Final Reflections	157
	References	158
Chapter 5	**Planning the Asbestos Abatement Project**	**159**
	Pre-Construction Surveys	159
	Project Design Surveys	163
	Non-Sampling Considerations	167
	Limits of abatement and phases of work	167
	Negative pressure enclosure	168
	Contractor mobilization area	169
	Decontamination and load-out facilities	169
	Visibility barriers	170
	Electrical power	170
	Essential building services	171
	HVAC systems	172
	Consultant's field office	173

	Inaccessible ACM	173
	Material condition	173
	Abatement Project Design	174
	What is a project design?	175
	Why do a project design?	175
	Is a project design always needed?	175
	Can a project be bid from the baseline survey report?	176
	Abatement Drawings	176
	Abatement Specifications	180
	Bid Solicitation	181
	The bid package	182
	The pre-bid conference	184
	Contractor selection	184
	References	184
Appendix 5A	**Abatement Project Contractual Relationships and Responsibilities**	**185**
	The Project Monitor	188
Appendix 5B	**Wallboard: More than Joint Compound**	**191**
	Understanding Wallboard Systems	191
	Sampling Wallboard Systems	195
	Composite Sampling and Analysis	200
	Wallboard Sampling Results	202
	Wallboard Removal	202
	References	202
Chapter 6	**Abatement Projects—Removal of Asbestos-Containing Materials**	**203**
	The Pre-Construction Meeting	203
	Preparation of Removal Area	205
	Construction of the Enclosure	205
	Critical barriers	205
	Negative pressure enclosures	208
	Protecting surfaces	215
	Decontamination Facilities	221
	Final Preparation Checklist Items	225
	Surveillance During Asbestos Removal	229
	Class I Removal	230
	Class II Removal	234
	Flooring materials	234
	Wallboard removal	238
	Other Project Monitor Duties	240
Sidebar 6.1	**Negative Pressure Enclosure Dynamics**	**240**
	References	242
Appendix 6A	**Pre-Construction Meeting**	**243**
Appendix 6B	**Air Monitoring Before and During Removal**	**245**
	Background Samples	245

Samples During Preparation and Removal 246
Ambient Samples 247
Samples Inside the Enclosure 249
Monitoring Negative Air Machine Exhaust 250
Sampling inside the duct 250
Sampling at the duct exit 251
Sampling in the space receiving the discharged air 252
References 252

Chapter 7 Abatement Projects—Visual Inspections and Clearance 253
Class I Work 254
Complete Removal of ACM and Surface Residue 254
Inspect for Completeness of Removal 256
Apply Sealer to Substrate or Components 267
Clean and Remove Plastic from Protected Surfaces 270
Perform Final Cleaning Inside Enclosure 270
Inspect for Completeness of Cleanup 272
Perform Air Sampling and Analysis for Clearance 275
How many samples are collected? 275
How are the pumps calibrated? 275
How do you take the samples? 277
How long do the pumps run? 280
How are the samples analyzed? 280
Dismantle Critical Barriers and Decontamination Facilities 281
Class II Work 281
Floor Tile Removal 282
Complete removal of ACM and surface residue 282
Inspect for completeness of removal 282
Apply sealer to substrate 283
Clean and remove plastic from protected surfaces 283
Perform final cleaning inside enclosure 283
Inspect for completeness of cleanup 283
Perform air sampling and analysis for clearance 284
Dismantle critical barriers and decontamination facilities 284
Wallboard Removal 284
Complete removal of ACM and surface residue 284
Inspect for completeness of removal 284
Apply sealer to substrate; perform final cleaning and inspection 285
Perform air sampling and analysis for clearance 285
Dismantle critical barriers and decontamination facilities 285
Encapsulation 285
Documentation and Certificate of Completion 285

Sidebar 7.1	**Unexpected Situations**	**287**
	Conditions Not Anticipated During Project Design	287
	Excessive Deterioration of Site Conditions	287
Sidebar 7.2	**The Consequences of Unremoved Material**	**288**
Sidebar 7.3	**Clearance Samples—When to Start the Pumps**	**291**
	References	292
Appendix 7A	**Encapsulation of ACMs**	**293**
	Definitions	293
	Encapsulation as Abatement	293
	Testing Encapsulants	295
	Cohesion-adhesion testing	295
	Coverage and penetration tests	297
	Encapsulation as Adjunct to Removal	297
	References	299
Appendix 7B	**Visual Inspection for O&M**	**300**
	Definitions and Limitations of O&M	300
	Visual Inspection for O&M Activities	301
	Before the Work Begins	301
	During the Work	303
	At the Conclusion of the Work	304
Chapter 8	**Asbestos-Cement Products**	**309**
	Production and Uses of Asbestos-Cement	309
	Worldwide Production	309
	Uses of Asbestos-Cement	310
	Some Myths and Facts about Asbestos-Cement	311
	Sampling and Analyzing Asbestos-Cement Products	321
	Assessing Asbestos-Cement Products	321
	Abatement and O&M for Asbestos-Cement Products	321
	Significance and Use: Some Final Thoughts	324
	References	324
Appendix 8A	**Inside and Outside an Asbestos-Cement Factory**	**325**
	References	328
About the Authors		**329**