



This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional person should be sought.

President: Roy Lipner

Publisher and Director of Distance Learning: Evan M. Butterfield

Senior Development Editor: Laurie McGuire

Content Consultant: Alan Carson

Production Coordinator: Daniel Frey

Creative Director: Lucy Jenkins

© 2003

Carson Dunlop & Associates Limited. All rights reserved.

Published by Dearborn™ Real Estate Education
a Division of Dearborn Financial Publishing, Inc.®
a Kaplan Professional Company®
30 South Wacker Drive
Chicago, IL 60606-7481
www.dearbornRE.com

All rights reserved. The text of this publication, or any part thereof, may not be reproduced in any manner whatsoever without written permission in writing from the publisher.

Printed in the United States of America.

03 04 05 10 9 8 7 6 5 4 3 2 1

CONTENTS

INTRODUCTION 1

- Features of This Book 1
- An Overview of Gas and Oil Furnaces 2

CHAPTER 1

INTRODUCTION TO HEATING 3

- 1.1 How Heat Is Generated 4
- 1.2 How To Spread Heat around 4
- 1.3 How To Control Heat 5
- 1.4 Keeping Heat Safe 5
- 1.5 Getting Rid of the Waste Products 5
- 1.6 The BTU—A Measure of the Amount of Heat 6
- 1.7 How Much Heat Do We Need? 6
- 1.8 Why Are Houses Sometimes Uncomfortable Even if There's Enough Heat? 7
- 1.9 The Evolution of Central Heating 8
- 1.10 Heat Transfer 16
 - Chapter Review Questions 20
 - Key Terms 20

CHAPTER 2

GAS METERS AND PIPING 21

- 2.1 Gas Meters 22
- 2.2 Gas Piping 25
 - Chapter Review Questions 36
 - Key Terms 36

CHAPTER 3

COMBUSTION AIR, BURNERS, AND HEAT SHIELDS 37

- 3.1 Combustion Air 38
- 3.2 Inadequate Combustion Air 45
- 3.3 Gas Burner 45
- 3.4 Heat Shield 58
 - Chapter Review Questions 59
 - Key Terms 60

CHAPTER 4**HEAT EXCHANGERS AND FURNACE CABINETS 61**

- 4.1** Heat Exchanger 62
- 4.2** Furnace Cabinets 71
- Chapter Review Questions 77
- Key Terms 77

CHAPTER 5**FAN CONTROLS AND HIGH LIMIT SWITCHES 78**

- 5.1** Fan Controls 79
- 5.2** Limit Switches 80
- 5.3** Conditions 81
- Chapter Review Questions 84
- Key Terms 84

CHAPTER 6**THERMOSTATS AND VENTING SYSTEMS 85**

- 6.1** Thermostats 86
- 6.2** Venting Systems and Vent Connectors 91
- Chapter Review Questions 103
- Key Terms 103

CHAPTER 7**DISTRIBUTION SYSTEM 104**

- 7.1** Overview 105
- 7.2** Blowers 111
- 7.3** Filters 116
- 7.4** Humidifiers 123
- 7.5** Duct Systems, Registers, and Grilles 128
- 7.6** Summary 139
- Chapter Review Questions 139
- Key Terms 140

CHAPTER 8**IMPROVING EFFICIENCY 141**

- 8.1** Conventional Gas Furnace Efficiency 142
- 8.2** Mid-Efficiency Furnaces 143
- 8.3** Condensing Furnaces 153
- 8.4** Conditions 168
- 8.5** Summary 177

Chapter Review Questions	177
Key Terms	178

CHAPTER 9**GRAVITY, COMBINATION, AND VARIABLE OUTPUT
FURNACES 179**

9.1 Gravity Gas Furnace	180
9.2 Combination Furnaces	182
9.3 Variable Output Furnaces	186
Chapter Review Questions	187
Key Terms	187

CHAPTER 10**REVIEW, SEQUENCE OF OPERATIONS,
AND LIFE EXPECTANCIES 188**

10.1 Components	189
10.2 Sequence of Operation	189
10.3 Inspection and Testing Procedure	190
10.4 Life Expectancies of Furnaces	190
Chapter Review Questions	191

CHAPTER 11**STORAGE TANKS, FILL AND VENT PIPES, SUPPLY LINES,
AND FILTERS 193**

Introduction	194
11.1 Oil Storage Tanks	194
11.2 Oil Fill and Vent Pipes	199
11.3 Oil Supply Lines	201
11.4 Oil Filter	203
Chapter Review Questions	204
Key Terms	205

CHAPTER 12**BURNER, REFRACTORY, AND PRIMARY CONTROLLER 206**

12.1 Burner	207
12.2 Refractory or Fire Pot	213
12.3 Primary Controller	215
Chapter Review Questions	217
Key Terms	218

CHAPTER 13**DRAFT REGULATOR AND VENT CONNECTOR 219**

- 13.1** Draft Regulator 220
- 13.2** Vent Connector (Exhaust Flue) 223
 - Chapter Review Questions 229
 - Key Terms 230

CHAPTER 14**EFFICIENCY AND SEQUENCE OF OPERATION 231**

- 14.1** Mid-Efficiency Oil Burners 232
- 14.2** General Efficiency 235
- 14.3** Sequence of Operation for an Oil Furnace 235
 - Chapter Review Questions 236

APPENDIX A**STANDARDS OF PRACTICE 237**

- The ASHI Standards of Practice 237
- Notes on the Standards 242

APPENDIX B**INSPECTION TOOLS 245****APPENDIX C****INSPECTION CHECKLISTS 247****APPENDIX D****INSPECTION PROCEDURES 251**

- The Distribution System 253
- Summary 254

APPENDIX E**ANSWERS TO CHAPTER REVIEW QUESTIONS 255****INDEX 263**