

NHIE HOME INSPECTION MANUAL

Bruce A. Barker

NHIE Home Inspection Manual

**Copyright © 2015 by Examination Board of Professional Home Inspectors, Inc. (EBPHI)
All rights reserved. No part of this book may be reproduced or retransmitted in any
form or by any means without the written permission of the copyright holder.**

Publisher's Cataloging-in-Publication Data

Bruce A. Barker

NHIE home inspection manual / Bruce A. Barker

Includes bibliographic references and index.

ISBN 13: 978-0-9964518-0-2

1. Housing- Standards --Popular works. 2. Building laws--Popular works. 3. Dwellings--Design
and construction--Standards--Popular works. I Title.

TABLE OF CONTENTS

1: SITE CONDITIONS	1
INTRODUCTION	1
SITE COMPONENT TERMS	1
RETAINING WALLS.....	2
Introduction.....	2
Construction.....	3
Defects, Maintenance, Safety, Standards	5
GRADE AND DRAINAGE	5
Introduction.....	5
Common Drainage Systems.....	7
Defects, Maintenance, Safety, Standards	8
VEGETATION	9
Introduction.....	9
Defects, Maintenance, Safety, Standards	10
DRIVEWAYS, WALKWAYS, AND PATIOS	10
Driveway.....	10
Walkway	11
Patio	12
Construction.....	12
Defects, Maintenance, Safety, Standards	14
STOOPS AND PORCHES.....	15
Introduction.....	15
Construction.....	15
Defects, Maintenance, Safety, Standards	16
BALCONIES	17
Introduction.....	17
Construction.....	17
Defects, Maintenance, Safety, Standards	18
DECKS.....	19
Introduction.....	19
Construction.....	19
Defects, Maintenance, Safety, Standards	30
REVIEW QUESTIONS.....	32
 2: EXTERIOR COMPONENTS	 33
INTRODUCTION	33
EXTERIOR COMPONENT TERMS	33
WALL COVERINGS AND RELATED TRIM	34
Introduction.....	34
Adhered Masonry Veneer	35
Aluminum Siding (also Steel Siding)	36
Asbestos Cement Siding.....	37
Brick Veneer (also Natural Stone)	37

Fiber Cement Siding.....	40
Hardboard Siding.....	42
Insulbrick Siding.....	43
Stucco – Cement.....	43
Stucco – EIFS	44
Vinyl Siding.....	45
Wood Structural Panel Siding	46
Wood Siding.....	47
Wall Covering Trim.....	48
EAVES AND ASSOCIATED TRIM.....	50
EXTERIOR DOORS	51
Hinged Doors.....	51
Sliding Doors.....	53
Bulkhead Doors	53
Door Safety Issues	54
Defects, Maintenance, Safety, Standards	56
EXTERIOR WINDOWS	57
Window Safety Issues	61
STEEP SLOPE ROOF COVERINGS.....	63
Introduction.....	63
Asbestos Cement Shingles	63
Asphalt (Fiberglass) Shingles.....	64
Concrete and Clay Tiles.....	66
Fiber Cement Roofing	69
Metal Shingles.....	70
Metal Panels	72
Slate Shingles.....	74
Synthetic Component (Polymer) Roof Coverings	76
Wood Shingles and Shakes	76
Ice Dams.....	79
LOW SLOPE ROOF COVERINGS	80
Introduction.....	80
Built-Up Roof Membranes (BURs).....	81
Mineral-Surfaced Roll Roofing.....	82
Modified Bitumen Roofing.....	83
Polyurethane Foam Roofing	85
Single-ply Membrane Roofing.....	87
ROOF DRAINAGE SYSTEMS.....	89
Gutters (Steep Slope Roof Drainage)	89
Low Slope Roof Drainage.....	90
FLASHING AND SEALANTS	91
Keeping Water Out of the Home.....	91
Wall Penetration Flashing.....	92
Roof Penetration Flashing	95
Sidewall and Headwall Flashing.....	96
Flashing Defects, Maintenance, Standards	99

SKYLIGHTS.....	99
REVIEW QUESTIONS.....	102
3: STRUCTURAL COMPONENTS	103
INTRODUCTION	103
STRUCTURAL COMPONENT TERMS.....	103
FOUNDATIONS	107
Forces Affecting Houses	107
Footings, Piles, Piers, and Columns.....	108
Basement Foundation	112
Crawl Space Foundation	117
Slab-on-Grade Foundation.....	118
Slab-on-Stem Wall Foundation.....	119
Slab Foundation Reinforcement.....	119
Slab Foundation Defects and Standards	120
FLOOR SYSTEM	121
Introduction.....	121
Dimension Lumber Floor Systems.....	122
Wood I-Joists and Engineered Wood (Floors and Roofs).....	131
Floor Trusses	135
WALL SYSTEM.....	137
Introduction.....	137
Fireblocking and Fire Separation	138
Foam Plastic Materials	141
Wood-Framed Wall Systems.....	141
Concrete Masonry Unit (CMU) and Structural Brick Wall Systems.....	147
Insulating Concrete Forms Wall Systems	150
Structural Insulated Panel Wall Systems (SIPS).....	151
Uncommon Wall Materials and Systems	152
ROOF AND CEILING SYSTEM	155
Introduction.....	155
Roof Styles	155
Dimension Lumber Roof Systems.....	156
Typical Construction Techniques.....	156
Truss Roof Systems	161
Wood I-Joists and Engineered Wood Roof Systems	165
Attic Access.....	165
REVIEW QUESTIONS.....	167
4: THE ELECTRICAL SYSTEM	168
INTRODUCTION	168
ELECTRICAL SYSTEM TERMS.....	168
UPDATING THE ELECTRICAL SYSTEM TO CURRENT REQUIREMENTS.....	171
ELECTRICAL SERVICE	171
Grounding and Bonding	171
Electrical Service Ratings (Capacity)	176

Electrical Service Drop and Service Lateral..... 177
Service Equipment, Panelboards, and Enclosures..... 180
ELECTRICAL PANEL INTERIORS..... 183
Electrical Panel Inspection Safety..... 183
Overcurrent Protection Devices (OPDs) 184
Other Typical Defects Inside Panelboard Enclosures 189
Subpanel Grounding and Bonding..... 190
Potential Problem Panelboards 193
WIRING METHODS..... 195
Modern Wiring Methods..... 195
Old Wiring Methods 201
Solid-conductor Aluminum Wiring..... 202
RECEPTACLES, SWITCHES, LIGHTS, AND APPLIANCES..... 205
Receptacles 205
Switches 210
Lighting..... 213
Smoke Alarms and Carbon Monoxide Alarms 217
REVIEW QUESTIONS..... 221

5: THE COOLING SYSTEM.....222

INTRODUCTION 222
COOLING SYSTEM TERMS 222
AIR CONDITIONING EQUIPMENT CLASSIFICATIONS..... 225
HOW AIR CONDITIONERS WORK 226
Introduction..... 226
Basic Theory 226
States of Matter 226
The Cooling Cycle 227
The Heat Pump Heating Cycle..... 229
DETERMINING AIR CONDITIONING SYSTEM CAPACITY 230
Introduction..... 230
Air Conditioning System Capacity Determination 231
INSPECTING AIR CONDITIONING SYSTEMS..... 231
Introduction..... 231
Operating Air Conditioning Systems 232
Inspecting Package Systems..... 232
Inspecting Window Units and Through-Wall Units 233
Inspecting Replacement Condenser Units..... 234
Inspecting Mini-Split Systems 234
Inspecting Evaporative (Swamp) Coolers..... 235
Determining System Capacity and Age 236
Temperature Drop Inspection..... 237
Current Draw Measurement..... 238
Service Access Inspection..... 239
RELATED AIR CONDITIONING SYSTEM COMPONENTS 241
Primary Condensate Disposal System 241

Auxiliary Condensate Management System 242
 Refrigerant Line Set..... 242
 Thermostats 243
AIR DISTRIBUTION SYSTEM 243
 Air Distribution System Types 243
 Air Distribution System Design 244
 Low Pressure Ducts..... 245
 High Pressure Ducts 250
 Return Ducts and Inlets 250
 Filters..... 250
REVIEW QUESTIONS..... 252

6: THE HEATING SYSTEM..... 253

INTRODUCTION 253
 HEATING SYSTEM TERMS 253
 HOW HEAT TRANSFER WORKS 255
 HOW COMBUSTION WORKS 255
 COMBUSTION AIR..... 256
 DETERMINING HEATING SYSTEM CAPACITY 261
 Introduction..... 261
 Heating System Capacity Determination 261
 HEATING EQUIPMENT CLASSIFICATIONS 262
 INSPECTING HEATING SYSTEMS 263
 GAS APPLIANCE CATEGORIES 264
 GAS FORCED-AIR FURNACES 265
 GAS FLOOR FURNACES AND OIL FLOOR FURNACES 269
 GAS WALL FURNACES AND OIL WALL FURNACES 272
 GAS ROOM HEATERS AND OIL ROOM HEATERS (VENTED) 274
 GAS APPLIANCES AND OIL APPLIANCES (UNVENTED) 275
 GAS DECORATIVE FIREPLACES AND OIL DECORATIVE FIREPLACES (VENTED) .. 278
 CATEGORY I GAS VENT SYSTEMS 280
 SPECIAL GAS VENT SYSTEMS..... 289
 OIL HEATING SYSTEMS 290
 Oil Burners..... 290
 OIL VENT SYSTEMS..... 294
 ELECTRIC HEATING SYSTEMS..... 299
 Electric Heating System Types 299
 Electric Central Forced-air Furnaces (Air Handlers)..... 299
 Distributed Electric Heaters (Baseboard Heaters)..... 301
 Electric Radiant Heating Systems 302
 HOT WATER HEATING SYSTEMS 303
 Hot Water Boiler Components 305

STEAM HEATING SYSTEMS.....	313
Introduction.....	313
Steam Heating System Types	314
Steam Heating System Operating Cycle	314
Steam Heating Distribution Systems.....	315
Steam Boiler Components.....	319
SOLID FUEL HEATING SYSTEMS	321
RELATED HEATING SYSTEM COMPONENTS.....	322
FUEL DISTRIBUTION SYSTEMS.....	323
REVIEW QUESTIONS.....	324
7: INSULATION AND VENTILATION	325
INTRODUCTION	325
INSULATION AND VENTILATION TERMS	326
HOW INSULATION WORKS	327
HOW VAPOR RETARDERS WORK.....	328
THE HOUSE AS A SYSTEM	330
COMMON TYPES OF INSULATION.....	332
Batt Insulation	332
Loose Fill/Blown-in Insulation	332
Sheet/Rigid Insulation.....	333
Spray Foam Insulation.....	334
Other Insulation Types	335
ENERGY EFFICIENCY AND MOISTURE MANAGEMENT COMPONENTS.....	337
Water-Resistive Barriers (WRBs).....	337
Radiant Barriers	337
Fenestration.....	338
MECHANICAL VENTILATION AND EXHAUST	339
Mechanical Ventilation Systems.....	339
Whole-house Fans	344
Local Exhaust Systems.....	345
ATTIC VENTILATION	349
Ventilated Attics.....	349
Unventilated (Closed) Attic.....	353
CRAWL SPACE VENTILATION.....	354
Ventilated Crawl Spaces	354
Unventilated (Closed) Crawl Spaces	356
BASEMENT WALL INSULATION	358
REVIEW QUESTIONS.....	360

8: THE PLUMBING SYSTEM.....361

INTRODUCTION361

PLUMBING SYSTEM TERMS361

WATER SERVICE AND DISTRIBUTION PIPES 368

 General Water Supply and DWV Pipe Installation Requirements 368

 Copper Tubing 370

 Chlorinated Polyvinyl Chloride (CPVC) 371

 Galvanized Steel 372

 PEX Tubing 373

 Polybutylene (PB) Tubing..... 374

 Other Water Pipes..... 375

 Uncommon Water Pipes..... 376

 Water Connectors 376

 Water Valves..... 377

PLUMBING FIXTURES378

 Faucets and Similar Valves..... 378

 Bathtubs 381

 Showers and Tub/Showers 382

 Sinks 386

 Toilets, Bidets, Urinals 387

 Other Fixtures 391

BACKFLOW PREVENTION..... 392

WATER TREATMENT DEVICES 394

HOT WATER CIRCULATION SYSTEMS 396

WELLS.....397

FIRE SUPPRESSION (SPRINKLER) SYSTEMS.....402

DOMESTIC HOT WATER SYSTEMS (DHW).....402

DRAIN, WASTE, AND VENT PIPES (DWV).....412

 Acrylonitrile Butadiene Styrene (ABS) Pipe..... 413

 Cast Iron Pipe..... 414

 Clay Sewer Pipe 415

 Galvanized Steel Pipe 416

 Orangeburg Sewer Pipe..... 416

 Polyvinyl Chloride (PVC) Pipe..... 417

 Uncommon DWV Pipes 418

DRAIN, WASTE, AND VENT (DWV) SYSTEM COMPONENTS.....418

 Traps and Fixture Drains..... 424

 Plumbing Vents..... 428

 Private Sewage Disposal Systems 436

 Sewage Ejectors, Backwater Valves, Sump Pumps..... 439

FUEL STORAGE AND DISTRIBUTION SYSTEMS..... 443

REVIEW QUESTIONS..... 453

9: THE HOUSE INTERIOR	454
INTRODUCTION	454
INTERIOR WALL AND CEILING FINISHES	454
INTERIOR DOORS.....	459
Cased Openings.....	459
Hinged Swinging Doors.....	459
Sliding Doors and Bifold Doors	460
FLOOR COVERINGS	461
Introduction.....	461
Carpet.....	461
Laminate	462
Linoleum and Vinyl	463
Tile and Stone.....	464
Wood	465
STAIRWAYS AND LANDINGS	466
Introduction.....	466
Stairways.....	466
HANDRAILS AND GUARDS	472
Handrails	472
Guards.....	473
CABINETS AND COUNTERTOPS	475
Cabinets.....	475
Countertops.....	476
VEHICLE DOORS AND DOOR OPERATORS.....	478
Vehicle Doors	478
Vehicle Door Operators	480
REVIEW QUESTIONS.....	482
10: FIREPLACES AND CHIMNEYS	483
INTRODUCTION	483
FIREPLACE TERMS	484
MASONRY FIREPLACES.....	486
Fireplace Components	486
Fireplace Clearances to Combustibles.....	488
FIREPLACE OPERATING EFFECTIVENESS	490
Introduction.....	490
Combustion Air	490
Fireplace Doors	491
MASONRY CHIMNEYS.....	491
Introduction.....	491
Chimney Construction.....	491
FACTORY-BUILT FIREPLACES AND CHIMNEYS.....	498
Introduction.....	498
Fireplace.....	499
Chimney (Flue)	500

GENERAL CHIMNEY ISSUES	502
FIREPLACES INSERTS	504
WOOD-BURNING STOVES	505
CLEARANCE TO COMBUSTIBLES REDUCTION	509
REVIEW QUESTIONS.....	511
11: KITCHEN APPLIANCES	512
INTRODUCTION	512
APPLIANCE TERMS	512
COOKTOP, RANGE, OVEN	513
DISHWASHING MACHINE.....	516
MICROWAVE OVEN AND EXHAUST HOOD	518
FOOD-WASTE DISPOSER	521
TRASH COMPACTOR.....	522
REFRIGERATORS AND FREEZERS.....	523
REVIEW QUESTIONS.....	525
12: SWIMMING POOLS AND SPAS	526
INTRODUCTION	526
POOL INSPECTION AND STANDARDS OF PRACTICE.....	526
POOL TERMS	527
POOL SAFETY	528
Introduction.....	528
Access Barriers	528
Entrapment.....	530
Egress and Entrance	531
POOL ELECTRICAL	532
Introduction.....	532
Receptacles and Switches	532
Lights Near Pools	533
Underwater Lights	533
Overhead Wires	534
Pool Electrical Supply	534
Grounding and Bonding	535
POOL SHELL AND INTERIOR FINISH	537
Introduction.....	537
In-ground Pool Shells	537
Concrete Pool Finishes.....	538
POOL DECK AND COPING	539
CIRCULATION SYSTEM	540
Introduction.....	540
Pump	540
Filter.....	541
Skimmer	542

Pipes and Valves 542
Sanitation Systems..... 543
Automatic Water Fill Systems..... 544
Blower 545
CLEANING SYSTEMS..... 545
POOL HEATERS 546
Introduction..... 546
Gas Pool Heaters..... 546
Heat Pump Pool Heaters and Solar Pool Heaters..... 548
VEGETATION, GRADING, RETAINING WALLS 549
REVIEW QUESTIONS..... 550

13: LANDSCAPE IRRIGATION SYSTEMS 551

INTRODUCTION 551
IRRIGATION SYSTEM INSPECTION AND STANDARDS OF PRACTICE 551
IRRIGATION SYSTEM TERMS 552
IRRIGATION SYSTEM COMPONENTS 553
Water Source..... 553
Backflow Prevention 553
Pipes 553
Valves 554
Controllers..... 555
Emitters 555
Irrigation Systems Defects, Maintenance, Standards..... 556
REVIEW QUESTIONS..... 557

14: ANALYSIS AND REPORTING OF FINDINGS..... 558

INTRODUCTION TO INSPECTION SCOPE AND LIMITATIONS..... 558
Inspection Scope 558
Inspection Limitations 559
STANDARDS OF PRACTICE (SOP) 560
REPORT WRITING 561
Communication 561
Report Formats 561
Deficiency Statements..... 562
Deficient Conditions 565
System and Component Descriptions 568
Inspection Limitation Statements..... 573
Other Report Contents..... 576
INSPECTION TEST INSTRUMENTS 578
THE INSPECTION PROCESS 581
REVIEW QUESTIONS..... 585

15: INSPECTION BUSINESS OPERATION590

STARTING A HOME INSPECTION BUSINESS 590

 Introduction..... 590

 The Business Plan 590

 Types of Business Ownership..... 591

 Government Licensing and Registration 592

 Insurance..... 594

 Accounting and Financial Management 595

BUSINESS LAW 599

 Introduction..... 599

 Dealing with Dissatisfied Clients 599

 Types of Home Inspector Liability 602

INSPECTION AGREEMENTS (CONTRACTS)..... 604

 Introduction..... 604

 Contract Basics 605

 Contract Contents (Required)..... 607

 Contract Contents (Optional) 608

HOME INSPECTION ETHICS 611

 Introduction..... 611

 Conflicts of Interest 611

 Ethical Reporting 612

 Ethical Business Practices..... 613

HOME INSPECTION MARKETING 613

 Introduction..... 613

 What is Marketing? 613

 Marketing the Intangible 614

 Features and Benefits 614

 Elements of a Marketing Plan..... 615

 Marketing Resources..... 615

REVIEW QUESTIONS..... 616

16: ANSWERS TO REVIEW QUESTIONS 618

17: GLOSSARY 619

INDEX 639