Envelope Professional

TESTING KNOWLEDGE LIST

THE SYMBOL OF EXCELLENCE FOR HOME PERFORMANCE CONTRACTORS

JANUARY 3, 2013

Acknowledgements
The Building Performance Institute, Inc. would like to thank those who support the BPI national expansion and all of the dedicated professionals who have participated in the development of this document.

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1. Envelope Professional Testing Knowledge List

1.1 Building Science

1. Basic Terms & Definitions
    1. Airflow in buildings/ducts: CFM, CFM50, CFM25, ACHn, ACH50, FPM
    2. Effective leakage area
    3. Area weighted R-Value
    4. Baseload
    5. British thermal unit (Btu)
    6. Condensation
    7. Sones
    8. Pressure differential
    9. Temperature differential
    10. Efficiency
    11. Watt-hour
    12. R and U Value
    13. Ton of refrigeration
    14. Total equivalent length
    15. Dehumidification / Humidification
    16. Inches of Water Column (iwc)
    17. Pascal (Pa)
    18. Hydrostatic pressure
    19. Natural ventilation
    20. Mechanical ventilation
    21. Net free area
    22. Equipment efficiency descriptors
    23. Permeability and perm rating
    24. Vapor barriers/retarders
    25. Building ventilation
    26. IAQ (indoor air quality)
    27. IEQ (indoor environmental quality)
    28. Psychrometrics
    29. Vented/Unvented combustion appliance

2. Principles of Energy, Air & Moisture
    1. Thermodynamics: conduction, convection, radiation, ΔT
    2. Factors that affect insulation performance
    3. Wind-driven house pressurization/depressurization
    4. Natural and Mechanical driving forces of infiltration/exfiltration as well as pressurization/depressurization
    5. Heat gain/loss
    6. BTU content of fuels
    7. Moisture transport mechanisms

8. Principles of combustion

3. Combustion Science
    1. Combustion analysis: oxygen, flue-gas temperature, carbon monoxide
    2. Carbon Monoxide (CO) testing of combustion appliances
    3. Basics of: Combustion appliance venting, draft, and combustion air
    4. Open combustion safety issues: Combustion air, draft, depressurization, spillage, backdrafting
    5. Effect of duct leakage on depressurization of CAZ

1.2 Envelope Systems and their interaction with other Building Systems

1. Building Components
    1. Duct configurations and components
    2. Hydronic distribution configurations and components
    3. Structural components of residential construction
    4. Thermal boundaries and insulation applications
    5. Electrical components and safety considerations
    6. Fuel delivery systems and safety considerations
    7. Bulk water management components: weather-resistant barrier, drainage, plumbing gutters sumps etc)
    8. Vapor barriers, weather-resistant barriers
    9. Radiant barrier principles and installations
    10. Understand/recognize heat and energy recovery ventilators
    11. Understand fenestration types and characteristics
    12. Understand issues involved with basements, crawlspaces, slabs, attics, attached garages, interstitial cavities, and bypasses
    13. Understand issues involved with interstitial building cavities and unconditioned zones, such as attics and attached garages.
    14. Understand issues involved with ventilation equipment
    15. Understand basic heating equipment components controls and operation
    16. Understand basic cooling equipment components controls and operation
    17. Understand basic DHW equipment components controls and operation
    18. Identify common mechanical safety controls
    19. Identify insulation types and R-Values
    20. Understand various mechanical ventilation equipment and strategies

2. Conservation Strategies
    1. Appropriate insulation applications based on existing conditions
    2. Opportunity for ENERGY STAR lighting and appliances
    3. Identify duct sealing opportunities and applications
    4. Understand importance of air leakage control and remediation procedures
    5. Understand importance of air leakage control in conjunction with insulation performance/ improvements

6. Blower door-guided air sealing techniques
7. Understand proper insulation installation procedures
8. Appropriate applications for sealed crawlspaces basements and attics
9. Appropriate applications for fenestration upgrades including modification or replacement

3. Comprehensive Building Assessment Process
    1. Understand/recognize need for conducting appropriate diagnostic procedures
    2. Interaction between mechanical systems envelope systems and occupant behavior
    3. Understand basic mathematics & science

4. 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. Process and calculate information from blower door test results
    3. Understand building shell/envelope leakage as a function of pressure difference and the size of holes in the air barrier
    4. Apply fundamental construction mathematics and unit conversions
    5. Understand ventilation needs
    6. Ventilation calculations and strategies
    7. Proper methods for identifying / testing fuel leaks
    8. Combustion Appliance Zone (CAZ): depressurization, spillage, draft, Carbon Monoxide (ambient and flue)
    9. Carbon Monoxide (CO) evaluation: ambient
    10. Blower door setup, accurate measurement and interpretation of results

11. Duct leakage testing (total leakage and leakage to outside): setup, accurate measurement and interpretation of results
12. Pressure pan testing
13. Basic pressure diagnostic procedures including understanding "With Reference To" (WRT)
14. Recognize contributing factors to comfort problems
15. Inspect for areas containing moisture or bulk water in undesirable locations
16. Understand and inspect for basic electrical safety

1.4 BPI National Standards and Project Specifications

1. Installation Safety and Specification
    1. Understand applicability content and intent of BPI National Standards
    2. Recognize need for a professional local/state/national codes evaluation
    3. Understand hazards associated with knob & tube wiring and be able to determine if it is live using basic electrical inspection techniques
    4. Address attic ventilation requirements
    5. Be able to specify materials and processes needed for building performance projects

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

1. Installation Safety and Specification
    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. Apply appropriate strategies for alignment of insulation and air barrier
    8. Working knowledge of various types of insulation and air sealing techniques and materials
    9. Methods for determining if dense packing procedure has reached appropriate density
    10. Blown: Air pressure to material ratio manufacturers recommended density to achieve the R-value

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 importance of coordinating air-sealing work with insulation work
    4. Understand the impact of installed actions on cost benefit analysis guidance

2. Professional Conduct and Work Ethics
    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, 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.

Envelope

- ANSI/BPI-1200-S-2015 Standard Practice for Basic Analysis of Buildings
- Technical Standards for the Envelope 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.