Building
Performance
Institute, Inc.

June 29, 2011

DOCKET
10-BSTD-01
DATE JUN 29 2011
RECD. JUN 29 2011

VIA E-MAIL: docket@energy.state.ca.us

California Energy Commission (CEC)
ATTN: Mazi Shirakh
Dockets Office, MS-4
Re: Docket No. 10-BSTD-01
1516 Ninth Street
Sacramento, CA 95814-5512

RE: Comments to Proposed Changes to Title 24

Dear Mr. Shirakh:

In reviewing the changes proposed for Title 24 and attending the May 31, 2011 **2013 Building Energy Efficiency Standards Staff Workshop**, the Building Performance Institute (BPI) offers these salient points for the CEC to consider:

- The California Energy Commission (CEC), through Title 24, strives to implement a performance-based approach to residential construction through the use of prescriptive measures. These performance-based prescriptions cover many areas of the code, from the number of feet of PEX plumbing that can be used per sq ft of home, to space for solar to be documented--without actually requiring the structural capacity necessary to bear a solar installation, to infiltration recommendations. As you've heard in verbal comments at the workshops, this is unlikely to be effective. Historical compliance rates bear that out.
- The appendix of Title 24 calls out the RESNET Draft Standard 802 Test Protocol. There is no need to adopt a standard that is not prevalent, common, or at this point, even a fully publically reviewed consensus standard, to achieve your goals. Even the authors of the May 31 presentation agreed during the workshop that it is a relatively simple test for a qualified professional. Step-by-step instructions--especially controversial draft instructions that are unlikely to be finalized--are not necessary, likely to confuse the workforce, and reduce the likelihood of compliance with the code.
- BPI Certified Professionals, as well as HERS raters, RESNET professionals, and others certified in this arena are capable of performing "**Base code prescriptive maximum air leakage rate of 3 ACH50 for single family homes**" proposed as new Base Code Language in Section 151(f)(13)**.** Therefore, we recommend that the language specify Certified Professionals vs. citing a draft standard step-by-step specification. By requiring certification it ensures someone has been trained and verified to do this work vs. just reading the step-by-step instructions and trying to perform the work.

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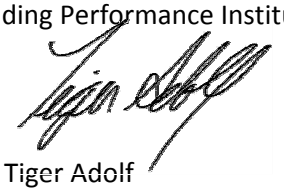
- In cooperation with CEC and the development of Energy Upgrade California, the State of California has more than 1,900 BPI Certified professionals. Coupling this with California HERS and HERS II raters, there is more than ample coverage across the state without requiring a new step-by-step instruction standard.
- CEC has already invested significantly in developing a BPI Certified workforce (more than 1,900 strong), and has also assisted in the development of a robust training structure through the community college network. Community colleges, for-profit, and not-for-profit organizations throughout California are part of the BPI training affiliate network delivering building science training, professionally proctored BPI Certification Exams, as well as other training services to the contractor community.
- We also suggest you communicate with and use the BPI Affiliate training network as a conduit for code training, that provides BPI continuing education units (CEUs) to deliver the message of the new code revisions once adopted, and to promote performance-based contracting in new construction as well as existing. Take what you've done, and grow it, use it, and allow all of California to profit from it.

Lastly, we have provided in the attachments that follow background on BPI and a BPI certification skills chart prepared for CEC staff to review.

If you have any questions or require further clarifications to the comments we provided please do not hesitate to contact me directly.

Best Regards,

Building Performance Institute, Inc.



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Attachments
xc: Larry Zarker, BPI
Bruce DeMain, BPI
Panama Bartholomy, CEC

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ATTACHMENT I: BACKGROUND ON BPI

Building Performance Institute, Inc. (BPI) is a recognized global leader supporting the development of a highly professional home performance industry through consensus standards development, individual and organizational credentialing, and a rigorous quality assurance program. BPI is accredited **by the American National Standards Institute (ANSI) as a national Standards Development Organization supporting the residential energy efficiency retrofit community. BPI also has an application in process to become an ANSI-Accredited Certification Body.** In 1996, the first certifications were issued for weatherization auditors and installation personnel. Since that time, BPI has expanded its capabilities to serve not only the weatherization industry, but also the growing building performance contracting industry from both a residential and multifamily buildings perspective. Today, BPI offers the following:

- **certification of individuals** in residential building energy auditing and analysis, mechanical, envelope and multifamily designations;
- **accreditation of organizations** committed to using a quality management system to deliver home performance services;
- **quality assurance** for accredited organizations to verify conformance with standards and provide feedback on best practices;
- **affiliation of training organizations** capable of providing localized delivery of services to prepare candidates for BPI certification exams and to deliver exams; and
- **national technical standards** founded on sound building science principles developed in an open, transparent, consensus-based process.

BPI has supported significant growth in credentialing for the home performance industry and weatherization assistance programs nationwide. A total of 24,657 BPI certifications had been issued in the home performance marketplace as of the end of June 2011. More than 670 BPI Accredited Contracting Companies provide whole-house services and participate in the BPI Quality Assurance Program nationwide. BPI Standards and Professional credentials support more than 100 energy efficiency programs, like Energy Upgrade California, nationwide. BPI's growth has been exponential and growth in the western region during 2010 exceeded 400%.BPI is 501(c)(3) private non-profit, founded in 1993. The national credentialing process and nationwide expansion of BPI is supported by the **U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and U.S. Department of Housing and Urban Development (HUD)**. BPI's Mission is to: *Raise the bar in performance contracting.* Reliable, highly skilled home performance contractors are in increasing demand, thanks to local efforts to increase the value of housing stock using a qualified local workforce to perform services that cannot be outsourced; meet climate change goals; and reduce energy consumption to achieve peak load management goals; and reduce dependence on imported fuels. Programs rely on BPI Standards and professional credentialing, because they know they will get quality work with a good return on investment. In fact, the Home Performance with ENERGY STAR® program BPI or equivalent for individual certification, company accreditation and program quality assurance protocols.

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ATTACHMENT II:
BPI CERTIFICATION SKILLS COMPARISON

BPI Certified Professionals are capable of performing a variety of diagnostics, including blower door testing, duct pressure testing, combustion safety testing (which appears to not be addressed in Title 24), mechanical performance, and many other things. See the attached skills BPI professionals must demonstrate in professionally proctored timed and written exams to achieve certification.

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Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Description of anticipated role of BPI Certified Professional	Building Analyst: This is a mid-level position for candidates possessing fieldbased inspection experience and knowledge of building science principles. This job designation is suitable for a whole house auditor or a sales representative.	Shell Specialist: This is a supervisor level position for candidates possessing Auditor level certification and advanced building shell diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.	Heating Specialist: This is a supervisor level position for candidates possessing Auditor level certification and advanced heating system diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.	Cooling Specialist: This is a supervisor level position for candidates possessing Auditor level certification and residential cooling and heat pump system diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.
General knowledge	The core knowledge base makes up the single point of entry (the 100 question exams - each designation, and 100 question exam has 50 questions that are identical - these items)				
	Efficiency	X	X	X	X
	Understand Equipment Efficiency Descriptors	X	X	X	X
	Combustion Efficiencies: AFUE, SSE	X	X	X	X
	Heat pump efficiencies: SEER, HSPF	X	X	X	X
	Room air-conditioner efficiency: EER	X	X	X	X
	Understand basic heating / cooling equipment components controls and operation	X	X	X	X
	Capacity of combustion appliances and electrical appliances	X	X	X	X
	Understand basic mathematics & science	X	X	X	X
	Apply fundamental construction mathematics and unit conversions	X	X	X	X
	Identify basic structural components of residential construction	X	X	X	X
	Understand climate specific concerns	X	X	X	X
	Calculate heating degree days and cooling degree days	X	X	X	X
	Understand impact of building orientation, landscape drainage, and grading	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand impact of shading on heating / cooling loads	X	X	X	X
Thermodynamics	Thermodynamics and Heat Transfer	X	X	X	X
	radiation	X	X	X	X
	conduction	X	X	X	X
	convection	X	X	X	X
	emissivity	X	X	X	X
	reflectivity	X	X	X	X
	absorbtivity	X	X	X	X
	ΔT including air movement due to temperature gradients	X	X	X	X
	Temperature differential	X	X	X	X
	thermal resistance / transmittance	X	X	X	X
	latent heat	X	X	X	X
	sensible heat	X	X	X	X
	evaporation	X	X	X	X
	condensation	X	X	X	X
	specific heat	X	X	X	X
	heat capacity	X	X	X	X
	input / output capacity	X	X	X	X
	Heat gain / loss:	X	X	X	X
	internal	X	X	X	X
	heat transmission	X	X	X	X
Field Testable knowledge	The specific knowledge base separates the designations. There are 50 designation-specific questions on each written exam and the items below are field testable.				
Air flow and blower door	Understand airflow in buildings / ducts: CFM, CFMn, CFM50, CFM25, ACH, ACHn, ACH50, FPM	X	X	X	X
	Blower door application: setup, accurate measurement, calculation, and ability to process and interpret test results	X	X	X	X
	Understand blower door use for identifying critical air sealing areas	X	X	X	X
	Blower door-guided air sealing techniques	X	X	N/A	N/A

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	effective leakage area	X	X	X	X
	air leakage	X	X	X	X
	Application of measured air leakage test results	X	X	X	X
	Understand importance of air leakage control in conjunction with insulation performance/ improvements	X	X	X	X
	Understand importance of air leakage control and remediation procedures	X	X	X	X
Ducts	Effect of duct leakage on depressurization of CAZ	X	X	X	X
	Total equivalent length	X	X	X	X
	Appropriate application of insulation on the duct/ pipe distribution system	X	X	X	X
	Check for proper duct system balance between supply and return	N/A	N/A	X	X
	Methods of duct leakage testing & equipment	N/A	N/A	X	X
	Duct leakage testing (total leakage and leakage to outside): setup, accurate measurement and interpretation of results	N/A	S - Standards requirement, but not currently tested	X	X
	Identify basic duct configurations and components	X	X	X	X
	Identify duct sealing opportunities and applications	X	X	X	X
	Understand / recognize need for conducting appropriate diagnostic procedures including when to refer to a specialist for further investigation	X	X	X	X
Pressures	Pressure differential	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand and convert Pressure units: Inches of Water Column (iwc), Pascal (Pa)	X	X	X	X
	Pressure boundary	X	X	X	X
	House pressurization/ depressurization by various forces	X	X	X	X
	Basic pressure diagnostic procedures including understanding "With Reference To" (WRT)	X	X	X	X
	Room-to-room pressure diagnostics	X	X	X	X
	Pressure pan diagnostics	X	X	X	X
	Proper application and use of a pressure differential measuring device; including ability to identify wind-driven pressurization and depressurization	X	X	X	X
	Proper application and use of pressure and temperature charts	N/A	N/A	N/A	X
	Understand building shell/envelope leakage as a function of pressure difference and the size of holes in the air barrier	X	X	X	X
Combustion and Combustion Analysis	Principles of combustion	X	X	X	X
	Combustion process	X	X	X	X
	Carbon Monoxide (CO)	X	X	X	X
	Carbon Monoxide (CO) evaluation: ambient	X	X	X	X
	Combustion air	X	X	X	X
	Oxygen (O2)/Combustion air	X	X	X	X
	flue-gas temperature	N/A	N/A	X	N/A
	Carbon Dioxide (CO2)	N/A	N/A	X	N/A
	Steady State Efficiency	N/A	N/A	X	N/A
	Effect of fuel overpressure/underpressure	N/A	N/A	X	N/A

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	BTU	X	X	X	X
	BTU/hr	X	X	X	X
	BTU content of fuels	X	X	X	X
	Basics of: Combustion appliance venting, draft, and combustion air including identification of proper sizing/vent tables	X	X	X	X
	Understand combustion safety issues: Combustion air, draft, worst case / baseline depressurization, spillage, backdrafting, unvented combustion appliances	X	X	X	X
	Combustion Analysis	X	X	X	X
	Carbon Monoxide (CO) testing of combustion appliances	X	X	X	X
	Combustion appliance zone (CAZ)	X	X	X	X
	Combustion appliance venting	X	X	X	X
	Sealed/Open Combustion	X	X	X	X
	Combustion Appliance Zone (CAZ): depressurization, spillage, draft, Carbon Monoxide (ambient and flue)	X	X	X	X
	Combustion gas analysis and data interpretation/application	N/A	N/A	X	N/A
	Identify proper appliance and combustion appliance venting	X	X	X	X
	Using combustion analysis and safety testing results to develop appropriate recommendations	X	X	X	X
	Proper application and use of combustion analysis equipment	N/A	N/A	X	N/A
	Causes of CAZ depressurization	X	X	X	X
	Worse Case Depressurization Test	X	X	X	X
	Spillage/Backdrafting	X	X	X	X
	Spillage evaluation	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Draft: Overfire/Chimney	X	X	X	X
	Atmospheric/Fan-assisted draft	X	X	X	X
	Draft testing	X	X	X	X
	Driving forces (natural and mechanical)	X	X	X	X
Ventilation	Apply blower door test results and Building Tightness Limit (minimum ventilation requirements) in development of improvement strategies	X	X	X	X
	Whole-house Natural / mechanical building ventilation	X	X	X	X
	Address attic ventilation requirements	X	X	X	
	Calculate building tightness levels (minimum ventilation requirements)	X	X	X	X
	Test and balance a supply/return ventilation system for optimal performance	N/A	N/A	X	X
	Understand issues involved with ventilation equipment	X	X	X	X
	Understand various mechanical ventilation equipment and strategies: spot, ERV, HRV	X	X	X	X
	Understand/recognize heat and energy recovery ventilators	X	X	X	X
	Vent system components and safety considerations	X	X	X	X
	Vented/Unvented combustion appliance	X	X	X	X
	Direct Vent/Non Direct Vent	X	X	X	X
	Understand and inspect vent/chimney applications	X	X	X	X
	net free area	X	X	X	X
	Ventilation calculations and strategies	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Use and apply appropriate codes & standards for chimney applications & appropriate material clearances (i.e NFPA-54)	X	X	X	X
	Verify installed airflow rates of ventilation devices	N/A	X	X	X
	Working knowledge of proper vent design and components	N/A	N/A	X	X
	Appropriate equipment for identification of air distribution problems	N/A	N/A	X	X
	Appropriate equipment for identification of hydronic distribution problems	N/A	N/A	X	X
	Identify basic hydronic distribution configurations and components	X	X	X	X
	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)	N/A	N/A	X	X
	Visual evaluation of the distribution system	X	X	X	X
	Measure and verify individual register airflow and compare to design specifications	N/A	N/A	X	X
	Determine appropriate total system airflow	N/A	N/A	X	X
Cooling systems	Principles of refrigeration	N/A	N/A	N/A	X
	Ton of refrigeration	X	X	X	X
	Alternating Current	N/A	N/A	X	X
	Direct current	N/A	N/A	X	X
	Condensation/condensate	N/A	N/A	X	X
	Entrainment	N/A	N/A	X	X
	Upflow/Downflow/Counterflow	N/A	N/A	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Static Pressure Drop, Total External Static Pressure	N/A	N/A	X	X
	Refrigerant	N/A	N/A	N/A	X
	Superheat	N/A	N/A	N/A	X
	Subcooling	N/A	N/A	N/A	X
	psia	N/A	N/A	N/A	X
	psig	N/A	N/A	N/A	X
	Thermostatic Expansion Valve	N/A	N/A	N/A	X
	Measurement techniques for determining pressure drops across various refrigeration system components	N/A	N/A	N/A	X
	Calculation of of target superheat/subcooling	N/A	N/A	N/A	X
	Cleaning up a system that has been contaminated	N/A	N/A	N/A	X
	Coil inspection and appropriate actions	N/A	N/A	N/A	X
	Condensate system components and safety considerations	N/A	N/A	N/A	X
	Measurement and verification of no voltage drop across contacts	N/A	N/A	N/A	X
	Measurement of liquid/suction line temperatures	N/A	N/A	N/A	X
	Measurement of wet/dry bulb temperatures	N/A	N/A	N/A	X
	Non condensable/mixed refigerant test	N/A	N/A	N/A	X
	Procedures for properly evacuating refrigerant system and determining integrity of the system with a vacuum test	N/A	N/A	N/A	X
	Proper application and use of refrigerant guages	N/A	N/A	N/A	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Proper application for weighing in refrigerant change	N/A	N/A	N/A	X
	Proper applications and use of temperature measuring devices	X	X	X	X
	Refrigerant charge analysis using superheat or subcooling method based on metering device	N/A	N/A	N/A	X
	Refrigerant delivery systems and safety considerations	N/A	N/A	N/A	X
	Refrigeration cycle diagnostics	N/A	N/A	N/A	X
	System capacity calculation	N/A	N/A	N/A	X
	TXV Metering diagnostics	N/A	N/A	N/A	X
Heating Systems	Measure and verify temperature rise/drop interpret results and apply corrective actions	N/A	N/A	X	X
	Equipment control strategies for maximizing occupant comfort and minimizing energy consumption	X	X	X	X
	Heating & cooling efficiency applications	X	X	X	X
	Fuel leak detection	X	X	X	X
	Fuel storage and delivery system integrity and appropriate actions	X	X	X	X
	Heat exchanger inspection and appropriate actions	N/A	N/A	X	N/A
	Identify common mechanical safety controls	X	X	X	X
	Proper use of modeling to determine heating and cooling equipment sizing and appropriate energy conservation measures	X	X	X	X
	Recognize need for mechanical equipment improvements	X	X	X	X
	Factors that effect mechanical system performance	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Determine fan cycle settings and sequence of operation	N/A	N/A	X	X
	Determine and adjust firing rate of appliances	N/A	N/A	X	N/A
	Basic fuel delivery systems and safety considerations	X	X	X	X
	Proper methods for identifying / testing fuel leaks	X	X	X	X
Shell and Insulation	Area weighted R-Value	X	X	X	X
	R and U Values	X	X	X	X
	Converting R and U values	X	X	X	X
	Understand hazards associated with knob & tube wiring and be able to determine if it is live using basic electrical inspection techniques	X	X	X	X
	Blown insulation: Air pressure to material ratio manufacturers recommended density to achieve the R-value	N/A	X	N/A	N/A
	Identify insulation types and R-Values	X	X	X	X
	Apply appropriate strategies for alignment of insulation and air barrier	N/A	X	X	X
	Appropriate insulation applications and installation based on existing conditions	X	X	X	X
	Radiant barrier principles and installations	X	X	X	X
	Determine appropriate method for assessing wall insulation levels	X	X	X	X
	Factors that affect insulation performance: density, installation, moisture	X	X	X	X
	Thermal boundaries and insulation applications	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand needs for protective shielding and baffling for the preparation of insulation installation	X	X	X	X
	Understand proper insulation installation procedures	N/A	X	N/A	N/A
	Understand the implications of adding insulation without airsealing	X	X	X	X
	Understand the importance of coordinating air-sealing work with insulation work	X	X	X	X
	Working knowledge of various types of insulation and air sealing techniques and materials	X	X	X	X
	Indentify/understand high density cellulose	X	X	X	X
	Methods for determining if dense packing procedure has reached appropriate density	N/A	X	X	N/A
	Appropriate applications for sealed crawlspaces basements and attics	X	X	X	X
	Determine basement air-sealing strategy	X	X	X	X
	Recognize need for airsealing measures and their impact on other building systems	X	X	X	X
	Identify thermal bridges	X	X	X	X
	define stack effect	X	X	X	X
	define exfiltration and infiltration	X	X	X	X
	Understand issues involved with attics	X	X	X	X
	Understand issues involved with basements crawlspaces and slabs	X	X	X	X
	Understand issues involved with conditioned space	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand issues involved with interstitial building cavities and bypasses	X	X	X	X
Moisture	Psychrometrics, including test and evaluate; bulk water, diffusion, capillary action	X	X	X	X
	Vapor barriers/retarders	X	X	X	X
	Vapor barriers, weather-resistant barriers	X	X	X	X
	permeability and perm rating	X	X	X	X
	Bulk water management components: weather-resistant barrier, drainage, plumbing gutters sumps etc)	X	X	X	X
	Moisture transport mechanisms:	X	X	X	X
	Inspect for areas containing moisture or bulk water in undesirable locations	X	X	X	X
	basics of Dehumidification / Humidification as well as measurement equipment	X	X	X	X
	Dehumidification / Humidification	X	X	X	X
	Identify areas of highest relative humidity	X	X	X	X
DHW	Domestic Hot Water (DHW) conservation strategies	X	N/A	X	X
	standby loss	X	X	X	X
	Understand basic DHW equipment components controls and operation	X	X	X	X
	Understand need for modeling various options for heating, cooling and DHW applications, as well as other efficiency upgrades	X	X	X	X
	Water conservation devices and strategies	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
Solar and renewables	Awareness for solar gain reduction in cooling climate/solar gain opportunities in heating climates	X	X	X	X
	Opportunity potential renewable energy applications: geothermal , photovoltaic, wind	X	X	X	X
Fenestration	Appropriate applications for fenestration upgrades including modification or replacement	X	X	X	X
	Understand fenestration types and efficiencies	X	X	X	X
Electrical	Understand and inspect for basic electric safety (e.g. frayed wires, open boxes, etc)	X	X	X	X
	Basic electrical components and safety considerations	X	X	X	X
	peak electrical demand	X	X	X	X
	watts	X	X	X	X
	watt-hours	X	X	X	X
	baseload / Seasonal energy use	X	X	X	X
	Opportunity for ENERGY STAR lighting and appliances	X	X	X	X
	Understand benefit for ENERGY STAR labeled lights and appliances	X	X	X	X
	Understand impact on load associated with lighting and appliance retrofits	X	X	X	X
Air and Environment	IAQ (indoor air quality): moisture, CO, dust	X	X	X	X
	IEQ (indoor environmental quality)	X	X	X	X
	Understand indoor environment considerations for the environmentally sensitive	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand issues involved with attached garages	X	X	X	X
	Isolation procedures for household pollutants	X	X	X	X
	Locations in which to identify indoor air quality issues	X	X	X	X
	Locations in which to identify indoor air quality issues	X	X	X	X
	Material Safety Data Sheets	X	X	X	X
	Precautions when working around chemical biological and other potential hazards	X	X	X	X
Customer Service	Determine areas of customer complaints/concerns in interview	X	X	X	X
	Elements of a documentation system	X	X	X	X
	Elements of effective oral communcation with customer	X	X	X	X
	Elements of effective written communication with customer	X	X	X	X
	Interaction between mechanical systems, envelope systems and occupant behavior	X	X	X	X
	Practice building science within your limits of professional competency	X	X	X	X
	Present options for comprehensive conservation strategies that are consistent with sound building science practices	X	X	X	X
	Provide appropriate cost benefit analysis guidance	X	X	X	X
	Understand the impact of installed actions on cost benefit analysis guidance	X	X	X	X
	Recognize contributing factors to comfort problems	X	X	X	X
	Recognize contributing factors to efficiency problems	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Recognize contributing factors to performance/reliability/durability problems	X	X	X	X
	Understand the non energy benefits of building performance improvements	X	X	X	X
	Understand the implications of building performance improvements on occupants and other building systems/components	X	X	X	X
	Understand the role of and basic elements of a quality management system	X	X	X	X
	Understand the use of utility history analysis in conservation strategies	X	X	X	X
Laws, Codes, and Regulations	Recognize need for a professional local/state/national codes evaluation	X	X	X	X
	Understand applicability and intent of industry good/best practices	X	X	X	X
	Understand applicability and intent of local/state/national codes	X	X	X	X
	Understand fire codes as necessary to apply home-performance in a code-approved manner.	X	X	X	X
	Understand/recognize building locations where non-flammable materials must be used	X	X	X	X
	Federal/State/Local Requirements (EPA OSHA)	X	X	X	X
	Understand applicability content and intent of BPI National Standards	X	X	X	X

Knowledge Area	Task	BA	Envelope	Heating	AC/Heat Pump
	Understand applicability and intent of Home Performance with ENERGY STAR	X	X	X	X
	Understand/recognize building locations where opportunities for retrofit materials and processes are	X	X	X	X
Work processes	Be able to specify appropriate materials and processes needed for building performance projects	X	X	X	X
	Understand role and responsibilities of the building analyst professional	X	N/A	N/A	N/A
	Understand the roles and responsibilities of the envelope professional	N/A	X	N/A	N/A
	Understand the roles and responsibilities of the heating professional	N/A	N/A	X	N/A
	Understand the roles and responsibilities of the cooling professional	N/A	N/A	N/A	X

BUILDING PERFORMANCE INSTITUTE, INC.

Building Analyst I (Auditor)

The symbol of contractor excellence

This is a mid-level position for candidates possessing field-based inspection experience and knowledge of building science principles. This job designation is suitable for a whole house auditor or a sales representative.

BUILDING PERFORMANCE INSTITUTE, INC.

Saratoga Technology + Energy Park
10 Hermes Road Suite 200
Malta, NY 12020
www.bpi.org

Phone: 518-899-2727
Fax: 518-899-1622
Email: info@bpi.org

Knowledge and Skill Areas for Testing:

- **Health and Safety Diagnostics:** health and safety of client and crews, familiarity with indoor contaminants and moisture-induced problems, knowledge of building codes and OSHA standards and National Fuel Gas Code venting standards, must perform comprehensive combustion safety tests (CO, spillage, draft, CAZ depressurization), and identify IAQ/moisture issues and recommend remediation strategies
- **Intermediate Building Science:** building construction, materials, and knowledge of interaction of zones found within the structure, basic math, determination of R– and U-Values of building components
- **Air Flow Diagnostics:** use of blower doors to determine air leakage locations in the thermal envelope, pressure pan tests for duct leakage evaluation, calculation of airtightness limits and appropriate applications, basic pressure diagnostics
- **Construction Management:** client education and management skills, ability to accurately document measurements and diagnostic results, specification of appropriate shell and heating measures for sub-contractors, work-scope development including prioritization of measures

BUILDING PERFORMANCE INSTITUTE, INC.

Building Performance Envelope Specialist

The symbol of contractor excellence

This is a supervisor level position for candidates possessing Auditor level certification and advanced building shell diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.

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Knowledge and Skill Areas for Testing:

- **Health and Safety:** health and safety of client and crews, knowledge of indoor contaminants, moisture-induced problems, and mitigation strategies, understanding of interactive effects of building shell and mechanical systems affecting IAQ and building component durability, proper use and maintenance of tools, equipment, and materials related to building diagnostics and installations, post-installation inspections
- **Advanced Building Science:** understanding of heat and moisture transport mechanisms, moisture management strategies, psychrometric chart applications, pressure effects of ducted distribution systems related to comfort and thermal performance
- **Inspection and Diagnostic Skills:** advanced blower door diagnostic techniques, thermal by-pass identification, ventilation system inspection, duct leakage evaluation and diagnostics, thermal and pressure boundary identification, thermal imaging applications
- **Installation Skills:** thermal by-pass repairs, advanced air sealing techniques, insulation installation techniques and applications, window and door installation, ventilation system design, basic combustion appliance maintenance, duct sealing and insulation applications and techniques, understanding of pressure balancing applications

BUILDING PERFORMANCE INSTITUTE, INC.

Building Performance Heating Specialist

The symbol of contractor excellence

This is a supervisor level position for candidates possessing Auditor level certification and advanced heating system diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.

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Knowledge and Skill Areas for Testing:

- **Health and Safety:** health and safety of client and crews, understanding of interactive effects of building shell and mechanical systems affecting IAQ and mechanical system performance, proper use and maintenance of tools, equipment, and materials related to heating system diagnostics and maintenance, post-installation inspections
- **Advanced Building Science:** understanding of combustion theory and venting principles, pressure effects of ducted distribution systems related to comfort and thermal performance, ducted distribution system design, hydronic system control strategies, heat load and system sizing calculations and procedures
- **Inspection and Diagnostic Skills:** identification of proper controls and safety devices for heating and DHW systems, basic heating system electrical inspection and diagnostics, duct leakage measurement, combustion gas analysis to measure SSE, heat exchanger integrity inspections
- **Installation Skills:** duct repair and sealing, pressure balancing, combustion appliance vent repair, ventilation system installation, heating appliance clean and tune including: oil and gas burners, heat exchangers, and warm air distribution systems, gas oven clean and tune

BUILDING PERFORMANCE INSTITUTE, INC.

Building Performance AC/Heat Pump Specialist

The symbol of contractor excellence

This is a supervisor level position for candidates possessing Auditor level certification and residential cooling and heat pump system diagnostic, evaluation, and repair skills. This job designation is suitable for a field crew supervisor.

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Knowledge and Skill Areas for Testing:

- **Health and Safety:** health and safety of client and crews, proper use and maintenance of tools, equipment, and materials related to refrigerant-based system diagnostics and maintenance, post-installation inspections, compliance with EPA regulations for handling refrigerants
- **Advanced Building Science:** understanding of refrigerant cycles and heat-pump principles, relationship of combined effects of temperature and humidity control to comfort, pressure effects of ducted distribution systems related to comfort and thermal performance, ducted distribution system design, air conditioning and heat-pump control strategies, heat load and system sizing calculations and procedures
- **Inspection and Diagnostic Skills:** identification of proper controls and safety devices for central cooling and heat pump systems, basic system electrical inspection and diagnostics, duct leakage measurement, system airflow measurement, refrigerant charge diagnostic methods (super-heat and sub-cooling)
- **Installation Skills:** duct repair and sealing, pressure balancing, ventilation system installation, AC clean and tune including: correcting refrigerant charge and airflow, heat exchanger and distribution system maintenance