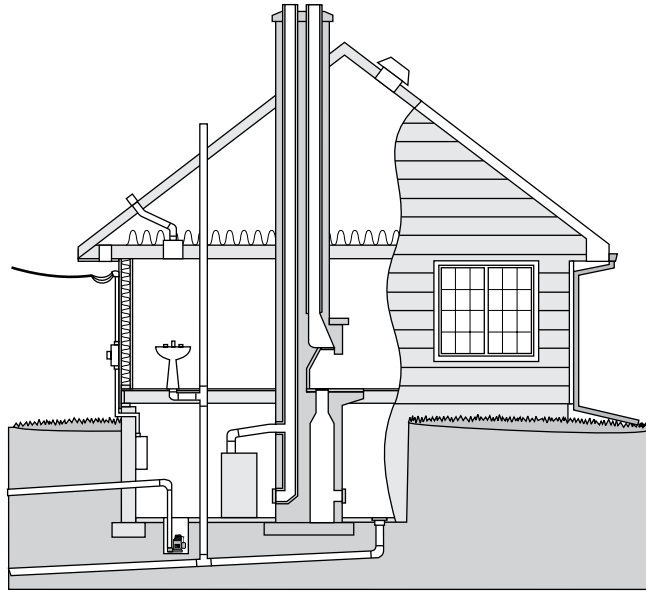


# HOME SYSTEMS ILLUSTRATED

F I F T H   E D I T I O N

# HOME SYSTEMS ILLUSTRATED

F I F T H   E D I T I O N



Published by  
Tom Feiza – How to Operate Your Home – Mr. Fix-It, Inc.  
Mr. Fix-It Press  
N8 W28892 Shepherds Way  
Waukesha, WI 53188

web: [www.htoyh.com](http://www.htoyh.com)  
phone: 262-303-4884  
fax: 262-303-4883  
email: [tom@htoyh.com](mailto:tom@htoyh.com)

Illustrations by Lindsay Mefford, Tom Feiza  
Layout by Tom Feiza III

Fifth Edition  
Copyright ©  
Tom Feiza – How to Operate Your Home

No part of this book and illustrations may be copied, reproduced or transmitted in any form or by any means, electronic or mechanical, including photography, recording or scanning, or in any information storage and retrieval system, without permission in writing from Tom Feiza – Mr. Fix-It, Inc.

## End User Agreement for Illustrations

This is a legally binding document. Please read it carefully.

This is a legally binding agreement between you, the buyer, and Tom Feiza – Mr. Fix-It, Inc. Upon your acceptance of this agreement, you are granted a limited license to use the illustrations provided in the disc/download and the reference booklet. Upon the first use of the illustrations you are consenting to all the terms and conditions of this agreement. You are agreeing without your signature that this agreement is legal, binding and enforceable in any jurisdiction.

The buyer is entitled to use the illustrations (drawings, line art, images) on the disc/download in home inspection reports, brochures, newsletters, advertisements, and presentation materials.

The buyer further agrees not to resell, lease or give all or part of the illustrations to any person or company. The buyer agrees not to use the illustrations in any materials (books, reports, booklets, website design, brochures, newsletters, advertisements, presentation materials, and so on) produced for resale.

Unauthorized copying, distributing or reselling of this disc/download or its contents is strictly prohibited. This disc/download is sold as a single-use license only. For multiple users or quantity fees, contact Tom Feiza – Mr. Fix-It, Inc.

The illustrations are designed to be used to explain basic systems found in most homes. The illustrations are not designed to be technically correct and are not designed to be used as design, evaluation, consulting, or construction information. We cannot verify that the illustrations meet the requirements of any jurisdiction. Refer to the authorities administering building inspection and construction requirements in your area for specific design and code requirements.

© Tom Feiza – Mr. Fix-It, Inc. – How to Operate Your Home

*How To Operate Your Home*, *Tom Feiza – Mr. Fix-It*, and *Mr. Fix-It* are trademarks of Tom Feiza – Mr. Fix-It, Inc.

# TABLE OF CONTENTS

## CHAPTER 1 – AIR CONDITIONING, COOLING .....1

A001 - Air Conditioning System with Warm Air Furnace.....	2
A002 - Filter Maintenance - Cooling with Air Conditioning .....	2
A003 - Heat Pump .....	2
A004 - Air Conditioning - Exterior Electrical Disconnect.....	2
A005 - Types of Exterior Disconnects .....	2
A007 - Heat Pump - Exterior Electrical Disconnect.....	2
A008 - Types of Exterior Disconnects .....	3
A009 - Air Conditioning Leaks .....	3
A010 - Air Conditioning in Attic .....	3
A011 - Air Conditioning in Attic - Leaks.....	3
A012 - Central Air From Garage Unit .....	3
A013 - AC Condenser - Clearance to Obstructions.....	3
A014 - AC Condenser - Keep Coil Clean .....	4
A015 - Multi-Zone Forced Air System.....	4
A016 - Multi-Zone Duct Damper Detail.....	4
A017 - Multi-Zone Duct Damper (Rectangular).....	4
A018 - Duct Damper - Forced Air .....	4
A019 - Forced Air Flow and Induction .....	4
A020 - High and Low Returns .....	5
A021 - Whole House Ventilation Fan.....	5
A022 - Outside Air Supply to Heat_Cool Return Duct .....	5
A023 - Humidifier With Bypass Duct Off.....	5
A024 - Heat - Cool Thermostat.....	5
A025 - Types of Fans .....	5
A026 - Evaporative Cooler Details .....	6
A027 - Evaporative Cooler (Swamp Cooler), Ductwork .....	6
A028 - High and Low Return - Heating.....	6
A029 - High and Low Return - Cooling.....	6
A030 - AC Evaporator Coil and Pan Details.....	6
A031 - AC Compressor_Evaporator .....	6
A032 - Refrigeration Cycle - Residential AC.....	7
A033 - Condensate Pump for AC .....	7
A034 - Ductless AC System .....	7
A035 - Window AC Unit.....	7
A036 - AC Condenser - Clearance to Vents .....	7
A037 - AC Condenser - Not Level .....	7
A038 - Temperature Drop Across AC Coil .....	8
A039 - AC Compressor Types .....	8
A040 - Old Heating Ductwork - Typical Upper Level .....	8
A041 - Modern Ductwork - Heating and Cooling.....	8
A042 - Whole House Ventilation Fan Problems .....	8
A043 - AC - Water Cooled .....	8
A044 - Air Conditioning - Exterior Electrical Disconnect.....	9
A045 - Heat Pump - Exterior Electrical Disconnect.....	9
A046 - High and Low Returns .....	9
A047 - A Ton Of Cooling .....	9
A048 - No Cooling, Check This .....	9
A049 - Air Conditioning Disconnects .....	9
A050 - AC System with Warm Air Furnace - Quiz .....	10

## CHAPTER 2 – BASEMENT, CRAWL, FOUNDATION .... 11

B001 - Palmer Valve Cross-Section .....	13
B002 - Basement - Concrete Block (Older Construction).....	13
B003 - Correct_Incorrect Grading .....	13
B004 - Downspout to Storm Sewer .....	13
B005 - Basement - Concrete Block (Newer Construction).....	13
B006 - Sump Pump to Surface to Prevent Freezing .....	13
B007 - Sump Pump Discharge with Check Valve.....	14

B008 - Grading - Negative, Problem .....	14
B009 - Incorrect_Correct Grading .....	14
B010 - Window Well .....	14
B011 - Measure for Proper Grading .....	14
B012 - Basement Leaks at Lower Block.....	14
B013 - Basement Leaks - Top of Wall .....	15
B014 - Basement - Drain Tile Test.....	15
B015 - Serious Settlement Cracks .....	15
B016 - Typical Step Crack .....	15
B017 - Serious Cracks in a Block Wall .....	15
B018 - Serious Horizontal Cracks .....	15
B019 - Correct_Incorrect Downspout Extension .....	16
B020 - Basement Block Wall - 11 Course (Block Height).....	16
B021 - Basement Block Wall - Typical Section.....	16
B022 - Basement Block Wall - Brick Veneer.....	16
B023 - Basement Shear Crack at Base.....	16
B024 - Shear and Step Cracks, Displacement.....	16
B025 - Measure Wall Movement - Tipping #1 .....	17
B026 - Measure Wall Movement - Horizontal Crack.....	17
B027 - Basement Wall Tipping In .....	17
B028 - Forces on Basement Wall.....	17
B029 - Step Crack on Beam End Wall.....	17
B030 - Control Joints in Concrete Basement Walls.....	17
B031 - Basement Floor Cracks - Control Joints .....	18
B032 - Green Mortar Cracks .....	18
B033 - Efflorescence (Salt Stains).....	18
B034 - Beam End Movement - Block Pushed Out .....	18
B035 - Basement Wall Reinforcement (Beams).....	18
B036 - Basement Wall Reinforcement at Beam End Wall.....	18
B037 - Beam Repair - Set in Concrete Floor.....	19
B038 - Typical Steel Beam Reinforcement.....	19
B039 - Drilled Block for Drainage .....	19
B040 - Basement Drainage - Gravel, Tile, Damp Proof.....	19
B041 - Block Wall Reinforcement - Rods and Concrete.....	19
B042 - Block Wall Reinforcement - Rods and Concrete Problems.....	19
B043 - Basement Horizontal Crack at Garage Floor .....	20
B044 - Floor Cracks Parallel to Footing.....	20
B045 - Drain Tile Types .....	20
B046 - Wall Attachment - Foundation to Framing.....	20
B047 - Wall Tips - Split Sill Plate .....	20
B048 - Pilasters on Block Foundation Wall.....	20
B049 - Water Leaks Through Floor Slab .....	21
B050 - Poured Wall With Cracks and Leaks.....	21
B051 - Epoxy Injection - Basement Crack.....	21
B052 - Sump Pump - Roots in Crock .....	21
B053 - Sump Pump - Small Flex Pipe .....	21
B054 - Sump Pump - With Check Valve.....	21
B055 - Sump Pump to Surface With Proper Extension.....	22
B056 - Sump Pump to Storm Sewer .....	22
B057 - Soil Settlement - Typical .....	22
B058 - Patio Slab Settlement .....	22
B059 - Sidewalk Settlement - Typical .....	22
B060 - Entrance Slab Support.....	22
B061 - Downspout Lateral Broken.....	23
B062 - Water Spud Test.....	23
B063 - Standpipe - Prevent Sewer Backup.....	23
B064 - Drainage Around Structure .....	23
B065 - Gutter Leaks - Wet Basement.....	23
B066 - Stoop Movement_Block Foundation Damage .....	23
B067 - Stoop Movement_Concrete Foundation Damage.....	24
B068 - Footing Settlement, Wall Movement .....	24

# HOME SYSTEMS ILLUSTRATED

B069 - Window Well Drain.....	24
B070 - Tipping Wall, Top Crack .....	24
B071 - Measure Wall Movement - Tipping #2 .....	24
B072 - Serious Cracks in a Block Wall with Corner Shear .....	24
B073 - Stoop Movement_Block Foundation Damage .....	25
B074 - Vertical Crack on Beam End Wall .....	25
B075 - Poured Concrete Wall Displacement .....	25
B076 - Basement Wet - Poor Backfill .....	25
B077 - Masonry Flashing Problems .....	25
B078 - Basement Wall Tipping - Gap .....	25
B079 - Sump Pumps - Pedestal, Submersible .....	26
B080 - Submersible Sump Pump .....	26
B081 - Pedestal Sump Pump .....	26
B082 - Grading - Negative, Slab.....	26
B083 - Grading - Negative, Deck.....	26
B084 - Slope and Grading, Ground Cover .....	26
B085 - Grading .....	27
B086 - Downspout Extension .....	27
B087 - Basement Block Wall 11 Course (Block Height) .....	27
B088 - Shear and Step Cracks, Displacement .....	27
B089 - Step Cracks on a Beam End Wall.....	27
B090 - Multiple Horizontal Cracks .....	27
B091 - Sump Pump Discharge Options.....	28
B092 - Sump Pump to Sanitary Sewer.....	28
B093 - Sump Pump Failure - Float Rubs.....	28
B094 - Sump Pump Discharge Leak .....	28
B095 - Basement Problem with Cut and Fill.....	28
B096 - Exposed Basement Foundation.....	28
B097 - Stone Foundation Wall.....	29
B098 - Sump Pumps - Impeller .....	29
B099 - Measure Wall Movement with Level #1 .....	29
B100 - Measure Wall Movement with Level #2 .....	29
B101 - Proper Grading and Ground Cover.....	29
B102 - Problem Grading and Ground Cover .....	29
B103 - Proper Grading - Sidewalk.....	30
B104 - Grading - Hard Surface.....	30
B105 - Grading - Hard Surface Problems.....	30
B106 - Grading - Soft Surface Problems.....	30
B107 - Basement Parts, Terms.....	30
B108 - Basement Sill Attachment.....	30
B109 - Submersible Sump Pump - Tether Float .....	31
B110 - Submersible Pump - Tether Float Problems.....	31
B111 - Wall Tieback Anchors .....	31
B112 - Helical Pier Repair .....	31
B113 - Push Pier Repair .....	31
B114 - Footings - Wall, Column .....	31
B115 - Swale - Drainage Around Home.....	32
B116 - Carbon Fiber Wall Repair.....	32
B117 - Settlement - Vertical Cracks .....	32
B118 - Serious Cracks and Displacement .....	32
B119 - Bulging Block Basement Wall .....	32
B120 - Bulging Block Wall with Shear Crack.....	32
B121 - Serious Settlement and Step Crack.....	33
B122 - Settlement - Block Basement.....	33
B123 - Settlement - Block Basement #2.....	33
B124 - Foundation Issues - Exterior #1 .....	33
B125 - Foundation Issues - Exterior #2.....	33
B126 - Downspout Problems and Solutions .....	33
B127 - Broken Storm Sewer Issues .....	34
B128 - Storm Sewer Test #1.....	34
B129 - Storm Sewer Test #2.....	34

B130 - Baseboard Drain, Repair .....	34
B131 - Window Well - Surface Grade Problem .....	34
B132 - Window Well Missing.....	34
B133 - Window Well Problems .....	35
B134 - Window Well Tipping Problem .....	35
B135 - Grading - Soil Too High.....	35
B136 - Grading - Soil Too High_Fix.....	35
B137 - Underground Pipe Abandoned.....	35
B138 - Veneer Movement - Foundation Issue .....	35
B139 - Sump Pump Flow Restrictions.....	36
B140 - Sump Pump - Quality Discharge Piping.....	36
B141 - Sump Pump Battery Backup, One Pipe.....	36
B142 - Battery Back Up - Two Pipes .....	36
B143 - Battery Back Up #2.....	36
B144 - Basement Tile Test - Spud Test .....	36
B145 - Basement Tile Test, Bad .....	37
B146 - Poor Draining, Ground Cover Repair.....	37
B147 - Interior Drain Tile Repair, Typical .....	37
B148 - Block Foundation, Newer.....	37
B149 - Poured Concrete Wall - Newer .....	37
B150 - Poured Concrete Wall, Bulge.....	37
B151 - Poured Concrete Wall - Shear .....	38
B152 - Poured Concrete Wall - Shear, Tipping.....	38
B153 - Downspout Extension Fix .....	38
B154 - Drain Tile, Gravel, Sump Pump, Waterproof.....	38
B155 - Footing Drain - Plastic Forms - Drain.....	38
B156 - Foundation Components.....	38
B157 - Basement Wall Types .....	39
B158 - Grading, Gutters, & Downspouts .....	39
B159 - Quiet the Sump Pump.....	39

## CHAPTER 3 – DOORS, WINDOWS..... 41

D001 - Double-Hung Wood Windows.....	42
D002 - Condensation on Windows .....	42
D003 - Window Lintel .....	42
D004 - Patio Screen Door Adjustment.....	42
D005 - Door Sweep .....	42
D006 - V-Strip Weather Strip .....	42
D007 - Brick Home Lintel.....	43
D008 - Garage Door and Operator - Torsion Spring.....	43
D009 - Garage Door Operator Control Button.....	43
D010 - Garage Door and Operator - Extension Spring .....	43
D011 - Garage Door Operator - Manual Release .....	43
D012 - Garage Door Pressure Test.....	43
D013 - Garage Door Photo Eye Test.....	44
D014 - Garage Door Key Cable Release .....	44
D015 - Garage Door - Extension Spring Safety Cable.....	44
D016 - Doorway Parts .....	44
D017 - Panel Door Parts .....	44
D018 - Door Style Types .....	44
D019 - Door Construction.....	45
D020 - Steel or Fiberglass Door .....	45
D021 - Door - Left or Right-Hand .....	45
D022 - Door Sweep - Adjustments .....	45
D023 - Door Adjustment - Rubs.....	45
D024 - Door Adjustment - Strike Plate.....	45
D025 - Door - Mortise Lock .....	46
D026 - Door - Key in Knob, Dead Bolt.....	46
D027 - Door - Interior Lock Sets.....	46
D028 - Bypass Sliding Door .....	46

## TABLE OF CONTENTS

D029 - Bypass_Sliding Door Removal .....	46	D090 - Glass and Interior Condensation .....	56
D030 - Bypass_Sliding Door Adjustment #1 .....	46	D091 - Relative Humidity _ Dew Point .....	57
D031 - Bypass_Sliding Door Adjustment #2 .....	47	D092 - Windows_Doors - Rot .....	57
D032 - Bifold Doors .....	47	D093 - High Efficiency Glass Performance .....	57
D033 - Bifold Door Hardware .....	47	D094 - Window Condensation with Window Covering #2 .....	57
D034 - Bifold Door Tips .....	47	D095 - Window Condensation with Inside Screen #2 .....	57
D035 - Bifold Door Adjustments .....	47	D096 - Window Condensation Mechanics #2 .....	57
D036 - Bifold Door - Up_Down .....	47	D097 - Panel Door Parts - Quiz .....	58
D037 - Patio Door Adjustment .....	48	D098 - Latch and Strike Plate .....	58
D038 - Patio Door - Remove .....	48	D099 - Window Flashing, Brick Veneer .....	58
D039 - Patio Screen Door - Remove .....	48	D100 - Brick Veneer - Flashing Below Window .....	58
D040 - Patio Door Security .....	48	D101 - Brick Veneer - Spacing to Framing .....	58
D041 - Screen Replacement .....	48	D102 - Brick Veneer Cap Stone .....	58
D042 - Parts of a Window - Double Hung .....	48	D103 - Window Head Flashing #1 .....	59
D043 - Double-Hung Window - Sash Cords .....	49	D104 - Window Head Flashing #2 .....	59
D044 - Window Security Pins .....	49	D105 - Window Head Flashing #3 .....	59
D045 - Window Glazing (Glass) .....	49	D106 - Window Head Flashing, Overhang .....	59
D046 - Types of Windows .....	49	D107 - Windowsill Flashing #1 .....	59
D047 - Types of Glass (Glazing) .....	49	D108 - Windowsill Flashing #2 .....	59
D048 - Double-Hung Window Frame & Parts .....	49	D109 - Door Head Flashing .....	60
D049 - Glazing Components .....	50	D110 - Door Sill Flashing .....	60
D050 - Glazing Components - High-Performance .....	50	D111 - Cap Flashing Details .....	60
D051 - Window Security Option 1 .....	50	D112 - Cap Flashing Details #2 .....	60
D052 - Window Security Option 2 .....	50	D113 - Horizontal Trim Flashing, Stucco .....	60
D053 - Window Weatherstripping .....	50		
D054 - Masonry Lintel Section_Flashing .....	50	<b>CHAPTER 4 – ELECTRICAL .....</b>	<b>61</b>
D055 - Stone Sills Tipping - Brick Veneer .....	51	E001 - Underground_Overhead Service Entrance .....	63
D056 - Wall Drainage Screen .....	51	E002 - Electrical Main Circuit Breaker Panel .....	63
D057 - Window Flashing Problem .....	51	E003 - Electrical Main Fuse Panel .....	63
D058 - Metal Head_Cap Flashing Edge .....	51	E004 - Types of Wire .....	63
D059 - Flashing and Paper Direct Water Out .....	51	E005 - Types of Outlets .....	63
D060 - Window Well .....	51	E006 - Air Conditioning - Exterior Electrical Disconnect .....	63
D061 - Revolving Spring Sash Balance .....	52	E007 - Outlet - Old Style .....	64
D062 - Extension Spring Sash Balance .....	52	E008 - Polarity - Correct_Reversed .....	64
D063 - Twisted Rod Spring Balance .....	52	E009 - Outlet with Ground .....	64
D064 - Tubular Skylight .....	52	E010 - Doorbell Button .....	64
D065 - Basement Egress Window .....	52	E011 - Fuses and Breakers .....	64
D066 - Vented Skylight .....	52	E012 - Fluorescent Light Fixture_Ballast .....	64
D067 - Double-Hung Window .....	53	E013 - Circuit Breaker Resets .....	65
D068 - Casement Window .....	53	E014 - GFCI Breaker Reset .....	65
D069 - Sliding Window_Slider .....	53	E015 - Typical Screw-In Fuses .....	65
D070 - Fixed Window .....	53	E016 - Ground Fault Circuit Interrupter (GFCI) .....	65
D071 - Bow Window .....	53	E017 - Wire Size - Load (Amp) Capacity .....	65
D072 - Bay Window .....	53	E018 - Service Entrance (Main Feed) Wire Sizes .....	65
D073 - Awning Window .....	54	E019 - Electrical Service Outside - Warm, Dry Climate .....	66
D074 - Hopper Window .....	54	E020 - Arc Fault Circuit Interrupter (AFCI) .....	66
D075 - Window Flashing - Brick Veneer .....	54	E021 - 240-volt Outlet - With and Without Ground .....	66
D076 - Window Flashing - Brick Veneer Problems .....	54	E022 - GFCI Protects Outlets Downstream .....	66
D077 - Window Flashing - Faux Stone Problems .....	54	E023 - Polarity - Lamp Socket, Plug, Cord .....	66
D078 - Casement Window Section .....	54	E024 - Service Entrance Clearance #1 .....	66
D079 - Casement Window Section - 2x6 Walls .....	55	E025 - Service Entrance Clearance #2 .....	67
D080 - Windows - 2x4 vs. 2x6 Walls .....	55	E026 - Service Entrance Drip Loop .....	67
D081 - Wall Thickness - Condensation .....	55	E027 - Service Entrance - Utility_Homeowner .....	67
D082 - Window Condensation Mechanics .....	55	E028 - Service Entrance Bracing .....	67
D083 - Window Condensation with Inside Screen .....	55	E029 - Service Entrance - Ground .....	67
D084 - Window Condensation with Window Covering .....	55	E030 - Service Entrance Wiring_Attachment .....	67
D085 - Window Condensation .....	56	E031 - Polarity - Outlet, Plug .....	68
D086 - Double Hung Window - Section .....	56	E032 - Electrical Receptacles - 110_125 Volt .....	68
D087 - Double Hung Window - Condensation .....	56	E033 - Electrical Receptacles - 240 Volt .....	68
D088 - Condensation - Glass Locations .....	56	E034 - 120 Volt Receptacle Adapter .....	68
D089 - Sliding Patio Door, 2x6 Wall .....	56		

## HOME SYSTEMS ILLUSTRATED

E035 - Receptacle Wiring - 120 Volt.....	68	E096 - Exposed Wires in Garage.....	78
E036 - Switches - 120 Volt, Single Pole, 3-Way.....	68	E097 - Missing Box Cover.....	79
E037 - Three-Way Switch.....	69	E098 - Electrical Wire Splices Without Box.....	79
E038 - Knob and Tube Wiring.....	69	E099 - Romex (NM Cable) - Typical Plastic Box_Wiring.....	79
E039 - Wire Insulation Color Coding.....	69	E100 - Lamp Cord Wiring - Not Allowed.....	79
E040 - Wire Capacity - Gauge.....	69	E101 - NM Cable (Romex) Connectors.....	79
E041 - Types of Electrical Cable - NM.....	69	E102 - Disposal Wiring Problems.....	79
E042 - Types of Electrical Cable - NM, UF.....	69	E103 - Exposed Wires - Exterior.....	80
E043 - Types of Electrical Cable - Old, Modern.....	70	E104 - Entrance Lights.....	80
E044 - Volts, Amperage, Wattage.....	70	E105 - Stairway Lights.....	80
E045 - Electrical Panel Clearance.....	70	E106 - Electrical Outlets in Modern Bathroom.....	80
E046 - Bulbs_Light Fixtures.....	70	E107 - Electrical Wiring in Modern Kitchen.....	80
E047 - Double Tapping Electrical Breaker.....	70	E108 - Required Outlets - Interior.....	80
E048 - Can Light Fixtures - Heat.....	70	E109 - Closet Light Clearances.....	81
E049 - Doorbell Wiring.....	71	E110 - 120_240 Volt Appliance_Amps.....	81
E050 - Doorbell - Two Buttons_Chimes.....	71	E111 - Attic Wiring.....	81
E051 - Transfer Switch, Generator.....	71	E112 - Disconnect at AC - Clearance.....	81
E052 - Electrical Disconnect and Reset - Disposal.....	71	E113 - Ceiling Fan Mounting.....	81
E053 - Well - Main Water Disconnects.....	71	E114 - Underground Wiring.....	81
E054 - Furnace Utility Disconnects.....	71	E115 - Exterior Outlet Covers.....	82
E055 - Steam Boiler Disconnects.....	72	E116 - Smoke Detectors Required.....	82
E056 - Boiler Disconnects - Water, Power.....	72	E117 - GFCI Requirements - Residential.....	82
E057 - Electric Water Heater Disconnect.....	72	E118 - GFCI - Line_Load.....	82
E058 - Air Conditioning - Exterior Electrical Disconnect.....	72	E119 - GFCI Test - Simple Test.....	82
E059 - Air Conditioning Disconnects.....	72	E120 - GFCI Circuit Tester.....	82
E060 - Heat Pump - Exterior Electrical Disconnect.....	72	E121 - Circuit_Outlet Tester.....	83
E061 - Heat Pump Disconnects.....	73	E122 - Line Voltage_Low Voltage Track Lights.....	83
E062 - Electronic Air Filter Control.....	73	E123 - Can Lights - Proper Bulbs.....	83
E063 - Water Softener Disconnects.....	73	E124 - Compact Fluorescent Lamps.....	83
E064 - Humidifier Disconnects - Electric, Water.....	73	E125 - Safety of GFCI vs. Breaker.....	83
E065 - Mound System Controls_Alarm.....	73	E126 - Grounding Concepts - Safety.....	83
E066 - Dishwasher - Water & Electrical Disconnect.....	73	E127 - Disconnects_Safety.....	84
E067 - Well - Water & Electrical Disconnects.....	74	E128 - Disconnects - Safety Option.....	84
E068 - Whirlpool Controls_Disconnect.....	74	E129 - Disconnect_Safety Cord Option.....	84
E069 - Gas Fireplace Controls - Sealed Unit.....	74	E130 - Electrical Service Mast, Flashing.....	84
E070 - Gas Fireplace Controls.....	74	E131 - Electric Bond_Ground Water Meter.....	84
E071 - Attic Ventilation Fan - Controls.....	74	E132 - Electrical Bond_Ground Well Tank.....	84
E072 - Heat Recovery Ventilator (HRV) Controls.....	74	E133 - Electrical Panel Clearance #2.....	85
E073 - Water Heater - Oil-Fired Controls_Disconnects.....	75	E134 - Open Knockouts - Not Safe.....	85
E074 - Underground Service Entrance.....	75	E135 - Electrical Baseboard Heat.....	85
E075 - Overhead Service Entrance.....	75	E136 - Electrical Baseboard Heat - Outlets.....	85
E076 - Air Conditioning - Exterior Electrical Disconnect.....	75	E137 - Overfused Circuits_Wire Size.....	85
E077 - Electrical Polarity at Light.....	75	E138 - Sticking Light Bulb.....	85
E078 - Ground Fault Circuit Interrupters.....	75	E139 - Can Light LED Retrofit.....	86
E079 - Watts, Volts, Amps - AC.....	76	E149 - Can Light - Condensation Repair (IC).....	86
E080 - Watts, Volts, Amps - Problem.....	76	E150 - Can Light - Condensation Repair, Seal in Box.....	86
E081 - Watts Per Residential AC Circuit.....	76	E151 - Can Light - Efficient Lamp Sump.....	86
E082 - Watts and Typical Amps.....	76		
E083 - Extension Cord Load Limits.....	76	<b>CHAPTER 5 - EXTERIOR.....</b>	<b>87</b>
E084 - Read the Extension Cord.....	76	X002 - Brick Veneer Flashing.....	88
E085 - Extension Cord - Garage Door.....	77	X003 - Overhangs Are Important.....	88
E086 - Extension Cord Problems.....	77	X004 - Roof Edge Flashing - Eave.....	88
E087 - Receptacles - Don't Overload.....	77	X005 - Roof Edge Flashing - Rake Edge.....	88
E088 - Outlet Problems - Hazards.....	77	X006 - Z Flashing - Panel Siding.....	88
E089 - Light Hung From Cord - Hazard.....	77	X007 - Horizontal Trim Flashing and Problems.....	88
E090 - Crowded Electrical Box - Too Many Wires.....	77	X008 - Horizontal Panel Flashing and Problems.....	89
E091 - Open Knockouts - Electrical Box.....	78	X009 - Deck Ledger Flashing.....	89
E092 - Non-Metallic Cable Support.....	78	X010 - Flashing Over Window.....	89
E093 - Non-Metallic Cable Under Floor Framing.....	78	X011 - Cantilevered Deck Flashing.....	89
E094 - Non-Metallic Cable Stapling.....	78	X012 - Window with Nailing Flange - Flashing.....	89
E095 - NM Wire in Steel Studs.....	78		

X013 - Horizontal Panel Flashing Problems.....	89	F013 - Chimney Saddle (Cricket).....	102
X014 - Stucco - Traditional Cement, Three-Coat .....	90	F014 - Chimney Flashing .....	102
X015 - EIFS - Synthetic Stucco.....	90	F015 - Warm Air Furnace - Chimney.....	102
X016 - Window and Flashing_Housewrap .....	90	F016 - Backdrafting Fireplace, Kitchen Fan = ODOR .....	102
X017 - J-Channel - Vinyl Siding.....	90	F017 - Backdrafting Dryer Can Suck.....	102
X018 - Window Head Flashing_Housewrap.....	90	F018 - Water Heater Signs of Backdrafting.....	102
X019 - Leaks - Two-Story Brick Veneer.....	90	F019 - Gas Water Heater with Signs of Backdrafting.....	103
X020 - EIFS - Drainage Plane.....	91	F020 - Flame Impingement .....	103
X021 - Stone Sill Tipping - Brick Veneer.....	91	F021 - Combustion Air for Sealed Furnace Room.....	103
X022 - Masonry Vener Flashing.....	91	F022 - Chimney Top Damper .....	103
X023 - Masonry Vener Flashing - Problems #1.....	91	F023 - Wood Stove Insert.....	103
X024 - Masonry Vener Flashing - Problems #2.....	91	F024 - Wood Stove Insert with Liner .....	103
X025 - Window Flashing - Brick Veneer.....	91	F025 - Freestanding Wood Stove - Flue .....	104
X026 - Window Flashing - Brick Veneer Problems.....	92	F026 - Fireplace - Flexible Stainless Liner .....	104
X027 - Window Flashing - Faux Stone Problems.....	92	F027 - Chimney Height Requirement.....	104
X028 - Brick and Stone Leaks.....	92	F028 - Shared Chimney Connections .....	104
X029 - Faux Stone & Faux Brick Leaks.....	92	F029 - Metal Chimney Parts.....	104
X030 - Wall Flashing - Water Flow Fundamentals .....	92	F030 - Rain Cap for Masonry Chimney.....	104
X031 - Water Protection Principles.....	92	F031 - Metal Chimney in Wood Frame.....	105
X032 - Rusted Lintel - Cracks, Movement.....	93	F032 - Metal Chimney in Wood Frame - Problems .....	105
X033 - Veneer Movement - Foundation Issue .....	93	F033 - Fireplace Ash Pit.....	105
X034 - Water Splash - Rot.....	93	F034 - Chimney Cleanout.....	105
X035 - Grading, Gutters, & Downspouts .....	93	F035 - Chimney Problems - Masonry Chimney.....	105
X036 - Deck Ledger Fastening with Spacer .....	93	F036 - Gas Fireplace Venting.....	105
X037 - Deck Ledger Bolting.....	93	F037 - Heating Fireplace Schematic.....	106
X038 - Deck Terms, Part #2 .....	94	F038 - Gas Fireplace Controls - Sealed Unit.....	106
X039 - Cantilevered Deck Flashing.....	94	F039 - Gas Fireplace Controls .....	106
X040 - Window Flashing, Brick Veneer.....	94	F040 - Metal Fireplace - Refractory Panels.....	106
X041 - Masonry Veneer Flashing.....	94	F041 - Metal Fireplace - Refractory Panel Defects .....	106
X042 - Masonry Veneer Support.....	94	F042 - Gas Fireplace - Soot, Stains .....	106
X043 - Masonry Veneer Water Management .....	94	F043 - Fireplace Problems - Tight Home, Draft Issues .....	107
X044 - Brick Veneer - Flashing Below Window .....	95	F044 - Manufactured Metal Fireplace.....	107
X045 - Brick Veneer - Spacing to Framing .....	95	F045 - Manufactured Metal Fireplace - Defects #1 .....	107
X046 - Brick Veneer Cap Stone.....	95	F046 - Metal Manufactured Fireplace - Defects #2 .....	107
X047 - Brick Veneer Venting.....	95	F047 - Masonry Fireplace - Defects #1 .....	107
X048 - Window Head Flashing #1 .....	95	F048 - Masonry Fireplace - Defects #2 .....	107
X049 - Window Head Flashing #2.....	95	F049 - Unvented Appliance _ Gas Log issues .....	108
X050 - Window Head Flashing #3.....	96	F050 - Masonry Chimney - Attic Problems #1 .....	108
X051 - Window Head Flashing, Overhang .....	96	F051 - Masonry Chimney - Attic Problems #2 .....	108
X052 - Window Sill Flashing #1.....	96	F052 - Masonry Chimney Defects - Above Roof .....	108
X053 - Window Sill Flashing #2.....	96	F053 - Chimney - Oversized Flue, Water Heater .....	108
X054 - Door Head Flashing.....	96	F054 - Chimney - Oversized Flue Repair.....	108
X055 - Door Sill Flashing.....	96	F055 - Chimney - Oversized Flue, Furnace .....	109
X056 - Cap Flashing Details.....	97	F056 - B-Vent - Attic Insulation Shield.....	109
X057 - Cap Flashing Details #2.....	97	F057 - Masonry Chimney - Flue Openings.....	109
X058 - Horizontal Trim Flashing - Stucco.....	97		

**CHAPTER 6 – FIREPLACE, CHIMNEY..... 99**

F001 - Direct Vent Fireplace.....	100
F002 - Typical Masonry Chimney - Double Flue .....	100
F003 - Typical Metal Chimney.....	100
F004 - Flue Pipe to Masonry Chimney.....	100
F005 - Masonry Fireplace.....	100
F006 - Masonry Fireplace Parts .....	100
F007 - Metal-Framed Prefabricated Fireplace.....	101
F008 - Chimney Parts - Good_Poor Design.....	101
F009 - Masonry Fireplace - Outside Air Supply.....	101
F010 - Wood-Burning Stove .....	101
F011 - Masonry Chimney with Metal Liner .....	101
F012 - Masonry Chimney with Flex Metal Liner .....	101

**CHAPTER 7 – HEATING..... 111**

H001 - Gas Warm Air Furnace .....	112
H002 - Mid-Efficiency Warm Air Furnace.....	112
H003 - High-Efficiency Warm Air Furnace.....	112
H004 - Warm Air Furnace and Distribution Ducts.....	112
H005 - Hydronic (Hot Water) Boiler and Distribution.....	112
H006 - Steam Boiler and One-Pipe Distribution .....	112
H007 - Fuel Oil Burner.....	113
H008 - Furnace Utility Disconnects .....	113
H009 - Filter Maintenance - Warm Air Furnace .....	113
H010 - Warm Air Furnace and Distribution Ducts.....	113
H011 - Warm Air Furnace - Horizontal Flow .....	113
H012 - Warm Air Furnace - Downflow .....	113
H013 - Warm Air Furnace with Oil Burner .....	114



## HOME SYSTEMS ILLUSTRATED

H014 - Warm Air Furnace Fan and Motor.....	114
H015 - Warm Air Furnace Belt Drive Maintenance.....	114
H016 - Warm Air Furnace_ Lubrication.....	114
H017 - Warm Air Furnace Fan Door Safety Switch.....	114
H018 - Humidifier on Gas Warm Air Furnace.....	114
H019 - High and Low Returns.....	115
H020 - Warm Air Furnace Dampers.....	115
H021 - Humidistat (Humidifier Control).....	115
H022 - Dehumidifier.....	115
H023 - Heat - Cool Thermostat.....	115
H024 - Heat Only Thermostat.....	115
H025 - Digital Thermostat.....	116
H026 - Fiberglass Filter - Flow Direction.....	116
H027 - 1-Inch Pleated Paper Filter.....	116
H028 - 6-Inch Pleated Paper Filter.....	116
H029 - Electronic Air Filter.....	116
H030 - Humidifier Without Transfer Duct.....	116
H031 - Humidifier Problems.....	117
H032 - Humidifier with Bypass Duct On.....	117
H033 - Humidifier with Bypass Duct Off.....	117
H034 - Humidifier System and Controls.....	117
H035 - Humidifier Automatic Controls.....	117
H036 - Humidifier Bypass.....	117
H037 - Humidifier - Fan Powered.....	118
H038 - Boiler Disconnects - Water, Power.....	118
H039 - Warm Air Furnace in Garage.....	118
H040 - Steam Boiler Disconnects.....	118
H041 - Warm Air Furnace with Damper and Igniter.....	118
H042 - Duct Damper - Forced Air.....	118
H043 - Flame Impingement.....	119
H044 - Forced Air Flow and Induction.....	119
H045 - Air Flow Induction_Dirt Deposits.....	119
H046 - Hydronic Heat - Convective Air Flow.....	119
H047 - Multi-Zone Forced Air System.....	119
H048 - Multi-Zone Duct Damper Detail.....	119
H049 - Multi-Zone Duct Damper (Rectangular).....	120
H050 - High and Low Return - Heating.....	120
H051 - High and Low Return - Cooling.....	120
H052 - Old Heating Ductwork - Typical Upper Level.....	120
H053 - Modern Ductwork – Heating and Cooling.....	120
H054 - Hydronic Heat - Fin Tube & Damper.....	120
H055 - Air Conditioning Disconnects.....	121
H056 - Heat Pump - Exterior Electrical Disconnects.....	121
H057 - Heat Pump Disconnects.....	121
H058 - Electronic Air Filter Control.....	121
H059 - Heat Recovery Ventilation Controls.....	121
H060 - Air Conditioning - Exterior Electrical Disconnect.....	121
H061 - Gas Warm Air Furnace.....	122
H062 - Typical Fuel Oil Tank Parts.....	122
H063 - 1-Inch Pleated Paper Filter.....	122
H064 - 4- to 6-Inch Pleated Paper Filter.....	122
H065 - Underground Storage Tank (UST) #1.....	122
H066 - Underground Storage Tank (UST) #2.....	122
H067 - Oil Tank Defects.....	123
H068 - Hydronic Boiler - Typical Older.....	123
H069 - Hydronic Boiler - Typical Newer.....	123
H070 - Hydronic Boiler - High Efficiency.....	123
H071 - Hydronic Boiler - Gravity (Old).....	123
H072 - Hydronic Boiler Circulating Systems.....	123
H073 - Hydronic Boiler - Possible Defects.....	124
H074 - Hydronic Boiler Expansion Tanks.....	124

H075 - Hydronic Boiler Gauges.....	124
H076 - Circulating Pump Oil.....	124
H077 - Boilers - Steam vs. Hot Water.....	124
H078 - Boiler Zone Valves and Controls.....	124
H079 - Hydronic Radiator vs. Fin Tube.....	125
H080 - Bleed Radiator.....	125
H081 - Bleed Convector - Fin Tube.....	125
H082 - Radiators - Steam vs. Hot Water.....	125
H083 - Hydronic Heating in Floor.....	125
H084 - In-Floor Electric Heating.....	125
H085 - Furnace_Appliance Gas Connector Problem.....	126
H086 - Electrical Baseboard Heat.....	126
H087 - Electrical Baseboard Heat - Outlets.....	126
H088 - Convection, Conduction, Radiation.....	126
H089 - Gravity Warm Air Furnace.....	126
H090 - Gravity Furnace Ductwork Improved.....	126
H091 - Ductwork, 1950's Forced Air.....	127
H092 - Combustion.....	127
H093 - Heating with Masonry Fireplace.....	127
H094 - Heating with Wood Stove.....	127
H095 - Btu, Water, Steam.....	127
H096 - Btu, Condensing Furnace.....	127
H097 - Gas Warm Air Furnace - Quiz.....	128
H098 - Airflow Direction, Furnace Filter.....	128
H099 - Btu-British Thermal Unit.....	128

## CHAPTER 8 – INSULATION.....129

I001 - Insulation - Cape Cod.....	130
I002 - Band Joist Insulation.....	130
I003 - Heating Cost vs. R Value (Cold Climate).....	130
I004 - Insulation vs. Heat Loss.....	130
I005 - Attic - Air Bypass.....	130
I006 - Attic Trap Door - Insulate, Seal.....	130
I007 - Convection Loop.....	131
I008 - Insulation – Thermal Boundary_Envelope.....	131
I009 - Insulation – Diminishing Return.....	131
I010 - Heat and Air Loss - Can Lights.....	131
I011 - Heat and Air Bypass at Inside Soffit.....	131
I012 - Knee Wall Insulation.....	131
I013 - Knee Wall Insulation Problems.....	132
I014 - Air Bypass at Insulation - Overhang.....	132
I015 - Insulation Baffle at Overhang.....	132
I016 - Blocked Soffit Vent.....	132
I017 - Insulate Floor.....	132
I018 - Attic Stairs and Door - Seal.....	132
I019 - Air Bypass - Chimney.....	133
I020 - Insulation - Typical Wall.....	133
I021 - Insulation - Better Wall.....	133
I022 - Ice Dam - Can Light.....	133
I023 - Heating Cost vs. R Value - Cold Climate.....	133
I024 - Attic Insulation - Foam.....	133
I025 - Air Leaks - Top of Wall.....	134
I026 - Foam Insulation_Seal Box Sill.....	134
I027 - Box Sill - Fiberglass Problem.....	134
I028 - Slab Insulation_Thermal Break.....	134
I029 - Slab and Wall Insulation_Thermal Break.....	134
I030 - Basement Foam Insulation.....	134
I031 - Slab and Wall Insulation_Thermal Break #2.....	135
I032 - Air Leaks - Top of Wall, Foam Air Stop.....	135
I033 - Knee Wall Insulation Problem #1.....	135

I034 - Knee Wall Insulation Repair #1 .....	135	M011 - Smoke Detector_Alarm .....	147
I035 - Energy Heel Truss.....	135	M012 - Garage Door and Operator - Torsion Spring .....	147
I036 - Knee Wall Insulation Problem #2 .....	135	M013 - Garage Door Operator Control Button .....	148
I037 - Knee Wall Insulation Repair #2 .....	136	M014 - Garage Door Operator - Extension Spring .....	148
I038 - Attic Air Leak at Return Duct .....	136	M015 - Garage Door Operator Manual Release .....	148
I039 - Attic Air Leak at Return Duct - Repair.....	136	M016 - Garage Door Pressure Test.....	148
I040 - Attic Air Leaks - Black Stains.....	136	M017 - Garage Door Photo Eye Test .....	148
I041 - Basement Sill Without Insulation.....	136	M018 - Garage Door Key Cable Release.....	148
I042 - Attic Access Scuttle, Door Insulation .....	136	M019 - Potential Carbon Monoxide Sources in the Home .....	149
I043 - Can Light - Roof Leak or Condensation?.....	137	M020 - Carbon Monoxide Detector .....	149
I044 - Can Light, Condensation Repair, IC.....	137	M023 - Snow_Roof Rake .....	149
I045 - Can Light - Condensation Repair, Seal in Box.....	137	M024 - Snow Melt Sock - Remove Ice Dam.....	149
I046 - Can Light - Efficient Lamp Swap.....	137	M025 - Capillary Action.....	149
I047 - Attic Moisture - Chimney Air Leak .....	137	M026 - Construction Clues to Find Studs.....	149
I048 - Attic Moisture, Chimney Air Leak Repair .....	137	M027 - Electronic Stud Finders .....	150
I049 - Attic Folding Ladder Insulation .....	138	M028 - Lumber Sizes - Nominal and Actual .....	150
I050 - Attic Sliding Ladder Insulation .....	138	M029 - On-Center Framing .....	150
I051 - Cantilevers Are Cold.....	138	M030 - Joist Subfloor Squeaks, Fixes.....	150
I052 - Cantilevered Closets are Cold.....	138	M031 - Joist Bridging.....	150
I053 - Cantilevered Closets Are Cold, Repair.....	138	M032 - Screws - Pilot and Clearance Holes.....	150
I054 - Dropped Soffit Air Leak Fix.....	138	M033 - Counter Snap - Special Screw .....	151
I055 - Shed Roof Envelope Problem.....	139	M034 - Squeek No More .....	151
I056 - Shed Roof Envelope Repair.....	139	M035 - Hardwood Floor Squeaks - Nail from Above .....	151
I057 - Insulate Non-Vented Crawl Space .....	139	M036 - Hardwood Squeaks - Screw from Above.....	151
I058 - Crawl Space Vapor Barrier.....	139	M037 - Hardwood Squeaks - Screw from Below.....	151
I059 - Windy, Attic Insulation Problem.....	139	M038 - Squeak Relief.....	151
I060 - Windy Conditions, Attic Insulation Solution .....	139	M039 - Secure Floor Through Carpeting.....	152
I061 - Crawl Space Ventilation .....	140	M040 - Wash Siding - Work Up.....	152
I062 - Sealed Crawl Space.....	140	M041 - Wash Siding - Tools .....	152
I063 - Bathtub and Building Envelope Problem.....	140	M042 - Ghost Stains on Exterior Walls.....	152
I064 - Bathtub and Building Envelope Repair.....	140	M043 - Soot Deposits at Doorway.....	152
I065 - Shower and Building Envelope Problem.....	140	M044 - Soot Stains at Carpet and Walls.....	152
I066 - Building Envelope Repair.....	140	M045 - Dark Soot Stains Above Light Bulbs.....	153
I067 - Fireplace and Building Envelope Problem .....	141	M046 - Soot Stains at Pictures.....	153
I068 - Fireplace and Building Envelope Repair .....	141	M047 - Flame Impingement.....	153
I069 - Skylight Shaft Insulation.....	141	M048 - Ghost Stains on Walls, Ceiling .....	153
I070 - Skylight Tube Insulation .....	141	M049 - Candle - Soot Generator .....	153
I071 - Air Sealing Attic #1 .....	141	M050 - Candle - Trim Wick.....	153
I072 - Air Sealing Attic #2 .....	141	M051 - Soot - Dirt Above Radiation .....	154
I073 - Air Sealing Attic #3 .....	142	M052 - Construction Clues to Find Studs.....	154
I074 - Air Sealing Attic, Soffit.....	142	M053 - Garage Door - Extension Spring Safety Cable.....	154
I075 - Air Sealing Attic, Top of Wall.....	142	M054 - Relative Humidity _ Dew Point.....	154
I076 - Clues to Air Leak, Attic Trap Door .....	142	M055 - Heavy Picture or Mirror Hanging .....	154
I077 - Air Seal Electrical Outlets .....	142	M056 - Refrigerator - Power Saver Switch .....	154
I078 - Basement Sill Without Insulation.....	142	M057 - Refrigerators - Clean Drain Pan .....	155
I079 - Basement Sill Fiberglass Insulation .....	143	M058 - Refrigerator - Clean Coil.....	155
I080 - Basement Sill Foam Insulation.....	143	M059 - Simple Wall Patch .....	155
I081 - Can Light LED Retrofit .....	143	M060 - Clothes Dryer Venting - Good Conditions .....	155
<b>CHAPTER 9 – MISCELLANEOUS.....</b>	<b>145</b>	M061 - Clothes Dryer Venting - Poor Conditions.....	155
M001 - Mudjacking .....	146	M062 - Stuck Bulb Solutions .....	155
M002 - Home Floor Plan .....	146	M063 - Clothes Washer - Hose Screens .....	156
M003 - Patio Screen Door Adjustment .....	146	M064 - Flood-Proof Washer Hoses .....	156
M004 - Ceiling Fan, Balance Weight.....	146	M065 - Garden Hose Leaks, Fittings.....	156
M005 - Swale Drainage Around Home .....	146	M066 - Paint vs. Primer .....	156
M006 - Sources of Moisture .....	146	M067 - Hose Fitting Leak .....	156
M007 - Moist Warm Air Rises .....	147	M068 - Hose Split, Fix .....	156
M008 - Wind Pushes Air Through a Home .....	147	M069 - Clean the Disposal .....	157
M009 - Caulk Technique - Gaps.....	147	M070 - Water Moves with Air - Cold Climate .....	157
M010 - Caulk Technique - Corner Joint.....	147	M071 - Rain Barrel, Roof Drainage .....	157
		M072 - Rain Barrel with Auto Diverter .....	157
		M073 - Rain Barrel with Manual Diverter.....	157

# HOME SYSTEMS ILLUSTRATED

M074 - Rain Barrel, Problems .....	157
M075 - Clean Shower Head .....	158
M076 - Squeaky Door - Oil Hinge.....	158
M077 - Plumb, Level, Square.....	158
M078 - 5 in 1 Painter's Tool.....	158
M079 - Faucet Strainer Problems.....	158
M080 - Sticking Light Bulb.....	158
M081 - Bucket Flush.....	159
M082 - How Radon Enters a Home.....	159
M083 - Radon (Uranium Decay).....	159
M084 - Radon Health Risk - U.S.....	159
M085 - Stair Guardrail.....	159
M086 - Guard Railing.....	159
M087 - Stair Requirements.....	160
M088 - Guardrail, Ladder-Type.....	160
M089 - Stair Handrail Requirements.....	160
M090 - Stair Rise and Run.....	160
M091 - Stair Tread Requirements.....	160
M092 - Threshold Height - Safety.....	160

## CHAPTER 10 - PLUMBING.....161

P001 - Gas Shutoff Valve .....	163
P002 - Exterior Gas Meter and Shutoff .....	163
P003 - Typical Fuel Oil Tank in Basement.....	163
P004 - Propane Gas Tank and Shutoff.....	163
P005 - Water Supply System in a Cold Climate.....	163
P006 - Well Pressure Tanks .....	163
P007 - Ball Valve .....	164
P008 - Gate Valve .....	164
P009 - Globe Valve.....	164
P010 - Hose Bibs.....	164
P011 - Small Saddle Valve .....	164
P012 - Garbage Disposal.....	164
P013 - Garbage Disposal Reset.....	165
P014 - Garbage Disposal Wrench.....	165
P015 - Water Hammer Arresters .....	165
P016 - Drainage, Waste and Vent (DWV) System.....	165
P017 - Storm_Sanitary Sewer in Street.....	165
P018 - Septic System.....	165
P019 - Conventional Septic System.....	166
P020 - Mound Septic System.....	166
P021 - Sewage Ejector Pump .....	166
P022 - Modern Well Storage Tank - Expandable Bladder.....	166
P023 - Air Gap for Dishwasher Drain .....	166
P024 - Toilet - Running at Night.....	166
P025 - Typical Toilet .....	167
P026 - Floor Drain Trap - Sewer Smell.....	167
P027 - Toilet Leak at Floor.....	167
P028 - Sanitary Sewer Cleanout.....	167
P029 - Water Conditioner_Typical Bypass Valving.....	167
P030 - Vermin-Proof Well Cap .....	167
P031 - Backflow Preventer.....	168
P032 - Modern Water Hammer Arrestor.....	168
P033 - Disposal - Potential Trap Problem .....	168
P034 - Hose Bib - Backflow Prevention.....	168
P035 - Air Admittance Valve .....	168
P036 - Plumbing Vent of Island Sink.....	168
P037 - S Trap - Not Allowed.....	169
P038 - Temperature and Pressure (T & P) Valve.....	169
P039 - Faucet Air Gap.....	169

P040 - Sanitary Sewer Check Valve.....	169
P041 - Hose in Laundry Tub - Cross Connection.....	169
P042 - Hose in Laundry Tub - Prevent Contamination.....	169
P043 - Gas Line, Drip Leg.....	170
P045 - Standpipe Drain .....	170
P047 - Water Heater Gas Connections.....	170
P048 - Electrical Disconnect and Reset - Disposal.....	170
P051 - Water Softener Installation - Typical.....	170
P052 - Centrifugal Pump Basics.....	170
P053 - Well Pump - Submersible .....	171
P054 - Well Pressure Tank Problems.....	171
P055 - Well Pump and Pressure Tank, Submersible.....	171
P056 - Well - Main Water Disconnects.....	171
P057 - Well Tank with Air Volume Control.....	171
P058 - Well - Two Pipe Deep Well.....	171
P059 - Shallow Well System .....	172
P060 - Disposal Odor .....	172
P061 - Dishwasher - Water & Electrical Supply.....	172
P062 - Ice Maker Water Supply (Shutoff Valve).....	172
P063 - Water Main Meter - Warm Climate.....	172
P064 - Water Supply_Valve Warm Climate.....	172
P065 - Exterior Gas Meter and Lockable Valve.....	173
P066 - Operating Wrench Type Valve .....	173
P067 - Water Meter with Radio Transmitter.....	173
P068 - Double Water Meter.....	173
P069 - Water Meter with Phone Connection.....	173
P070 - Water Meter with Remote Read.....	173
P071 - Gas Meter Inside.....	174
P072 - Water Cistern.....	174
P073 - Irrigation Meters - Shutoff and Drain.....	174
P074 - Water Softener Flow and Valves.....	174
P075 - Propane Gas Shutoff Valves.....	174
P076 - Gas Shutoff Valve - Typical.....	174
P077 - Hose Bibs - Parts.....	175
P078 - Conventional Septic Tank & Field.....	175
P079 - Mound Septic System - Parts.....	175
P080 - Well Tank with Bladder.....	175
P081 - Typical Water Heater Parts - Electric.....	175
P082 - Typical Water Heater Parts - Gas.....	175
P083 - Water Distribution with Basement.....	176
P084 - Water Distribution with Crawl Space.....	176
P085 - Water Distribution with Slab.....	176
P086 - Metal Distribution Piping.....	176
P087 - Plastic Distribution Piping.....	176
P088 - PEX Piping - Manifold.....	176
P089 - Water Softener - Two Tanks.....	177
P090 - Water Softener - Tank in Tank.....	177
P091 - Water Softener Bypass.....	177
P092 - Iron Removal System.....	177
P093 - Reverse Osmosis Treatment.....	177
P094 - Water Filter.....	177
P095 - Sink with Overflow and Stopper.....	178
P096 - Sink Overflow_Potential Odor.....	178
P097 - Sink Stopper Adjustments.....	178
P098 - Irrigation - Backflow Prevention.....	178
P099 - Sink Plugged - Remove Stopper.....	178
P100 - Sink Plugged - Use Plunger.....	178
P101 - Trap Plugged - Clean with Tool.....	179
P102 - Clean Trap Plugged - Dismantle.....	179
P103 - Polybutylene Plumbing Identification.....	179
P104 - Whirlpool Tub.....	179

P105 - Hot Tub, Spa Equipment.....	179	P166 - Why Use a House Trap.....	189
P106 - Swimming Pool Equipment.....	179	P167 - House Trap Inside.....	190
P107 - Toilet - Water Shutoff.....	180	P168 - Combined Sewer, House Trap in Basement.....	190
P108 - Washer Shutoff - Tub.....	180	P169 - Combined Sewer, Housetrap Outside.....	190
P109 - Washer Shutoff - In Wall.....	180	P170 - Quiet the Sump Pump.....	190
P110 - Water Softener Bypass Lever.....	180		
P111 - Floor Drain Trap.....	180	<b>CHAPTER 11 – ROOFING.....</b>	<b>191</b>
P112 - Electric Water Heater Disconnect.....	180	R001 - Roof - 4_12 Slope.....	192
P113 - Water Softener Disconnects.....	181	R002 - Typical Ice Dam and Leak.....	192
P114 - Humidifier Disconnects - Electric, Water.....	181	R003 - Types of Roofs.....	192
P115 - Mound System Controls_Alarm.....	181	R004 - Roof Terms.....	192
P116 - Whirlpool Controls_Disconnect.....	181	R005 - Components of an Asphalt Shingle Roof.....	192
P117 - Drainage, Waste and Vent (DWV) Details.....	181	R006 - Asphalt Shingles - New vs. Worn.....	192
P118 - Garbage Disposal Wrench.....	181	R007 - Bituminous Membrane.....	193
P119 - Hose Bibs - Types, Details.....	182	R008 - Metal Valley Flashing (Open Valley).....	193
P120 - Sewage Ejector vs. Sump Pump.....	182	R009 - Chimney Flashing.....	193
P121 - Septic System Details.....	182	R010 - Chimney Saddle (Cricket).....	193
P122 - Municipal Storm_Sanitary Sewers.....	182	R011 - Step Flashing - Sidewall.....	193
P123 - Typical Fuel Oil Tank Parts.....	182	R012 - Plumbing Vent Flashing.....	193
P124 - Broken Storm Sewer Issues.....	182	R013 - Roof Slope - Roof Material Type.....	194
P125 - Storm Sewer Test #1.....	183	R014 - Skylight - Potential Problem.....	194
P126 - Storm Sewer Test #2.....	183	R015 - Step Flashing - Sidewall_Building Paper.....	194
P127 - Underground Pipe Abandoned.....	183	R016 - Kick-Out Flashing.....	194
P128 - Dishwasher - Water Hammer Arrestor.....	183	R017 - Wood Shakes.....	194
P129 - Water Hammer Arrestor - Washing Machine #1.....	183	R018 - Tile Roof.....	194
P130 - Water Hammer Arrestor - Washing Machine #2.....	183	R019 - Flat or Low-Slope Roof - Rubber, EPDM.....	195
P131 - Temperance (Tempering) Valve.....	184	R020 - Wood Shingles.....	195
P132 - Water Heater - T & P Discharge Options.....	184	R021 - Ice Dam - Can Light.....	195
P133 - Water Heater - Expansion Tank_Regulator.....	184	R022 - Snow_Roof Rake.....	195
P134 - Copper Press Fitting.....	184	R023 - Snow Melt Sock - Remove Ice Dam.....	195
P135 - Pex Tubing - Installation Tips.....	184	R024 - Roof Edge Flashing - Eave.....	195
P136 - Tankless Water Heater.....	184	R025 - Overhangs Are Important.....	196
P137 - FVIR Gas Water Heater.....	185	R026 - Roof Edge Flashing - Rake Edge.....	196
P138 - Push-Fit Fitting.....	185	R027 - Chimney Saddle (Cricket).....	196
P139 - Underground Storage Tank (UST) #1.....	185	R028 - Chimney Flashing.....	196
P140 - Underground Storage Tank (UST) #2.....	185	R029 - Metal Chimney Parts_Flashing.....	196
P141 - Oil Tank Defects.....	185	R030 - Metal Chimney in Wood Frame_Flashing.....	196
P142 - Temperature Pressure Relief Valve.....	185	R031 - Eave Flashing - Shingles.....	197
P143 - No Air Gap - Back-Up.....	186	R032 - Gutters - High Back_Low Back.....	197
P144 - Dishwasher Air Gap Operation.....	186	R033 - Bituminous Membrane.....	197
P145 - Dishwasher Air Gap Leak.....	186	R034 - Components of a Roof & Gutter System.....	197
P146 - Toilet - Random Filling.....	186	R035 - Bituminous Membrane - Seal Nails.....	197
P147 - Toilet - Poor Flush.....	186	R036 - Metal Drip Edge at Eave.....	197
P148 - Power Flush Toilet.....	186	R037 - Rake Drip Edge.....	198
P149 - Septic System Maintenance.....	187	R038 - Roof Flashing to Vertical Wall.....	198
P150 - Storm_Sanitary Sewer Operation.....	187	R039 - Laminated Shingle Nailing.....	198
P151 - Sewage Ejector Pump.....	187	R040 - Asphalt Shingle Nailing.....	198
P152 - Mound Septic System Operation.....	187	R041 - Asphalt Shingle Nailing Problems.....	198
P153 - Drainage, Waste and Vent Operation.....	187	R042 - Asphalt Shingle and Nailing - (Three Tab).....	198
P154 - Dishwasher - High Loop Drain.....	187	R043 - Asphalt Shingle Nailing Problems.....	199
P155 - Dishwasher Drain Options.....	188	R044 - Plumbing Vent Flashing Problems - Neoprene.....	199
P156 - Drip at the Valve Packing.....	188	R045 - Plumbing Vent Flashing Problems - Lead.....	199
P157 - Clean the Disposal.....	188	R046 - Plumbing Vent Flashing Types.....	199
P158 - Toilet Leak into Bowl.....	188	R047 - Missing Starter Strip.....	199
P159 - Faucet Strainer Problems.....	188	R048 - Worn Asphalt Shingles.....	199
P160 - Bucket Flush.....	188	R049 - New Three-Tab Asphalt Shingles.....	200
P161 - Toilet - Flush and Refill.....	189	R050 - Worn Asphalt Shingles - Shrinkage.....	200
P162 - Exterior Gas Meter and Lockable Valve - Quiz.....	189	R051 - Worn Asphalt Shingles - Curling.....	200
P163 - Typical Toilet - Quiz.....	189	R052 - Worn Asphalt Shingles - Cracks.....	200
P164 - Faucet Drip Wastes Water.....	189	R053 - Worn Asphalt Shingles - Granules Missing.....	200
P165 - Combined Storm and Sanitary Sewer.....	189		

## HOME SYSTEMS ILLUSTRATED

R054 - Worn Asphalt Shingles - Holes .....	200	S028 - Wall Drainage Screen .....	212
R055 - Worn Asphalt Shingles - Nail Pops .....	201	S029 - Deck without Flashing, Half Log .....	213
R056 - Worn Asphalt Shingles - Breakage .....	201	S030 - Window Flashing Problem .....	213
R057 - Shingles, Starter Strip, Drip Edge .....	201	S031 - Metal Head_Cap Flashing Edge .....	213
R058 - Metal Open Valley - Typical Details .....	201	S032 - Termite Shield .....	213
R059 - Closed-Cut Valley .....	201	S033 - Flashing and Paper Direct Water Out .....	213
R060 - Woven Valley .....	201	S034 - Post Tension Cables in Slab .....	213
R061 - Ridge Shingles .....	202	S035 - Post Tension Foundation Slab Detail .....	214
R062 - Shingle Spacing - Typical .....	202	S036 - Pile Foundation .....	214
R063 - Shingle Spacing, Start, Deck .....	202	S037 - Pier, Caisson Foundation .....	214
R064 - Shingle Layout and Spacing Problems .....	202	S038 - Load-Bearing Walls .....	214
R065 - Nails Lifting_Rising .....	202	S039 - Beams - Types .....	214
R066 - Nailing - Standard, High-Wind .....	202	S040 - Floor Joists .....	214
R067 - Metal Edge Flashing .....	203	S041 - Floor Truss Systems .....	215
R068 - Excessive Shingle Overhang .....	203	S042 - Subflooring - Typical Options .....	215
R069 - Asphalt Shingles - Low Slope .....	203	S043 - Subfloor for Mud-Set Ceramic Tile .....	215
R070 - Asphalt Roll Valley - Problems .....	203	S044 - Masonry Veneer Flashing .....	215
R071 - Step Flashing .....	203	S045 - Masonry Veneer Flashing - Problems #1 .....	215
R072 - Zinc Strips .....	203	S046 - Masonry Veneer Flashing - Problems #2 .....	215
R073 - Tar Patching - Chimney Flashing .....	204	S047 - Window Flashing - Brick Veneer .....	216
R074 - Tar Patching - Wall Flashing .....	204	S048 - Window Flashing - Brick Veneer Problems .....	216
R075 - Roof_Siding Clearance .....	204	S049 - Window Flashing - Faux Stone Problems .....	216
R076 - Skylight - Flashing .....	204	S050 - Brick and Stone Leaks .....	216
R077 - Skylight Flashing - Tar .....	204	S051 - Faux Stone & Faux Brick Leaks .....	216
R078 - Sidewall Flashing Details .....	204	S052 - Wall Flashing - Water Flow Fundamentals .....	216
R079 - Flashing to Brick_Masonry Sidewall .....	205	S053 - Water Protection Principles .....	217
R080 - Flashing to Brick Sidewall .....	205	S054 - Veneer Movement - Foundation Issues .....	217
R081 - Flashing - Fastening to Masonry Options .....	205	S055 - Settlement - Block Basement .....	217
R083 - Chimney Flashing - Saddle Issues .....	205	S056 - Foundation Issues - Exterior #1 .....	217
R084 - Broken Storm Sewer Issues .....	205	S057 - Basement Wall Types .....	217
R085 - Storm Sewer Test #1 .....	205	S058 - Foundation Issues - Exterior #2 .....	217
R086 - Storm Sewer Test #2 .....	206	S059 - Rusted Lintel - Cracks, Movement .....	218
R087 - Underground Pipe Abandoned .....	206	S060 - Grading - Soil Too High .....	218
R088 - Downspout Extension Fix.ai .....	206	S061 - Grading - Soil Too High_Fix .....	218
R089 - Roof Terms - Quiz.ai .....	206	S062 - Footings On Slope - 7-Foot Rule .....	218
<b>CHAPTER 12 – STRUCTURE, FRAMING.....207</b>		S063 - Structural Movement, Older Home .....	218
S001 - Band Joist Insulation .....	209	S064 - Detached Garage - Roof Structural Movement .....	218
S002 - Condensation on Windows .....	209	S065 - Garage Door Header Sag .....	219
S003 - Home Cross-Section .....	209	S066 - Window Movement - Structural .....	219
S004 - Foundation Wall Sections .....	209	S067 - Garage_Home Fire Resistance .....	219
S005 - Masonry Exterior Wall Section .....	209	S068 - Brick Home Construction .....	219
S006 - Balloon Frame_Platform Frame .....	209	S069 - Structural Span .....	219
S007 - Typical 2x4 Wall Framing .....	210	S070 - Deck Ledger Flashing .....	219
S008 - Non-Load-Bearing Masonry Veneer .....	210	S071 - Cantilever Deck Flashing .....	220
S009 - Brick Home Elevation_Masonry Lintel Section .....	210	S072 - Deck Terms and Parts .....	220
S010 - Double-Hung Wood Window .....	210	S073 - Deck Terms, Parts #2 .....	220
S011 - Typical Wall Section (2x6 Framed) .....	210	S074 - Deck Joist Spans .....	220
S012 - Home Side View .....	210	S075 - Deck Ledger Attachment - Fasteners .....	220
S013 - Floor Framing Squeak Fix .....	211	S076 - Deck Ledger Fasten with Spacer .....	220
S014 - Roof Framing - Joist, Truss .....	211	S077 - Deck Support without Ledger .....	221
S015 - Swales - Drainage Around Home .....	211	S078 - Deck Ledger Bolting .....	221
S016 - Joist Span - Floor Framing .....	211	S079 - Deck Ledger at Cantilevered House Framing .....	221
S017 - Roof Rafter Span - Shed Roof .....	211	S080 - Deck Ledger Flashing Issue .....	221
S022 - Concrete Control Joints .....	211	S081 - Deck Ledger Board-Fastener Details .....	221
S023 - Control Joint - Concrete Slab .....	212	S082 - Common Deck Ledger Bolting Problems#1 .....	221
S024 - Roof Rafter Span - Gable Roof .....	212	S083 - Common Deck Ledger Bolting Problems #2 .....	222
S025 - Roof Rafter Span - Ridge Beam .....	212	S084 - Deck Post Support Issues .....	222
S026 - Stone Sills Tipping - Brick Veneer .....	212	S085 - Deck Beams (Built Up) .....	222
S027 - Masonry Lintel Section_Flashing .....	212	S086 - Deck Beam to Post Connections .....	222
		S087 - Deck Ledger Attachment with I Joists .....	222
		S088 - Deck Beam and Post Problems .....	222

S089 - Deck Beam Splices Over Posts .....	223	V008 - Bath Exhaust Fan Into Attic.....	235
S090 - Deck Guardrail Requirements.....	223	V009 - Bath Exhaust Fan - Soffit Problems.....	235
S091 - Deck Stair Typical Dimensions .....	223	V010 - Bath_Kitchen Static Vent .....	235
S092 - Deck Stair Typical Level Requirement.....	223	V011 - Kitchen Fan - Recirculating.....	235
S093 - Deck Stair Railing .....	223	V012 - Kitchen Exhaust Fan - Ducted Through Sidewall .....	235
S094 - Deck Stair Stringers - Common Problems .....	223	V013 - Kitchen Exhaust Fan - Ducted Through Roof .....	236
S095 - Deck Stair Handrail Grip Size .....	224	V014 - Kitchen Range Downdraft Fan .....	236
S096 - Deck Railing Post Connection Problems .....	224	V015 - Home Exhaust Duct Options.....	236
S097 - Deck Railing Post Connection Improved .....	224	V016 - Bath Exhaust Elbows, Bends.....	236
S098 - Joist Hanger Nailing.....	224	V017 - Bath Fan Problems .....	236
S099 - Decks Free Standing - Lateral Bracing.....	224	V018 - Bath Exhaust Ducting Through Sidewall.....	236
S100 - Maximum Post Height, Lateral Bracing.....	224	V019 - Bath Exhaust Ducting Through Roof .....	237
S101 - Deck Solid Stair Stringer.....	225	V020 - Bath Exhaust, Central System .....	237
S102 - Deck Framing at Cantilevered Bay .....	225	V021 - Bath Exhaust Fan Through Sidewall.....	237
S103 - Deck Ledger - Incorrect Placement .....	225	V022 - Bath Exhaust Between Framing, Sidewall.....	237
S104 - Scissor Truss .....	225	V023 - Whole House Ventilation Fan.....	237
S105 - Custom Scissor Truss.....	225	V024 - Attic Ventilation Fan - Installation Problems.....	237
S106 - Storage Room Truss .....	225	V025 - Attic Ventilation Fan - Controls.....	238
S107 - Energy Heel Truss .....	226	V026 - Attic Ventilation Grills, Types.....	238
S108 - Adhered Manufactured Stone Veneer (AMSV) .....	226	V027 - Attic Ventilation Grills, NFA Requirements .....	238
S109 - Adhered Stone Clearance to Stoop .....	226	V028 - Outside Air Supply to Heating Return Duct.....	238
S110 - Adhered Stone Clearance to Pavement.....	226	V029 - Outside Air Supply to Heat_Cool Return Duct .....	238
S111 - Siding and Adhered Stone Connections.....	226	V030 - Ventilation - Two Basic Types .....	238
S112 - Adhered Stone, Water Resistant Barrier .....	226	V031 - Backdrafting Fireplace, Kitchen Fan Odor.....	239
S113 - Adhered Stone, Rain Screen Barrier.....	227	V032 - Backdrafting Dryer Can Suck.....	239
S114 - Water Resistant Barrier & Rain Screen.....	227	V033 - Water Heater Signs of Backdrafting.....	239
S115 - Adhered Stone Clearance to Roof .....	227	V034 - Radon Removal - Sub Slab Depressurization .....	239
S116 - Adhered Stone, WRB Overlap at Corners.....	227	V035 - Heat Recovery Ventilator .....	239
S117 - Adhered Veneer, Vertical Transition .....	227	V036 - Sources of Moisture .....	239
S118 - Adhered Stone, Window Sill.....	227	V037 - Moist Warm Air Rises.....	240
S119 - Adhered Stone, Window Jam.....	228	V038 - Wind Pushes Air Through a Home.....	240
S120 - Adhered Stone, Window Head Flashing .....	228	V039 - Wind Over Roof Creates Pressure, Suction .....	240
S121 - Adhered Stone, Water Resistant Barrier Details.....	228	V040 - Types of Fans .....	240
S122 - Adhered Stone, Parts for Application .....	228	V041 - Vented Skylight .....	240
S123 - Adhered Stone, Optional Casing Bead .....	228	V042 - Attic Ventilation Requirements .....	240
S124 - Masonry Veneer vs Adhered Veneer .....	228	V043 - Blocked Soffit Vent.....	241
S125 - Adhered Stone Mortar Scratch Coat.....	229	V044 - Attic Ventilation for Shed Roof .....	241
S126 - Floor Movement - Hump in Floor #1 .....	229	V045 - Attic Venting Without Soffit.....	241
S127 - Floor Movement - Hump in Floor #2 .....	229	V046 - Attic Ventilation - Continuous Soffit Vent.....	241
S128 - Floor Movement - Hump in Floor #3 .....	229	V047 - Combustion Air for Sealed Furnace Room .....	241
S129 - Wood-Framed Sags, Movement #1 .....	229	V048 - Evaporative Cooler (Swamp Cooler), Ductwork .....	241
S130 - Wood-Framed Sags, Movement #2.....	229	V049 - Evaporative Cooler Details .....	242
S131 - Wood-Framed Sags, Movement #3.....	230	V050 - Attic Ventilation - Typical .....	242
S132 - Wood-Framed Load Bearing Walls .....	230	V051 - Whole House Ventilation Fan Problems .....	242
S133 - Floor Deflection Design.....	230	V052 - Attic Ventilation Fan - Controls.....	242
S134 - Floor Sags, Ceramic Tile Issues .....	230	V053 - Heat Recovery Ventilation Controls .....	242
S135 - Cantilevers and Floor Framing.....	230	V054 - Clothes Dryer Venting - Good Conditions.....	242
S136 - Collar Ties and Roof Framing #1 .....	230	V055 - Clothes Dryer Venting - Poor Conditions .....	243
S137 - Collar Ties and Roof Framing #2 .....	231	V056 - Bath Fan Duct Problem #1.....	243
S138 - Structured Wood Shrinkage.....	231	V057 - Bath Fan Duct Problem #2.....	243
S139 - Structural Loads.....	231	V058 - Bath Fan Duct Problem #3.....	243
<b>CHAPTER 13 - VENTILATION .....</b>	<b>233</b>	V059 - Attic Ridge Vent Problem #1 .....	243
V001 - Attic Ventilation - Snow .....	234	V060 - Attic Ridge Vent Problem #2 .....	243
V002 - Attic Ventilation.....	234	V061 - Attic Ridge Vent Problem #3 .....	244
V003 - Bathroom Fan Discharge Through Attic.....	234	V062 - Fascia Attic Vent System .....	244
V004 - Attic Ventilation Fan .....	234	V063 - Radon Removal - Sub Slab Depressurization #2 .....	244
V005 - Attic Ventilation - Ridge Vent.....	234	V064 - Crawl Space Ventilation .....	244
V006 - Bath Exhaust Fan Through Roof .....	234	V065 - Sealed Crawl Space .....	244
V007 - Bathroom Exhaust Fan Problems .....	235	V066 - Radon Removal - Sub Slab Depressurization #3 .....	244
		V067 - How Radon Enters a Home .....	245
		V068 - Radon (Uranium Decay) .....	245

# HOME SYSTEMS ILLUSTRATED

V069 - Radon Health Risk, U.S.....	245
------------------------------------	-----

## CHAPTER 14 – WATER HEATERS ..... 247

W001 - Temperature and Pressure Valve.....	248
W002 - Gas Water Heater with Thumps, Gurgles, and Pops.....	248
W003 - Electric Water Heater Temperature Dial.....	248
W004 - Gas Water Heater Temperature Dial.....	248
W005 - Electric Water Heater Reset.....	248
W006 - Gas Water Heater with Signs of Backdrafting.....	248
W007 - Typical Water Heaters.....	249
W008 - Water Scalding Chart.....	249
W009 - Water Heater Gas Connections.....	249
W010 - Temperature and Pressure (T & P) Valve.....	249
W012 - Water Heater Valves_Disconnects.....	249
W013 - Water Heater in Garage.....	249
W014 - Water Heater Earthquake Areas.....	250
W015 - Water Heater - Oil-Fired.....	250
W016 - Water Heater Gas Connections.....	250
W017 - Electric Water Heater Disconnect.....	250
W018 - Water Heater - Oil-Fired Controls_Disconnect.....	250
W020 - Water Heater - Expansion Tank_Regulator.....	250
W021 - Tankless Water Heater.....	251
W022 - FVIR Gas Water Heater.....	251
W023 - Water Heater - T & P Discharge Options.....	251
W024 - Water Heater T & P - Drip.....	251

## CHAPTER 15 – SPANISH ILLUSTRATIONS .....253

A001S - Sistema de Aire Acondicionado con Horno de Aire Caliente.....	255
A003S - Bomba de Calor.....	255
A009S - Pérdidas en el Aire Acondicionado.....	255
A010S - Aire Acondicionado en el Ático.....	255
A011S - Aire Acondicionado en el Ático - Pérdidas.....	255
A012S - Aire Acondicionado Central Ubicado en el Garaje.....	255
A026S - Detalles del Enfriador Evaporador.....	256
A027S - Enfriador Evaporador, Sistema de Conducto.....	256
A031S - Compresor_Evaporador de Aire Acondicionado.....	256
A032S - Ciclo de Refrigeración - Aire Acondicionado Residencial.....	256
A036S - Condensador de Aire Acondicionado - Respiraderos.....	256
A037S - Condensador de Aire Acondicionado - Está a Desnivel.....	256
B005S - Sótano - Bloque de Concreto.....	257
B011S - Medida para la Nivelación Apropiada.....	257
B065S - Pérdidas de la Canaleta - Sótano Mojado.....	257
B083S - Nivelación - Negative, Cubierta.....	257
B086S - Extensión de la Salida del Bajante.....	257
D013S - Prueba del Sensor de Seguridad de la Puerta del Garaje.....	257
D015S - Puerta del Garaje - Cable de Seguridad.....	258
D017S - Partes de una Puerta de Paneles.....	258
D019S - Construcción de Puertas.....	258
D020S - Puerta de Acero o Fibra de Vidrio.....	258
D030S - Ajuste de una Puerta Deslizante_Derivación.....	258
D034S - Puerta Biplegable - Consejos #1.....	258
D042S - Partes de una Ventana Colgante Doble.....	259
D043S - Ventana Colgante Doble - Cuerdas del Marco.....	259
D046S - Tipos y Estilos de Ventanas.....	259
D047S - Tipos de Vidrio (Vidriado).....	259
D051S - Opción 1 para la Seguridad en una Ventana.....	259
E002S - Tablero de Cortacircuito.....	259
E013S - Reencender un Interruptor de Circuito.....	260
E019S - Tablero de Cortacircuito Exterior - Clima Cálido y Seco.....	260

E022S - GFCI Protégé Otros Tomacorrientes Conectados Después.....	260
E024S - Requisitos de la Entrada Principal de Servicio.....	260
E029S - Entrada Principal de Servicio - Toma a Tierra.....	260
E031S - Polaridad - Tomacorriente, Enchufe.....	260
E034S - Adaptador para un Tomcorriente de 120 Voltios.....	261
E046S - Bombillas_Accesorios de Iluminación.....	261
E068S - Controles de la Bañera de Hidromasaje_Desconexión.....	261
E074S - Entrada Principal de Servicio Subterránea.....	261
E077S - Polaridad Eléctrica de Bombilla.....	261
E078S - Interruptor del Circuito de Fallos en Toma a Tierra.....	261
X014S - Estuco - Cemento Tradicional de Tres Capas.....	262
X015S - EIFS - Estuco Sintético.....	262
F001S - Hogar de Ventilación Directa.....	262
F002S - Típica Chimenea de Mampostería - Conducto Doble.....	262
F007S - Hogar Prefabricado de Marco Metálico.....	262
F009S - Hogar de Mampostería - Suministro de Aire Externo.....	262
F010S - Estufa de Leña.....	263
F024S - Estufa de Leña Insertada con Revestimiento.....	263
F029S - Partes de una Chimenea Metálica.....	263
F030S - Tapa de Lluvia una Chimenea de Mampostería.....	263
F031S - Chimenea Metálica con Marco de Madera.....	263
F038S - Controles del Hogar de Gas - Unidad Sellada.....	263
H001S - Horno de Aire Caliente de Gas.....	264
H007S - Quemador de Aceite Combustible.....	264
H009S - Mantenimiento del Filtro - Horno de Aire Caliente.....	264
H010S - Horno de Aire Caliente y Conductos de Distribución.....	264
H011S - Horno de Aire Caliente - Flujo Horizontal.....	264
H012S - Horno de Aire Caliente - Flujo Hacia Abajo.....	264
H013S - Horno de Aire Caliente con Quemador Aceite.....	265
H023S - Termostato - Calefacción y Enfriamiento.....	265
H025S - Termostato Digital.....	265
H026S - Filtro de Fibra de Vidrio - Dirección del Flujo.....	265
H027S - Filtro de Papel Plisado de 1 Pulgada.....	265
H028S - Filtro de Papel Plisado de 6 Pulgadas.....	265
H029S - Filtro de Aire Electrónico.....	266
H034S - Sistema y Controles de Humidificador.....	266
H038S - Interruptores para Desconectar la Caldera.....	266
H039S - Horno de Aire Caliente en el Garaje.....	266
H040S - Interruptores para Desconectar la Caldera de Vapor.....	266
H042S - Amortiguador del Conduction - Aire Forzado.....	266
H050S - Retornos Superiores e Inferiores - Calefacción.....	267
H057S - Interruptores para Desconectar la Bomba de Calor.....	267
H061S - Horno de Aire Caliente de Gas.....	267
H063S - Filtro de Papel Plisado de 1 Pulgada.....	267
H064S - Filtro de Papel Plisado de 4 a 6 Pulgadas.....	267
I001S - Aislamiento - Cape Cod.....	267
I005S - Ático - Derivación de Aire.....	268
I007S - Círculo de Convección.....	268
I008S - Aislamiento - Barrera Termal_Sello.....	268
I020S - Aislamiento - Pared Típica.....	268
I021S - Aislamiento - Le Mejor Pared.....	268
M011S - Detector_Alarma de Humo.....	268
M019S - Fuentes Potenciales de Monóxido de Carbono en la Casa.....	269
P003S - Tanque Típico de Aceite Combustible en el Sótano.....	269
P004S - Tanque de Gas Propano y Válvula de Cierre.....	269
P005S - Sistema de Suministro de Agua en Clima Frío.....	269
P013S - Reencender el Triturador de Comida.....	269
P015S - Amortiguadores de Agua.....	269
P016S - Sistema de Drenaje, Deshecho, y Ventilación (DWV).....	270
P018S - Sistema Séptico.....	270
P021S - Eyector do Cloaca.....	270

P025S - Inodoro Típico.....	270	V006S - Extractor de Baño a Través del Techo .....	280
P027S - Fuga de Agua en la Base del Inodoro.....	270	V012S - Extractor de Cocina - Conducido a Través de Pared .....	280
P032S - Amortiguador de Agua Moderno .....	270	V013S - Extractor - Conducido a Través del Techo .....	281
P034S - Válvula para Grifo de Manguera - Prevención de Contraflujo .....	271	V018S - Conducto del Extractor de Baño .....	281
P042S - Fregadero de Lavandería - Prevención de Contaminación.....	271	V026S - Rejillas de Ventilación del Ático, Tipos.....	281
P043S - Línea de Gas, Cañería de Drenaje.....	271	V030S - Ventilación - Dos Tipos Básicos .....	281
P051S - Instalación de Suavizador de Agua - Típica.....	271	V042S - Requerimientos para la Ventilación del Ático - Típicos .....	281
P055S - Bomba (Sumergible) de Pozo y Tanque de Presión.....	271	V053S - Controles de Recuperación del Calor y Ventilación.....	281
P061S - Lavaplatos - Suministro de Agua y Electricidad.....	271		
P063S - Tubería Principal_Medidor - Clima Cálido.....	272	<b>CHAPTER 16 - COLOR ILLUSTRATIONS.....</b>	<b>283</b>
P065S - Medidor Exterior de Gas y Válvula de Fijación.....	272	A009C - Air Conditioning Leaks.....	285
P066S - Operar una Válvula con Llave .....	272	A010C - Air Conditioning in Attic.....	285
P076S - Válvula de Cierre de Gas - Típica .....	272	A012C - Central Air From Garage Unit.....	285
P077S - Válvulas para Grifos de Manguera - Partes.....	272	A013C - AC Condenser - Clearance to Obstructions .....	285
P081S - Partes de un Calentador de Agua - Eléctrico.....	272	A014C - AC Condenser - Keep Coil Clean.....	285
P082S - Partes de un Calentador de Agua - a Gas .....	273	A015C - Multi-Zone Forced Air System .....	285
P083S - Distribución de Agua en Casa con Sótano .....	273	A023C - Humidifier With Bypass Duct Off .....	286
P084S - Distribución de Agua en Casa con Espacio Angosto.....	273	A029C - High and Low Return - Cooling .....	286
P085S - Distribución de Agua con Losa.....	273	A036C - AC Condenser - Clearance to Vents .....	286
P101S - Sifón Bloqueado - Limpiar con Alambre o Herramienta.....	273	A037C - AC Condenser - Not Level.....	286
P102S - Sifón Bloqueado - Desarmar.....	273	A040C - Old Heating Ductwork, Typical Upper Level .....	286
P104S - Bañera de Hidromasaje.....	274	A041C - Modern Ductwork, Heating & Cooling .....	286
P105S - el Equipo de Jacuzzi_Spa .....	274	A042C - Whole House Ventilation Fan Problems.....	287
P106S - el Equipo de la Piscina_Alberca.....	274	A047C - A Ton of Cooling .....	287
P117S - Sistema de Drenaje, Deshechos y Respiradero .....	274	A048C - No Cooling, Check This.....	287
P118S - Llave de Triturador de Comida, Reencender .....	274	A049C - Air Conditioning Disconnects.....	287
P119S - Grifos de Manguera - Tipos y Detalles.....	274	B040C - Basement Drainage - Gravel, Tile, Damp Proof.....	287
P120S - Ejector do Cloaca en Comparación a Bomba de Sumidero.....	275	B057C - Soil Settlement - Typical .....	287
P121S - Detalles del Sistema Séptico.....	275	B065C - Gutter Leaks - Wet Basement .....	288
P122S - Alcantarilla de la Municipalidad .....	275	B069C - Window Well Drain .....	288
P123S - Partes de un Tanque de Aceite Combustible Típico .....	275	B084C - Slope and Grading, Ground Cover.....	288
R001S - Techo - Inclinción de 4_12.....	275	B085C - Grading.....	288
R003S - Tipos de Techos.....	275	B086C - Downspout Extension.....	288
R004S - Términos de Techo.....	276	B094C - Sump Pump Discharge Leak.....	288
R006S - Tejas de Asfalto - Nuevas en Comparación con Viejas .....	276	B105C - Grading, Hard Surface Problems .....	289
R017S - Ripias de Madera .....	276	B107C - Basement Parts, Terms .....	289
R018S - Techos de Tejas.....	276	B126C - Downspout Problem and Solutions .....	289
R019S - Techo Plano o de Baja Inclinción - Caucho, EPDM.....	276	B131C - Window Well - Surface Grade Problem.....	289
R020S - Tejas de Madera .....	276	B133C - Window Well Problems .....	289
R032S - Canaletas - Border Alto_Borde Bajo.....	277	B153C - Downspout Extension Fix.....	289
R033S - Membrana Bituminosa en las Canaletas.....	277	B156C - Foundation Components .....	290
R044S - Problemas de Cubrejuntas de Cañerías - Neopreno .....	277	B157C - Basement Wall Types.....	290
R045S - Problemas de Cubrejuntas de Cañerías - Plomo .....	277	B158C - Grading, Gutters, & Downspouts.....	290
R057S - Tejas de Asfalto, Listón Inicial, Gotero de Borde .....	277	B159C - Quiet the Sump Pump.....	290
S004S - Secciones de la Pared de la Cimentación .....	277	D004C - Patio Screen Door Adjustment .....	290
S005S - Sección de Pared de Mampostería Exterior .....	278	D007C - Brick Home Lintel.....	290
S006S - Estructura de Globo - Estructura de Plataforma .....	278	D009C - Garage Door Operator Control Button .....	291
S007S - Estructura Típica de Pared de 2x4.....	278	D011C - Garage Door Operator - Manual Release .....	291
S011S - Sección de Pared Típica (Enmarcado de 2x6) .....	278	D016C - Doorway Parts.....	291
S014S - Estructura del Techo - Viga, Armazón .....	278	D030C - Bypass_Sliding Door Adjustment #1 .....	291
S015S - Zanja - Desagüe.....	278	D031C - Bypass_Sliding Door Adjustment #2 .....	291
S025S - Envergadura de las Vigas del Techo - Cumbreira .....	279	D034C - Bifold Door Tips.....	291
S034S - Cables de Poste de Tensión en la Losa.....	279	D098C - Latch and Strike Plate .....	292
S035S - Losa de Cimentación de Poste de Tensión.....	279	E002C - Electrical Main Circuit Breaker Panel .....	292
S036S - Cimentación de Pilotes.....	279	E008C - Polarity - Correct, Reversed.....	292
S037S - Cimentación de Muelle .....	279	E010C - Doorbell Button.....	292
S038S - Paredes de Carga .....	279	E019C - Electrical Service Outside - Warm, Dry Climate .....	292
S040S - Vigas de Piso.....	280	E024C - Service Entrance Clearance #1.....	292
S041S - Sistemas de Armazón de Piso .....	280	E025C - Service Entrance Clearance #2.....	293
V002S - Ventilación de Ático .....	280	E036C - Switches - 120 Volt, Single Pole, 3-Way .....	293
V005S - Ventilación de Ático - Respiradero de la Cumbreira.....	280		



## HOME SYSTEMS ILLUSTRATED

E047C - Double Tapping Electrical Breaker .....	293	M027C - Electronic Stud Finder .....	303
E048C - Can Light Fixtures - Heat .....	293	M028C - Lumber Sizes - Nominal and Actual .....	303
E056C - Boiler Disconnects for Water and Power .....	293	M029C - On-Center Framing .....	303
E059C - Air Conditioning Disconnects .....	293	M030C - Joist - Subfloor Squeaks, Fixes .....	304
E061C - Heat Pump Disconnects .....	294	M033C - Counter Snap - Special Screw .....	304
E066C - Dishwasher - Water & Electrical Disconnect .....	294	M040C - Wash Siding, Work Up .....	304
E077C - Electrical Polarity at Light .....	294	M041C - Wash Siding - Tools .....	304
E086C - Extension Cord Problems .....	294	M042C - Ghost Stains On Exterior Walls .....	304
E106C - Electrical Outlets in Modern Bathroom .....	294	M048C - Ghost Stains On Walls, Ceiling .....	304
E107C - Electrical Wiring in Modern Kitchen .....	294	M050C - Candle, Trim Wick .....	305
E119C - GFCI - Simple Test .....	295	M051C - Soot-Dirt Above Radiation .....	305
E121C - Circuit_Outlet Tester .....	295	M052C - Construction Clues to Find Studs .....	305
E123C - Can Lights - Proper Bulbs .....	295	M055C - Heavy Picture or Mirror Hanging .....	305
E124C - Compact Fluorescent Lamps .....	295	M058C - Refrigerator, Clean Coil .....	305
E125C - Safety of GFCI vs. Breaker .....	295	M059C - Simple Wall Patch .....	305
E126C - Grounding Concepts - Safety .....	295	M060C - Clothes Dryer Venting, Good Conditions .....	306
E138C - Sticking Light Bulb .....	296	M061C - Clothes Dryer Venting, Poor Conditions .....	306
F012C - Masonry Chimney With Flex Liner .....	296	M062C - Stuck Bulb Solutions .....	306
F018C - Water Heater Signs of Backdrafting .....	296	M063C - Clothes Washer, Hose Screens .....	306
F030C - Rain Cap for Masonry Chimney .....	296	M064C - Flood Proof Washer Hoses .....	306
F032C - Metal Chimney in Wood Frame - Problems .....	296	M065C - Garden Hose Leaks, Fittings .....	306
F035C - Chimney Problems - Masonry Chimney .....	296	M066C - Paint vs. Primer .....	307
F052C - Masonry Chimney Defects - Above Roof .....	297	M069C - Clean the Disposal .....	307
F053C - Chimney - Oversized Flue, Water Heater .....	297	M072C - Rain Barrel With Auto Diverter .....	307
F054C - Chimney - Oversized Flue Fix .....	297	M075C - Clean Shower Head .....	307
H008C - Furnace Utility Disconnects .....	297	M076C - Squeaky Door - Oil Hinge .....	307
H009C - Filter Maintenance - Warm Air Furnace .....	297	M077C - Plumb, Level, Square .....	307
H011C - Warm Air Furnace - Horizontal Flow .....	297	M078C - 5 in 1 Painter's Tool .....	308
H012C - Warm Air Furnace .....	298	M082C - How Radon Enters a Home .....	308
H013C - Warm Air Furnace With Oil Burner .....	298	M083C - Radon (Uranium Decay) .....	308
H019C - Cooling - Low Return Closed .....	298	M084C - Radon Health Risk - U.S. .....	308
H020C - Warm Air Furnace Dampers .....	298	P001C - Gas Shutoff Valve .....	308
H031C - Humidifier Problems .....	298	P005C - Water Supply System in a Cold Climate .....	308
H038C - Boiler Disconnects - Water, Power .....	298	P006C - Well Pressure Tanks .....	309
H040C - Steam Boiler Disconnects .....	299	P009C - Globe Valve .....	309
H042C - Duct Damper - Forced Air .....	299	P015C - Water Hammer Arresters .....	309
H046C - Hydronic Heat - Convective Air Flow .....	299	P016C - Drainage, Waste and Vent (DWV) System .....	309
H050C - High and Low Return - Heating .....	299	P017C - Storm Sanitary Sewer in Street .....	309
H055C - Air Conditioning Disconnects .....	299	P018C - Septic System .....	309
H057C - Heat Pump Disconnects .....	299	P019C - Conventional Septic System .....	310
H061C - Gas Warm Air Furnace .....	300	P021C - Sewage Ejector Pump .....	310
H063C - 1-Inch Pleated Paper Filter .....	300	P023C - Air Gap for Dishwasher Drain .....	310
H068C - Typical Older Hydronic Boiler .....	300	P027C - Toilet Leak at Floor .....	310
H069C - Typical Newer Hydronic Boiler .....	300	P028C - Sanitary Sewer Cleanout .....	310
H070C - Hydronic Boiler - High Efficiency .....	300	P032C - Modern Water Hammer Arrester .....	310
H071C - Gravity-Type Hydronic Boiler (Old) .....	300	P034C - Hose Bib, Backflow Prevention .....	311
H073C - Hydronic Boiler Possible Defects .....	301	P035C - Air Admittance Valve .....	311
H074C - Hydronic Boiler Expansion Tank .....	301	P042C - Laundry Tub Hose, Prevent Contamination .....	311
H078C - Boiler Zone Valves and Controls .....	301	P052C - Centrifugal Pump - Basics .....	311
H098C - Airflow Direction, Furnace Filter .....	301	P054C - Well Pressure Tank Problems .....	311
I001C - Insulation - Cape Cod .....	301	P056C - Well - Main Water Disconnects .....	311
I005C - Attic - Air Bypass .....	301	P061C - Dishwasher, Water & Electrical Supply .....	312
I006C - Attic Trap Door - Insulate, Seal .....	302	P063C - Water Main Meter - Warm Climate .....	312
I008C - Insulation - Thermal Boundary_Envelope .....	302	P064C - Water Supply-Valve Warm Climate .....	312
I019C - Air Bypass - Chimney .....	302	P065C - Exterior Gas Meter and Lockable Valve .....	312
I022C - Ice Dam - Can Light .....	302	P066C - Operating Wrench Type Valve .....	312
I023C - Heating Cost vs R Value - Cold Climate .....	302	P071C - Gas Meter Inside .....	312
M001C - Mudjacking .....	302	P079C - Mound Septic System, Parts .....	313
M004C - Ceiling Fan, Balance Weight .....	303	P083C - Water Distribution to Home With Basement .....	313
M009C - Caulking Techniques .....	303	P084C - Water Distribution to Home With Crawl Space .....	313
M010C - Caulk Technique - Corner Joint .....	303	P085C - Water Distribution With Slab .....	313

## TABLE OF CONTENTS

P096C - Sink Overflow_Potential Odor .....	313	S038C - Load-Bearing Walls .....	318
P097C - Sink Stopper Adjustments .....	313	S057C - Basement Wall Types.....	319
P099C - Sink Plugged - Remove Stopper .....	314	S067C - Home Fire Resistance.....	319
P101C - Trap Plugged - Clean With Tool.....	314	S068C - Brick Home Construction.....	319
P102C - Trap Plugged - Dismantle.....	314	S069C - Structural Span.....	319
P112C - Electric Water Heater Disconnect.....	314	V006C - Bath Exhaust Fan Through Roof.....	319
P117C - Drainage, Waste and Vent (DWV) Details .....	314	V007C - Bathroom Exhaust Fan Problems .....	319
P118C - Garbage Disposal Wrench.....	314	V009C - Bath Exhaust Fan - Soffit Problems .....	320
P119C - Hose Bibs - Types, Details.....	315	V017C - Bath Fan Problems.....	320
P120C - Sewage Ejector vs. Sump Pump.....	315	V024C - Attic Ventilation Fan - Installation Problems .....	320
P121C - Septic System Details .....	315	V034C - Radon Removal - Sub Slab Depressurization.....	320
P136C - Tankless Water Heater .....	315	V039C - Wind Over Roof Creates Pressure, Suction.....	320
P144C - Dishwasher Air Gap Operation.....	315	V056C - Bath Fan Duct Problem #1 .....	320
P145C - Dishwasher Air Gap Leak.....	315	V063C - Radon Removal - Sub Slab Depressurization #2.....	321
P147C - Toilet - Poor Flush .....	316	V066C - Radon Removal - Sub Slab Depressurization #3.....	321
P157C - Clean the Disposal .....	316	V067C - How Radon Enters a Home.....	321
P158C - Toilet Leak into Bowl.....	316	V068C - Radon (Uranium Decay).....	321
P159C - Faucet Strainer Problems.....	316	V069C - Radon Health Risk, U.S .....	321
P160C - Bucket Flush.....	316	W002C - Gas Water Heater With Thumps, Gurgles, and Pops.....	321
P161C - Toilet - Flush and Refill .....	316	W008C - Water Scalding Chart .....	322
P162C - Faucet Drip, Waste Water .....	317	W013C - Water Heater in Garage .....	322
P165C - Combined Storm and Sanitary Sewer .....	317	W021C - Tankless Water Heater .....	322
P165C - Quiet the Sump Pump.....	317	W022C - FVIR Gas Water Heater .....	322
R004C - Roof Terms.....	317	W024C - Water Heater T & P, Drip.....	322
R026C - Roof Edge Flashing - Rake Edge.....	317	X002C - Brick Veneer Flashing .....	322
R048C - Worn Asphalt Shingles .....	317	X013C - Horizontal Panel Flashing Problems .....	323
R067C - Metal Edge Flashings.....	318	X021C - Stone Sills Tipping - Brick Veneer .....	323
R081C - Flashing - Fastening to Masonry Options .....	318	X031C - Water Protection Principles .....	323
R085C - Storm Sewer Test #1 .....	318	X035C - Grading Gutters & Downspouts.....	323
S022C - Concrete Control Joints.....	318		
S026C - Stone Sills Tipping - Brick Veneer .....	318	<b>INDEX .....</b>	<b>325</b>