

Residential Weatherization National Skill Standards

Prepared For:

**Home Builders Institute
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An Overview of HBI Framework for Skill Standards

We are pleased to present the ninth in a series of National Skill standards for the residential construction industry. The goal of this project is to establish national standards for the residential construction industry that reflect industry skill requirements. The standards will provide a basis for the certification and training of workers as well as provide employers with objective benchmarks for employee selection and the evaluation of training needs. In addition, educators will find the standards useful for designing curriculum and evaluating an individual's training outcomes.

These standards in and by themselves do not represent a model-training program. These standards are designed to be a source in developing program and curriculum and evaluating the outcomes of residential weatherization training programs.

Residential weatherization standards are designed for entry-level and skilled weatherization technicians. Standards are developed and validated for the following six weatherization specialties: *Core*, and *Installation, Insulation, HVAC (Heating, Ventilation, and Air Conditioning), Carpentry and Facilities Maintenance Technician*. Sixteen (16) critical work functions or duty areas are identified.

Critical work functions describe the major tasks and content areas of work within a specialty.

Key activities or major tasks and knowledge involved in completing critical work functions are also provided.

Performance Indicators or skill standards, which help determine when critical work functions and key activities are being performed competently and meet standards, are referenced to critical work functions. These indicators are linked to critical work functions and key activities.

In addition, applied academic skills required to perform key activities are provided. These include mathematics, communications, and science-applied academic skills.

How the Standards Were Developed

A committee of seven subject matter experts (SMEs) representing residential weatherization technicians, small- and medium-size weatherization contractors, instructors, trainers and other experts in the field from different parts of the nation were used to establish and validate the standards. The final list of 16 critical work functions cutting across six weatherization specialties reflects and accommodates regional differences.

The project called for the formation of a committee of National Association of Home Builders (NAHB) leaders in the field of weatherization.

These leaders represented the following regions: Northeast, Southwest, Southeast, Midwest and Mid-Atlantic.

- A preliminary list of critical work functions and activities organized into duty areas performed by residential weatherization technicians was developed and acquired through examination of industry texts, curriculum, TARs (Job Corps Training Achievement Records), association reference materials and other sources of information about the organization and array of tasks performed and knowledge required in weatherization.
- A committee of seven SMEs edited, reviewed and rated critical work functions and key activities and applied academic skills. The committee also reviewed and referenced applied academic skills, safety requirements and tools required for each of these functions and activities.

Weatherization Specialties

Subject Matter Experts (SME) divided the broad weatherization occupational category into five specialties.

This reflects the trends towards specialization in the residential home building industry.

The table below shows the percent of all weatherization activities performed by each specialty. A total 114 activities were identified and rated by the committee.

Table 1 illustrates a core of occupational activities, which are common to many weatherization specialties. For example, through training in carpentry, trainees should gain a broad based for work in weatherization.

Table 1 What percent of weatherization activities are performed by each specialty?

Weatherization Installation Technician	100%
Insulation Technician	73%
Facilities Maintenance Technician	71%
Carpentry Technician	67%
HVAC Technician	61%

How Standards are organized

Weatherization standards are organized into the follow broad categories: Applied Academic; Basic Occupational Skills and Occupational Specific Skills. Performance indicators or skill standards have been developed for each key activity or major tasks and knowledge required for completing critical work functions.

Applied Academic skills include Math, Measurement, Blueprint Reading, which are fundamental to weatherization trainees and entry- and skill-level workers.

Basic Occupational Skills include Safety, Hand Tools, Power Tools, Specialized Equipment (e.g., Blower Door), Anchors and Fasteners, Weatherization Concepts, and Weatherization Measures.

Weatherization Occupational Skills are organized into the following critical work functions skill categories: (1) Weatherization Installation, (2) Weatherization Air Sealing, (3) Weatherization Ductwork, (4) Weatherization Insulation, and (5) Weatherization Repairs and Replacement.

Applied Academic Skills

Weatherization technicians must master a broad array of applied academic skills in order to work and communicate effectively on the job site.

Math

- Demonstrates proper use of calculators
- Calculates square foot, linear and cubic measures
- Uses whole numbers, decimals and fractions
- Converts oral or written information into math equations

- Performs estimating for simple projects
- Converts decimals into feet and inches

Measurement

- Uses tape/ruler to measure to the nearest 1/16th"
- Determines measures using 3-4-5 right triangles
- Determines measures using equilateral triangles

Blue Prints

- Identifies major elements of floor plans & elevations
- Determines locations & orientation from blueprints
- Identifies basic blueprint details and terminology
- Uses window and door schedules

Basic Occupational Skills

Weatherization technicians are also required to be proficient in a variety of basic occupational skills many of which cut across all of the other specialties.

General Safety Procedures

- Inspects, uses and maintains PPE Equipment
- Follows standard safety rules
- Uses proper fall protection equipment
- Handles and stores hazardous materials safely
- Works safely around electricity
- Identifies common weatherization health issues
- Identifies mold problems
- Works lead safe, asbestos safe, & insulation safe
- Safe handling and installation of spray foam
- Understands MSDS
- Knows and follows basic OSHA standards
- Follows ladder safety procedures
- Plans for use & accessibility of fire extinguishers

- Uses basic first aid supplies and procedures
- Follows fall protection safety procedures
- Recognizes hazardous site conditions and materials
- Explains dangers of knob & tubing wiring
- Uses hard hats, headlamps & lighting work areas

Hand Tool Use, Safety & Maintenance

- Measuring and marking tools
- Leveling & layout tools
- Boring and cutting tools
- Fastening and dismantling tools
- Caulking & foam guns
- Maintains and stores tools

Power Tool Use, Safety & Maintenance

- Saws
- Drills and drivers
- Fastening tools (power- & powder-actuated, etc.)
- Pneumatic stapling & nailing tools
- Electric nibblers & shears
- Miter & chop saws

- Table saws
- Maintains and stores tools

Specialized Weatherization Equipment

- Blower doors
- Infrared cameras
- Artificial smoke
- Duct blaster
- Insulation blowers
- Combustion appliance testing
- Pressure pan (testing CFMs, leakage in ducts, etc)
- Moisture & mold-testing equipment

Anchors & Fasteners

- Understands different uses of anchors, fasteners
- and adhesives
- Selects appropriate anchors, fasteners, and
- adhesives
- Installs anchors, fasteners and adhesives correctly

Weatherization Concepts

- Understands "house as a system"
- Understand and follows energy audit lists and
- work orders
- Understands impact of climate zones on house
- systems
- Understands basics of an energy audit and manual J
- Understands characteristics of energy efficient home
- Understands thermal envelope and air barriers
- Understands conduction, convection and radiation
- heat transfer
- Understands how leakage can occur
- Understands types of sealants and their usage
- Understands how to visually inspect exterior of home
- Understands how to visually inspect interior of home
- Understands importance of proper ventilation
- Understands preservation of existing finishes

- Sensitivity to historic preservation requirements

Weatherization Measures

- Understands building shell measures, e.g.,
- blower door tests
- Understands mechanical measures
- Understands base load measures
- Understands combustion appliance zone (CAZ) testing

Weatherization Occupational Skills

Weatherization Installation -- Air Sealing

- Seals air leakage areas/install air barriers
- Weatherstrips & caulks around doors & windows
- Properly mitigates moisture in crawl spaces and basements
- Properly insulates and air seal crawl spaces and basements
- Properly installs attic ventilation
- Properly weatherizes attic hatches and pull-down stairs

Weatherization Measures

- Understands building shell measures, e.g.,
- blower door tests
- Understands mechanical measures
- Understands base load measures
- Understands combustion appliance zone (CAZ) testing

Weatherization Occupational Skills

Weatherization Installation -- Air Sealing

Weatherization Installation -- Ductwork

- Properly install vent exhaust fans & clothes dryers
- Repairs, installs, seals and insulates duct and piping systems
- Installs mechanical ventilation systems e.g., exhaust fans
- Installs fresh air intakes and exhaust fans for combustion appliances

Weatherization Installation -- Insulation

- Properly removes and disposes of insulation and waste materials
- Properly installs all types of insulation
- Properly insulates exterior walls, floors and ceilings
- Installs water heater blankets
- Properly installs insulation around recessed lighting

Weatherization Repairs and Replacement

- Prepares surfaces for repairs and painting
- Applies paint over unpainted wood surfaces
- Cleans and stores paint products as per OSHA/MSDS
- Properly installs gutters, downspouts & perimeter drainage
- Removes, installs drywall and paneling
- Removes, installs siding including: soffit, fascia
- Removes, installs step flashing, drip caps & ridge caps
- Removes, installs shingles and roll roofing
- Removes, installs baseboards, base-caps,

shoes and molding

- Properly install fire stopping & blocking insulation
- dams around chimneys

Critical Work Functions and Key Activity

Ratings

Importance ratings and percent of weatherization technicians who perform critical work functions and key activities for the six weatherization specialties are found in Appendix A.

Importance

The importance of key activities, tasks and topical content areas reported in Appendix A is the product of the proficiency or skill required to perform each task and the impact or risk to the employer, job incumbent, and/or homeowner if the task is performed improperly. Impact or risk includes possible injury to the job incumbent, financial exposure or litigation to the employer, health risk to the home owner, to name but a few.

Proficiency was rated by the SMEs using a four-point scale with a 1 indicating Minimally Skilled and a 4, Highly Skilled.

Risk was rated was rated using a four-point scale with a 1 indicating Minimal Risk and 4 Catastrophic Risk.

The product of Proficiency and Risk results in a 16 point scale:

- ✓ Extremely Important 13-16
- ✓ Moderate Important 9-12
- ✓ Somewhat Important 5-8
- ✓ Low Importance 1-4

Importance ratings are reported for entry level and semi-skilled workers.

The percent of specialty—Core, Install Technician, Insulation Technician, HVAC Technician, and Carpenter—requiring weatherization skill and/or knowledge is reported in Appendix A. One hundred percent (100%) of weatherization installers require

the 193 skills and/or knowledge rated by the SMEs. The gap analysis—a comparison between all weatherization skills and/or knowledge and the specialties—indicates that insulation technicians have the highest overlap with all the 193 weatherization skills at 73%, facilities maintenance technician 71%, carpenter 67% and HVAC technician 61%.

A “Yes” or “No” in Appendix A indicates if the weatherization skill and/or knowledge correlate with each specialty.

Applied Academics

Appendix B reports applied academic skills in the following content areas: Math, Safety, Communication Skills, Safety and Materials. Each of these content areas is defined in Appendix B. This shows a relatively high level of math and communications skills for weatherization technicians. Math skills include basic measurement as well as geometry. Communication skills include the ability to follow as well as give complex directions.

Tools and Equipment

Appendix C lists weatherization hand tools and supplies, power tools and shop tools.

Analysis of Importance Ratings

Table 2 below illustrates the difference between entry- and skilled-level weatherization technicians as rated by the committee of SMEs. Skills and knowledge required by skilled-level technicians are rated significantly greater than those required by entry-level technicians.

The rank order importance of applied academics, basic occupational skills and specific occupational skills is comparable for entry- and skilled-level technicians.

The chart below illustrates the comparability between these levels.

	<u>Entry</u>	<u>Skilled</u>
1. Applied Academics	4	8
2. Specific Occupational Skills	5	11
3. Basic Occupational Skills	10	14

Table 2. Importance Ratings for Entry and Skilled Level Weatherization Technicians

	<u>Entry</u>	<u>Skilled</u>
Safety	16	16
Hand Tool Use, Safety & Maintenance	9	12
Power Tool Use, Safety & Maintenance	8	15
Specialized Equipment	4	12
Math	6	8
Measurement	6	8
Blueprint	1	9
Temporary Work Platforms	16	16
Anchors & Fasteners	8	12
Weatherization Concepts	4	10
Weatherization Measures	1	6
Weatherization Installation -- Air Sealing	6	12
Weatherization Installation -- Ductwork	7	13
Weatherization Installation -- Insulation	9	13
Weatherization Repairs and Replacement	5	14

Appendix A HBI/NAHB Weatherization Importance

Rating Scales

Proficiency

- 1 Minimal Rarely need this skill or knowledge
- 2 Moderate Performs under regular supervision
- 3 High Performs with limited supervision
- 4 Expert Performs quality work independently

Entry-Level=Qualified to perform effectively under supervision

Skilled-Level= Performs quality work indecently

Impact

- 1 Minimal Little risk if done poorly
- 2 Moderate Moderate risk if done poorly
- 3 High Significant risk if done poorly
- 4 Critical Catastrophic risk if done poorly

Importance

Entry			Skilled			<i>Specialties requiring skill in this area</i>						
Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull	HVAC	CARP	FM	

Sample Ratings

Safety

Inspects, uses and maintains PPE Equipment	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Follows standard safety rules	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Uses proper fall protection equipment	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Handles and stores hazardous materials safely	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Works safely around electricity	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Identifies common weatherization health issues	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Identifies mold problems	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Works lead safe, asbestos safe, insulation safety	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Safely handles and installation of spray foam	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Understands MSDS	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Knows and follows basic OSHA standards	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes

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Importance

	Entry			Skilled			<i>Specialties requiring skill in this area</i>					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Follows ladder safety procedures	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Use & accessibility of fire extinguishers	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Basic first aid supplies and procedures	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Follows fall protection safety procedures	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Hazardous site conditions and materials	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Understands dangers of knob & tubing wiring	4	4	16	4	4	16	Yes	Yes	Yes	No	No	No
Hard hats, headlamps & lighting work areas	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
			16			16						

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	Entry			Skilled			<i>Specialties requiring skill in this area</i>					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Hand Tool Use, Safety & Maintenance												
Measuring and marking tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Leveling & layout tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Boring and cutting tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Fastening and dismantling tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Caulking & foam guns	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Maintains and stores tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
			9			12						
Power Tool Use, Safety & Maintenance												
Saws	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Drills and drivers	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes
Fastening tools (power- & powder-actuated, etc)	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Pneumatic stapling & nailing tools	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Electric nibblers & shears	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Miter & chop saws	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Table saws	2	4	8	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Maintains and stores tools	3	3	9	4	3	12	Yes	Yes	Yes	Yes	Yes	Yes

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	Entry			Skilled			<i>Specialties requiring skill in this area</i>					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Specialized Equipment												
Blower doors	1	3	3	4	3	12	Yes	Yes	Yes	No	No	No
Infrared cameras	1	3	3	4	3	12	Yes	Yes	Yes	No	No	No
Artificial smoke	3	1	3	3	1	3	Yes	Yes	Yes	No	No	No
Duct blaster	1	3	3	4	3	12	Yes	Yes	Yes	No	No	No
Insulation blowers	3	3	9	4	3	12	Yes	Yes	Yes	No	No	Yes
Combustion appliance testing	1	4	4	4	4	16	Yes	Yes	Yes	No	No	No
Pressure pan (testing CFMs, leakage in ducts, etc)	1	3	3	4	3	12	Yes	Yes	Yes	No	No	No
Moisture & mold-testing equipment	1	4	4	4	4	16	Yes	Yes	Yes	No	No	No
			4			12						

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	Entry			Skilled			<i>Specialties requiring skill in this area</i>					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Math												
Demonstrates proper use of calculators	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Calculates square foot, linear and cubic measures	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Uses whole numbers, decimals and fractions	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Converts oral or written information into math equations	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Performs estimating for simple projects	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Converts decimals into feet and inches	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
			6			8						
Measurement												
Uses tape/ruler to measure to the nearest 1/16th"	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Determines measures using 3-4-5 right triangles	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
Determines measures using equilateral triangles	3	2	6	4	2	8	Yes	Yes	Yes	Yes	Yes	Yes
			6			8						

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Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%

Blueprint

Identifies major elements of floor plans & elevations	1	1	1	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
Determines locations & orientation from blueprints	1	1	1	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
Identifies basic blueprint details and terminology	1	1	1	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
Uses window and door schedules	1	1	1	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
			1			9						

Temporary Work Platforms

Identifies wood, metal & pump jack scaffolds components	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Identifies brackets, horses & ladders components	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Builds staging area platforms (Baker & pipe staging)	4	4	16	4	4	16	Yes	Yes	Yes	No	Yes	Yes
Safely sets-up and dismantle scaffolds	4	4	16	4	4	16	Yes	Yes	Yes	No	Yes	Yes
Safety erects and uses ladders	4	4	16	4	4	16	Yes	Yes	Yes	No	Yes	Yes
Safety erects and uses pump jacks	4	4	16	4	4	16	Yes	Yes	Yes	No	No	No
Safely installs and uses roof brackets	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Safely setups and uses ladder jacks	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Safely setups and uses stilts	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
Safely setups and uses mechanical lifts & apparatus	4	4	16	4	4	16	Yes	Yes	Yes	Yes	Yes	Yes
			16			16						

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Sample Ratings		2	2	4	4	4	16	100%	100%	73%	61%	67%	71%

Anchors & Fasteners

Understands different uses of anchors, fasteners and adhesives

Selects appropriate anchors fasteners and adhesives

Installs anchors, fasteners and adhesives correctly

Understands different uses of anchors, fasteners and adhesives	3	3	9	4	3	12	Yes	Yes	Yes	No	No	No
Selects appropriate anchors fasteners and adhesives	2	3	6	4	3	12	Yes	Yes	No	No	No	No
Installs anchors, fasteners and adhesives correctly	3	3	9	4	3	12	Yes	Yes	Yes	Yes	No	No
			8			12						

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Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Weatherization Concepts												
Understands "house as a system"	2	1	2	3	3	9	Yes	Yes	No	Yes	No	No
Understands and follows energy audit lists and work orders	3	2	6	4	3	12	Yes	Yes	Yes	Yes	Yes	No
Understands impact of climate zones on house systems	2	1	2	3	3	9	Yes	Yes	Yes	Yes	No	No
Understands basics of an energy audit and manual J	2	1	2	3	3	9	Yes	Yes	Yes	Yes	No	Yes
Understands characteristics of energy-efficient home	2	1	2	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
Understands thermal envelope and air barriers	2	1	2	3	3	9	Yes	Yes	Yes	Yes	Yes	Yes
Understands conduction, convection and radiation heat transfer	2	1	2	3	3	9	Yes	Yes	No	No	No	Yes
Understands how leakage can occur	2	1	2	3	3	9	Yes	Yes	No	No	No	Yes
Understands types of sealants and their usage	3	3	9	4	3	12	Yes	Yes	Yes	Yes	No	Yes
Understands how to visually inspect <u>exterior</u> of home	2	1	2	3	3	9	Yes	Yes	No	Yes	Yes	Yes
Understands how to visually inspect <u>interior</u> of home	2	1	2	3	3	9	Yes	Yes	No	Yes	Yes	Yes
Understands importance of proper ventilation	3	2	6	3	3	9	No	Yes	No	No	No	No
Understands preservation of existing finishes	3	3	9	4	3	12	No	Yes	No	Yes	No	No
Displays sensitivity to historic preservation requirements	3	3	9	4	3	12	No	Yes	No	Yes	No	No
			4			10						

Appendix A HBI /NAHB Weatherization Importance

Rating Scales

Proficiency

- 1 Minimal Rarely need this skill or knowledge
- 2 Moderate Performs under regular supervision
- 3 High Performs with limited supervision
- 4 Expert Performs quality work independently

Entry-Level=Qualified to perform effectively under supervision

Skilled-Level= Performs quality work indecently

Impact

- 1 Minimal Little risk if done poorly
- 2 Moderate Moderate risk if done poorly
- 3 High Significant risk if done poorly
- 4 Critical Catastrophic risk if done poorly

	Importance											
	Entry			Skilled			<i>Specialties requiring skill in this area</i>					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Weatherization Measures												
Understands building shell measures e.g., blower door tests	1	1	1	3	2	6	No	Yes	No	No	No	No
Understands mechanical measures e.g., cleaning HVAC	1	1	1	3	2	6	No	Yes	Yes	No	Yes	No
Understands base load measures	1	1	1	3	2	6	No	Yes	No	No	Yes	Yes
Understands combustion appliance zone (CAZ) testing	1	1	1	3	2	6	No	Yes	No	No	No	No
			1			6						

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Importance

Entry			Skilled			<i>Specialties requiring skill in this area</i>						
Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM	

Sample Ratings

Weatherization Installation -- Air Sealing

Seals air leakage areas/install air barriers	3	3	9	4	3	12	No	Yes	Yes	No	No	No
Weather-strips and caulk around doors & windows	3	3	9	4	3	12	No	Yes	Yes	No	Yes	Yes
Properly mitigates moisture in crawl spaces and basements	3	3	9	4	3	12	No	Yes	No	No	No	No
Properly insulates and air seal crawl spaces and basements	3	3	9	4	3	12	No	Yes	No	No	No	No
Properly installs attic ventilation	2	3	6	4	3	12	No	Yes	No	No	Yes	Yes
Properly weatherizes attic hatches and pull down stairs	2	3	6	4	3	12	No	Yes	No	No	Yes	Yes
Understands use of blower door for air sealing procedures	2	2	4	4	3	12	No	Yes	No	No	No	No
Replaces, installs and modifies windows and doors	2	2	4	4	3	12	No	Yes	No	Yes	No	No
Removes, installs, repairs or replaces windows and doors	1	2	2	4	3	12	No	Yes	No	Yes	No	No
Operates blower door for air sealing procedures	1	1	1	4	3	12	No	Yes	No	Yes	Yes	Yes
			6			12						

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Importance

	Entry			Skilled			Specialties requiring skill in this area					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Weatherization Installation -- Ductwork												
Properly installs vent exhaust fans & clothes dryers	2	3	6	4	3	12	No	Yes	No	Yes	No	No
Repairs, installs, seals and insulates duct and piping systems	3	3	9	4	3	12	No	Yes	Yes	No	No	No
Installs mechanical ventilation systems e.g., exhaust fan	2	2	4	4	3	12	No	Yes	Yes	No	No	No
Installs fresh air intakes and exhaust fans for combustion appliances	2	4	8	4	4	16	No	Yes	Yes	No	No	No
			7			13						
Weatherization Installation -- Insulation												
Properly removes and disposes of insulation and waste materials	3	3	9	4	3	12	No	Yes	Yes	No	No	No
Properly installs all types of insulation	3	3	9	4	3	12	No	Yes	No	No	No	Yes
Installs insulating foam	3	3	9	4	3	12	No	Yes	Yes	No	No	No
Properly insulates exterior walls, floors and ceilings	3	3	9	4	3	12	No	Yes	No	No	Yes	Yes
Installs water heater blankets	3	3	9	4	3	12	No	Yes	No	No	Yes	Yes
Properly installs insulation around recessed lighting	2	4	8	4	4	16	No	Yes	No	No	Yes	Yes
			9			13						

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Proficiency

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Importance

	Entry			Skilled			Specialties requiring skill in this area					
	Prof	Impact	Import	Prof	Impact	Import	Core	Install	Insull.	HVAC	CARP	FM
Sample Ratings	2	2	4	4	4	16	100%	100%	73%	61%	67%	71%
Weatherization Repairs and Replacement												
Prepares surfaces for repairs and painting	3	3	9	4	3	12	No	Yes	No	No	Yes	Yes
Applies paint over unpainted wood surfaces	3	3	9	4	3	12	No	Yes	No	No	Yes	Yes
Cleans and stores paint products as per OSHA/MSDS	3	3	9	4	3	12	No	Yes	No	No	Yes	Yes
Properly installs gutters, downspouts & perimeter drainage	2	3	6	4	3	12	No	Yes	No	No	Yes	Yes
Removes, installs drywall and paneling	2	3	6	4	3	12	No	Yes	No	No	Yes	Yes
Removes, installs siding including: soffit, fascia	1	3	3	4	4	16	No	Yes	No	No	Yes	Yes
Removes, installs step flashing, drip caps & ridge caps	1	3	3	4	4	16	No	Yes	No	No	Yes	Yes
Removes, installs shingles and roll roofing	1	3	3	4	4	16	No	Yes	No	No	Yes	Yes
Removes, installs baseboards, base-caps, shoes and molding	1	2	2	4	3	12	No	Yes	No	No	Yes	Yes
Properly installs fire stopping & blocking insulation dams around chimneys	1	3	3	4	4	16	No	Yes	Yes	No	No	No
			5			14						

Appendix B HBI/NAHB Weatherization Applied Academics

Math

- 1= Measurement
- 2= Arithmetic
- 3= Layout
- 4= Applied geometry

Safety

- 1= Fall protection
- 2= Hazardous materials
- 3= Electrical protection
- 4= Power tools

Communication Skills

- 1= Follow verbal directions
- 2= Follow written directions
- 3= Give simple directions
- 4= Give complex directions

- 5= Confined spaces
- 6= Ladders and scaffolds
- 7= PPE
- 8=Respirators

Materials

- 1= Select appropriate materials
- 2= Apply as specified

- 9=Basic first aid

Applied Academics				
	Math	Comm.	Materials	Safety
Safety	NA	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Inspects, uses and maintains PPE Equipment	NA	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Follows standard safety rules	NA	1,2,3,4	1,2	1,5,6,9
Uses proper fall protection equipment	NA	1,2,3,4	1,2	2,7,8,9
Handles and stores hazardous materials safely	NA	1,2,3,4	1,2	3,4,6,7,9
Works safely around electricity	NA	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Identifies common weatherization health issues	NA	1,2,3,4	1,2	2,5,7,8,9
Identifies mold problems	NA	1,2,3,4	1,2	2,5,7,8,9
Works lead safe, asbestos safe, insulation safe	NA	1,2,3,4	1,2	2,5,7,8,9
Safe handling and installation of spray foam	NA	1,2,3,4	1,2	2,5,7,8,9
Understands MSDS	NA	1,2,3,4	1,2	2,5,7,8,9
Knows and follows basic OSHA standards	NA	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Follows ladder safety procedures	NA	1,2,3,4	1,2	1,2,3,5,6,7,9
Use & accessibility of fire extinguishers	NA	1,2,3,4	1,2	2,3,5,7,8,9
Basic first aid supplies and procedures	NA	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Follows fall protection safety procedures	NA	1,2,3,4	1,2	1,5,6,7,9
Recognizes hazardous site conditions and materials	NA	1,2,3,4	1,2	2,3,5,7,8,9
Understands dangers of knob & tubing wiring	NA	1,2,3,4	1,2	2,3,9
Uses hard hats, headlamps & lighting work areas	NA	1,2,3,4	1,2	5,7,9

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Applied Academics			
Math	Comm.	Materials	Safety

Hand Tool Use, Safety & Maintenance

Measuring and marking tools	1,2,3,4	1,2,3,4	1,2	7,9
Leveling & layout tools	1,2,3,4	1,2,3,4	1,2	7,9
Boring and cutting tools	1,2	1,2,3,4	1,2	7,9
Fastening and dismantling tools	NA	1,2,3,4	1,2	7,9
Caulking & foam guns	NA	1,2,3,4	1,2	7,9
Maintains and stores tools	NA	1,2,3,4	1,2	7,9

Power Tool Use, Safety & Maintenance

Saws	NA	1,2,3,4	1,2	3,4,7,9
Drills and drivers	NA	1,2,3,4	1,2	3,4,7,9
Fastening tools (power- & powder-actuated, etc)	NA	1,2,3,4	1,2	3,4,7,9
Pneumatic stapling & nailing tools	NA	1,2,3,4	1,2	3,4,7,9
Electric nibblers & shears	NA	1,2,3,4	1,2	3,4,7,9
Miter & chop saws	NA	1,2,3,4	1,2	3,4,7,9
Table saws	NA	1,2,3,4	1,2	3,4,7,9
Maintains and stores tools	NA	1,2,3,4	NA	3,4,7,9

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Applied Academics			
Math	Comm.	Materials	Safety

Specialized Equipment

Blower doors	1,2,3,4	1,2,3,4	NA	3,9
Infrared cameras	NA	1,2,3,4	NA	NA
Artificial smoke	NA	1,2,3,4	NA	7,9
Duct blaster	1,2	1,2,3,4	NA	3,9
Insulation				
Blowers	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Combustion appliance testing	1,2	1,2,3,4	NA	7,9
Pressure pan (testing CFMs, leakage in ducts, etc)	1,2	1,2,3,4	NA	7,9
Moisture & mold-testing equipment	1,2	1,2,3,4	NA	2,5,7,8,9

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Applied Academics			
Math	Comm.	Materials	Safety

Math	Demonstrates proper use of calculators	1,2,3,4	1,2,3,4	NA	NA
	Calculates square foot, linear and cubic measures	1,2,3,4	1,2,3,4	NA	NA
	Uses whole numbers, decimals and fractions	1,2,3,4	1,2,3,4	NA	NA
	Converts oral or written information into math equations	1,2,3,4	1,2,3,4	NA	NA
	Performs estimating for simple projects	1,2,3,4	1,2,3,4	NA	7,9
	Converts decimals into feet and inches	1,2,3,4	1,2,3,4	NA	NA
Measurement	Uses tape/ruler to measure to the nearest 1/16th"	1,2,3,4	1,2,3,4	NA	7,9
	Determines measures using 3-4-5 right triangles	1,2,3,4	1,2,3,4	NA	7,9
	Determines measures using equilateral triangles	1,2,3,4	1,2,3,4	NA	7,9
Blueprint	Identifies major elements of floor plans & elevations	1,2,3,4	1,2	NA	NA
	Determines locations & orientation from blueprints	1,2,3,4	1,2	NA	NA
	Identifies basic blueprint details and terminology	1,2,3,4	1,2	NA	NA
	Uses window and door schedules	1,2,3,4	1,2	NA	NA

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Applied Academics			
Math	Comm.	Materials	Safety

Temporary Work Platforms

Identifies wood, metal & pump jack scaffolds components	NA	1,2	1,2	NA
Identifies brackets, horses & ladders components	NA	1,2	1,2	NA
Builds staging area platforms (Baker & pipe staging)	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely sets-up and dismantle scaffolds	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely erects and uses ladders	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely erects and uses pump jacks	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely installs and uses roof brackets	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely setups and uses ladder jacks	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9
Safely setups and uses stilts	1,2	1,2,3,4	1,2	1,3,6,7,9
Safely setups and uses mechanical lifts & apparatus	1,2,3,4	1,2,3,4	1,2	1,3,6,7,9

Anchors & Fasteners

Understand different uses of anchors, fasteners and adhesives	NA	1,2,3,4	1,2	NA
Selects appropriate anchors fasteners and adhesives	NA	1,2,3,4	1,2	NA
Install anchors, fasteners and adhesives correctly	1,2,3	1,2,3,4	1,2	1,2,5,6,7,8,9

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Applied Academics			
Math	Comm.	Materials	Safety

Weatherization Concepts

Understands "house as a system"	1,2,3,4	1,2,3,4	1,2	NA
Understand and follows energy audit lists and work orders	1,2,3,4	1,2,3,4	1,2	NA
Understands impact of climate zones on house systems	1,2,3,4	1,2,3,4	1,2	NA
Understands basics of an energy audit and manual J	1,2,3,4	1,2,3,4	1,2	NA
Understands characteristics of energy efficient home	1,2,3,4	1,2,3,4	1,2	NA
Understands thermal envelope and air barriers	1,2,3,4	1,2,3,4	1,2	NA
Understands conduction, convection and radiation heat transfer	1,2,3,4	1,2,3,4	1,2	NA
Understands how leakage can occur	1,2,3,4	1,2,3,4	1,2	NA
Understands types of sealants and their usage	1,2,3,4	1,2,3,4	1,2	NA
Understands how to visually inspect <u>exterior</u> of home	1,2,3,4	1,2,3,4	1,2	NA
Understands how to visually inspect <u>interior</u> of home	1,2,3,4	1,2,3,4	1,2	NA
Understands importance of proper ventilation	1,2,3,4	1,2,3,4	1,2	NA
Understands preservation of existing finishes	1,2,3,4	1,2,3,4	1,2	NA
Displays sensitivity to historic preservation requirements	NA	1,2,3,4	1,2	NA

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Applied Academics			
Math	Comm.	Materials	Safety

Weatherization Measures

Understands building shell measures e.g., blower door tests	1,2,3,4	1,2,3,4	NA	NA
Understands mechanical measures e.g., cleaning HVAC systems	1,2,3,4	1,2,3,4	NA	NA
Understands base load measures	1,2,3,4	1,2,3,4	NA	NA
Understands combustion appliance zone (CAZ) testing	1,2,3,4	1,2,3,4	NA	NA

Weatherization Installation -- Air Sealing

Seal air leakage areas/install air barriers	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Weather-strip & caulk around doors & windows	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly mitigates moisture in crawl spaces and basements	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly insulates and air seals crawl spaces and basements	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly installs attic ventilation	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly weatherizes attic hatches and pull down stairs	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Understands use of blower door for air sealing procedures	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Replaces, installs and modifies windows and doors	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Removes, installs, repairs or replaces windows and doors	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Operates blower door for air sealing procedures	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9

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Applied Academics			
Math	Comm.	Materials	Safety

Weatherization Installation -- Ductwork

Properly installs vent exhaust fans & clothes dryers	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Repairs, installs, seals and insulates duct and piping systems	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Installs mechanical ventilation systems e.g., exhaust fan	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Installs fresh air intakes and exhaust fans for combustion appliances	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9

Weatherization Installation -- Insulation

Properly removes and disposes of insulation and waste materials	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly installs all types of insulation	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Installs insulating foam	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly insulates exterior walls, floors and ceilings	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Installs water heater blankets	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly installs insulation around recessed lighting	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9

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9=Basic first aid

Weatherization Repairs and Replacement

Applied Academics				
	Math	Comm.	Materials	Safety
Prepares surfaces for repairs and painting	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Applies paint over unpainted wood surfaces	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Cleans and stores paint products as per OSHA/MSDS	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Properly install gutters, downspouts & perimeter drainage	1,2,3,4	1,2,3,4	1,2	1,2,3,4,6,7,9
Removes, installs drywall and paneling	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9
Removes, installs siding including: soffit, fascia	1,2,3,4	1,2,3,4	1,2	1,2,3,4,6,7,9
Removes, installs step flashing, drip caps & ridge caps	1,2,3,4	1,2,3,4	1,2	1,2,3,4,6,7,9
Removes, installs shingles and roll roofing	1,2,3,4	1,2,3,4	1,2	1,2,3,4,6,7,9
Removes, installs baseboards, base-caps, shoes and molding	1,2,3,4	1,2,3,4	1,2	1,2,3,4,6,7,9
Properly installs fire stopping & blocking insulation dams around chimneys	1,2,3,4	1,2,3,4	1,2	1,2,3,4,5,6,7,8,9

Appendix C Weatherization Tools and Supplies

Hand Tools & Supplies

Safety glasses	Nail sets
Ear protection	Voltage/continuity tester and polarity tester
Steel toe safety shoes	Headlamp/hard hats
Respirators and safety or dust filter mask	All purpose putty knife
Gloves	Spackling knives
Claw hammers & holster	6-inch mill file
Tape measure 25' or more	Vinyl siding remover
Pencils	Caulking gun
Chalk box and chalk	Foam gun
Tri-square	Knee pads
Spirit/torpedo Levels	Knife sharpener
Utility knife	Hand saw
Slotted screwdrivers	Hammer stapler
Phillips screwdrivers	Duct tape
Insulated screw drivers	Foil tape
Adjustable wrench	Batt knife
Flat bar	Hand sander
Channel lock pliers	Stud finder
Tin/metal snips	
Nail pouch w/belt	
Sheet rock keyhole saw	

Appendix C Weatherization Tools and Supplies

Standard Power Tools (All Heavy Duty)

- Cordless drill & bits
- Right angle drill with clutch
- Miter saws
- Circular saw
- Variable speed reversible hammer drill (1/2")
- Reciprocating saw
- Screw gun
- Air compressor and hoses
- Extension cords
- Powder-actuated tools
- Pneumatic staple gun
- Hole saw supplies
- Table saws
- Finish nail guns

Appendix C Weatherization Tools and Supplies

Shop Tools

Generator	Vise
Shop Vacuum	4' Level
Portable lights	Saw horses
Water hoses	Individual fall arrest PPE
Bench Grinder	Framing square
Heat gun	T square
Painting equipment	Personal Protection Gear
Ladders--step & extension	Back support belts
Portable GFCIs	Hepa Vacuum
Socket set	Wrecking bar
Open end wrench set	Shovels
Hex-key wrench set	Rakes
Pop-rivet	Brooms, mop and bucket
Propane torch	Hand truck/dolly
Pipe cutters	Little giant fold up ladder
Tubing cutters and reamers	Spring clamps
Bolt cutter	
Files	