



## CONTRACTORS STATE LICENSE BOARD LICENSE EXAMINATION STUDY GUIDE



### WARM-AIR HEATING, VENTILATING, AND AIR-CONDITIONING (C-20)

#### Content of the Examination

The Warm-Air Heating, Ventilating and Air-Conditioning (C-20) Examination is divided into four major sections:

#### 1. Evaluation, Design, and Estimation (26%)

- HVAC system design and evaluation
- Load and psychrometric calculations
- Duct system design and layout
- Job cost estimation

#### 2. Fabrication, Installation, and Startup (27%)

- Duct system fabrication
- Equipment installation
- Electrical and mechanical components
- Plumbing and refrigeration components
- Air distribution and duct systems
- HVAC system startup

#### 3. Troubleshooting, Repair, and Maintenance (22%)

- HVAC system diagnostic tests and evaluation
- HVAC system maintenance or repair

#### 4. Safety (25%)

- Personal protective equipment (PPE)
- Job site safety requirements (Cal/OSHA)
- Handling hazardous materials

*\*Percentages are approximate\**

#### Test Site Policy

This is a closed-book examination. No reference materials may be used during the examination. All materials brought to the examination site must be left in an unmonitored area at your own risk.

#### Test Strategy

This is a multiple-choice examination with four choices per question. Examination questions are written to provide only one BEST answer. Some questions require mathematical computation. A calculator will be provided.

There is no penalty for guessing. If you are unsure about a particular question, it is better to try to answer the question than to leave the question blank.

Plenty of time is provided to answer all examination questions, so be sure to read each question and its four choices completely and carefully before selecting the BEST possible answer to the question.

#### Sample Questions

Below are three typical examination questions. The correct answer is underlined.

1. What is the function of a thermocouple in a gas furnace?
  - a. It is a safety control for the fan.
  - b. It is a safety device that confirms the existence of a pilot flame.
  - c. It is a safety device for electronic ignition systems.
  - d. It is a safety device that controls the thermostat.
2. A chiller refrigerates which of the following?
  - a. Circulating air
  - b. Carbon dioxide
  - c. Circulating water
  - d. Nitrogen

3. A packaged water source heat pump eliminates which of the following components?

- a. Capacitor
- b. Evaporator
- c. Reversing valve
- d. Air-cooled condenser

*\*All questions are written and reviewed by licensed contractors who are actively working in the trade\**

## Resources

*Publisher information for reference books and code is provided below. Other sources for reference books may be found online. California code books can be viewed online: [www.bsc.ca.gov](http://www.bsc.ca.gov)*

### **2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings.**

California Energy Commission.

PHONE: (800) 772-3300

INTERNET:

[www.energy.ca.gov/title24/2008standards](http://www.energy.ca.gov/title24/2008standards)

### **2016 California Building Code.** California Code of Regulations, Title 24. International Code Council.

PHONE: (800) 786-4452

INTERNET: [www.iccsafe.org](http://www.iccsafe.org)

### **2016 California Electrical Code.** California Code of Regulations, Title 24. BNI Publications, Inc.

PHONE: (888) 264-2665

INTERNET: [www.bni-books.com](http://www.bni-books.com)

### **2016 California Energy Code.** California Code of Regulations, Title 24. International Code Council.

PHONE: (800) 786-4452

INTERNET: [www.iccsafe.org](http://www.iccsafe.org)

### **2016 California Mechanical Code.** California Code of Regulations, Title 24. International Association of Plumbing and Mechanical Officials (IAPMO).

PHONE: (800) 854-2766

INTERNET: [www.iapmo.org](http://www.iapmo.org)

### **2016 California Plumbing Code.**

California Code of Regulations, Title 24. International Association of Plumbing and Mechanical Officials (IAPMO).

PHONE: (800) 854-2766

INTERNET: [www.iapmo.org](http://www.iapmo.org)

### **ASHRAE Handbooks (Fundamentals; HVAC Systems and Equipment; HVAC Applications; and Pocket Guide).** ASHRAE.

PHONE: (800) 527-4723

INTERNET: [www.ashrae.org](http://www.ashrae.org)

### **Doolin's Trouble Shooters Bible (2009).** James Doolin. Doolco, Inc.

PHONE: (800) 886-2653

INTERNET: [www.doolco.com](http://www.doolco.com)

### **HVAC Duct Construction Standards – Metal and Flexible.** Sheet Metal and Air Conditioning Contractors' National Association.

PHONE: (703) 803-2980

INTERNET: [www.smacna.org](http://www.smacna.org)

### **Manual D – Residential Duct Systems.**

### **Manual H – Heat Pump Systems.**

### **Manual J – Residential Load Calculation.**

### **Manual N – Commercial Load Calculation.**

### **Manual P – Psychrometrics.**

### **Manual Q – Commercial Duct Design.**

### **Manual CS – Commercial Applications, Systems and Equipment.**

### **Manual RS – Comfort, Air Quality, and Efficiency by Design.**

### **Manual S – Residential Equipment Selection.**

Air Conditioning Contractors of America.

PHONE: (888) 290-2220

INTERNET: [www.acca.org](http://www.acca.org)

### **Refrigeration & Air Conditioning Technology; Seventh Edition.** Whitman, B., Johnson, B.,

Tomczyk, J., & Silberstein, E. Delmar. Cengage Learning.

PHONE: (800) 354-9706

INTERNET: [www.cengagebrain.com](http://www.cengagebrain.com)

### **State of California General Industry & Electrical Safety Orders (Cal/OSHA) and State of**

### **California Construction & Electrical Safety Orders (Cal/OSHA). 2015.** California Code of Regulations, Title 8. Mancomm.

PHONE: (877) 626-2666

INTERNET: [www.mancomm.com](http://www.mancomm.com)

VIEW ONLINE:

[www.dir.ca.gov/dosh/LawsAndRegulations.htm](http://www.dir.ca.gov/dosh/LawsAndRegulations.htm)

*\*Publisher information is current as of 12/16\**