



Heating Professional

TESTING KNOWLEDGE LIST



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Preface

This policy and procedures manual was developed under contract for the Building Performance institute, Inc. The manual will be reviewed on a three-year basis and modification may be made at that time or sooner if it is deemed to improve the certification process.

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1. Heating Professional Testing Knowledge List

1.1 Building Science

1. Basic Terms and Definitions
 1. ACH (air changes per hour)
 2. ACH50 (air changes per hour and 50 Pascals)
 3. CFM (cubic feet per minute)
 4. CFM25 (cubic feet per minute at 25 Pascals)
 5. CFM50 (cubic feet per minute at 50 Pascals)
 6. CFMn (cubic feet per minute natural)
 7. Alternating Current
 8. Direct Current
 9. AFUE
 10. SEER
 11. EER
 12. HSPF
 13. SSE (Steady
 14. Carbon Monoxide
 15. Carbon Dioxide
 16. Oxygen
 17. Sulfur Dioxide
 18. Effective leakage area
 19. FPM (feet per minute)
 20. Area weighted R-Value
 21. Backdrafting
 22. Baseload
 23. British thermal unit (Btu)
 24. Condensation
 25. Condensate
 26. Sones
 27. Pressure differential
 28. Temperature differential
 29. Efficiency
 30. Watt-hour
 31. R and U Value
 32. Ton of refrigeration
 33. Entrainment
 34. Total equivalent length
 35. Dehumidification/Humidification
 36. Inches of Water Column (iwc)
 37. Pascal (Pa)
 38. Internal gains

39. Hydrostatic pressure
40. Natural ventilation
41. Mechanical ventilation
42. Net free area
43. Input capacity
44. Output capacity
45. Gallons Per Hour (GPH)
46. Gallons Per Minute (GPM)
47. Equipment efficiency descriptors
48. Peak Demand
49. Permeability and perm rating
50. Vapor barriers/retarders
51. Building ventilation
52. Solar gain
53. Standby loss
54. IAQ (indoor air quality)
55. IEQ (indoor environmental quality)
56. Psychrometrics
57. Vented/Unvented combustion appliance
58. Direct Vent/Non Direct Vent
59. Sealed/Atmospheric Combustion
60. Upflow/Downflow/Counterflow
61. Flue Gas
62. Sensible/Latent Heat
63. Static Pressure Drop, Total External Static Pressure
64. Oil Viscosity

1.2 Heating Systems and their interaction with other Building Systems

1. Principles of Energy, Air & Moisture
 1. Thermodynamics
 2. Factors that affect insulation performance
 3. Factors that effect mechanical system performance
 4. Wind-driven house pressurization/depressurization
 5. Natural and Mechanical driving forces of infiltration/exfiltration as well as pressurization/depressurization
 6. Heat gain/loss
 7. BTU content of fuels
 8. Moisture transport mechanisms
 9. Principles of combustion
2. Combustion Science
 1. Carbon Dioxide (CO₂)

2. Carbon Monoxide (CO)
 3. Oxygen (O₂)
 4. Sulfur Dioxide (SO₂)
 5. Combustion process
 6. Combustion air
 7. Combustion appliance zone
 8. Spillage
 9. Draft
 10. Combustion appliance venting and concerns
 11. Effect of duct leakage on depressurization of CAZ
 12. Worse Case Depressurization
 13. Combustion Analysis
 14. Steady State Efficiency
 15. Effect of fuel overpressure/underpressure
3. Building Components
 1. Duct configurations and components
 2. Hydronic distribution configurations and components
 3. Structural components of residential construction
 4. Thermal boundary: insulation and air barrier location, effectiveness
 5. Electrical components and safety considerations
 6. Fuel delivery systems and safety considerations
 7. Vent system components and safety considerations
 8. Bulk water management components (drainage plumbing gutters sumps etc)
 9. Vapor barriers, weather-resistant barriers
 10. Radiant barrier principles and installations
 11. Understand/recognize heat and energy recovery ventilators
 12. Understand fenestration types and efficiencies
 13. Understand issues involved with basements crawlspaces and slabs
 14. Understand issues involved with conditioned space
 15. Understand issues involved with attics, crawl spaces, basements, attached garages
 16. Understand issues involved with attached garages
 17. Understand issues involved with interstitial building cavities and bypasses
 18. Understand issues involved with ventilation equipment
 19. Understand basic heating equipment components controls and operation
 20. Understand basic cooling equipment components controls and operation
 21. Understand basic DHW equipment components controls and operation
 22. Identify common mechanical safety controls
 23. Identify insulation types and R-Values
 24. Understand various mechanical ventilation equipment and strategies
4. Conservation Strategies
 1. Understand appropriate applications for fenestration upgrades including modifications or replacement

2. Understand appropriate insulation and air sealing opportunities for upgrades based on existing conditions
 3. Opportunity for ENERGY STAR lighting and appliances
 4. Identify duct sealing opportunities and applications
 5. Understand importance of air leakage control and remediation procedures
 6. Understand importance of air leakage control in conjunction with insulation performance/ improvements
 7. DHW conservation strategies
 8. Heating & cooling efficiency applications
 9. Proper use of available resources to determine heating and cooling equipment sizing distribution system sizing equipment selection (i.e. ANSI/ACCA Manual J/S/D/T or equivalent)
 10. Appropriate application of insulation on the duct/ pipe distribution system
 11. Appropriate applications for sealed crawlspaces basements and attics
5. Comprehensive Building Assessment Process
 1. Understand/recognize areas/topic of customer complaints to determine in interview
 2. Understand/recognize need for conducting appropriate diagnostic procedures
 3. Interaction between mechanical systems envelope systems and occupant behavior
 4. Understand basic mathematics & science
6. Design Considerations
 1. Appropriate insulation applications based on existing conditions
 2. Understand/recognize building locations where non-flammable materials must be used
 3. Understand/recognize building locations where opportunities for retrofit materials and processes are needed to correct problems and/or enhance performance
 4. Understand climate specific concerns
 5. Understand indoor environment considerations for the environmentally sensitive
 6. Understand impact of building orientation
 7. Understand impact of landscape drainage and site grading
 8. Understand impact of shading on loads
 9. Awareness for solar gain reduction in cooling climate
 10. Awareness for solar gain opportunities in heating climate
 11. Appropriate applications for sealed crawlspaces basements and attics
 12. Determine basement air-sealing strategy dependant on the
 13. Interpretation and application of blower door test results

1.3 Measurement and Verification of Building Performance

1. Applied Diagnostics & Troubleshooting
 1. Application of measured air leakage test results
 2. Apply fundamental construction mathematics and unit conversions

3. Understand ventilation needs
 4. Ventilation calculations and strategies
 5. Proper methods for identifying/testing fuel leaks
 6. Psychrometric evaluation
 7. Spillage evaluation
 8. Working knowledge of proper vent design and components
 9. Draft testing
 10. Blower door measurements
 11. Duct leakage testing (total leakage and leakage to outside)
 12. Pressure pan testing
 13. CAZ depressurization
 14. Carbon monoxide measurements
 15. Basic pressure diagnostic procedures including understanding "With Reference To" (WRT)
 16. Recognize contributing factors to health/safety and comfort problems
 17. Recognize contributing factors to performance/reliability/durability problems
 18. Recognize contributing factors to efficiency problems
 19. Combustion gas analysis and data interpretation/application
 20. Measure and verify temperature rise/drop interpret results and apply corrective actions
 21. Inspect for areas containing moisture or bulk water in undesirable locations
 22. Check for proper duct system balance between supply and return
 23. Measure and verify individual register airflow and compare to design specifications
 24. Heat exchanger inspection and appropriate actions
 25. Determine fan cycle settings and sequence of operation
 26. Heating system safety testing
 27. DHW system safety testing
 28. Visual evaluation of the distribution system
 29. Determine and adjust firing rate of appliances
 30. Ensure proper polarity and grounding of the heating system
 31. Fuel storage and delivery system integrity and appropriate actions
 32. Understand and inspect for basic electric safety
 33. Understand and inspect vent/chimney applications
2. Tools and Equipment
 1. Proper applications and use of temperature measuring devices
 2. Appropriate equipment for identification of air distribution problems
 3. Appropriate equipment for identification of hydronic distribution problems
 4. Proper applications and use of blower door equipment
 5. Fuel leak detection
 6. Proper application and use of combustion analysis equipment
 7. Methods of duct leakage testing & equipment
 8. Proper application and use of a pressure differential measuring device

1.4 BPI National Standards and Project Specifications

1. Comprehensive Building Assessment
 1. Understand applicability content and intent of BPI National Standards
 2. Understand applicability and intent of local/state/national codes
 3. Understand applicability and intent of industry good/best practices
 4. Understand applicability and intent of Home Performance with ENERGY STAR
 5. Understand hazards associated with knob & tube wiring and be able to determine if it is live using basic electrical inspection techniques
 6. Use and apply appropriate codes & standards for chimney applications & appropriate material clearances (i.e NFPA-54)
 7. Address attic ventilation requirements
 8. Be able to specify materials and processes needed for building performance projects

1.5 Optimizing the Installation, Operation, and Maintenance of Building Systems

1. Comprehensive Building Assessment
 1. Recognize need for airsealing measures and their impact on other building systems
 2. Recognize need for mechanical equipment improvements
 3. Understand blower door use for identifying critical air sealing areas
 4. Apply blower door test results in development of improvement strategies
 5. Understand needs for protective shielding and baffling for the preparation of insulation installation
 6. Verify installed airflow rates of ventilation devices
 7. Test and balance a supply/return ventilation system for optimal performance
 8. Apply appropriate strategies for assuring insulation/air barrier alignment occurs
 9. Working knowledge of various types of insulation and air sealing techniques and materials
 10. Methods for determining if dense packing procedure has reached appropriate density
 11. Blown: Air pressure to material ratio manufacturers recommended density to achieve the R-value
 12. Using combustion safety testing results for appropriate actions
 13. Understand the impact on load associated with lighting and appliance retrofits
2. Appliances and Lighting
 1. Understand impact on load associated with lighting and appliance retrofits

1.6 Professional Ethics, Conduct & Communications

1. Conservation Strategies
 1. Present options for comprehensive conservation strategies that are consistent with sound building science practices
 2. Understand the implications of building performance improvements on occupants and other building systems/components
 3. Understand the impact of installed actions on cost-benefit analysis guidance
 4. Understand the non energy benefits of building performance improvements
2. Comprehensive Building Assessment
 1. Elements of effective oral communication with customer
 2. Elements of a documentation system
 3. Elements of effective written communication with customer
 4. Understand the role of and basic elements of a quality management system
3. Personal Safety & Work Practices
 1. Locations in which to identify indoor air quality issues
 2. Material Safety Data Sheets
 3. Federal/State/Local Requirements (EPA OSHA)
 4. Isolation procedures for pollutants
 5. Practice building science within your limits of professional competency
 6. Precautions when working around chemical, biological and other potential hazards
 7. Understand the roles and responsibilities of the envelope professional

2. Standards of Reference

All BPI exams are based on a mixture of industry practices, axiomatic¹ concepts, and major standards of references. No singular source exists that could touch upon every aspect for what is considered testable. Conversely, there is no limit to the potential useful material found in print and online.

Heating

- [ANSI/BPI-1200-S-2015 Standard Practice for Basic Analysis of Buildings](#)
- [Technical Standards for the Heating Professional](#)

3. Contact Information

If you have any questions, comments, or concerns regarding the testing knowledge list please contact BPI's Certification Development department at certdev@bpi.org.

¹ An axiomatic concept is something implicit that requires no proof or explanation (e.g. – the sum of 2 and 2 is 4, or gravity states that if you drop something, it will fall to a lower level.