



## HBI Curricula Overview

Home Builders Institute (HBI) is the nation's leading educational resource for career technical education in the building industry. Vetted by subject matter experts, the award-winning curricula is based on the National Association of Home Builders' (NAHB) Green Building Standard™ and National Skills Standards and is one of only three pre-apprenticeship curricula recognized by the Department of Labor (DOL).

Through HBI's competency-based model infused with blended learning, students are guaranteed to learn residential construction focused skills, receive hands-on training and master the knowledge needed for employment in an entry-level job in the building industry. As of Q1 of 2024, HBI serves 35,000 students and instructors nationwide.

Partnering with NAHB, its 140,000+ members and 700+ state and local Home Builder Associations (HBAs) and Student Chapters, HBI offers industry recognized certification in nine (9) trade disciplines, in addition to a CORE certification. Standard assessments are administered in the secure CTETechWorks™ learning management system alongside more than 2,500 additional blended learning resources, online gamification tools, student performance reporting tools and live online training integration. For CTE programs and individuals seeking 3<sup>rd</sup> party verification, HBI partners with NOCTI to offer certification assessments.

Instructor certification is the first step in utilizing HBI curricula. Through a hybrid approach, instructors are given the tools and support they need to be successful. Following the initial instructor certification, a mentorship period commences to provide continuous support and social learning opportunities alongside fellow instructors.

Strengthening career technical education (CTE) across the country to meet industry workforce demand is at the core of HBI partnerships. Schools to Skills is just one example of an annual campaign in partnership with The Home Depot Foundation and the National Housing Endowment. This two-year Grant Program provides funding to assist secondary schools in creating or enhancing their construction trades programs. It provides a no-cost pathway toward industry-recognized certifications for middle school and high school students.

**The Pre-Apprenticeship Certificate Training (PACT)** curricula employs a blended learning approach to meet all learning styles: visual/spatial learning through observation; aural/auditory learning through listening; verbal/linguistic learning through the spoken or written word; physical/kinesthetic learning by hands-on tasks; logical/mathematical learning through a systematic approach; social/interpersonal learning through collaboration; and solitary/intrapersonal learning through self study.

**PACT CORE** This curriculum includes the following areas of focus: basic safety, trade math and measurement, an introduction to tools and materials in residential construction, and employability skills.

### **Learning Objectives:**

#### **Safety:**

##### **SAFE WORKING PRACTICES**

1. Describe and practice safe use of hand and power tools.
2. Distinguish between safe and unsafe installation practices.
3. Inspect work area to ensure a safe working environment.
4. Identify hazardous conditions associated with tools and equipment.
5. Identify hazardous conditions associated with work areas.
6. Identify hazardous conditions associated with chemicals/supplies.
7. Select and wear proper safety attire on the job site including personal protective equipment [PPE] (safety glasses, safety footwear, hearing protection, hard hats, etc.).
8. Accept the responsibility of the personal safety of other workers.
9. Demonstrate the ability to report all injuries immediately to the instructor.
10. Demonstrate personal safety rules/OSHA regulations.
11. Demonstrate shop safety rules/OSHA regulations.
13. Locate and operate fire safety equipment.
14. Demonstrate safe use of ladders and scaffolding.
15. Demonstrate safe fall protection procedures and equipment use.
16. Demonstrate the ability to properly lift and carry construction materials.

##### **BASIC FIRST AID**

17. Identify locations of all first aid equipment and materials.
18. Demonstrate basic first aid practices.

***(Estimated 40hrs +/-)***

#### **Construction Math:**

##### **BASIC CONSTRUCTION MATH**

1. Read a rule to the nearest 16th of an inch
2. Calculate whole numbers using addition, subtraction, multiplication, and division.
3. Calculate fractions using addition, subtraction, multiplication, and division.
4. Calculate decimals using addition, subtraction, multiplication, and division.
5. Add, subtract, multiply, and divide measurements using measuring tools.
6. Calculate square foot and lineal foot measurements.
7. Apply specific formulas for estimating materials.
8. Calculate ranges, ratios, and indexes such as a HERS Energy Index.

##### **PRINT READING**

9. Read and interpret basic construction prints.
10. Identify basic architectural symbols and abbreviations.
11. Demonstrate proper use of tools used to determine square.
12. Demonstrate proper use of tools used to determine plumb.

13. Demonstrate proper use of tools used to determine level.  
**(Estimated 40hrs +/-)**

#### Tools & Construction Materials:

##### HAND TOOLS

1. Demonstrate the proper use, care, and maintenance of hand tools.
2. Describe safety rules for each hand tool.
3. Demonstrate the proper use, care, and maintenance of ladders and scaffolding.
4. Identify/select appropriate hand tools for specific tasks in carpentry.
5. Identify/select appropriate hand tools for specific tasks in electrical.
6. Identify/select appropriate hand tools for specific tasks in plumbing.
7. Identify/select appropriate hand tools for specific tasks in brick masonry.
8. Identify/select appropriate hand tools for specific tasks in landscaping.
9. Identify/select appropriate hand tools for specific tasks in Building Construction Technology.
10. Identify/select appropriate hand tools for specific tasks in painting and finishing.

##### POWER TOOLS

11. Demonstrate the proper use, care, and maintenance of power tools / equipment.
12. Describe safety rules for each power tool.
13. Identify/select appropriate power tools for specific tasks in carpentry.
14. Identify/select appropriate power tools for specific tasks in electrical.
15. Identify/select appropriate power tools for specific tasks in plumbing.
16. Identify/select appropriate power tools for specific tasks in brick masonry.
17. Identify/select appropriate power tools for specific tasks in landscaping.
18. Identify/select appropriate power tools for specific tasks in Building Construction Technology.
20. Demonstrate the proper use, storage, and handling of materials, chemicals, and compounds used in various trade areas.

##### CONSTRUCTION MATERIALS

20. Demonstrate the proper use, storage, and handling of materials, chemicals, and compounds used in various trade areas.
21. Identify/select appropriate construction equipment and materials for specific tasks in carpentry.
22. Identify/select appropriate construction equipment and materials for specific tasks in electrical.
23. Identify/select appropriate construction equipment and materials for specific tasks in plumbing.
24. Identify/select appropriate construction equipment and materials for specific tasks in brick masonry.
25. Identify/select appropriate construction equipment and materials for specific tasks in landscaping.
26. Identify/select appropriate construction equipment and materials for specific tasks in Building Construction Technology.

27. Identify/select appropriate construction equipment and materials for specific tasks in painting and finishing.

#### MEASURING AND CALCULATING

28. Demonstrate proper use of measurement tools.
- (Estimated 40hrs +/-)**

#### Career Wiz (Employability):

##### PREPARING FOR THE WORKFORCE

1. Obtain documentation for employment.
2. Obtain government-issued driver's license.
3. Identify and describe industry-related job qualifications.
4. Use media, Internet, and other resources to contact employers for job opportunities.
5. Practice and successfully complete a job application.
6. Create a résumé.
7. Practice and interview for a job.
8. Follow up with employers about interview and job.

##### PROFESSIONALISM IN THE WORKPLACE

9. Demonstrate compliance with a drug-free workplace.
10. Respond appropriately to supervision.
11. Follow written and verbal directions.
12. Complete assigned tasks.
13. Work safely.
14. Dress appropriately for work.
15. Arrive for work on time.
16. Shows respect for tools, materials and other's property.
17. Work as a team member with diverse races, sexes, ages, and cultures, treating all with respect.

**(Estimated 40hrs +/-)**

**Total Approx. 150 Hours**

**Prerequisite for Trade sections below**

**HBI PACT Core Certificate earned at completion.**

**PACT Green Building** This unit includes: basic environmental literacy; environmental impact of construction; building science fundamentals; green building terminology; and material, energy and resource conservation.

#### Learning Objectives:

##### BASIC ENVIRONMENTAL LITERACY

1. Identify primary natural resources.
2. Describe which resources are consumed and how.
3. Describe which resources are wasted and how.
4. Distinguish different kinds of environmental change.
5. Identify causes of environmental change.

6. Identify the role of construction in resource consumption including existing and future building stocks.
7. Identify the role of construction in waste.
8. Identify how construction causes of environmental change.

#### GREEN BUILDING CONCEPTS

9. Understand how site and lot design impact building performance.
10. Identify the sources of construction materials.
11. Identify the volume of construction materials used.
12. Identify the waste and recycling process of materials.
13. Understand different sources of energy for buildings.
14. Understand different uses of energy in buildings.
15. Identify sources of energy waste.
16. Understand different sources of water for buildings.
17. Understand different uses of water in buildings.
18. Identify sources of water waste.
19. Understand air flows and quality in buildings.
20. Identify sources of air contaminants.
21. Understand the effect of good building maintenance on the environment.
22. Distinguish between the effects of new construction and of maintenance on the environment.

#### GREEN BUILDING BASIC SKILLS

23. Identify hazardous conditions unique to green building.
24. Understand scales, ratios and other basic mathematical concepts used in green measurement.
25. Identify diagnostic tools used in energy-efficient and green building.
26. Identify hand and power tools unique to energy-efficient and green building.
27. Demonstrate environmentally friendly cleaning and maintenance of hand and power tools.
28. Identify basic construction materials unique to green building.
29. Identify employment opportunities in green construction.
30. Identify employment opportunities in green building and other environmental careers.

#### GREEN BUILDING TRADE SKILLS

31. Identify construction materials for green carpentry.
32. Identify material-efficient framing systems.
33. Demonstrate installation of insulation in framing.
34. Understand carpentry waste and recycling alternatives.
35. Identify energy-efficient windows, doors, and trim.
36. Identify materials for green electrical work.
37. Identify on-site renewable energy sources and connections to home electricity distribution system.
38. Have a basic understanding of metering, thermostat, and other efficient control and monitoring systems.
39. Identify materials for green plumbing.
40. Understand alternative water source systems.
41. Identify alternative water heating and treatment equipment.
42. Identify construction materials for green masonry.

43. Understand masonry waste and recycling alternatives.
44. Identify construction materials for landscaping.
45. Give three examples of indigenous plants and/or shrubs.
46. Identify environmentally friendly herbicides, fungicides, fertilizers, and other planting materials.
47. Identify water-efficient irrigation systems.
48. Understand appropriate storm water management.
49. Identify construction materials for green painting.
50. Understand VOC and other pollutant terms related to paints and finishes.
51. Understand appropriate disposal of paints or finishes.

**Approx. 50 Hours**

**Optional**

**HBI PACT Core Green Building Certificate earned at completion.**

**PACT Carpentry** This unit includes: carpentry tools identification and use; lumber identification and use; measurement; concrete forms; framing; shingling; exterior doors and windows; siding and trim; insulation; interior doors; and minor repairs.

### **Learning Objectives:**

#### **CARPENTRY TOOLS AND SAFETY1 CARPENTRY TOOLS AND SAFETY**

1. Understand the safe use of carpentry hand and power tools.
2. Demonstrate the proper use of carpentry tools and equipment.

#### **LUMBER IDENTIFICATION AND USE**

3. Describe lumber defects.
4. Describe standard lumber sizing

#### **CALCULATE SQUARE AND LINEAL FOOT MEASUREMENTSMEASUREMENTS**

5. Calculate square foot and lineal foot measurements and cubic measurements.
6. Translate measurements from paper to work environment.

#### **BUILD CONCRETE FORMS**

7. Identify the types of forms (conventional and engineered) and components.
8. Build forms for concrete walls, columns, and piers with proper bracing.
9. Strip concrete forms.

#### **FRAME FLOORS, WALLS/PARTITIONS, CEILINGS, AND ROOFS**

10. Identify the components of floor framing systems (conventional and engineered systems).
11. Identify the components of wall framing systems (wood and metal).
12. Identify the components of roof framing systems (conventional and engineered).
13. Frame walls, floors, and ceilings to 16" and 24" on center.
14. Frame a basic roof structure.

#### **APPLY ROOF SHINGLES**

15. Understand basic roofing concepts
16. Understand all basic roofing safety techniques.
17. Trim, position, and affix roof shingles properly.

#### **INSTALL EXTERIOR DOORS AND WINDOWS**

18. Identify different types and sizes of doors and windows.

19. Install exterior doors and windows per manufacturer's instructions and recommendations  
**INSTALL SIDING AND EXTERIOR TRIM**

20. Identify types of siding and exterior finish systems.
21. Measure, cut, and install siding per manufacturer's recommendations.
22. Install exterior trim per manufacturer's recommendations.

**INSTALL INSULATION AND WALLBOARD**

23. Identify different types and sizes of drywall and sheet goods.
24. Identify types of insulation and their uses.
25. Install insulation per manufacturer's recommendations.
26. Install drywall and plywood paneling per manufacturer's recommendations.

**INSTALL INTERIOR DOORS AND TRIM**

27. Install interior doors per manufacturer's recommendations.
28. Install interior trim per manufacturer's recommendations.

**PERFORM MINOR REPAIRS**

29. Identify common carpentry repair problems.
30. Perform minor repairs correctly.

**Approx. 150 Hours**

**HBI PACT Carpentry Certificate earned at completion.**

**PACT Electrical** This unit includes: electrical safety; fundamentals of National Electrical Code (NEC); electrical tools and materials identification and use; basic electrical formulas; installation of circuits, switches and outlets; and equipment testing.

### **Learning Objectives:**

**ELECTRICAL SAFETY**

1. Demonstrate basic electrical safety.
2. Demonstrate proper use of electrical safety equipment.
3. Identify and demonstrate safe/proper use of hand and power tools used in the electrical trade.
4. Demonstrate proper Lockout/Tagout procedures.

**TOOLS AND EQUIPMENT**

5. Understand the safe use of hand and power tools and cabling equipment.
6. Demonstrate the proper use of tools and equipment used in the electrical trade.
7. Identify conductors and cables found in residential applications.
8. Identify types of conductors commonly found in commercial applications.
9. Identify boxes (junction, pull, conduits, etc.) and their proper use in the electrical trade.
10. Identify fittings (connectors, couplings, straps, etc.) and their proper use in the electrical trade.

**BASIC ELECTRICAL CONCEPTS**

11. Follow proper electrical construction procedures when performing a task.
12. Describe job responsibilities for electrical occupations.
13. Identify basic electrical terminology.
14. Demonstrate familiarity with terms used in the NEC.
15. Describe basic provisions and the purpose of the NEC 110 and 250 for residential electricians.
16. Describe Ohm's and Watt's laws.
17. Solve electrical circuit problems using Ohm's and Watt's laws.
18. Describe the three common electrical faults (short circuit, open circuit, and ground fault).
19. Identify the characteristics of alternating current and direct current.



20. Identify common residential electrical construction symbols.
21. Demonstrate proper use of electrical testing equipment.
22. Identify renewable energy sources and electrical connections.

#### **CIRCUITS, SWITCHES, AND OUTLETS**

23. Identify, describe, then wire single pole, switch loop, three-way, and four-way switching circuits.
24. Identify, describe, then wire duplex, GFCI, and split receptacles.
25. Identify, describe, and explain the characteristics of a simple series circuit.
26. Identify, describe, and explain the characteristics of a simple parallel circuit.
27. Identify, describe, and explain the characteristics of a simple series parallel circuit.

**Approx. 150 Hours**

**HBI PACT Electrical Wiring Certificate earned at completion.**

**PACT Plumbing** This unit includes: plumbing tools and materials identification and use; pipe joining techniques; rough-in plumbing systems installation; pressure-testing; plumbing fixture installation; basic plumbing troubleshooting and repair.

#### **Learning Objectives:**

##### **BASIC PLUMBING TOOLS, CONCEPTS, AND SAFETY**

1. Identify and demonstrate the proper use of tools and equipment used in the plumbing trade.
2. Read a ruler to the nearest 1/16th of an inch.
3. Calculate slope required for building and sewer lines.
4. Identify common plumbing materials and fittings used for supply and DWV systems.
5. Identify common plumbing tools and equipment.
6. Identify common plumbing fixtures and appliances.
7. Identify common valve types and their uses (ball, gate, isolation/ shut-off, t&p, hose bibb, check, etc.).
8. Describe the operation of vacuum breakers, back-flow preventers, and anti-siphon devices.
9. Describe plumbing related "ADA" International Code Council (ICC) building code requirements.

##### **JOIN PIPE**

10. Cut and join copper tubing using appropriate tools and techniques including sweating, compression, and shark-bite.
11. Describe methods of cutting and joining cast iron pipe, both service weight and no hub types.
12. Cut, ream and thread black iron or galvanized pipe using pipe cutter, ratchet threader, and reamer.
13. Describe the steps for joining threaded black iron or galvanized.
14. Describe the benefits and methods of installing PEX tubing, fittings, use expanders, insert fitting, and rings.
15. Describe flexible gas piping (gastite, trappipe).
16. Cut and join PVC/CPVC using appropriate tools and methods.

##### **ROUGH-IN PLUMBING SYSTEM**

17. Secure horizontal and vertical lines of pipe to wood and metal surfaces.
18. Locate and mark holes for plumbing and install pipe through wood walls, ceilings, and floors.

##### **INSTALL FIXTURES**

19. Install water closet.
20. Install kitchen faucet with sprayer assembly.
21. Install lavatory faucet.
22. Install garbage disposal.
23. Install dishwasher.



24. Install tub/shower combination with faucet.

#### **PRESSURE-TEST SYSTEMS**

25. Describe pressure-testing for supply.
26. Explain procedures for testing DWV systems using hydrostatic means

#### **REPAIR BASIC PLUMBING PROBLEMS**

27. Repair common faucet leaks and repair issues.
28. Diagnose and repair common toilet malfunctions
29. Disassemble and clean kitchen sink and lavatory sink P-Trap.
30. Describe the operation of ball, disc, cartridge, and compression faucets.
31. Describe procedures to replace heating element on a water heater.
32. Identify components of gas and electric water heaters.

#### **WATER/ENERGY SAVING ALTERNATIVES**

33. Explain and describe the characteristics of low-flow faucets, aerators, and showerheads.
34. Describe and explain operating principles of a dual flush water closet.
35. Describe and explain the principles of tankless water heaters.

**Approx. 150 Hours**

**HBI PACT Plumbing Certificate earned at completion.**

**PACT Masonry** This unit includes: mortar preparation; scaffolding identification and use; masonry tools and material identification and use; applied math and measurement related to brick and block projects.

#### **Learning Objectives:**

##### **GENERAL MASONRY CONCEPTS**

1. Describe the use of brick and block the masonry trade.
2. Identify masonry tools associated with masonry tending (shovels, brick tongs, mortar boards, etc.).
3. Demonstrate the correct use and maintenance of masonry hand and power tools.
4. Mix mortars to proper proportions.
5. Prepare the jobsite to start work.

##### **TEMPORARY WORK PLATFORMS**

6. State uses and types of scaffolding.
7. Inspect scaffolding for safety problems.
8. Stock job to keep it running smoothly.
9. Clean up the jobsite.

##### **MASONRY MEASURING AND CUTTING**

10. Demonstrate safety rules for masonry cutting.
11. Operate a masonry saw.
12. Cut masonry with a hammer and brick set.
13. Read and use a 6' rule and tape to the nearest 1/16."
14. Correctly use modular and spacing rules.

##### **BRICK, BLOCK, AND STONE**

15. Demonstrate the ability to lay brick and block.
16. Spread mortar.
17. Butter masonry units.
18. Lay units to a line.
19. Tool joints.
20. Rake out joints.
21. Describe pointing and cleaning safety precautions.

22. Use environmentally friendly material to clean mortar off brick.

**Approx. 150 Hours**

**HBI PACT Plumbing Certificate earned at completion.**

**PACT Landscaping** This unit includes: landscaping tools and material identification and use; equipment testing and maintenance; Safety Data Sheet use; planting, hydration and fertilization; and lawn and turf management.

### **Learning Objectives:**

#### **LANDSCAPING SAFETY**

1. Demonstrate the safe use of landscaping hand tools.
2. Demonstrate the safe use of electric and gas landscaping power tools.
3. Demonstrate an understanding of appropriate safety gear (ear muffs, safety shoes, goggles) to be used in performing tasks.
4. Demonstrate the proper use of Safety Data Sheets (SDS) and “right to know” laws.
5. Demonstrate the proper procedures to store gasoline and hazardous chemicals.
6. Read and follow agency or company policies and procedures manuals.

#### **LANDSCAPING MATERIALS IDENTIFICATION**

7. Identify two insects and the type(s) of insecticide(s) used to control each.
8. Identify one plant disease and the type(s) of fungicide(s) used to control it.
9. Identify four weeds and the type(s) of herbicide(s) used to control each.
10. Identify and locate 10 shrubs or kinds of ground cover in the landscape.
11. Identify one type of turf grass.

#### **LANDSCAPING AND MAINTENANCE**

12. Protect a newly seeded lawn and water until established.
13. Add mulch to ornamental beds.
14. Install a weed barrier in an ornamental bed.
15. Remove weeds from ornamental beds with hand tools.
16. Plant flowers (annuals, biennials, bulbs).
17. Plant shrubs.
18. Fertilize shrubs.
19. Prune shrubs.
20. Irrigate lawns and planted areas.
21. Aerate turf with a power aerator.
22. Dethatch turf with a power dethatcher.
23. Revitalize worn turf grass with seed or sod.
24. Plant ground cover.
25. Create hardscapes and surfaces.

**Approx. 150 Hours**

**HBI PACT Landscaping Certificate earned at completion.**

**PACT Painting** This unit includes: Painting and finishing tool and material identification and use; surface preparation; paint application using brush, roller, and spray techniques; basic drywall repair; and texture application.

### **Learning Objectives:**

#### **PAINTING TOOLS AND SAFETY**

1. Understand the safe use of painting hand and power tools.
2. Demonstrate the proper use of painting tools and equipment.

#### **PAINTING FUNDAMENTALS**

3. Explain basic painting theories.
4. Discuss different specialty finishes and their application.

#### **PROTECTING SURFACES**

5. Identify tools and materials used to protect surfaces.
6. Describe and demonstrate the importance of proper cleanup.

#### **SURFACE PREPARATION**

7. Describe and demonstrate the different methods of preparing new and previously painted wood surfaces.
8. Describe and demonstrate the different methods of preparing new and previously painted concrete and masonry surfaces.
9. Describe and demonstrate the different methods of preparing new and previously painted drywall.
10. Demonstrate the procedures of high-pressure water cleaning.

#### **SEALANT, FILLER, AND REPAIRS**

11. Identify and use various sealants and fillers for appropriate tasks.

#### **PAINTS AND COATINGS**

12. Identify the basic functions of solvents and additives.
13. Differentiate between water-based, oil-based, and epoxy-based paints and coatings.
14. Explain the function of various types of paints and coatings

#### **APPLICATION**

15. Demonstrate the proper use of various types of rollers and frames.
16. Demonstrate proper paint application to various surfaces.

#### **WOOD FINISHING AND STAINS**

17. Identify various types of wood in regard to application of stain or finish.
18. Differentiate between stains and other coatings.

#### **DRYWALL FINISHING**

19. Identify and demonstrate how to use proper hand tools to finish or repair drywall.
20. Identify and use various types of materials for drywall finishing or repair.

#### **SPRAYING**

21. Demonstrate proper application and use of spraying equipment.
22. Properly clean, maintain, and store equipment and tools.

#### **TEXTURING**

23. Demonstrate proper use and safe use of tools.

***Approx. 150 Hours***

***HBI PACT Painting Certificate earned at completion.***

**PACT Building Construction Technology (BCT)** This unit includes: tool and material identification and use; work order comprehension and application; drywall and tile repair; minor plumbing, carpentry, electrical, and appliance repair; preventive maintenance application; grounds maintenance; and basic exterior building maintenance.

## **Learning Objectives:**

### **GENERAL BUILDING CONSTRUCTION TECHNOLOGY CONCEPTS**

1. Fill and interpret work orders and make-ready checklists.
2. Fill out and correctly maintain service work orders.
3. Caulk around fixtures.
4. Repair and re-grout tile.

### **CARPENTRY MAINTENANCE**

5. Demonstrate carpentry safety practices.
6. Identify basic carpentry hand tools, their function, and how to use the tools safely.
7. Identify basic carpentry power tools, their function, and how to use the tools safely.
8. Identify anchors and fasteners.
9. Identify carpentry-related materials commonly used in carpentry maintenance.
10. Replace, repair, and install siding.
11. Perform weatherizing procedures.
12. Repair drywall and plaster walls.
13. Replace and repair interior walls.
14. Identify procedures for replacing, repairing, and installing floor coverings.
15. Install wall and ceiling insulation.
16. Install or replace interior trim.
17. List steps for installing keyed, privacy, and passage lock sets.
18. Describe key security systems.

### **ELECTRICAL MAINTENANCE**

19. Demonstrate electrical safety practices.
20. Identify basic electrical hand tools, their function, and how to use the tools safely.
21. Identify basic electrical power tools, their function, and how to use the tools safely.
22. Identify anchors and fasteners commonly used in electrical maintenance.
23. Identify electrical-related materials.
24. Properly use electrical test equipment, such as multimeters and outlet testers.
25. Troubleshoot/repair or replace outlets, switches, fuses, and fixtures in existing building.
26. Identify power supplies (e.g., single-phase, three-phase).
27. Wire 120-Volt circuits.
28. Wire low-voltage circuits using a schematic.
29. Identify and correct defective two-wire and three-wire cords & plugs.
30. Maintain emergency lighting systems, exit lights, and signs.
31. Check and test "hard-wired" smoke detectors.

### **PLUMBING MAINTENANCE**

32. Demonstrate plumbing safety practices.
33. Identify basic plumbing hand tools, their function, and how to use the tools safely.
34. Identify basic plumbing power tools, their function, and how to use the tools safely.
35. Identify anchors and fasteners commonly used in plumbing maintenance.
36. Identify plumbing-related materials.
37. Cut, clean, and glue plastic pipe.
38. Assemble compression fittings.
39. Replace and repair plumbing fixtures and connections.
40. Describe how a garbage disposal works.
41. Describe the three most common problems related to garbage disposals.
42. Identify and describe water supply, diverter and drains for a tub/shower.
43. Replace, repair, and install plumbing accessories.
44. Clean and replace traps, drains, and vents.
45. Identify and describe backflow prevention.

46. Demonstrate proper use and application of thread seal, pipe dope, and plumber's putty.

#### HVAC/PREVENTIVE MAINTENANCE

47. Demonstrate safety practices for servicing environmental control systems.
48. Identify basic hand tools, their function, and how to use the tools safely.
49. Describe basic heating operations for a gas furnace.
50. Clean the removable burner tubes and ports on a gas furnace.
51. Describe basic heating operations for electrical baseboard.
52. Test the heating element on an electric baseboard heater.
53. Describe basic heating operations for hydronic systems.
54. Identify 13 key parts of a hydronic heating system.
55. Describe the four main parts of an air conditioning system.
56. Describe the flow of refrigerant in an air conditioning system.
57. Clear evaporator pan and drain line.
58. Check thermostat operation.
59. Clean condenser.
60. Replace furnace and/or cooling filters.
61. Locate shutoffs for electrical and plumbing fixtures.
62. Identify potential electrical hazards.
63. Check the condition of emergency exit floor plans.

#### LANDSCAPING MAINTENANCE

64. Use and maintain grounds-keeping equipment (mowers, edger's, etc.) safely.
65. Identify basic landscaping hand tools, their functions, and how to use the tools safely.
66. Maintain and police grounds.
67. Prune trees and shrubs.
68. Identify basic components of a pool system.

#### APPLIANCE REPAIR

69. Identify common appliance components for a clothes dryer, washing machine, and dishwasher.
70. Test and replace a clothes dryer door switch.
71. Identify and describe key parts of an electric and gas range.
72. Remove/repair/replace the cook-top ignitor on a gas range.
73. Test and replace oven temperature control.
74. Describe how a dishwasher works and identify key parts.
75. Test the dishwasher motor.
76. Adjust and test the dishwasher door latch and switch.

***Approx. 220 Hours***

***HBI PACT Building Construction Technology Certificate earned at completion.***

**PACT Weatherization** This unit includes: environmental and economic impact of weatherization; building science fundamentals; tool and material identification and use; insulation, caulking and weatherstripping installation; exterior finish repair and replacement; energy efficient plumbing fixture replacement; and HVAC, plumbing, electrical, and occupant safety systems upgrades.

#### **Learning Objectives:**

##### **SAFETY**

1. Identify hazardous conditions unique to weatherization and remodeling, including lead, mold, and electrical and structural hazards (especially knob-and-tube wiring).

## CONCEPTS

2. Distinguish between facilities maintenance, green renovations, energy retrofits, and weatherization.
3. Identify weatherization program terms.
4. Understand how to fill out project and program work orders.
5. Understand how to fill out and correctly maintain weatherization service logs and paperwork.
6. Understand basic energy efficiency and air sealing concepts.

## BASIC SKILLS

7. Identify the primary energy diagnostic methods and their tools.
8. Understand basic diagnostic measures.
9. Identify tools and construction materials commonly used in weatherization projects.
10. Demonstrate proper environmentally friendly cleaning and maintenance of hand and power tools.
11. Identify materials for recycling from weatherization waste.

## TRADE SKILLS

12. Identify types of attic, exterior wall, and basement insulation and their respective functions (including blown, batt, and cellulose).
13. Demonstrate methods of installing insulation in existing framing systems, including attic and floor openings, knee walls, and basement band joists.
14. Demonstrate methods of installing insulation for major mechanical and plumbing equipment and lines, including water heater blankets and pipe insulation.
15. Identify types of caulking and other sealants and their respective functions.
16. Understand methods of installing sealants in existing building envelopes.
17. Identify and demonstrate installation of weather-stripping around windows, doors, and other exterior openings.
18. Demonstrate windowpane replacement and glazing compound application.
19. Identify energy-efficient windows, doors, and trim. 3
20. Apply proper removal of existing windows, doors, and trim.
21. Demonstrate proper installation of new windows, doors, and trim.
22. Repair and install exterior siding.
23. Repair interior drywall and plaster.
24. Repair and replace floor coverings.
25. Identify shutoffs for electrical, plumbing, and gas lines.
26. Identify defective electrical cords, plugs, outlets, switches, and fuses.
27. Understand methods for sealing air ducts and vents.
28. Identify faulty or hazardous HVAC equipment such as furnaces and window units.
29. Demonstrate basic replacement and maintenance techniques of HVAC operating components such as belts, bearings, and filters.
30. Properly clean HVAC equipment including condensing units and coils.
31. Replace basic plumbing fixtures such as showerheads and faucets.
32. Identify proper removal of existing lighting fixtures.
33. Install new lighting fixtures.
34. Check smoke and CO detectors.

**Approx. 150 Hours**

***HBI PACT Weatherization Certificate earned at completion.***

**PACT HVAC** This unit includes: tool and material identification and use; designing and building ductwork; HVAC wiring troubleshooting; preventive maintenance techniques;

chemical and hazardous material safety; air distribution and treatment system principles; and thermostat and control circuit operation.

### **Learning Objectives:**

#### **BASIC HVAC TECHNOLOGY SAFETY**

1. Identify Personal Protective Equipment [PPE] for HVAC work.
2. Demonstrate ability to determine appropriate PPE for specific tasks.
3. Select & wear proper safety attire on the job site including personal protective equipment [PPE] (safety glasses, safety footwear, hearing protection, hard hats, etc.).
4. Accept the responsibility for the personal safety of other workers.
5. Demonstrate the ability to properly lift & carry construction materials.
6. Describe safe use of ladders & scaffolding.
7. Demonstrate safe fall protection procedures & equipment use.
8. Demonstrate electrical safety practices.
9. Identify electrical hazards & corrective actions.
10. Demonstrate knowledge of proper Lock-out/Tag-out procedures.
11. Demonstrate the ability to determine all equipment is de-energized.

#### **HVAC MATH**

12. Calculate square foot, linear & cubic measurements.
13. Perform estimating for simple projects
14. Estimate repair costs for a simple HVAC service call

#### **HVAC TOOLS AND MATERIALS**

15. Understand the safe use of HVAC hand & power tools.
16. Identify basic HVAC specialty tools, their function, & how to use the tools safely.
17. Demonstrate the proper use of HVAC tools & equipment.
18. Identify anchors & fasteners commonly used in HVAC tasks.
19. Identify other materials commonly used in HVAC tasks.
20. Demonstrate proper precautions with & storage of HVAC-related chemicals & hazardous materials.
21. Explain how an oxy-acetylene torch set is used in HVAC.
22. Explain how to safely set up an oxy-acetylene torch set for use.
23. Explain how to safely adjust an oxy-acetylene torch set for use.
24. Explain proper maintenance of an oxy-acetylene torch set.

#### **BLUEPRINT READING**

25. Locate, identify, & describe major elements of blueprints, floor plans, & elevations.
26. Demonstrate ability to design & build HVAC systems accordingly.

#### **REFRIGERATION PRINCIPLES**

27. Describe the difference between refrigeration & air conditioning.
28. Identify multiple applications of refrigeration systems.
29. Explain the refrigeration process.
30. Explain the air-conditioning process.
31. Explain the basic refrigeration cycle.



32. Describe the four major components of a refrigeration system.
33. Explain superheat & subcooling
34. Measure & adjust superheat & subcooling
35. Describe factors that negatively affect superheat & subcooling

## **AIR CONDITIONING PRINCIPLES**

36. Identify the four major components of an air-conditioning system
37. Describe the flow of refrigerant in an air conditioning system
38. Describe what a condenser does
39. Explain the condensing process
40. Describe what an evaporator does
41. Explain the dehumidifying process & why it's important.
42. Describe the difference between an air conditioner & a heat pump.
43. Explain the purpose & function of the defrost cycle in a heat pump.

## **HVAC ELECTRICAL**

44. Identify basic electrical hand tools, their function, & how to use tools safely.
45. Identify basic electrical power tools, their function, & how to use tools safely.
46. Identify electrical-related materials.
47. Identify potential electrical hazards.
48. Demonstrate proper Lockout/Tagout procedures.
49. Explain Direct Current & its use in HVAC installations.
50. Explain Alternating Current & its use in HVAC installations.
51. Explain inductive reactance as it relates to HVAC installations.
52. Identify power supplies (e.g., single-phase, three-phase).
53. Properly use electrical test equipment, such as multimeters, ammeters, & outlet testers
54. Troubleshoot, then repair/replace wiring & conduit in existing HVAC installations
55. Wire 120-Volt circuits.
56. Wire low-voltage circuits using a schematic.

## **ELECTRIC MOTORS**

57. Identify three types of motors (e.g., single-, three- & split-phase).
58. Explain the principles of torque relating to electric motors
59. Describe the operational principles of three- & split-phase motors.

## **INSTRUMENTS AND REFRIGERANT**

60. Test & calibrate thermometers.
61. Demonstrate the ability to read & understand analog & digital scales on gauges & meters.
62. Identify the high- & low-pressure connections on A/C equipment.
63. Demonstrate how to properly connect gauges to A/C equipment.
64. Describe in detail proper leak detection techniques.
65. Demonstrate how to add refrigerant to or remove it from a system.
66. Explain proper reclamation & recycling of refrigerant
67. Demonstrate proper refrigerant recovery techniques.
68. Demonstrate proper refrigerant recovery machine maintenance.

## **TUBING AND PIPING**

69. Identify common tubing & piping components for HVAC.
70. Identify common tubing & piping fittings for HVAC.
71. Identify basic tubing & piping hand tools, their function, & how to use the tools safely.

72. Identify anchors & fasteners commonly used in tubing & piping applications within HVAC systems.
73. Identify tubing- & piping-related materials (flux, joint compound, pipe dope, etc.).
74. Demonstrate when to use and the application of thread-seal tape, pipe dope, and plumber's putty
75. Demonstrate how to cut and clean tubing and piping for joining.
76. Demonstrate how to flare copper tubing.
77. Demonstrate how to swage copper tubing.
78. Demonstrate how to safely set up a common propane torch.
79. Sweat joints on copper tubing.
80. Accurately measure & assemble tubing & piping runs.
81. Repair & replace existing tubing & piping runs & connections.

## **AIR DISTRIBUTION SYSTEMS**

82. Explain the principles of air distribution systems.
83. Identify basic components of air distribution systems.
84. Explain the importance of properly sealing ducts within a system.

## **HVAC PREVENTIVE MAINTENANCE**

85. Explain the benefits of proper preventive maintenance for HVAC equipment
86. Locate shut-offs for electrical & plumbing fixtures.
87. Demonstrate safety practices for servicing environmental control systems.
88. Clean the removable burner tubes & ports on a gas furnace
89. Check thermostat operation
90. Clean condenser
91. Clean evaporator pan and drain line
92. Replace furnace and/or cooling filters

## **AIR TREATMENT DEVICES**

93. Explain the purposes of treating the interior air in a building.
94. Describe the principles of air treatment in a building.
95. Explain the difference between contaminants & pollutants.
96. Explain what mold is & why it's harmful to human health.
97. Explain the importance of appropriate air cleaning & ventilation.
98. Name several types of air-treatment systems or devices.
99. Identify seven types of filters or filtering systems.
100. Explain MERV ratings.

## **HEATERS AND BOILERS**

101. Explain heat theory & heat transfer theory
102. Describe the relationship between heat & power.
103. Describes the theory of heat and heat transfer
104. List three common methods of heat transfer.
105. Explain the difference between electric, oil, & gas furnaces.
106. List the major furnace types from most-to-least efficient.
107. List the major components of a furnace
108. Define temperature.
109. Define humidity
110. Explain how temperature & humidity are related.
111. Explains the principle of humidity
112. Explain the difference between a heater & a boiler.



- 113. Test the heating element on an electric baseboard heater
- 114. Describe basic heating operations for electrical baseboard heaters
- 115. Describe basic heating operations for hydronic systems
- 116. Identify 13 key parts of a hydronic heating system
- 117. Describe basic heating operations for a gas furnace
- 118. List the major components of a boiler.
- 119. Explain what makes a boiler energy efficient.

***Approx. 480 Hours***

***HBI PACT HVAC Basic Certificate earned at completion.***