Building Analyst 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. Building Analyst Professional Testing Knowledge List

1.1 Building Science

1. Energy and Thermodynamics
    1. Knowledge of energy terms: watts, BTU/hr, watt-hours, BTU, therm, etc
    2. Knowledge of thermal resistance/transmittance including conversions: R-values, U-Values;
    3. Knowledge of latent and sensible heat
    4. Knowledge of thermal bridges
    5. Knowledge pressure boundaries
    6. Knowledge of thermal boundaries
    7. Basic knowledge of the 2nd Law of Thermodynamics and associated terms: conduction, convection, radiation

2. Combustion Science
    1. Knowledge of the principles of combustion
    2. Knowledge of combustion analysis
    3. Knowledge of Carbon Monoxide (CO) testing of combustion appliances
    4. Basic knowledge of combustion appliance venting configurations
    5. Knowledge of proper vent sizing and vent tables
    6. Knowledge of combustion appliance draft
    7. Knowledge of combustion air
    8. Knowledge of baseline depressurization
    9. Knowledge of worst case depressurization
    10. Knowledge of spillage
    11. Knowledge of backdrafting

3. Moisture and Psychrometrics
    1. Knowledge of moisture transport mechanisms: air flow, diffusion, capillary action
    2. Knowledge of relative humidity and dew point

4. Building Airflow
    1. Knowledge of airflow in buildings and associated terms
    2. Knowledge of ducts and associated terms
    3. Knowledge of stack effect
    4. Knowledge of exfiltration
    5. Knowledge of infiltration
    6. Knowledge of building pressurization/depressurization by various forces

5. Mechanical Systems
    1. Knowledge of total equivalent length
    2. Knowledge of natural and mechanical ventilation
    3. Knowledge of input and output capacity
    4. Knowledge of peak electrical demand

6. Distribution and Controls
    1. Knowledge of net free area
    2. Knowledge of standby loss
    3. Knowledge of basic system controls
    4. Knowledge of distribution systems

7. Indoor Air Quality (IAQ)
    1. Knowledge of IAQ: moisture, CO, dust, VOC's
    2. Knowledge of areas containing moisture
    3. Basic knowledge of Radon
    4. Basic knowledge of mold-like substances
    5. Basic knowledge of asbestos-like material

1.2 Buildings & Their Systems

1. Building Components and Construction
    1. Ability to identify basic structural components of residential construction
    2. Ability to identify basic bulk water management components (drainage, plumbing, gutters, sumps, etc)
    3. Ability to identify existing vapor barriers/retarders
    4. Knowledge of fenestration types and efficiencies
    5. Knowledge of thermal deficiencies in basements, crawlspaces and slabs
    6. Knowledge of attic types (hot roof, vented, vaulted, etc.)
    7. Knowledge of thermal and infiltration issues in attached garages
    8. Knowledge of interstitial cavities and bypasses
    9. Knowledge of the interaction between mechanical systems, envelope systems, and occupant behavior
    10. Understand impact of building orientation, landscape drainage, and grading
    11. Ability to identify thermal bridges

2. Mechanical Equipment
    1. Ability to identify basic duct components
    2. Ability to identify basic hydronic components
    3. Ability to identify basic fuel systems
    4. Ability to identify fuel system safety concerns
    5. Knowledge of basic heating/cooling equipment components controls and operation
    6. Ability to identify common mechanical safety controls
    7. Knowledge of basic DHW equipment components controls and operation

8. Ability to identify basic duct configurations

3. Building Thermodynamics
    1. Ability to identify existing thermal boundaries
    2. Ability to identify radiant barriers
    3. Ability to identify insulation types and R-values
    4. Ability to calculate heating degree days and cooling degree days
    5. Knowledge of heat gain/loss
    6. Knowledge of factors that affect insulation performance

4. Building Airflow
    1. Knowledge of ventilation needs
    2. Knowledge of issues involved with ventilation equipment
    3. Knowledge of various mechanical ventilation equipment and strategies
    4. Knowledge of air leakage control methods and their interaction with other systems

5. Indoor Air Quality
    1. Ability to identify conditions that could promote the growth of mold
    2. Ability to identify presence of mold-like substance
    3. Ability to identify asbestos-like substances

6. Renewables Potential
    1. Knowledge of opportunity for potential renewable energy applications

1.3 Testing & Data Collection

1. Combustion Safety Testing
    1. Identify proper appliance and combustion appliance venting
    2. Knowledge of Carbon Monoxide (ambient & combustion byproduct)
    3. Ability to set up home in natural conditions
    4. Ability to measure baseline pressure differential
    5. Ability to set up home in worst case condition
    6. Ability to measure worst case CAZ depressurization
    7. Ability to calculate minimum draft pressure based on existing weather conditions
    8. Ability to check for worst case spillage in heating systems
    9. Ability to check for worst case spillage in DHW
    10. Ability to identify time limits for spillage based on BPI standards
    11. Ability to perform testing under natural conditions
    12. Ability to apply appropriate combustion safety testing action levels based on BPI Standards
    13. Ability to identify the combustion appliance zones within the home

2. Indoor/Outdoor CO
    1. Ability to measure indoor carbon monoxide (CO) levels
    2. Ability to measure exterior carbon monoxide (CO) levels

3. Ability to measure heating system flue gas CO during combustion safety testing
4. Ability to measure DHW flue gas CO during combustion safety testing
5. Ability to monitor ambient CO levels in the CAZ during entire combustion safety testing
6. Ability to perform a CO test on a gas oven
7. Ability to apply appropriate CO action levels based on BPI Standards or other industry standards

3. Combustible Gas Leak Testing
    1. Knowledge of methods for identifying / testing fuel leaks
    2. Ability to conduct combustible gas leak testing
    3. Ability to verify leaks with a soapy solution

4. Blower Door Testing
    1. Ability to set combustion appliances to pilot or disable them
    2. Ability to verify solid fuel appliances are not operational
    3. Ability to properly set up blower door frame, shroud, and fan
    4. Ability to properly set up manometer
    5. Ability to appropriately prepare house for blower door testing
    6. Ability to measure baseline pressure differential
    7. Ability to take an accurate measurement
    8. Ability to interpret results
    9. Ability to conduct room by room inspection with blower door running
    10. Knowledge of blower door guided air sealing techniques

5. Mechanical Ventilation
    1. Knowledge of ventilation calculations and strategies
    2. Ability to determine volume of affected space
    3. Ability to identify the existing type of fan control
    4. Ability to identify the condition of the ductwork
    5. Ability to measure existing exhaust ventilation flow rate

6. Insulation Levels
    1. Knowledge of appropriate insulation applications and installation based on existing conditions
    2. Knowledge of installing insulation at high density
    3. Knowledge of appropriate methods for assessing wall insulation levels
    4. Knowledge of area weighted R-value
    5. Ability to determine attic insulation levels
    6. Knowledge of performance and code issues

7. HVAC Distribution Systems
    1. Ability to conduct pressure pan testing
    2. Ability to conduct room to room pressure differential diagnostics
    3. Ability to identify duct sealing opportunities and applications
    4. Ability to determine the distribution system

5. Ability to identify existing duct or hydronic pipe insulation

8. DHW
    1. Ability to determine first hour rating
    2. Knowledge of domestic hot water (DHW) conservation strategies
    3. Ability to determine existing water heater insulation
    4. Ability to determine existing pipe insulation

9. Appliances
    1. Ability to locate manufacturer's data plate
    2. Ability to determine appliance energy usage from manufacturer data

10. Lighting
    1. Ability to determine total wattage

11. Fenestrations
    1. Ability to identify door type
    2. Ability to identify window type

12. Thermal/Pressure Boundary
    1. Ability to locate an existing vapor retarder
    2. Ability to identify thermal boundary
    3. Ability to identify pressure boundary

13. Mechanical Equipment
    1. Ability to identify basic system controls
    2. Add ability to identify obvious safety hazards and missing components

14. Baseload
    1. Knowledge of baseload
    2. Knowledge of seasonal energy use
    3. Ability to identify sources that contribute to electrical baseload consumption
    4. Knowledge of methods used to determine electrical consumption of appliances

15. Water Conservation
    1. Ability to identify low water consuming appliances and faucets

16. Building Measurements
    1. Ability to accurately measure the perimeter of the home
    2. Ability to accurately measure a door

17. Health and Safety
    1. Ability to locate existing smoke/CO detectors
    2. Ability to locate existing moisture issues
    3. Ability to locate any electrical hazards
    4. Ability to evaluate mechanical systems for health and safety concerns

18. Construction Details
    1. Ability to identify sources and signs of moisture
    2. Ability to identify infiltration points and location of plumbing pipes and penetrations
    3. Ability to identify the wall type
    4. Ability to identify framing method
    5. Ability to safely measure cavity depth
    6. Ability to identify existing attic ventilation type
    7. Ability to measure attic floor area/roof cavity

1.4 Industry Standards

1. Applicability
    1. Knowledge of applicable content and intent of Industry Standards
    2. Ability to apply appropriate BPI Standards to collected data

2. Limitations
    1. Ability to recognize the need for a professional codes evaluation
    2. Knowledge of fire codes as necessary to apply home performance in a code-approved manner

1.5 Analyzing Collected Data

1. Combustion Safety Testing
    1. Ability to use combustion analysis and safety testing results to develop appropriate recommendations
    2. Ability to determine if the appliance passes the spillage test
    3. Ability to determine what steps should be taken if it does not pass
    4. Ability to use correct table in the BPI Standards to determine appropriate recommendations
    5. Ability to identify the need for further evaluation when other combustion sources exist

2. Indoor/Outdoor CO
    1. Ability to determine if ambient CO readings exceed action levels
    2. Ability to appropriately determine action levels based on test results for CO in the flue

3. Blower Door Testing
    1. Knowledge of blower door use for identifying critical air sealing areas
    2. Ability to apply blower door test results in development of improvement strategies

4. Mechanical Ventilation
    1. Ability to assess the condition of the ventilation ductwork
    2. Ability to assess the need for additional mechanical ventilation based on building needs

5. Insulation Levels
    1. Ability to determine proper insulation levels to be added in the attic
    2. Ability to determine proper insulation levels to be added in the walls
    3. Ability to determine proper insulation levels to be added to other areas of the building as appropriate

6. HVAC Distribution Systems
    1. Ability to identify duct or hydronic pipe insulation opportunities

7. DHW
    1. Ability to assess opportunities for water heater insulation
    2. Ability to assess opportunities for pipe insulation

8. Appliances
    1. Knowledge of the benefit of ENERGY STAR labeled appliances
    2. Ability to assess opportunities for ENERGY STAR appliances

9. Lighting
    1. Knowledge of benefit of ENERGY STAR labeled lighting
    2. Knowledge of the impact on load associated with lighting
    3. Ability to determine opportunity for ENERGY STAR lighting
    4. Ability to determine opportunity for efficient lighting controls

10. Fenestrations
    1. Ability to determine fit and performance
    2. Ability to determine appropriate applications for fenestration upgrades including modification or replacement
    3. Ability to identify any replacement concerns

11. Thermal/Pressure Boundary
    1. Ability to determine appropriate applications for sealed crawlspaces
    2. Ability to determine appropriate applications for basement
    3. Ability to determine appropriate applications for attics
    4. Ability to determine appropriate applications for other conditioned and unconditioned areas
    5. Ability to determine appropriate applications for other areas of the building as appropriate
    6. Ability to determine thermal boundary/pressure boundary alignment
    7. Ability to determine if the location of an existing vapor retarder is appropriate

12. Mechanical Equipment
    1. Ability to apply heating and cooling efficiency methods
    2. Knowledge of equipment control strategies for maximizing occupant comfort and minimizing energy consumption
    3. Ability to evaluate the availability of fuel switching opportunities
    4. Ability to assess the possibility for performance enhancements

13. Baseload
    1. Ability to disaggregate baseload energy use
    2. Knowledge of baseload reduction strategies

14. Water Conservation
    1. Ability to assess opportunities for water conservation devices and strategies

15. Building Measurements
    1. Ability to calculate square feet
    2. Ability to calculate cubic feet

16. Health and Safety
    1. Ability to determine if smoke/CO detectors are hard wired or battery operated
    2. Ability to assess existing moisture issues
    3. Ability to assess basic electrical hazards
    4. Ability to assess the possibility of lead based paint

17. Construction Details
    1. Ability to determine crawlspace ventilation requirements
    2. Ability to determine rim joist/box sill insulation requirements
    3. Ability to determine appropriate foundation insulation location
    4. Ability to determine appropriateness of a vapor barrier
    5. Ability to determine repairs needed and structural integrity of wall(s) to be insulated
    6. Ability to determine square footage of area to be insulated
    7. Ability to determine appropriate amount of insulation to be added
    8. Ability to identify appropriate type of insulation to be added
    9. Ability to determine feasibility for comfort and cost benefit of added insulation
    10. Ability to determine integrity of attic to be insulated

1.6 Modeling and Work scope

1. Modeling
    1. Knowledge of modeling software
    2. Knowledge of the purpose for modeling
    3. Ability to accurately input data
    4. Ability to analyze completed model
    5. Ability to recognize potential data errors on completed model

2. Proper use of modeling to determine heating and cooling equipment sizing and appropriate energy
    1. Knowledge of utility history analysis in conservation strategies
    2. Knowledge of the need for modeling various options for heating, cooling, and DHW applications, as well as other efficiency upgrades

3. Work scope
    1. Knowledge of the purpose of a work scope
    2. Knowledge of work scope components
    3. Knowledge of how to write up work scope
    4. Knowledge of measure recommendations in relation to the needs of the building
    5. Ability to prioritize recommended measures
    6. Ability to analyze completed work scope in relation to measure recommendations
    7. Ability to recognize potential data errors on a completed work scope
    8. Ability to write up a work scope
    9. Ability to specify appropriate materials and processes needed for building performance projects
    10. Ability to present options for comprehensive conservation strategies that are consistent with sound building science practices

2. Standards of Reference

All BPI exams are based on a mixture of industry practices, axiomatic[1] 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.

Building Analyst

- ANSI/BPI-1200-S-2015 Standard Practice for Basic Analysis of Buildings

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.