The Air A General Trade Knowledge Examination is composed of 130 questions. It will be administered in one session via computer in the calm atmosphere of one of our convenient testing centers at a time of your choosing.

The examination will have questions relating to the following content areas and necessary knowledge for each area includes:

- reading and interpreting plans and specifications
- reading and interpreting codes
- basic mathematics (addition, subtraction, multiplication, division, calculations of area and volume, fractions, decimals, percentages, calculating the sides of triangles, square roots, powers of numbers, and solving simple algebraic equations for unknown variables)

You should be prepared to respond to examination questions on any of the content areas listed.

Questions asked and content areas tested on previous examinations should not be assumed to be the only possible questions to be asked or content areas to be tested on this examination.

The percentage of questions shown for each content area may vary by as much as plus or minus three (3) percent. Please refer to the Candidate Information Brochure and the Reference List for additional information.

<table>
<thead>
<tr>
<th>Content Area A</th>
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<tr>
<td>Pre-Installation</td>
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<tr>
<td>1. Reading and interpreting plans and specifications</td>
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<td>knowledge of symbols</td>
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<td>knowledge of equipment efficiency</td>
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<td>knowledge of cost analysis and cost effectiveness</td>
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</table>
7. Determining HVAC load
   (Heating, Ventilation, Air Conditioning)
   knowledge of Florida energy codes
   knowledge of heating and cooling load calculations
   knowledge of R and U factors

8. Determining material and equipment live load requirements
   knowledge of weights of materials
   knowledge of structural capabilities
   knowledge of rigging

9. Designing HVAC systems
   (Heating, Ventilation, Air Conditioning)
   knowledge of equipment efficiency
   knowledge of psychrometrics
   knowledge of heating and cooling loads
   knowledge of seasonally adjusted and energy efficiency ratio
   knowledge of pressure and enthalpy relationship (diagrams)
   knowledge of air flow and duct design
   knowledge of pipe sizing
   knowledge of wiring requirements, procedures and techniques
   knowledge of types of controls and requirements
   knowledge of refrigeration requirements

10. Designing duct systems
    knowledge of air flow and duct design
    knowledge of insulation requirements

11. Determining proper HVAC equipment
    (Heating, Ventilation, Air Conditioning)
    knowledge of manufacturer's equipment
    knowledge of proper sizing
    knowledge of loads
    knowledge of psychrometrics
    knowledge of proper locations of equipment
    knowledge of codes

12. Determining proper pipe sizes
    knowledge of pipe sizing tables
    knowledge of valves and fittings
    knowledge of liquid flow
    knowledge of resistance to flow and friction losses

13. Determining proper control requirements
    knowledge of wiring requirements and procedures and techniques
    knowledge of types of control and requirements
    knowledge of air conditioning equipment
    knowledge of refrigeration equipment

14. Determining proper fan motor requirements
    knowledge of wiring requirements, procedures and techniques
    knowledge of fans
    knowledge of fan motors
    knowledge of fan performance and CFM

15. Determining proper pipe insulation
    knowledge of heating and cooling loads
    knowledge of R and U factors
    knowledge of insulating techniques and requirements

16. Determining proper compressor capacity
    knowledge of heating and cooling loads
    knowledge of refrigeration requirements

17. Designing grease handling duct systems
    knowledge of air flow and duct design
    knowledge of sizing
    knowledge of fan and motor capabilities
    knowledge of filter requirements
    knowledge of fire and building codes

18. Unloading, lifting and lowering materials
    knowledge of safety requirements
    knowledge of loading and lifting equipment
    knowledge of rigging techniques and requirements

19. Determining proper mechanical equipment
    knowledge of fire codes
    knowledge of safety requirements
    knowledge of sprinkler and standpipe requirements
    knowledge of design requirements

20. Determining proper pump requirements
    knowledge of pump types, capacities, and requirements
    knowledge of fluid flow
21. Determining proper boiler requirements
   knowledge of boiler requirements
   knowledge of pressure requirements
   knowledge of steam properties
   knowledge of fuel gas requirements
   knowledge of fuel oil requirements

22. Layout and determining pipes, valves, fittings, and related components
   knowledge of pump types and requirements
   knowledge of valve and fitting types and requirements
   knowledge of tank sizing
   knowledge of fluid flow
   knowledge of pipe fitting
   knowledge of metal pipe requirements
   knowledge of plastic pipe requirements

23. Determining appropriate pipe sealants
   knowledge of welding
   knowledge of pipe fitting
   knowledge of metal pipe properties
   knowledge of plastic pipe properties

24. Complying with piping plans and specifications

Content Area B  9%
Sheet Metal Ducts

1. Fabricating rectangular ducts under 2 ft
   knowledge of sheet metal ducts
   knowledge of fiberglass ducts
   knowledge of flex ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles

2. Fabricating rectangular ducts over 2 ft.
   knowledge of sheet metal ducts
   knowledge of fiberglass ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles

3. Fabricating round ducts
   knowledge of sheet metal ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles
   knowledge of flex ducts
   knowledge of duct socks

4. Taping duct seams
   knowledge of sheet metal ducts
   knowledge of fiberglass ducts
   knowledge of flex ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles
   knowledge of mastics and tapes

5. Fabricating standing seams for sheet metal ducts
   knowledge of duct fittings
   knowledge of sheet metal ducts

6. Fabricating snap lock seams for sheet metal ducts
   knowledge of duct fittings
   knowledge of sheet metal duct design requirements

7. Fabricating other locks and seams
   knowledge of sheet metal ducts
   knowledge of fiberglass duct liners

8. Fabricating interior lined sheet metal ducts
   knowledge of duct fittings
   knowledge of sheet metal duct design requirements

9. Fabricating fittings for rectangular ducts
   knowledge of duct fittings
   knowledge of sheet metal ducts

10. Fabricating fittings for round ducts
    knowledge of duct fittings
    knowledge of sheet metal layout

11. Fabricating kitchen hoods
    knowledge of codes
    knowledge of sheet metal layout

12. Fabricating kitchen hood exhausts
    knowledge of codes
    knowledge of sheet metal layout

13. Fabricating drain pans
    knowledge of codes
    knowledge of sheet metal layout
Content Area C    23%
Installation of Refrigeration and HVAC Systems

1. Installing split system air conditioners
   - knowledge of duct fittings
   - knowledge of sheet metal ducts
   - knowledge of air handlers
   - knowledge of refrigerant piping
   - knowledge of insulation requirements
   - knowledge of thermostats
   - knowledge of heat strips
   - knowledge of condensate piping
   - knowledge of condensate overflow protection

2. Installing package system air conditioners
   - knowledge of refrigeration cycles
   - knowledge of thermostats
   - knowledge of heat strips
   - knowledge of condensate piping
   - knowledge of condensate overflow protection

3. Installing split system heat pumps
   - knowledge of refrigeration cycles
   - knowledge of condensers
   - knowledge of air handlers
   - knowledge of refrigerant piping
   - knowledge of insulations
   - knowledge of thermostats
   - knowledge of heat strips
   - knowledge of condensate piping
   - knowledge of condensate overflow protection
   - knowledge of fire stats

4. Installing package heat pumps
   - knowledge of refrigeration cycles
   - knowledge of heat pump installation requirements
   - knowledge of thermostats
   - knowledge of heat strips
   - knowledge of condensate piping
   - knowledge of condensate overflow protection
   - knowledge of fire stats

5. Installing air-cooled systems
   - knowledge of air-cooled condensers
   - knowledge of air-cooled system installation requirements

6. Installing water cooled systems
   - knowledge of water-cooled condensers
   - knowledge of water-cooled system installation requirements

7. Installing secondary coolant systems
   - knowledge of secondary coolant condensers

8. Installing chilled water (or other temperature) systems
   - knowledge of chilled water loops
   - knowledge of water chillers and evaporators
   - knowledge of release vents
   - knowledge of air separators

9. Installing water towers
   - knowledge of evaporative cooling
   - knowledge of water tower principles, forced drag and induced drafts
   - knowledge of secondary coolant condensers

10. Installing systems under 25 tons
    - knowledge of installation techniques for system and associated components
    - knowledge of dead loads
    - knowledge of controls
    - knowledge of wiring procedures and techniques
    - knowledge of compressor capacities

11. Installing systems between 25 - 100 tons
    - knowledge of installation techniques for system and associated components
    - knowledge of dead loads
    - knowledge of wiring procedures and techniques
    - knowledge of compressor capacities

12. Installing systems over 100 tons
    - knowledge of installation techniques for systems and associated components
    - knowledge of dead loads
    - knowledge of wiring procedures and techniques
    - knowledge of compressor capacities

13. Installing centrifugal compressor systems
    - knowledge of centrifugal compressors
    - knowledge of chilled water systems
    - knowledge of chilled water loops
    - knowledge of water chillers and evaporators
    - knowledge of pipe fittings
    - knowledge of motor starters
    - knowledge of gauges
    - knowledge of valves and fittings

14. Installing absorption cycle systems
    - knowledge of absorption cycles
    - knowledge of absorption cycle refrigerants
    - knowledge of refrigerant piping
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<tr>
<th>15. Installing ultra low temperature systems</th>
<th>22. Installing smoke detectors</th>
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<th>16. Installing low and medium temperature systems</th>
<th>23. Installing exhaust (or make-up air) systems</th>
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<th>24. Installing grease handling duct systems</th>
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<th>18. Installing reach-in coolers</th>
<th>25. Installing ammonia refrigerant systems</th>
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<th>19. Installing ventilation systems (duct work)</th>
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<tr>
<th>21. Installing ground water (geothermal) heat pumps</th>
<th>28. Performing fire department required smoke tests</th>
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<tr>
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Content Area D 14%
Installation of Refrigeration and HVAC Equipment Components

1. Installing air-cooled condensers
   knowledge of wiring requirements, procedures and techniques
   knowledge of air-cooled condenser characteristics
   knowledge of metal pipes
   knowledge of refrigerant piping

2. Installing water-cooled condensers
   knowledge of wiring requirements and procedures and techniques
   knowledge of water tower characteristics
   knowledge of water-cooled condenser characteristics
   knowledge of secondary coolant condensers
   knowledge of metal pipes
   knowledge of plastic pipes
   knowledge of pipe fittings
   knowledge of refrigerant piping
   knowledge of all refrigerants

3. Installing hermetic and semi-hermetic compressors
   knowledge of wiring requirements, procedures and techniques
   knowledge of compressor characteristics
   knowledge of metal pipes
   knowledge of refrigerant piping
   knowledge of all refrigerants

4. Installing centrifugal compressors
   knowledge of wiring requirements, procedures and techniques
   knowledge of centrifugal compressor characteristics
   knowledge of types of refrigerants
   knowledge of power requirements
   knowledge of design operating pressures
   knowledge of motor efficiency ratings
   knowledge of metal pipe fittings
   knowledge of refrigerant piping

5. Installing air handlers and evaporators
   knowledge of wiring requirements, procedures and techniques
   knowledge of metal pipes
   knowledge of refrigerant piping
   knowledge of all refrigerants
   knowledge of control needs and requirements

6. Installing fans and blowers
   knowledge of wiring requirements, procedures and techniques
   knowledge of air flow and duct designs
   knowledge of fans
   knowledge of fan motors
   knowledge of air handlers
   knowledge of condensers

7. Installing motors for fans and blowers
   knowledge of wiring requirements, procedures and techniques
   knowledge of air flow and duct designs
   knowledge of fans
   knowledge of fan motors
   knowledge of air handlers

8. Installing sheet metal duct work
   knowledge of sheet metal ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles

9. Installing fiberglass duct work
   knowledge of fiberglass ducts
   knowledge of duct fittings
   knowledge of duct outlets and grilles
   knowledge of duct hanging techniques and requirements

10. Installing other duct work (flexible)
    knowledge of air flex duct installation and fastening techniques
    knowledge of duct fittings
    knowledge of duct outlets and grilles

11. Installing grilles, registers and volume dampers
    knowledge of air flow and duct designs
    knowledge of duct outlets and grilles

12. Installing fire dampers and metal chimneys
    knowledge of fire codes
    knowledge of fire dampers and metal chimney installations and fastenings

13. Installing refrigerant piping
    knowledge of brazing
    knowledge of refrigerant piping
    knowledge of pipe fittings
    knowledge of pipe hanging
    knowledge of pipe sizing
14. Installing horizontally supported piping
   knowledge of weights of materials
   knowledge of structural capabilities
   knowledge of hangers
   knowledge of supports

15. Installing flues
   knowledge of sheet metal duct installation techniques
   knowledge of duct fittings
   knowledge of gas codes

16. Installing air filters
   knowledge of air filter installation techniques

17. Installing warm air appliances (heaters)
   knowledge of heater installation techniques
   knowledge of wiring procedures and techniques
   knowledge of fire codes

18. Installing gas appliances
   knowledge of fuel gases
   knowledge of gas appliances
   knowledge of installing controls
   knowledge of wiring procedures and techniques
   knowledge of gas codes

19. Installing fuel oil appliances
   knowledge of fuel oils
   knowledge of fuel appliance installation techniques
   knowledge of types of controls and requirements
   knowledge of wiring requirements, procedures and techniques

20. Installing heat exchangers
   knowledge of heat transfer
   knowledge of installing controls
   knowledge of wiring requirements, procedures and techniques

21. Installing receivers
   knowledge of receivers
   knowledge of refrigerant piping
   knowledge of local codes

22. Installing heat strips
   knowledge of wiring requirements, procedures and techniques
   knowledge of heat strips
   knowledge of fire stats
   knowledge of fire codes

23. Installing copper tubing and fittings
   knowledge of copper tubing
   knowledge of refrigerant piping
   knowledge of brazing
   knowledge of pressure testing

24. Installing other tubing or fittings
   knowledge of metal pipes
   knowledge of welding
   knowledge of brazing
   knowledge of pressure testing

25. Welding and brazing copper tubing
   knowledge of welding
   knowledge of copper tubing

26. Silver brazing copper to steel joints
   knowledge of welding
   knowledge of copper tubing
   knowledge of metal pipes

27. Flaring copper tubing
   knowledge of copper tubing
   knowledge of flaring tools

28. Soft soldering copper tubing
   knowledge of brazing
   knowledge of copper tubing

29. Soldering swaged joints
   knowledge of brazing
   knowledge of copper tubing
   knowledge of metal pipe
   knowledge of swaging tools

30. Welding metal with filler rods
   knowledge of metal pipes
   knowledge of welding

31. Installing steel pipes
   knowledge of piping and steel pipes
   knowledge of pipe fittings
   knowledge of hangers
   knowledge of welding

32. Threading pipes
   knowledge of pipe fittings
   knowledge of metal pipes

33. Cutting mild steel with oxy-acetylene torches
   knowledge of oxy-acetylene torches
   knowledge of metal pipe characteristics
34. Installing refrigerant tubing under 2 inches
   knowledge of brazing
   knowledge of copper tubing
   knowledge of flaring tools
   knowledge of swaging tools
   knowledge of copper fittings
   knowledge of oxy-acetylene torches

35. Installing refrigerant tubing 2 inches or over
   knowledge of brazing
   knowledge of copper tubing
   knowledge of flaring tools
   knowledge of swaging tools
   knowledge of copper fittings
   knowledge of oxy-acetylene torches

36. Installing refrigerant metering devices
   knowledge of expansion valves
   knowledge of capillary tubes
   knowledge of brazing
   knowledge of copper tubing

37. Installing heat pump reversing valves
   knowledge of reversing valves
   knowledge of copper tubing
   knowledge of low-voltage wiring

38. Installing thermostatic expansion valves
   knowledge of expansion valves
   knowledge of copper tubing

39. Installing capillary tube metering devices
   knowledge of capillary tubes
   knowledge of copper tubing

40. Installing liquid line dryers and filters
   knowledge of dryer and filters
   knowledge of copper tubing
   knowledge of vacuum systems
   knowledge of refrigerant recovery

41. Installing suction line dryers and filters
   knowledge of dryers and filters
   knowledge of copper tubing
   knowledge of vacuum systems
   knowledge of refrigerant recovery

42. Installing heat pump line dryers and filters
   knowledge of dryers and filters
   knowledge of copper tubing
   knowledge of vacuum systems
   knowledge of refrigerant recovery

43. Installing oil traps
   knowledge of oil traps
   knowledge of copper tubing

44. Installing bellows-type temperature controls
   knowledge of control requirements
   knowledge of temperature requirements
   knowledge of copper tubing
   knowledge of bellows-type temperature controls

45. Installing chilled water low temperature controls
   knowledge of low temperature controls
   knowledge of control requirements
   knowledge of temperature requirements
   knowledge of low-voltage wiring

46. Installing dual, high or low-pressure control switches
   knowledge of high and low pressure control characteristics
   knowledge of brazing
   knowledge of copper tubing
   knowledge of pressure requirements
   knowledge of low-voltage wiring
   knowledge of control installation techniques

47. Installing temperature controls
   knowledge of temperature requirements
   knowledge of pressure requirements
   knowledge of control requirements
   knowledge of low-voltage wiring

48. Installing oil-pressure safety control switches
   knowledge of pressure requirements
   knowledge of safety requirements
   knowledge of pipe fittings
   knowledge of control characteristics
   knowledge of low-voltage wiring

49. Installing summer-winter switch-over controls
   knowledge of low-voltage wiring
   knowledge of temperature requirements
   knowledge of control requirements

50. Installing thermostats
   knowledge of low-voltage wiring
   knowledge of temperature requirements
   knowledge of control characteristics
51. Installing water regulating valves
knowledge of low-voltage wiring
knowledge of temperature requirements
knowledge of control requirements
knowledge of pressure requirements
knowledge of bellows-type temperature controls
knowledge of water valves

52. Installing pressure regulators and strainers
knowledge of design pressure requirements
knowledge of control characteristics
knowledge of hot gas bypasses

53. Installing humidity and thermostatic controls
knowledge of control characteristics
knowledge of calibrating controls
knowledge of low-voltage wiring
knowledge of manufacturer's recommendations

54. Installing pneumatic controls
knowledge of pneumatic piping
knowledge of pneumatic controls
knowledge of air compressors
knowledge of control requirements

55. Installing solid-state controls
knowledge of manufacturer's recommendations
knowledge of codes

56. Soldering electrical connections
knowledge of brazing
knowledge of electrical wiring procedures and techniques

57. Installing transformers
knowledge of electrical wiring procedures and techniques
ability to read wiring diagrams

58. Installing capacitors
knowledge of electrical wiring procedures and techniques

59. Installing contactors
knowledge of electrical wiring procedures and techniques

60. Installing current relays
knowledge of electrical wiring procedures and techniques

61. Installing safety disconnects
knowledge of electrical wiring procedures and techniques

62. Installing defrost timers
knowledge of electrical wiring procedures and techniques
knowledge of control requirements
knowledge of wiring diagrams
knowledge of placement of electrical wires
knowledge of electrical relationship between current voltage and resistance

63. Installing defrost heaters
knowledge of electrical wiring procedures
knowledge of control requirements
knowledge of defrost operation

64. Installing defrost thermostats
knowledge of electrical wiring procedures and techniques
knowledge of control requirements
knowledge of wiring diagrams
knowledge of placement of electrical wires
knowledge of electrical relationship between current voltage and resistance

65. Installing air-pressure switches
knowledge of pneumatic piping
knowledge of pneumatic controls
knowledge of air compressors
knowledge of wiring diagrams
knowledge of placement of electrical wires
knowledge of electrical relationship between current voltage and resistance

66. Installing electric humidistats
knowledge of electrical wiring procedures and techniques
knowledge of humidity control requirements
knowledge of wiring diagrams
knowledge of placement of electrical wires
knowledge of electrical relationship between current voltage and resistance

67. Installing electronic air cleaners
knowledge of electrical wiring procedures and techniques
knowledge of wiring diagrams
knowledge of placement of electrical wires
knowledge of electrical relationship between current voltage and resistance
knowledge of manufacturer's recommendations
68. Wiring three-phase equipment  
knowledge of electrical wiring procedures and techniques  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

69. Wiring single-phase equipment  
knowledge of electrical wiring procedures and techniques  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

70. Installing three-phase equipment  
knowledge of electrical wiring procedures and techniques  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

71. Installing single-phase equipment  
knowledge of electrical wiring procedures and techniques  

72. Installing capacitor start motors  
knowledge of electrical wiring procedures and techniques  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  
knowledge of fan motors  
knowledge of compressor requirements  

73. Installing shaded-pole motors  
knowledge of electrical wiring procedures and techniques  
knowledge of fan motors  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

74. Installing split-phase motors  
knowledge of electrical wiring procedures and techniques  
knowledge of fan motors  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

75. Installing fan blades  
knowledge of fans  
knowledge of wiring diagrams  
knowledge of placement of electrical wires  
knowledge of electrical relationship between current voltage and resistance  

76. Installing fan control switches  
knowledge of electrical wiring procedures and techniques  
knowledge of fan motors  
knowledge of control requirements  
knowledge of low-voltage wiring  

77. Installing hermetic compressor overload protectors  
knowledge of electrical wiring procedures and techniques  
knowledge of safety requirements  

78. Installing fan belts  
knowledge of fans  
knowledge of motor amperage requirements  

79. Installing drive pulleys  
knowledge of fans  
knowledge of pulley ratios  
knowledge of motor amperage requirements  

80. Installing limit control switches  
knowledge of control characteristics  
knowledge of safety requirements  

81. Installing solenoid coils  
knowledge of electrical wiring procedures and techniques  
knowledge of low-voltage wiring  

82. Installing magnetic starters  
knowledge of electrical wiring procedures and techniques
83. Installing starting relays
   knowledge of electrical wiring procedures and
techniques

84. Installing duty-motor protection devices
   knowledge of electrical wiring procedures and
techniques

85. Installing motor controllers
   knowledge of motor controllers
   knowledge of proper motor and overcurrent
   protection
   knowledge of circuit breakers and fuses
   knowledge of electrical wiring procedures
   knowledge of controls

86. Installing plastic pipes and fittings
   knowledge of plastic pipes and fittings
   knowledge of different grades of pipe
   knowledge of pressure testing
   knowledge of safety codes
   knowledge of joining materials
   knowledge of cleaning and gluing materials

87. Installing of surge protectors
   knowledge installation techniques
   knowledge of SP Sizing

88. Installing of phase monitors
   knowledge of PM installation
   knowledge of PM sizing

89. Installing of geothermal systems
   knowledge of sizing of geothermal loops
   knowledge of loop types

Content Area E 9%
Maintenance Analysis of Refrigeration and
HVAC Systems

1. Reading pressure and enthalpy diagrams for
   various refrigerants
   knowledge of pressure and enthalpy
   relationships
   knowledge of reading pressures
   knowledge of gauges
   knowledge of refrigeration testing equipment

2. Reading and analyzing electrical circuits
   knowledge of electrical wiring procedures and
   techniques
   knowledge of low-voltage wiring
   knowledge of electrical testing equipment

3. Testing current relays
   knowledge of electrical wiring procedures and
   techniques
   knowledge of electrical testing equipment

4. Testing capacitors
   knowledge of electrical wiring procedures and
   techniques
   knowledge of electrical testing equipment

5. Testing defrost thermostats
   knowledge of controls
   knowledge of manufacturer's recommendations

6. Testing high-voltage transformers
   knowledge of electrical wiring procedures and
   techniques
   knowledge of electrical testing equipment

7. Testing high-voltage relays
   knowledge of electrical wiring procedures and
   techniques
   knowledge of electrical testing equipment

8. Testing low-voltage relays
   knowledge of low-voltage electrical wiring
   procedures and techniques
   knowledge of electrical testing equipment
   ability to utilize a amprobe
   ability to utilize a ohmmeter

9. Testing magnetic starters
   knowledge of electrical wiring procedures and
   techniques
   knowledge of electrical testing equipment

10. Testing potential relays
    knowledge of electrical wiring procedures and
    techniques
    knowledge of electrical testing equipment

11. Testing appropriate motor terminals
    knowledge of electrical wiring procedures and
    techniques
    knowledge of electrical testing equipment
12. Determining operating pressures of refrigeration or air conditioning systems
   knowledge of design pressure requirements
   knowledge of refrigerant pressure gauges
   knowledge of pressure and temperature relationships

13. Determining air volumes
   knowledge of air flow and duct designs
   ability to utilize a velometer
   ability to utilize a pitot tube
   ability to utilize a manometer
   ability to utilize a volume flow meter (flow hood)

14. Determining changes in enthalpy
   knowledge of refrigeration testing equipment
   knowledge of psychrometrics
   ability to utilize a thermometer
   ability to utilize a psychrometer

15. Determining wet bulb and dry bulb temperatures
   knowledge of refrigeration testing equipment
   knowledge of psychrometrics
   ability to utilize a thermometer
   ability to utilize a psychrometer

16. Determining current draw (amperage)
   knowledge of electrical wiring procedures and techniques
   knowledge of electrical testing equipment
   ability to utilize an amprobe
   ability to utilize a volt-ohm meter

17. Determining voltages
   knowledge of electrical wiring procedures and techniques
   knowledge of electrical testing equipment
   ability to utilize an amprobe
   ability to utilize a volt-ohm meter

18. Determining power consumption
   knowledge of electrical wiring procedures and techniques
   knowledge of electrical testing equipment

19. Determining working pressure in pipes
   knowledge of pressure testing gauges
   knowledge of access valves

20. Testing non-pressure type storage tanks
    knowledge of tanks and pollution controls

21. Using testing equipment
    (velometer, amprobe, volt-ohm meter, vacuum gauges, etc.)
    knowledge of electrical testing equipment
    knowledge of refrigeration testing equipment
    knowledge of how and when to use equipment

22. Using chlorine and halogen leak detecting devices
    knowledge of refrigeration testing equipment
    knowledge of how and when to use devices

Content Area F 14%
Maintenance Service of Refrigeration and HVAC Systems

1. Using nitrogen regulators
   knowledge of pressure regulators

2. Using other gas regulators
   knowledge of pressure regulators

3. Repairing semi-hermetic compressors
   knowledge of electrical wiring procedures and techniques
   knowledge of mechanical methods and procedures

4. Repairing hermetic compressors
   knowledge of electrical wiring procedure and techniques
   knowledge of mechanical methods and procedures

5. Repairing centrifugal compressors
   knowledge of electrical wiring procedure and techniques
   knowledge of mechanical methods and procedures

6. Repairing blowers
   knowledge of electrical wiring procedures and techniques
   knowledge of fans
   knowledge of fan motors

7. Calibrating air sensitive thermostats
   knowledge of electrical wiring procedures and techniques
   knowledge of fans
   knowledge of fan motors
8. Calibrating chilled-water low temperature controls
   knowledge of low temperature controls
   knowledge of control requirements
   knowledge of low-voltage wiring
   knowledge of temperature requirements
   knowledge of refrigeration testing equipment

9. Calibrating dual or low pressure control switches
   knowledge of high and low pressure controls
   knowledge of brazing
   knowledge of copper tubing
   knowledge of refrigeration testing equipment

10. Calibrating pneumatic controls
    knowledge of pneumatic piping
    knowledge of pneumatic controls
    knowledge of air compressors

11. Calibrating proportional thermostats
    knowledge of low-voltage wiring
    knowledge of temperature requirements
    knowledge of control requirements
    knowledge of refrigeration testing equipment

12. Calibrating summer-winter switch-over controls
    knowledge of low-voltage wiring
    knowledge of temperature requirements
    knowledge of control requirements
    knowledge of refrigeration testing equipment

13. Adjusting thermostatic temperature controls
    knowledge of low-voltage wiring
    knowledge of temperature requirements
    knowledge of control requirements
    knowledge of refrigeration testing equipment

14. Adjusting thermostatic motor controls
    knowledge of low-voltage wiring
    knowledge of temperature requirements
    knowledge of control requirements
    knowledge of refrigeration testing equipment
    knowledge of electrical wiring procedures and techniques

15. Adjusting superheat setting on expansion valves
    knowledge of expansion valves
    knowledge of control requirements
    knowledge of refrigeration testing equipment
    knowledge of superheat

16. Adjusting oil-pressure safety controls
    knowledge of pressure
    knowledge of gauges
    knowledge of pipe fittings
    knowledge of control requirements
    knowledge of low-voltage wiring
    knowledge of refrigeration testing equipment

17. Adjusting temperature controls
    knowledge of temperature requirements
    knowledge of pressure requirements
    knowledge of control requirements
    knowledge of low-voltage wiring
    knowledge of refrigeration testing equipment

18. Adjusting high pressure safety cutouts
    knowledge of high and low temperature controls
    knowledge of electrical wiring procedures and techniques
    knowledge of low-voltage wiring
    knowledge of control operating requirements
    knowledge of refrigeration testing equipment
    knowledge of pressure gauges

19. Adjusting freezer controls
    knowledge of control operating requirements
    knowledge of low-voltage wiring
    knowledge of temperature measurements

20. Adjusting defrost time clocks
    knowledge of control requirements
    knowledge of low-voltage wiring
    knowledge of electrical wiring procedures and techniques
    knowledge of temperature measurement

21. Adjusting bellows-type temperature controls
    knowledge of control requirements
    knowledge of temperature requirements
    knowledge of bellows-type temperature controls operating requirements

22. Operating oil safety control solid state pressure sensing devices
    knowledge of pressure requirements
    knowledge of safety requirements
    knowledge of control operating requirements
    knowledge of low-voltage wiring
    knowledge of refrigeration testing equipment

23. Aligning drive pulleys
    knowledge of mechanical alignments
24. Adjusting tension of v-belts
   knowledge of how and when to adjust

25. Calibrating electric actuating valves
   knowledge of mechanical operation
   requirements
   knowledge of refrigeration testing equipment

26. Calibrating electric humidistats
   knowledge of humidity control requirements
   knowledge of control requirements
   knowledge of low-voltage wiring
   knowledge of refrigeration testing equipment

27. Reversing the rotation of three-phase or single-phase motors
   knowledge of electrical wiring procedures and techniques
   knowledge of electrical testing equipment

28. Starting seized hermetic compressor motors
   knowledge of electrical wiring procedures and techniques
   knowledge of electrical testing equipment

29. Adjusting crankcase pressure regulating valves
   knowledge of pressure regulators
   knowledge of pressure measurement
   knowledge of evaporators
   knowledge of compressors

30. Adjusting evaporator pressure regulating valves
   knowledge of pressure regulators
   knowledge of pressure measurement
   knowledge of evaporators
   knowledge of superheat

31. Adjusting unloaders
   knowledge of pressure measurement (gauges)
   knowledge of effect of pressure on compressor capacities

32. Cleaning cooling towers
   knowledge of cleaning chemicals
   knowledge of scale properties
   knowledge of water deposit controls
   knowledge of bleed-off

33. Cleaning foreign matter from systems
   knowledge of cleaning chemicals
   knowledge of solvents

34. Cleaning water-cooled condensers
   knowledge of cleaning chemicals
   knowledge of water-cooled condensers
   knowledge of organic water problems

35. Cleaning condensate drain lines
   knowledge of safety switches
   knowledge of cleaning and adjusting techniques
   knowledge of repairing condensate drains
   knowledge of condensate pipe installation and traps

Content Area G 9%
Safety and Equipment

1. Wearing hearing and head protection
   knowledge of safety requirements

2. Installing warning signs and barricades
   knowledge of lock-out/tag-out

3. Wearing eye and face protection
   knowledge of safety requirements

4. Using respiratory protection
   knowledge of safety requirements

5. Digging with backhoes, trenchers or tractors
   knowledge of safety requirements

6. Using overhead hoists and cranes
   knowledge of weights
   knowledge of riggings

7. Using ventilation devices
   knowledge of toxic materials

8. Using mobile equipment
   (e.g., forklifts, hi-lifts and cranes)
   knowledge of safety requirements

9. Using ladders, scaffolds and rolling platforms
   knowledge of safety requirements
   knowledge of assembly
10. Using various hand and power tools (e.g., power shears, wrenches and snips)
   knowledge of safety requirements
   knowledge of proper operation procedures

11. Using air compressors
   knowledge of safe operating pressures
   knowledge of safety requirements

Content Area H Energy Management

1. Conduct energy testing
   knowledge of duct pressure testing
   knowledge of blower door tests
   knowledge of the effects of the building envelope on the operations of the HVAC

2. Promote energy efficiency equipment
   knowledge of energy efficient equipment
   knowledge of programmable and Wi-Fi enabled thermostats
   knowledge of zoning system
   knowledge of energy recovery ventilators (ERVs)
   knowledge of cost analysis and cost effectiveness
   knowledge of green buildings and renewable energy

3. Complete energy forms
   knowledge of energy form software
   knowledge of building material efficiencies (R and U factors)
   knowledge of how to calculate thermal resistance

4. Perform load calculations
   knowledge of building materials (R and U Factors)
   knowledge of window efficiencies (heat gain)
   knowledge of impact of outside air change requirements
   knowledge of Florida energy codes
   knowledge of heating and cooling load calculations
   knowledge of how to calculate thermal resistances

Content Area I Indoor Air Quality 3%

1. Manage indoor air quality
   knowledge of UV bulbs
   knowledge of filter types
   knowledge of humidity control systems
   knowledge of air cleaners
   knowledge of air flows (test and balances)
   knowledge of effects of poor air quality on humans