Clean Jobs Workforce Network Program

2024-25 Program Manual

Chapter 7: Training and Certifications

Chapter Overview

By the end of Chapter 7, you will be able to:

- Explain the training expectations of the Clean Jobs Curriculum Framework that will be used by the CEJA Workforce Hubs Program.
- Comply with the Curriculum Framework requirements.
- Integrate the core equity values into the program's training and instruction.

The CEJA Workforce Hubs will create a qualified talent pipeline to fill job opportunities with diverse candidates in clean energy industries. Through program instruction, the CEJA Workforce Hubs will train, prepare, and empower participants by fostering resilience and self-sufficiency.

Clean Jobs Curriculum Framework Overview

The main objective of the CEJA Workforce Hubs is to increase access to and opportunities for education, training, and support services to help participants succeed in the labor market generally and the clean energy sector specifically. The CEJA legislation requires that the CEJA Workforce Hubs utilize a standard Clean Jobs Curriculum Framework ("curriculum framework"). This framework was developed through a stakeholder engagement process designed to identify the career pathways and training curriculum needed for participants to be skilled, work ready, and able to enter clean energy jobs. The CEJA Workforce Hubs will implement the curriculum framework to provide training, certification preparation; job readiness; and skill development. This framework includes soft skills, math skills, technical skills, certification test preparation, and other developmental opportunities necessary to transition program participants into workforce ready individuals.

The curriculum framework:

- Identifies the core training curricular competency areas needed to prepare program graduates to enter clean energy and related sector jobs.
- Identifies a set of required core cross-training competencies to provide a foundation for pursuing a career comprised of multiple clean energy job types.
- Integrates broad occupational training, remedial education, and work readiness support necessary for career entry into the general construction and building trade sectors.
- Identifies on-the-job training formats and provides suggested trainer certification standards, where relevant.
- Recommends best practices to cultivate an equitable, safe, dynamic, enjoyable, and successful working environment for all.

The legislation's definition of "clean energy jobs" includes jobs in the solar energy, wind energy, energy efficiency, energy storage, solar thermal, green hydrogen, geothermal, electric vehicle industries, other renewable energy industries, and industries achieving emission reductions. It also includes related industries that manufacture, develop, build, maintain, or provide ancillary services to renewable energy resources or energy efficiency products or services. These may include, but not be limited to the manufacture and installation of healthier building materials that contain fewer hazardous chemicals. Clean energy jobs also include administrative, sales, and other support functions within these industries and other related sector industries.

The curriculum framework is intended to be used as a set of guidelines, standards, and minimum requirements for curricula offered by grantees. As such, the framework outlines the overall program objectives, content, and certifications. It also provides recommendations and guidelines for how the curriculum should be taught.

Note: The curriculum framework is intended to serve as a guideline, not a list of requirements.

Table 7.1 describes what the curriculum framework does and does not do.

Table 7.1: Curriculum framework: What it does and does not do.

The curriculum framework *does . . .*	The curriculum framework *does not . . .*
Provide a set of objectives and main topics that must be covered. Examples and resources are provided for reference, but training providers can select the specific training materials and curriculum they want to use.	Provide detailed lesson plans and tell programs exactly what should be taught.
Allow training providers to teach additional content or offer additional certifications, beyond the required topics and certifications.	Limit the content that can be taught.
Provide suggestions for the learning environment and equipment needed, how long the program should take, and how skills and knowledge should be assessed.	Require that programs deliver the curriculum in a certain way.
Provide instructor credential, knowledge and skill requirements and recommendations.	Tell programs *who* should teach the program.

Allow Workforce Hubs to select the job-specific training curricula that best matches the workforce needs in their region.	Require that the Workforce Hubs teach all the job-specific training areas.
Provide a training framework for a few of the most in-demand entry-level clean energy jobs in Illinois. Hubs may offer training for other in-demand clean energy jobs, if desired.	Provide a training framework for all clean jobs in Illinois.
Allow flexibility in training delivery. It allows participants to test out of portions of the curriculum and be placed in a variety of existing or new clean energy training programs or on-the-job training, depending on their needs and interests.	Require that all participants follow the same training and career path.

Figure 7.1 describes the primary elements of the curriculum framework. It provides a high-level overview of how the curriculum framework works and how individuals flow through the program, from pre-assessments to job placement. The different components of the curriculum framework will be described in more detail below.

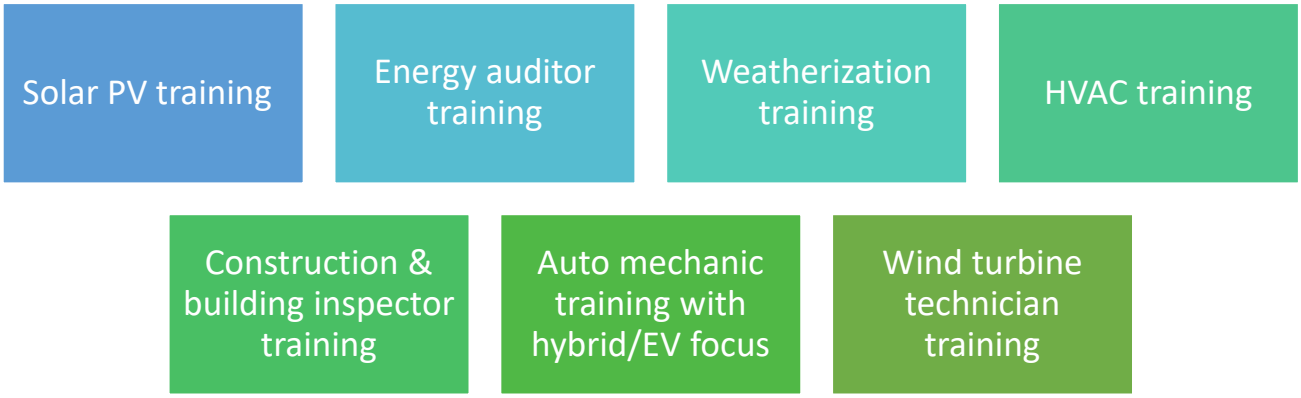
Figure 7.1: Overview of Clean Jobs Curriculum Framework

Bridge program training

The **bridge program** is a portion of the overall clean energy jobs curriculum framework (see Figure 1 above) that provides training in essential employability skills and clean energy basics to help participants succeed in an array of clean energy industries and workplaces. It prepares participants for the job-specific technical training options that follow the bridge program.

Job-specific training options

Following the completion of the bridge program, participants will be directed to a selection of **job-specific training options**. Workforce Hubs will help transition participants into these training options and support them throughout their training. Workforce Hubs must offer at least two unique job-specific training options, based on the employment needs in their area and connections with employers. Options include, but are not limited to:



Note: If a grantee would like to propose a different plan, they should seek approval from their Grant Manager.

Figure 7.1: Job-specific training options

The curriculum framework contains requirements and training guidelines for each option, with guidance regarding program delivery and instructional content. Training providers must align their curriculum with these guidelines and requirements.

Workforce Hubs should select job-specific training options based on regional job needs and training gaps. Workforce Hubs must align their curriculum with the frameworks. Workforce Hubs may also propose to develop a new training program for clean energy jobs *not* included in the list of specialties. To propose a new job-specific training option, the Workforce Hubs grantees will be required to document:

- The need for training in this area (including job demand, existing training programs, and employer partnership)
- Learning objectives
- Instructional hours
- Credentials and certifications
- Work-based learning opportunities
- Content taught

Equity Focused Training

Workforce Hubs must utilize an equity lens when delivering their training program by upholding the **core equity values** of diversity, inclusion, accessibility, welcoming, and belonging. Welcoming others and making room for differences not only helps create a dynamic, creative, and productive workplace, but also encourages a comfortable and enjoyable environment for all. Recognizing, embracing, and celebrating difference can foster a safe, supportive, and successful environment for disadvantaged and underserved groups that have been and continue to be subject to prejudice and systemic discrimination. Programs that embrace the core equity values create a culture that supports improved outcomes. **Equity** should be embedded throughout the curriculum while also contextualizing material and leveraging instructional techniques to meet the learning styles of all participants.

Commitment to these values means upholding them in all program elements and intentionally pursuing policies and practices to support all program participants and team members. The recommendations below provide specific guidance on centering equity in the delivery of their training program.

- Encourage participants to incorporate their current body of knowledge and utilize their lived experiences and personal expertise to achieve personal success.
- Recognize, welcome, and elevate participant contributions in the training room, worksite, and program environment.
- Develop genuine and quality relationships between and among all levels of staff and program participants. Encourage mutual trust.
- Show participants how their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Tell relatable stories during training.
- Intentionally communicate positive cultural and social messages regarding their career choice in the clean energy industry and emphasize the value of participants' contributions to the industry.
- Be willing to discuss and address difficult/taboo topics and work to find equitable solutions. Acknowledge in the curriculum, among staff, and on worksites the environmental and historical factors that impact underrepresented groups.
- Eliminate exclusionary practices within the learning environment and on worksites (for example, negatively singling out participants, overlooking or ignoring certain participants, verbally insulting or marginalizing membership in certain groups, or otherwise discounting participants).
- Provide additional instruction, coaching, mentoring, and sponsorship, as needed, for individuals who require supplementary or different supports to be successful.
- Represent diverse cultures in instructional materials and curricula, in physical spaces, and in online and print materials.
- Proactively and equitably share insights and wisdom, as well as influence and power, with all participants to develop skills, confidence, and leadership. Be aware of the ways some groups may be inadvertently singled out (for example, choosing a male to serve as a team leader for all group projects).
- Provide participants with multiple ways to demonstrate knowledge and capability. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.
- Through work-based learning opportunities or mentorships, connect participants with employers from R3 and/or EJ communities and businesses that are certified through the Business Enterprise Program to help participants feel a sense of belonging within the industry.

Curriculum Approval

Grantees are required to develop a Curriculum Plan as part of their Workplan, based on the requirements set forth in the Clean Jobs Curriculum Framework (described below). Grant Managers and Regional Administrators will review and assess the submitted Curriculum Plan. Upon approval, the Grant Manager will upload a copy of the Workplan to the grantee's Provider Info page in the CEJA Reporting System. The Curriculum Plan will be used to identify the training services offered to participants, adding them to the grantee's Provider Info page. The Grant Manager will send an approved copy of the Final Workplan to the grantee.

The Curriculum Plan, as part of the Workplan, must be submitted at least two weeks before the start dates of the grantees' program. Please allow at least one week for feedback and/or approval.

If changes to the curriculum are necessary after initial approval, grantees must email their Grant Manager, who will review the request. If approved, the Grant Manager will modify the training services in the CEJA Reporting System as needed and address any necessary changes to participant profiles.

Bridge Program Requirements

The **bridge program** is a portion of the overall Clean Jobs Curriculum Framework (see Figure 1) that provides training in job readiness skills and clean energy basics to help participants succeed in an array of clean energy industries and workplaces. It prepares participants for the job-specific technical training options that will be taught after the bridge program. The bridge program training should be taught before starting job-specific technical training, though aspects may be taught concurrently with the technical training component.

Workforce Hubs must provide all elements of the bridge program training, as described below. The bridge program should be tailored to participants' needs, based on the results of the pre-assessments.

The duration of the bridge program training is 120-200 hours, depending on individual needs and the needs of participating employers.

Program size is flexible depending on the number of participants and their needs. Recommended cohort size is between 5 and 20 participants. The training can also be delivered as an open entry/exit program where participants enter and exit the program when they are ready and able to do so.

Bridge Program Pre-Assessments

Prior to beginning the bridge program training, Workforce Hubs will help participants complete the following **pre-assessments**:

- Reading & Math Assessment
- Bridge Skills Assessment

These are separate from the intake assessments that are discussed in Chapters 5 and 6 (Service Needs Assessment and Career Assessment).

- **Reading and Math Assessment:** Participants will receive a reading and math assessment (using a standard test such as the TABE Test for Adult Assessment or ALEKS math assessment) to assess their reading and math level.
    - A sixth grade or higher reading and math level is required for the following job-specific training options: HVAC, Weatherization, Wind, and EV training. An eighth grade or higher reading and math level is required for the following job-specific training options: solar PV training and energy auditor training.
    - If participants do not have the appropriate reading or math levels for the job-specific training option they have selected, Workforce Hubs should provide access to tutoring or

adult education programs to receive additional math or reading instruction during the bridge program, before they begin the job-specific training.
    - See Illinois ABE/ASE Math and Language Arts Modules for basic adult education curriculum.
- **Bridge Skills Assessment:** Participants will complete a Bridge Skills Assessment to measure their knowledge in essential employability and clean energy basics skills. The pre-assessment should provide a baseline of where participants are at the time of entry to the program. It will also help identify areas where extra support is needed, while simultaneously allowing qualified participants to test out of elements of the bridge program if they have already demonstrated proficiency. See these sample pre-assessments.

Training Outcomes

Upon completion of the bridge program, participants will have the personal effectiveness, workplace, and clean energy basics skills to proceed to job-specific technical training program(s) in a clean energy career field of their choosing.

Workforce Hubs must offer bridge program training that covers the following content areas: **essential employability skills** and **clean energy basics**.

Note: See Chapter 8 for more information regarding completion.

Learning Environment and Format

Workforce Hubs should offer classrooms with computer access, proper lighting, proper acoustics, equipped to accommodate group activities, and space to move around comfortably. The learning environment should accommodate individuals with disabilities such as hearing loss or diminished vision, and any instructional materials, where applicable, should reflect the broad potential diversity of those enrolled. It is recommended that the bridge program training be offered in person, but some elements may be offered online.

Skill development and practice should be integrated into coursework. Participants should work individually and in diverse groups. Training should be contextualized to demonstrate how bridge program skills are used in a typical clean energy job. Essential employability skills should be integrated into clean energy basics training to demonstrate how these essential skills can support their ability to perform clean energy tasks.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Workforce Hubs should acknowledge the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

Work-based Learning Components

Work-based learning components should be included in your training programs, in partnership with clean energy employers. **Work-based learning,** as defined by the State of Illinois Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. Work-based learning is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth, firsthand engagement with the tasks required in a given career field, that are aligned to curriculum and instruction."

Work-based learning may include:

- Career awareness activities
- Career exploration activities, such as job-shadowing
- Workplace experience (hands-on work experience at a construction work site or simulated construction site, supervised by an employer)

Workforce Hubs are required to provide work-based learning opportunities as a part of the bridge program, in partnership with employers or nonprofit organizations in their region. Workforce Hubs are encouraged to form work-based learning partnerships with employers from equity investment eligible communities, equity eligible contractors, and businesses that are certified through the Business Enterprise Program to attain expert knowledge and to help participants feel a sense of belonging within the industry.

Assessments

In addition to the pre-assessments described above, Workforce Hubs should utilize assessments during and after the bridge program to measure learning and identify any additional training needs. Workforce Hubs are encouraged to use standard assessments that are developed through evidence-based industry-recognized providers or certificate granting institutions. Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. Furthermore, a variety of assessment strategies are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

Suggested assessments during the training include:

- Reflective writing prompts
- Dialogue/informal / informal interviews
- Aptitude tests/quizzes

Suggested assessments at the end of the training include:

- Role-playing on-the-job scenarios
- Formal demonstrations with evaluation and feedback by the instructor

Instructor requirements

Instructors who deliver the clean energy basics curriculum must have an intermediate to advanced knowledge in construction, the building trades, manufacturing technology, or other clean energy related fields.

Instructional staff must have a strong connection to target populations and communities, and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained to uphold the core equity values.

Instructors should know how to create learning objectives and learning evaluation criteria, facilitate conversations, involve participants, and communicate clearly. Instructors should be connected to administrative support staff to assist with support services, stipends, scheduling, etc.

Essential Employability Skills

Training objectives

At the end of this training, participants should be able to:

- Set personal and professional goals effectively, utilizing goal-setting skills.
- Demonstrate behaviors associated with dependability and reliability.
- Develop a personalized time management plan that demonstrates how to productively complete assigned tasks.
- Evaluate various strategies for learning from challenges, setbacks, and failures, and apply them to achieve personal and professional goals.
- Develop effective resume writing and interviewing skills to facilitate successful job searches.
- Create a sound personal finance plan, encompassing budgeting, savings, and investments, among other elements.
- Implement effective job application practices, including resume writing and interview techniques, to facilitate successful job searches.
- Implement emotion management strategies to cope with challenges and achieve personal and professional goals.
- Exhibit effective communication skills, including active listening, conveying ideas, expressing information effectively, and being understood by colleagues and customers.
- Work cooperatively with others, completing work assignments and achieving mutual goals.
- Utilize various digital tools, including email, keyboarding, word processing, and digital media, to complete job tasks and communicate courteously and directly.
- Interact with customers using role-play to understand their needs, answer questions, resolve issues, and nurture relationships effectively.
- Utilize critical thinking and problem-solving skills in a workplace context, use logical and reasoned analysis to address problems, identify root causes, implement appropriate solutions, and communicate solutions.
- Identify their legal right to work in an environment free of discrimination and harassment and understand how to address discrimination and harassment if it is experienced.

- Communicate and work effectively across a range of abilities, cultures, and backgrounds, emphasizing diversity, equity, and inclusion.

Curriculum content (40 hours)

Workforce Hubs are encouraged to tailor instruction to participants' individual needs, based on assessment results.

At a minimum, the personal effectiveness training must cover the following topics:

1. **Goal setting:** Employ goal-setting skills to set personal and professional goals.
2. **Dependability and reliability:** Explain how commitment and follow-through can ensure team effectiveness and help to meet collective goals.
3. **Time management:** Develop a time management plan to accomplish assigned tasks.
4. **Adaptability:** Explain different strategies to learn from challenges, setbacks, and failures; apply these strategies to achieve personal and professional goals.
5. **Financial literacy:** Create a personal finance plan and explain how personal finances relate to employability.
6. **Getting a job:** Apply effective job application practices (including resume writing and interviews) to search and apply for jobs.
7. **Emotion management:** Practice recognizing and managing emotions to cope with challenges and achieve personal and professional goals.
8. **Verbal communication skills:** Participants should improve their ability to listen to others, convey ideas, express information, and be understood by colleagues and customers.
9. **Workplace writing skills:** Participants should practice using standard business English to write documents and messages to colleagues and customers that are clear, direct, and courteous.
10. **Teamwork skills:** Participants should practice working cooperatively with others to complete work assignments and achieve mutual goals.
11. **Digital communication skills:** Participants should practice using email, keyboarding, word processing, and digital media to complete job tasks and communicate directly and courteously.
12. **Customer service skills:** Participants should practice working with customers to understand their needs, answer questions, resolve issues, and nurture relationships.
13. **Critical thinking and problem solving:** Participants should practice critical thinking and problem-solving skills to generate and evaluate solutions as they relate to the needs of the team, customer, and company.
14. **Workplace rights:** Participants should understand their right to work in an environment free of discrimination and harassment and what to do if they experience discrimination or harassment.
15. **Diversity and inclusion:** Participants should practice diversity and inclusion strategies to communicate and work effectively across a multitude of abilities, cultures, and backgrounds.

All essential employability training should be hands-on and scenario-based when possible. It should be contextualized and integrated into clean energy basics, to demonstrate how these skills are used in a typical clean energy job. It should allow participants to practice skills, set goals, develop plans, and demonstrate mastery.

Curriculum examples and resources

- Illinois Essential Employability Skills Framework and Self-Assessment
- Illinois workNet Job Skills Guide
- Revolution Learning and Development: Managing Yourself and Personal Effectiveness Training Course
- Illinois Adult Education: ABE/ASE Curriculum Project
- Northstar (digital literacy assessments and training)

Clean energy basics

Training objectives

After completing this training, participants should be able to:

- Identify job opportunities and analyze career pathways for their potential for growth and advancement in the clean energy industry.
- Develop a personalized clean energy pathway based on individual skills, interests, and credentials that leads to promising career advancement opportunities.
- Demonstrate safety practices in construction, electrical and solar fields, and comply with safety regulations and codes.
- Explain the skills and responsibilities of construction workers and apply them to the clean energy industry.
- Interpret basic construction drawings and their components and explain their relevance to clean energy installations.
- Identify the main components of building materials and building envelope systems, and explain installation procedures and materials of building, as they apply to the clean energy industry.
- Explain the importance of energy use, indoor air quality, and durability of building materials in the clean energy industry.
- Demonstrate the use of basic hand and power tools and proper use and maintenance of them during clean energy installations.
- Explain the different types of energy, energy conservation, features of green buildings, and principles of sustainability or energy efficiency in the clean energy industry.
- Explain basic electricity and clean energy fundamentals, including the principles of energy generation, transmission, and storage, as well as their applications in the clean energy industry.

If participants will be learning portions of the clean energy basics curriculum in the job-specific technical training, those portions may be omitted to avoid duplication of efforts (e.g., they do not need to take the Occupational Safety and Health Administration (OSHA) 10 twice).

Curriculum content (80+ hours)

At a minimum, the clean energy basics training should cover the following topics:

1. **Introduction to clean energy careers** (At least 5 hours).

   a. Clean energy careers and pathways: Develop a personalized clean energy career pathway leading to promising credentials and career advancement opportunities.
2. **Energy and sustainability fundamentals** (At least 5 hours).
   a. Clean energy definitions: Explain energy, clean energy, sustainability, energy efficiency, energy conservation, and climate change.
   b. Climate change: Explain how different clean energy careers will help with state and national climate goals.
   c. Sample curriculum guide for energy and sustainability fundamentals.
3. **Safety basics** (At least 10 hours). Training includes required certifications in OSHA 10 and First Aid/CPR.
   a. Safety compliance: Explain safety principles and regulations to maintain a secure work environment and how to comply with local, federal and jobsite health and safety demands.
   b. Personal protective equipment and safety practices: Demonstrate safety practices and proper use of PPE when navigating a construction environment.
   c. Working at height: Demonstrate safety practices when using ladders, applying scaffolding, safety harnesses, and rigging when navigating a construction environment.
   d. First aid/CPR: Demonstrate ability to administer emergency first aid and CPR and know when to call for help.
   e. Sample curriculum guide for safety basics.
4. **Building science principles** (At least 10 hours). The topics below align with the Building Performance Institute's Building Science Principles curriculum, though their actual Building Science Principles curriculum is more comprehensive and leads to a certification exam.
   a. Home performance and introduction to building science: Explain energy use in terms of building science.
   b. House-as-a-System: Describe "House-as-a-System" and how the different components work together to impact energy use.
   c. Energy & the building shell: Identify the main envelope components and control layers. Describe how heat is transferred in and out of the building envelope.
   d. Residential heating, cooling, and ventilation: Describe whole-house mechanical ventilation systems and combustion science. Identify the main components of mechanical heating and cooling systems.
   e. Evaluation strategies: Explain evaluation strategies of house performance including building envelopes, mechanical systems, appliances, and lighting.
   f. Energy efficiency solutions: Describe common energy efficiency strategies to reduce home energy use.
   g. Sample curriculum guide for building science principles.
5. **Construction basics** (At least 40 hours). The construction topics below align with those in the National Center for Construction Education (NCCER) Core Construction curriculum, though the NCCER Core curriculum is more comprehensive and leads to a certification exam.

a. Intro to hand and power tools: Identify, correctly set up, and operate hand and power tools.
b. Intro to schematics and blueprints: Understand how to read basic schematics and blueprints and how to differentiate among schematics needed for different trade areas.
c. Intro to design and construction processes: Describe the basic design and construction concepts in a residential construction project. With minimal supervision, safely construct or install an authentic project.
d. Intro to construction math and cost estimation:
    i. Apply measurement systems and scaling concepts to demonstrate proper use of measuring tools (time, temperature, distance, length, width, height, perimeter).
    ii. Demonstrate how to convert from one measurement to another and between decimals and fraction units.
    iii. Apply basic cost estimation principles to estimate labor and material costs.
    iv. Read and understand tables and graphs.
    v. Calculate perimeters, areas, and volumes of basic shapes and solids.
e. Intro to materials handling: Use knowledge of material types, standard sizes, and safe handling practices to identify and utilize materials needed for basic project types.
f. Sample curriculum guide for construction basics.

6. **Electrical basics training** (At least 10 hours). The topics below align with those in the Journeyman Electrician exam, though the actual Journeyman Electrician training is much more comprehensive.
    a. Intro to electricity: Explain where electrical power comes from and how electricity works.
    b. Intro to direct current and alternating current: Explain the basic difference between AC and DC voltage.
    c. Intro to circuits: Describe how circuits work, the components of a basic circuit, and three basic types of circuits.
    d. Intro to conductors: Explain what a conductor is and provide examples of good conductors and poor conductors.
    e. Intro to electrical safety procedures: Describe how to protect against over-current and electric shock.
    f. Sample curriculum guide for electrical basics.

All clean energy basics training should be hands-on, and scenario based when possible. It should be contextualized to demonstrate how these skills are used in a typical clean energy job. It should allow participants to practice skills, set goals, develop plans, and demonstrate mastery.

Job Specific Training Requirements

Grantees are required to provide at least two job-specific training options for participants to choose from or may propose a different option based on the clean energy employment needs of their region. Options include:

A. Solar Photovoltaic Training
B. Energy Auditor Training
C. Weatherization Training
D. HVAC Training
E. Construction and Building Inspector Training
F. Auto Mechanic Training, Hybrid and Electric Vehicle Focus
G. Wind Turbine Installation and Maintenance Training

A. Solar Photovoltaic Training Framework

The **CEJA workforce solar photovoltaic (PV)** training specialty is designed to prepare individuals for entry level jobs in the solar industry, including solar installer, solar sales representative, and solar site assessor or designer. This training curriculum framework focuses on the basic skills needed to understand, design, and assist in the safe installation of photovoltaic systems and should use both hands-on and classroom environment experiences. Upon completion of the training, individuals will be prepared to take the Photovoltaic Associate exam offered by the North American Board of Certified Energy Practitioners (NABCEP).

The training for the Solar PV Installer should involve at least 80 hours of instruction which may encompass in-person, on-line, or hybrid instruction. This is in addition to the hours required for the bridge program instruction. Courses with more contact hours, hand-on activities, and an instructor with significant solar PV system installation experience can contribute to a better learning experience.

A-1. Demonstration of need for training

There is a significant need for more solar energy workers in Illinois. In addition, equity requirements for solar employers will incentivize employers to hire trainees from the CEJA programs. In their Curriculum Plan, grantees should demonstrate the need for this training in their region by describing:

- The approximate number of job openings and current jobs in their region in solar installation, sales, and design.
- The potential benefits to equity investment eligible populations within the region.
- Existing solar training programs in the region and any training program gaps.
- The need for solar installation, sales, and design employees, as demonstrated through employer partnerships.

  Note: Employers must express a need for new employees and a willingness to hire graduates from the program through a Memorandum of Understanding.

A-2. Training outcomes

Upon completion of the training, participants should have obtained basic knowledge related to the design, sales, installation, and operation of Photovoltaic Systems. The participants should also have received sufficient instruction to be prepared to take the North American Board of Certified Energy Practitioners (NABCEP) PV Associate Exam. Finally, the participants should have sufficient technical and practical knowledge to be prepared to pursue employment opportunities in Solar Photovoltaic system installation, design, or sales.

A-3. Job(s)/roles trained by this training

- Solar Photovoltaic System Installer
- Solar Photovoltaic System Site Evaluator/Designer
- Solar Photovoltaic System Sales Representative

A-4. Career progression

- Solar PV Sales Representative and Site Assessor
- Solar PV Crew Chief
- Solar PV Project Manager
- PV System Inspector
- Solar Field Technician
- Solar Project Developer

For a more detailed solar career progression map, see the Interstate Renewable Energy Council's Solar Career Map

A-5. Prerequisites

Before beginning technical training, participants should:

- Be comfortable working in elevated spaces such as rooftops
- Be comfortable using hand and power tools and managing materials
- Be comfortable working in teams and individually
- Possess good communication skills
- Be capable of working 6-8 hours per day in the field (with occasional overtime)
- Have at least an eighth grade math level and reading level (tutoring/instruction should be provided to help people meet this requirement, if needed)
- Be able to use computers/tablets to communicate with clients and perform basic calculations
- Have OSHA 10 certification

Program participants that have completed the bridge program should have met these prerequisites.

A-6. Learning environment and format

It is strongly recommended that the technical training be offered as an in-person classroom and lab-based course, with extensive hands-on components. Classroom/Lab should have enough workspace for participants to work individually and in diverse groups. Access to either a computer lab or laptop is helpful to support student evaluation/testing and calculations. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Successful programs will acknowledge in the curriculum and among participants the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

A minimum of **10% of the curriculum hours** should be devoted to work-based learning activities. **Work-based Learning (WBL)**, as defined by the Illinois State Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. WBL is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth, firsthand engagement with the tasks required in each career field, which are aligned to curriculum and instruction."

Work-based learning may include:

- Career awareness activities
- Career exploration activities
- Workplace experience (hands-on work experience at a work site, supervised by an employer)
- Career development experience (On-the-job training, internship, or an apprenticeship)

Grantees are required to provide work-based learning components as part of their training. To meet this requirement, they are encouraged to partner with employers in their region, especially equity eligible contractors and businesses that are certified through the Business Enterprise Program with the goal of attaining expert knowledge and to help participants feel a sense of belonging within the industry. They are also encouraged to direct participants to work-based learning opportunities (including apprenticeships or on-the-job training) during or after they complete training.

A-7. Tools and equipment

The following tools and equipment are recommended:

- Basic construction tools (hammer, screwdriver, pliers, wire cutters, etc.)
- Access to power tools
- Access to diagnostic equipment
    - Multimeters
    - Insulation testing devices (e.g., megohmmeter)
    - Irradiance meter
    - Infrared thermometer (e.g., module, breaker, connection temperature measurement)
    - IV curve tracer
    - Battery capacity testing devices (e.g., load tester)
    - Hydrometer
- Course materials/books
- Access to demonstration PV systems / PV site installations or suitable props for hands-on activities
- Laptops, tablets, and/or computer lab
- Software for rooftop PV system design and estimator of solar energy collection efficiency

A-8. Instructor requirements

The curriculum must be delivered by a NABCEP Associate Registered Training Provider. Instructors must have intermediate to expert-level knowledge of the curriculum modules in the Core Curriculum section below.

It is strongly recommended that the instructor have significant recent experience in Solar PV system design, sales, and installation. It is recommended that the instruction team consist of:

- Lead instructor
- Facilitator, especially during labs
- Training admin/logistics support to assist with support services, stipends, scheduling

Instructional staff must have a strong connection to target populations and communities and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained in Diversity, Inclusion, Accessibility, and Equity, and committed to upholding these values.

A-9. Training objectives

By completing this training, participants will be able to:

1. Articulate the fundamental concepts of Solar PV systems, including key terminology and different system design options, and apply this knowledge to analyze different solar PV systems.
2. Analyze the landscape of Solar PV system installation, including consumer expectations, system capabilities, and long-term cost-benefit relations, and make informed recommendations based on this analysis.
3. Comply with governmental regulations and local and state building codes, contract provisions, and construction standards relevant to Solar PV system installation in all aspects of the work.
4. Analyze how Solar PV system design parameters impact overall system performance and make informed decisions to optimize system design based on this analysis.
5. Use technical and industry-specific terminology during Solar PV system installation and testing to communicate with team members, customers, and other stakeholders.
6. Effectively and safely use all necessary tools and equipment to assist in the installation, testing, and maintenance of Solar PV systems, and identify potential safety hazards and appropriate safety measures.
7. Contribute effectively as a member of a diverse team to install and test Solar PV systems at various work sites and consider both individual and team safety requirements in all aspects of the work.
8. Effectively scaffold existing strengths, experiential knowledge, and newly established trusting relationships to pursue a meaningful career in the clean energy industry.

A-10. Curriculum content overview

Table 7.2 summarizes the five domains of content recommended for the Solar Photovoltaic Installer curriculum for Technical Skill. The curriculum and training should align with the *most recent* NABCEP Photovoltaic Associate Training Job Task Analysis and prepare participants to successfully pass the

NABCEP Photovoltaic Associate Certification exam. A summary of the tasks found in the Job Task Analysis is shown in the tables below. Up-to-date local or state-wide codes, requirements, design considerations, and economic considerations should be taught. Where applicable, instructional materials should reflect the broad potential diversity of those enrolled.

Table 7.1: Solar Photovoltaic Association Job Task Analysis Domains

Domain I: Application	Domain II: Sales & Economics	Domain III: Design
Application	Sales & Economics	Design
-Describe types of PV system applications -Identify key features and benefits of specific types of PV systems -List the key component of specific types of PV systems -Understand the safety concerns associated with different types of PV systems -List the advantages and disadvantages of PV systems compared to other electricity generation sources	-Determine necessary customer information to collect -Identify the customer's motivations to install solar -Estimate system size to meet the customer's financial objective -Identify information from the client on electricity usage relevant to stand-alone solar -Recognize how federal, state, and local policies and available financial benefits affect different PV markets -Identify financial risks associated with PV systems -Identify common financing options and incentives -Identify predictable maintenance costs over the life of the system	-Ensure equipment is appropriate for intended use -Identify relevant codes and requirements that impact PV design and installation, including local codes and requirements -Recognize electrical concepts & terminology -Identify factors impacting solar resource on design and performance -Identify equipment specification data -Describe the function of typical components in PV systems -Explain PV system sizing considerations -Read an electrical diagram of a PV system -Recognize structural requirements of PV systems

Domain IV	Domain V
Installation	Maintenance and Operation
-Identify the elements of a complete site-specific safety plan -Identify the elements of the plan set -Identify the elements of racking installation -Identify the elements of electrical component installation -Identify the elements of energy storage component installation -Identify the elements of the system commissioning procedure	-Identify commonly used electrical test equipment and its purpose -Demonstrate the ability to analyze simple electrical circuits -Describe the effects of performance parameters that are commonly monitored for PV systems -Describe different types and elements of system performance monitoring equipment -Identify common factors that result in deviations from expected system performance -Describe typical maintenance requirements for PV systems -Identify the safety requirements for operating and maintaining different types of PV systems

A-11. Assessment methods

It is recommended that participants be evaluated via the following:

- In-class exams
- In class/lab evaluation
- Training final proficiency and field exams

Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. A variety of assessment strategies, such as lab evaluation and demonstrated knowledge proficiency, are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

A-12. Certification

Individuals who successfully complete the Solar PV curricula should be prepared to take the NABCEP Photovoltaic Associate Certification exam if they wish to take the exam. Participants are not required to pass the exam to complete the program; participants may need to take the exam multiple times to pass. The Workforce Hubs should assist with test preparation and provide funds to cover the exams.

A-13. References and example curriculum

- NABCEP Associate Registered Trainings
- US Department of Labor's Renewable Energy Competency Model
- NCCER Solar Photovoltaic Systems Curriculum

B. Energy Auditor Training Framework

The **CEJA workforce Energy Auditor (EA)** training specialty is designed to prepare participants for a career as an **Energy Auditor and/or Quality Control Inspector** for residential buildings. The course focuses on the basic skills needed to properly assess building performance in a hands-on and classroom environment. Upon completion of the training, participants will be prepared to take the Illinois Energy Auditor field exam, as well as the national Building Performance Institute (BPI) Energy Auditor certification exam and the BPI Quality Control Inspector sub-certification exam.

The training for Energy Auditor (Residential) should involve a minimum of 200 hours of instruction, in addition to the bridge program training.

B-1. Demonstration of need for training

Grantees must demonstrate the need for this training in their region in their Curriculum Plan. It is recommended that grantees reach out to employers and workforce development organizations in the region to better understand the employment and training needs. Grantees should describe:

- The approximate number of energy auditor job openings and current jobs in your region.
- The potential benefits to equity investment eligible populations within the region.
- Existing energy auditor training programs in the region and any training program gaps.
- The need for energy auditor employees, as demonstrated through employer partnerships. Employers must express a need for new employees and a willingness to hire graduates of the program through a Memorandum of Agreement.

B-2. Training outcomes

Upon completion of the training, participants will be prepared to take the exams for Illinois certification, as well as both the BPI Energy Auditor and Quality Control Inspector certifications. They will also be prepared to evaluate building performance utilizing health and safety standards.

B-3. Job(s)/roles trained by this training

- Energy Auditor, Residential
- Quality Control Inspector, Residential
- Weatherization Specialist

B-4. Career progression

- Energy Auditor (residential, commercial, and multifamily)
- Quality Control Inspector
- Energy Services Coordinator
- Building Performance Instructor-Weatherization Technical Trainer

B-5. Prerequisites

Before beginning technical training, participants should:

- Be comfortable in confined spaces (attics, crawl spaces, etc.)
- Be comfortable using basic tools

- Be comfortable working in teams and individually
- Possess good communication skills
- Be capable of working 6-8 hours per day in the field (with occasional overtime)
- Have at least an eighth grade math level
- Be able to use computers/tablets to perform basic calculations

By completing the bridge program, participants should have these required competencies.

B-6. Learning environment and format

It is strongly recommended that the technical training be offered as an in-person classroom and lab-based course, with extensive hands-on components. Classrooms and labs should have enough workspace for participants to work individually and in groups.

Access to either a computer lab or a laptop is helpful to support participant evaluation/testing and learning. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Successful programs will acknowledge in the curriculum and among participants the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

At least 10% of the curriculum hours should be work-based learning activities. Work-based learning (WBL), as defined by the Illinois Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. WBL is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth, firsthand engagement with the tasks required in a given career field, that are aligned to curriculum and instruction." Work-based learning may include:

- Career awareness activities
- Career exploration activities
- Workplace experience (hands-on work experience at a work site, supervised by an employer)
- Career development experience (On-the-job training, internship, or an apprenticeship)

Grantees are required to provide work-based learning components as part of their training, in partnership with employers in their region. To meet this requirement, they are encouraged to partner with employers in their region, especially equity eligible contractors and businesses that are certified through the Business Enterprise Program to attain expert knowledge and to help participants feel a

sense of belonging within the industry. They are also encouraged to direct participants to work-based learning opportunities (including apprenticeships or on-the-job training) during or after they complete training.

B-7. Tools and equipment

This training requires the following:

1. Tool belt
2. Basic construction tools set (hammer, screwdriver, pliers, wire cutters, etc.)
3. Access to power tools
4. Laptops and/or computer lab
5. Access to diagnostic equipment
    a. Blower door
    b. Digital manometer
    c. Infrared camera
    d. Combustion analyzer
    e. Combustible gas detector
    f. 4-gas monitor
    g. Exhaust fan flow meter
    h. Duct tightness assessment tools (e.g., duct blaster, pressure pan)
6. Dolly
7. Course materials/books
8. Access to demonstration buildings or suitable props for hands on activities (possible alternative compliance using VR or other digital means)
9. Access to a variety of functional water heating and Heating, Ventilation, Air Conditioning (HVAC) appliances for combustion safety testing (possible alternative compliance using VR or other digital means)

Recommended: Airflow visualization tool (e.g., physical props, interactive digital software/interfaces, videos)

B-8. Instructor requirements

Instructors must have intermediate to expert-level knowledge of the curriculum modules in the Core Curriculum section below and possess BPI Energy Auditor and BPI Quality Control Inspector certifications.

Instructional staff must have a strong connection to target populations and communities and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained in Diversity, Inclusion, Accessibility, and Equity, and committed to upholding these values.

It is recommended that the instruction team consist of:

- Lead instructor
- Facilitator, especially during labs
- Training admin/logistics support to assist with support services, stipends, scheduling

B-9. Training objectives

By completing this training, participants will be able to:

- Identify, evaluate, select, move, store, and supply construction and building material resources for all types of construction activities, and ensure timely and cost-effective completion of construction projects.
- Interpret, analyze, and compare data related to energy fuel types (e.g., propane, electricity, oil), energy consumption, and power units, and apply the fundamental principles of energy and power concepts.
- Comply with governmental regulations and local and state building codes, contract provisions, and construction standards relevant to construction activities, in all aspects of the work.
- Assess building/unit components regarding energy consumption and health and safety-related issues and generate a proposed scope of work based on cost-effectiveness, client priorities, and/or other energy efficiency program requirements, and effectively communicate this to stakeholders.
- Apply basic accounting and cost estimating related to construction/retrofit and building operations and make inform decision-making related to energy efficiency upgrades.
- Generate a recommended scope of work, including the cost-effectiveness of the proposed work, and make informed energy efficiency retrofit decisions.
- Identify and calculate potential savings from green energy retrofits, including solar, electrification, and upgrades to high-efficiency retrofits, and use this information to inform decision-making related to energy efficiency upgrades.

B-10. Curriculum content overview

Table 7.3 presents the three domains of energy auditors content for Sector-Specific Technical Skills. Training must align with the Building Performance Institute's BPI-1200 Standard and include all knowledge and skills required to take the BPI Energy Auditor certification exam. House and duct leakage testing methods must align with the Residential Energy Services Network (RESNET) 380 Standard. Training on the development of the scope of work must align with National Renewable Energy Laboratory (NREL) Standard Work Specifications (SWS). Core training topics are listed below.

Table 7.2: Energy auditor content domains

Domain I	Domain II	Domain III
Collection of Visual, Material, Dimensional, and Appliance Information about the Building for an Energy Audit	Diagnostic Testing of the Dwelling Unit for an Energy Audit	Evaluation of Collected Energy Audit Data to Determine the Scope of Work
-Document energy consumption -Document the building history -Conduct a physical/visual inspection -Collect health and safety data -Collect appliance and base load information -Identify a conditioned building enclosure -Collect mechanical ventilation data -Identify building insulation (attic, walls, and foundation/subspace) -Collect attic data -Collect wall data -Collect window and door data -Collect foundation/subspace data -Collect roof data	-Prepare the dwelling unit for the test(s) -Test the electric appliances -Conduct indoor air quality tests -Determine the safety and efficiency of combustion appliances -Determine air leakage of the building envelope -Determine the performance of HVAC distribution	-Evaluate the health and safety data -Evaluate the durability/structural integrity of the building -Evaluate the HVAC system -Evaluate the mechanical ventilation -Evaluate energy use -Evaluate the foundation/subspace -Evaluate the walls -Evaluate the attic -Evaluate the doors and windows -Use energy modeling software -Generate the recommended work scope

B-11. Assessment methods

It is recommended that participants be evaluated via the following:

- In-class exams
- In class/lab evaluation
- Training final proficiency and field exams
- BPI Energy Auditor written and field exams

Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. A variety of assessment strategies, such as lab evaluation and demonstrated knowledge proficiency, are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

B-12. Certification

The Energy Auditor training will prepare trainees to take the BPI Energy Auditor certification exam.

B-13. References and example curriculum

- ANSI/BPI-1200-S-2017
- Green Building Career Map
- Single-Family Energy Auditor Job Task Analysis

- Understanding by Design
- US Department of Labor's Renewable Energy Competency Model

C. Weatherization Training Framework

The weatherization training curriculum framework below is designed to prepare people for a career as a weatherization technician, weatherization field technician, or as a salesperson for a residential efficiency improvement organization. The curriculum should cover the basic skills needed by a weatherization technician to install upgrades to a home, through online or blended training with components of hands-on activities in a classroom, lab, or field environment. Upon completion of the training, participants will be prepared to take the Building Performance Institute (BPI) Retrofit Installer Technician (RIT) exam and have a firm grasp of the skills and competencies needed to be successful in installing and/or selling energy upgrades.

The training for Weatherization Installers and Technicians should involve a minimum of 200 hours which may encompass in-person, on-line, or hybrid instruction.

C-1. Demonstration of need for training

In your curriculum plan, grantees are asked to demonstrate the need for the job-specific training option in their region. It is recommended that grantees reach out to employers and workforce development organizations in the region to better understand the employment and training needs.

To demonstrate the need for this training, grantees should describe:

- The approximate number of energy auditor job openings and current jobs in your region.
- The potential benefits to equity investment eligible populations within the region.
- Existing weatherization training programs in the region and any training program gaps.
- The need for weatherization employees, as demonstrated through employer partnerships. Employers must express a need for new employees and a willingness to hire graduates of the program through a Memorandum of Agreement.

C-2. Training outcomes

Upon completion of the training, participants will be prepared to take the BPI RIT exam and apply for an entry-level position. They will have a firm grasp of the skills and competencies needed to be successful in installing and/or selling energy upgrades.

C-3. Job(s)/roles trained by this training

- Weatherization installation technician
- Weatherization marketing & sales
- Construction laborer with a retrofit focus

C-4. Career progression

- Weatherization installation supervisor
- Weatherization crew leader
- Weatherization field trainer

C-5. Prerequisites

Before beginning technical training, participants should:

- Be comfortable in confined spaces
- Be comfortable using basic tools
- Be comfortable working in teams
- Be capable of working 6-8 hours per day in the field (with occasional overtime)
- Have at least a sixth grade math level
- Be able to use computers/tablets to perform basic calculations
- Be able to work in all types of housing stock in most weather conditions

By completing the bridge program, participants should have these required competencies.

C-6. Learning environment and format

It is strongly recommended that the technical training be offered in an in-person classroom and lab-based format, with extensive hands-on components. These exercises should represent "real world" fieldwork to best prepare participants for their future tasks.

Access to either a computer lab or a laptop is helpful to support participants evaluation/testing and learning. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Successful programs will acknowledge in the curriculum and among participants the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

At least 10% of the curriculum hours should be work-based learning activities. Work-based learning (WBL), as defined by the Illinois Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. WBL is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth, firsthand engagement with the tasks required in a given career field, that are aligned to curriculum and instruction." Work-based learning may include:

- Career awareness activities
- Career exploration activities
- Workplace experience (hands-on work experience at a work site, supervised by an employer)
- Career development experience (On-the-job training, internship, or an apprenticeship)

Grantees are required to provide work-based learning components as part of their training, in partnership with employers in their region. To meet this requirement, they are encouraged to partner with employers in their region, especially equity eligible contractors and businesses that are certified through the Business Enterprise Program to attain expert knowledge and to help participants feel a sense of belonging within the industry. They are also encouraged to direct participants to work-based learning opportunities (including apprenticeships or on-the-job training) during or after they complete training.

C-7. Tools and equipment

This training requires the following:

- Diagnostic equipment specific to weatherization
- Tools to measure and record data
- Access to power tools
- Laptops and/or computer lab
- Tools and equipment to install specific energy upgrades
- Basic hand tools
- Course materials/books

C-8. Instructor requirements

Instructors must have intermediate to expert level knowledge of the curriculum modules in the Core Curriculum sections below.

It is recommended that the instructor have strong ties to the target communities and populations served. Instructor certification requirements could include but are not limited to BPI Home Energy Professional (HEP) Energy Auditor, BPI HEP Quality Control Inspector, BPI HEP Retrofit Installer Technician (RIT), BPI HEP Crew Leader (CL), BPI Air Leakage Control Installer (ALCI), BPI Healthy Home Evaluator (HHE), State Weatherization certification or other technical training certification relating to the housing, construction or home energy field.

Instructional staff must have a strong connection to target populations and communities and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained, and committed to upholding the core equity values.

It is recommended that the instruction team consist of:

- Lead instructor
- Facilitator, especially during labs
- Training admin/logistics support to assist with support services, stipends, scheduling

C-9. Training objectives

By the end of the training, learners should be able to:

- Explain modern weatherization measures, including their purpose, benefits, and impact on energy efficiency, occupant health, and safety.

- Demonstrate the ability to read and follow a work order to complete a set of energy upgrade tasks, and effectively communicate progress and issues to stakeholders.
- Display knowledge of fundamental principles of energy savings by comparing the existing system or systems with the proposed upgrades or repairs and identify opportunities for cost-effective energy savings.
- Prioritize and map out a work workplan in a timely and effective manner, taking into consideration the needs of the building occupants, budget constraints, and other relevant factors.
- Follow industry guidelines for safety, energy savings, and occupant and worker health, while ensuring that work is done safely and effectively.
- Use diagnostic equipment to verify the savings or performance of the work performed and identify potential issues and opportunities for improvement.
- Identify potential savings from retrofits, including solar, electrification, and upgrades to building efficiency to inform decision-making related to energy efficiency upgrades.

C-10. Curriculum content overview

Table 7.4 presents Weatherization Installers and Technicians and its career progression towards Crew Leader for Sector-Specific Technical Skill Tier 5 which are recommended in the training. The scope of work must also align with NREL's Standard Work Specifications (SWS).

Table 7.4. Weatherization Installers and Technicians content domains

Domain I	Domain II	Domain III
Weatherization installers and technicians' basic tasks	Weatherization installers and technicians' intermediate	High Level Task: Weatherization Crew Leader
-Maintain safety -Prepare for the job (before arriving at job site) -Prepare and maintain tools and materials on-site -Prepare and maintain job site -Identify materials and staffing needs -Prepare homeowner/occupants for the scope of work -Determine readiness of the job site for the scope of work -Install windows and doors -Install baseload measures -Clean all debris and work materials from the job site	-Locate and verify access to specific work areas -Protect interior/exterior of house (e.g., with drop cloths, poly, Tyvek booties, pressurizations) -Worksite safety and fall protection -Install roof penetrations and weatherproofing -Install or repair vapor retarders -Energy efficiency upgrades -Identify and report deviations from scope of work -Conduct diagnostic testing -Adjust scope of work as needed to reflect current conditions	-Develop Plan to Execute Scope of Work -Prepare and Maintain Job Site -Implement Scope of Work -Verify work orders, create change orders, and inspect completed work

C-11. Assessment methods

It is recommended that participants be evaluated via the following:

- In-class exams
- In class/lab evaluation
- Final exam including hands on demonstration

Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. A variety of assessment strategies, such as lab evaluation and demonstrated knowledge proficiency, are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

C-12. Certification

Training must include all knowledge required to take the Building Performance Institute RIT, State Weatherization certification or other technical training certification relating to the housing, construction, or home energy field.

C-13. References and example curriculum

1. Green Building Career Map
2. NREL Job Task Analysis: Retrofit Installer Technician
3. Understanding by Design
4. US Department of Labor's Renewable Energy Competency Model
5. Weatherization Crew Leader Job Task Analysis
6. Weatherization Standardized Curricula: Weatherization Assistance Program

D. HVAC Installer & Technician Training Framework

The CEJA workforce **HVAC installer** training specialty is designed to prepare people for a career as a Heating, Ventilation, Air Conditioning (HVAC) technician and/or a career in HVAC sales. The course covers the basic skills needed by an HVAC technician to install and service basic HVAC systems in a hands-on and classroom environment. Upon completion of the training, participants will have a firm grasp of the skills and competencies needed to be successful in an entry level position installing, servicing and/or selling HVAC systems, be prepared to take the Environmental Protectional Agency (EPA) Universal exam (Section 608 Technician Certification), as well as other NATE certification or HVAC Excellence exams.

The training for HVAC Installer should involve a minimum of 140 hours which may encompass in-person, on-line, or hybrid instruction.

D-1. Demonstration of need for training

Grantees are required to submit a curriculum plan that demonstrates the need for this training in their region. It is recommended that grantees reach out to employers and workforce development organizations in the region to better understand the employment and training needs.

To demonstrate the need for this training, please describe: The approximate number of HVAC installer/technician job openings and current jobs in your region.

- The potential benefits to equity investment eligible populations within the region.
- Existing energy auditor training programs in the region and any training program gaps.
- The need for energy auditor employees, as demonstrated through employer partnerships. Employers must express a need for new employees and a willingness to hire graduates of the program through a Memorandum of Agreement.

D-2. Training outcomes

Upon completion of the training, participants will be prepared to take the EPA Universal certification (Section 608 Technician Certification), as well as other NATE certificate or HVAC Excellence exams, and be qualified for an entry level position in the HVAC industry. They will have a firm grasp of the skills and competencies needed to be successful in installing, servicing, or selling HVAC systems.

D-3. Job(s)/roles trained by this training

- HVAC installer (residential)
- HVAC service technician (residential)
- HVAC marketing & sales

D-4. Career progression

- HVAC installation supervisor
- HVAC installation technician (commercial)
- HVAC service technician (residential)
- HVAC service technician (commercial)
- HVAC marketing/sales supervisor

- HVAC instructor

D-5. Prerequisites

Before beginning technical training, participants should:

- Have professional communication skills with other employees and clients
- Have the ability to read a wiring diagram and blueprints
- Have basic knowledge of a furnace, air conditioner, boiler, heat pumps and willingness to learn
- Be comfortable on ladders and in attics, crawlspaces, and rooftops
- Be comfortable using basic tools
- Be comfortable working in teams and individually
- Be capable of working 6-8 hours per day in the field (with occasional overtime)
- Have a sixth grade or higher math and reading level

By completing the bridge program, participants should have these required competencies.

D-6. Learning environment and format

It is strongly recommended that the technical training be offered as an in-person classroom and lab-based course, with extensive hands-on components. Classrooms and labs should have enough workspace for participants to work individually and in groups.

Access to either a computer lab or a laptop is helpful to support participant evaluation/testing and learning. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Successful programs will acknowledge in the curriculum and among participants the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

At least 10% of curriculum hours should be spent on work-based learning activities. Work-based learning (WBL), as defined by the Illinois Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. WBL is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth, firsthand engagement with the tasks required in a given career field, that are aligned to curriculum and instruction." Work-based learning may include:

- Career awareness activities

- Career exploration activities
- Workplace experience (hands-on work experience at a work site, supervised by an employer)
- Career development experience (On-the-job training, internship, or an apprenticeship)

Grantees are required to provide work-based learning components as part of their training, in partnership with employers in their region. To meet this requirement, they are encouraged to partner with employers in their region, especially equity eligible contractors and businesses that are certified through the Business Enterprise Program to attain expert knowledge and to help participants feel a sense of belonging within the industry. They are also encouraged to direct participants to work-based learning opportunities (including apprenticeships or on-the-job training) during or after they complete training.

D-7. Tools and equipment

This training requires the following:

- Classroom or mobile HVAC lab
- HVAC Hand Tools such as Crescent Wrenches, Hammers, Screwdrivers, Pliers, Tape Measure
- HVAC Safety Tools such as Multimeter, Safety Goggles, Footwear
- HVAC Specialty Tools such as Thermometer, Reciprocating Saw, Caulking Gun, HVAC Software
- Laptops, tablets, and/or computer lab
- Course materials/books

D-8. Instructor requirements

Instructors must have intermediate to expert level knowledge of the curriculum modules in the Core Curriculum section below. Instructors must have considerable experience in HVAC system design, installation, and maintenance.

Instructional staff must have a strong connection to target populations and communities and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained in Diversity, Inclusion, Accessibility, and Equity, and committed to upholding these values.

It is recommended that the instruction team consist of:

- Lead instructor
- Facilitator, especially during labs
- Training admin/logistics support to assist with support services, stipends, scheduling

D-9. Training objectives

By the end of the training, learners should be able to:

- Identify and evaluate basic and advanced HVAC systems (including heat pumps), and their components, operation, and efficiency.
- Know the fundamental principles of how HVAC systems (including heat pumps) operate, including basic HVAC troubleshooting, basic electrical concepts, identification of energy fuel types (e.g., propane, natural gas, all electric systems), and apply it to HVAC systems.

- Comply with governmental regulations and local and state building codes, contract provisions, and construction standards relevant to HVAC systems in all aspects of the work.
- Assess building/unit components regarding energy consumption and health and safety-related issues.
- Generate proposed scope of work based on cost-effectiveness, client priorities, and/or other energy efficiency program requirements, and effectively communicate this to stakeholders.
- Practice basic accounting and cost estimating related to construction/retrofit and building operations to make informed decisions related to HVAC upgrades.
- Generate a recommended scope of work, including the cost-effectiveness of the proposed work, to make informed decisions regarding HVAC system.
- Identify and calculate potential savings from green energy retrofits, including HVAC systems and upgrades to high-efficiency retrofits, to make informed decisions regarding energy efficiency upgrades.

D-10. Curriculum content overview

Table 7.5 presents four domains of content recommended for HVAC Mechanics and Installers' Sector-Specific Technical Skills, which are recommended for use in the training. Training should align with the NFPA 54 (National Fuel Gas Code) and ACCA QI-5 (HVAC Quality Installations) standard. The content should also align with NREL's Standard Work Specifications (SWS).

Table 3.5: HVAC content domains

Domain 1	Domain 2
Basic technical knowledge	Basic installation skills
-Demonstrate how to operate a basic residential HVAC system. -Identify and describe the function of system components of residential HVAC systems (e.g., furnace, air conditioner, coil, heat pump boiler, geothermal heat pump). -Demonstrate technical knowledge of sizing piping, wiring, fuses and breakers in residential heating and cooling systems. -Demonstrate knowledge of tools required in the HVAC trade and how to operate them.	-Demonstrate and describe installation techniques of residential natural gas heating, heat pump, and cooling equipment according to manufacturer's instructions. -Demonstrate and describe the procedures of measuring, cutting, and joining of copper tubing, black iron pipe, PVC pipe, and CVPC pipe. -Demonstrate and describe the procedures of measuring, cutting, and joining sheet metal. -Demonstrate the ability to troubleshoot HVAC systems -Demonstrate how to read blueprints and wiring diagrams. -Understand how to input and translate a load calculation program. -Follow the specs and P.M.I. of the equipment you are installing.

Domain 3	Domain 4
Work safety standards and practices	Customer service and sales
-Demonstrate and describe proper refrigerant techniques according to EPA 608 -Demonstrate and describe ladder and fall prevention safety in accordance with OSHA 29 CFR 1910 -Read and execute safety plan for HVAC system installation.	-Construct and deliver a sales presentation -Prepare an HVAC construction/remodel plan for a client -Explain the work order -Perform work order system -Assign work orders to other HVAC technicians -Follow through with technicians to verify work has been complete and work orders closed out properly -Work with outside vendors, engineers and consultants on projects affecting HVAC systems on buildings and incorporate their designs.

D-11. Assessment methods

Participants should be evaluated via the following:

- In-class exams
- In-class/lab evaluation
- EPA Section 608 Certification exam
- NATE certification exams or HVAC Excellence exams.
- Final exam including hands on demonstration

Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. A variety of assessment strategies, such as lab evaluation and demonstrated knowledge proficiency, are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

D-12. Certification

Training must prepare people to take the EPA Section 608 Certification exam.

It is recommended that training prepares participants for one or more of the following certification exams. Programs have the flexibility to select the exams that best meet their needs:

NATE certifications

- NATE Ready-to-Work certificate (fundamentals and safety)
- NATE Core Exam
- Specialty exam: Air to Air Heat Pump (installation or service)
- NATE Certified HVAC Professional exams (5 exams: HVAC Fundamentals, Electrical and Controls, Comfort and Airflow, Installation, and Service).

HVAC Excellence Employment Ready certifications:

- Air conditioning

- Basic refrigeration and charging procedures
- Electrical
- Electric Heat
- Heat Pumps/Geothermal Heat Pumps
- Building Automation Systems

D-13. References & example curriculum

- ACCA QI-5 (HVAC Quality Installations) standard.
- EPA refrigerant certification
- Green Building Career Map
- NFPA 54 (National Fuel Gas Code)
- Understanding by Design
- US Department of Labor's Renewable Energy Competency Model

E. Construction and Building Inspectors

The CEJA workforce C**onstruction and Building Inspector training** specialty is designed to prepare people for a career as a construction inspector and/or as a building inspector. The course prepares participants to investigate building components, building integrity, safe operation of mechanicals and appliances, and health and safety issues. Upon completion of the training, participants will have a firm grasp of the skills and competencies needed to be successful construction and building inspectors and be prepared to take the State of Illinois Licensed Home Inspector exam.

The training for Construction and Building Inspectors, Residential should involve a minimum of 80 hours which may encompass in-person, on-line, or hybrid instruction.

E-1. Demonstration of need for training

Grantees are required to submit a curriculum plan (part of the workplan) that demonstrates the need for this training in their region. Consider reaching out to employers and workforce development organizations in the region to better understand the employment and training needs.

Grantees should demonstrate the need for this training in their region by describing:

- The approximate number of construction and building inspector job openings and current jobs in your region.
- The potential benefits to equity investment eligible populations within the region.
- Existing construction and building inspector training programs in the region and any training program gaps.
- The need for new employees, as demonstrated through employer partnerships. Employers must express a need for new employees and a willingness to hire graduates of the program through a Memorandum of Agreement.

E-2. Training description

The CEJA workforce construction and building inspector training specialty is designed to prepare people for a career as a construction inspector and/or as a building inspector. The course trains on the basic construction skills needed by an inspector to thoroughly investigate building materials, its integrity, safe operation of mechanicals and appliances, as well as health and safety training through on-line or blended training, field training, and classroom environment. Upon completion of the training, participants will have a firm grasp of the skills and competencies needed to be successful in inspections, or building maintenance, and to take the State of Illinois Licensed Home Inspector exam.

E-3. Training outcomes

Upon completion of the training, participants will be prepared to take the State of Illinois Licensed Home Inspector exam and/or apply for an entry level position as a construction or building inspector.

E-4. Job(s)/roles trained by this training

- Licensed Home Inspector
- Property/ Building Maintenance Professional

E-5. Career progression

- Energy Auditor/ Building Analyst Professional
- Weatherization Installer and Technician
- Quality Control Inspector

E-6. Prerequisites

Before beginning technical training, participants should:

- Be comfortable on ladders and rooftops
- Be comfortable using basic tools
- Be comfortable working independently and in teams
- Be capable of working 6-8 hours per day in the field (with occasional overtime)
- Be able to do math and read at an eighth grade level or higher
- Be able to use computers/tablets to perform basic calculations
- Be prepared to learn new techniques and terminology
- Have the necessary soft skills for effective communication

By completing the bridge program, participants should have these required competencies.

E-7. Learning environment and format

It is strongly recommended that the technical training be offered as an in-person classroom and lab-based course, with extensive hands-on components. Classroom/Lab should have enough workspace for participants to work individually and in groups.

Access to either a computer lab or a laptop is helpful to support participant evaluation/testing and learning. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Workforce Hubs should create a trusting and supportive environment in which participants feel a sense of belonging. Workforce Hubs must reinforce and build from participants' existing knowledge and strengths. The learning environment is a place where participants know their cultural values, current knowledge, and experiences are transferable and reflected in the clean energy industry. Instructors should share relevant examples and tell relatable stories during training.

Undergirding this environment is a willingness to discuss and address difficult topics and work to find equitable solutions. Successful programs will acknowledge in the curriculum and among participants the environmental and historical factors that impact underserved and disadvantaged groups. Exclusionary practices have no place within the learning environment.

At least 10% of the curriculum hours should be work-based learning activities. Work-based learning (WBL), as defined by the Illinois Board of Education, provides participants with the opportunity to engage and interact with industry experts (employers), while learning to demonstrate essential employability and technical skills necessary for today's workforce. WBL is defined in Perkins V legislation as "sustained interactions with industry or community professionals in real workplace settings, to the extent practicable, or simulated environments at an educational institution that foster in-depth,

firsthand engagement with the tasks required in a given career field, that are aligned to curriculum and instruction." Work-based learning may include:

- Career awareness activities
- Career exploration activities
- Workplace experience (hands-on work experience at a work site, supervised by an employer)
- Career development experience (On-the-job training, internship, or an apprenticeship)

Grantees are required to provide work-based learning components as part of their training, in partnership with employers in their region. To meet this requirement, they are encouraged to partner with employers in their region, especially equity eligible contractors and businesses that are certified through the Business Enterprise Program to attain expert knowledge and to help participants feel a sense of belonging within the industry. They are also encouraged to direct participants to work-based learning opportunities (including apprenticeships or on-the-job training) during or after they complete training.

E-8. Tools and equipment

This training requires the following:

- Tool bag
- Basic inspection tools set (ladder, screwdriver set, measuring device, digital camera, flashlight, outlet polarity tester, non-contact voltage tester etc.)
- Access to power drill
- Laptops and/or computer lab
- Course materials/books

E-9. Instructor requirements

Instructors must have intermediate to expert level knowledge of the curriculum modules in the Core Curriculum section below.

Instructional staff must have a strong connection to target populations and communities and be capable of cultivating a welcoming, and inclusive environment. All staff, including instructors, must be trained in Diversity, Inclusion, Accessibility, and Equity, and committed to upholding these values.

It is recommended that the instruction team consist of:

- Lead instructor
- Facilitator, especially during labs
- Training admin/logistics support to assist with support services, stipends, scheduling

E-10. Training objectives

- Identify, evaluate, and determine current and potential issues of a building's shell, including roof type and condition, chimneys, flashing, exterior building cladding, site drainage, vegetation, and grading pitch at perimeter, to assess building integrity and safety.
- Display knowledge of fundamental principles of electrical components, including height of electrical line from utility to mask (service entrance), electric panel or breaker box type and

condition, outlet polarity, amperage, wire size and type, and condition of light fixtures, to assess electrical safety and functionality.
- Inspect for egress, including window and door operation, to assess occupant safety and accessibility.
- Evaluate plumbing components at hot water heater, faucets, showerheads, and proper drainage configurations, to assess plumbing safety and functionality.
- Determine the safety and functionality of installed appliances such as oven, refrigerator, dishwasher, and kitchen ventilation (e.g., microwave vent or range hood), to assess occupant safety and comfort.
- Evaluate the condition of the heating system(s), ensuring heat is supplied to all living and sleeping areas, to assess occupant safety and comfort.
- Assess building/unit components regarding integrity, function, and health and safety-related issues, and generate a detailed report regarding recommendations and hazards discovered at the time of inspection, and effectively communicate this to stakeholders.
- Practice basic accounting and cost estimating related to construction/retrofit and building operations, to inform decision-making related to repair or retrofit options.
- Use building inspector software to generate a report, including recommendations of professionals (e.g., roofing, electrical, plumbing professionals) as a guide to repair function or safety issues found, and effectively communicate this to stakeholders.

E-11. Curriculum content overview

Table 7.6 presents Construction and Building Inspectors tasks for Sector-Specific Technical Skill (Tier 5) in three levels which are recommended to address in the training. The scope of work must also align with NREL's Standard Work Specifications (SWS).

Table 4.6: Construction and Building Inspector Content Domains

Domain I	Domain II	Domain III
-Knowledge of building components -Ability to identify and describe them and their functions. -Collect exterior, interior, attics, basement/ crawlspace, mechanical ventilation data -Document the building history. -Conduct a physical/visual inspection.	-Ability to determine whether a building is safe to occupy. -List hazards such as tripping, cutting, electrical, falling, presence of mold, asbestos, potential radon etc.	-Generate a report using home inspector software. -Address each section of property. -List deficiencies and include photos. -Recommend qualified professional(s) for repairs.

E-12. Assessment methods

It is recommended that participants be evaluated via the following:

- In-class exams

- In class/lab evaluation
- State of Illinois Licensed Home Inspector exam
- Final exam including hands on demonstration

Additional instruction, coaching, mentoring, and sponsorship may be needed for individuals who require supplementary or different supports to be successful. A variety of assessment strategies, such as lab evaluation and demonstrated knowledge proficiency, are encouraged to account for participants' unique learning styles. Keep in mind, not all instructional strategies and means of assessment have been a significant part of everyone's educational background.

E-13. Certification

Training must include all knowledge required to take the Home Inspector Exam.

E-14. References and example curriculum

- ANSI/BPI-1200-S-2017
- Green Building Career Map
- Understanding by Design
- US Department of Labor's Renewable Energy Competency Model
- Weatherization Standardized Curricula: Weatherization Assistance Program

F. Hybrid/EV Technician Training Recommendations

There are few training programs and standard curricula available to prepare people to service and repair hybrid and electric vehicles (EV), in part because technologies are evolving quickly, electric vehicle technologies are often proprietary, and the electric/hybrid vehicle demand is still low in many areas. Therefore, what follows is a set of recommendations, rather than a standard curriculum framework for this focus area.

Due to the growing demand for electric and hybrid vehicles in Illinois, Workforce Hubs, especially those hubs located in areas with a large demand for electric and hybrid vehicles, are encouraged to partner with existing automotive technician training programs to add **hybrid/EV training** components to their programs.

An increasing number of municipalities in Illinois are electrifying their bus fleets. There is a large demand in Illinois for bus and truck mechanics with training to diagnose, service, and repair these larger vehicles as well. Workforce Hubs that work with bus and truck technician training programs are encouraged to add hybrid or electric vehicle training components to their programs.

Training to maintain and repair hybrid and electric vehicles is typically approached as an advanced training topic, after technicians have mastered basic diagnosis, service, and repair skills (e.g., engine repair, automatic transmission, manual drive train & axles, suspension & steering, brakes, electrical/electronic systems, heating & air conditioning, and engine performance).

However, there is a growing need for *all* technicians to learn electrical and safety basics so that they can safely service electric and hybrid vehicles.

For automotive training programs that wish to add an EV training component to their program, recommendations include:

- For all programs: Make sure your program has a strong electrical training foundation (such as a course on automotive electrical/electronic systems). This course could be adapted to include electric vehicle topics (see below).
- For all programs: Provide safety training for working with high voltage electric and hybrid vehicles, based on industry standards.
- Consider adding an advanced course that addresses basic maintenance and repair of hybrid and electric vehicles.
- Integrate hybrid and electric vehicle topics in other courses as relevant.
- Provide hands-on training on actual hybrid and/or electric vehicles or simulators, if possible, through connections with Original Equipment Manufacturers (OEMs).
- Develop strong connections to repair shops and dealerships servicing hybrid and electric vehicles.

Workforce Hubs may request program funds to develop and deliver a new hybrid/EV training component for an existing automotive program. Training providers are encouraged to leverage industry partnerships and other funding sources to purchase vehicles and equipment.

F-1. Curriculum recommendations

Hybrid/Electric vehicle curriculum should be developed through strong employer and industry input and based on industry standards, such as Automotive Service Excellence (ASE) standards.

Developing EV safety curriculum

The ASE Education Foundation's most recent 2023 Medium/Heavy Truck Program Standards includes a new "Electrified Vehicle High Voltage Safety" section under Electrical/Electronic Systems. The tasks in this section are also applicable for Automobile Programs and can be used to guide curriculum development on EV safety. The ASE Education Foundation expects to add these tasks to Automobile Program Standards soon.

The first five tasks in the Electrified Vehicle High Voltage Safety section are now required for all ASE accredited Truck Training Programs, including Inspection, Maintenance, and Minor Repair programs at high schools:

1. Demonstrate knowledge of hazards related to high voltage system/electric vehicles, including electrocution, fire, explosion, arc flash, gases and fumes, hazardous chemicals, and how to properly respond to emergency situations.
2. Demonstrate knowledge of high voltage system and component coloring, warning labels, lights, signage, and lock-out/tag-out procedures.
3. Demonstrate ability to identify which components and circuits contain high voltage.
4. List the steps needed to assess hazards prior to servicing a high voltage/electric vehicle, including awareness of automatic systems that may operate while the key switch/ignition is off.
5. Respond to the limitations on which systems, components, and circuits of a high voltage/electric vehicle a technician is capable of safely servicing based on their level of training and qualification.

Tasks 6-10 below are now required for all ASE accredited Truck Service Technology programs and Master Truck Service Technology programs.

6. Demonstrate knowledge of special multimeters, insulated tools, and other test equipment required for use in high voltage/electric vehicle circuits.
7. Demonstrate knowledge of personal protective equipment (PPE) required for use in high voltage/electric vehicle circuits.
8. Demonstrate knowledge of proper procedures used to disconnect/isolate the high voltage traction battery.
9. Demonstrate knowledge of a live-dead-live test to verify isolation of the high voltage traction battery.
10. Demonstrate knowledge of the testing and verification of ground circuit isolation between vehicle chassis ground and the high voltage circuits components.

It is recommended that all training programs incorporate these high voltage/electric vehicle safety tasks into their existing electrical coursework or develop a separate class to address these topics.

Developing advanced EV service and repair curriculum

Programs that wish to go beyond these safety basics should consider adding a course that prepares participants for ASE Light Duty Hybrid/Electric Vehicle Specialist (L3) exam. This exam is regularly updated to meet the changing demands of the industry.

Here are a few curriculum options to consider for preparing participants for the ASE L3 exam:

- Electric and Hybrid Vehicles, first edition (Pearson, 2022). By James D. Halderman and Curt Ward. This training is appropriate for a 3rd or 4th semester course in electrical systems, though it can be used as a standalone curriculum as well. It is aligned with the ASE L3 exam and is part of the Pearson Automotive Professional Technician Series.
- Advanced Electric Drive Vehicle Education Program (National Alternative Fuels Training Consortium, 2013). Though the NAFTC is currently revising the curriculum to address battery electric vehicles in greater depth, the basic components of the curriculum are still relevant. It is aligned with the ASE L3 exam.
- Light Duty Hybrid & Electric Vehicles, first edition (CDX Learning Systems, 2023). By Mark L. Quarto and Nicholas Goodnight. This curriculum, aligned with the ASE L3 exam, prepares participants to be entry-level technicians and covers topics including hybrid/EV safety systems, battery chemistries, power conversion, motor operation, and interconnected network dynamics. A textbook and online curriculum with resources for an online course is both available.
- Electric Vehicles: A Systems Approach (G-W, 2024). By Sean Bennett. This curriculum provides foundational knowledge to safely service all types of electric vehicles, with a strong emphasis on high-voltage safety.

F-2. OEM partnerships

Automotive programs in Illinois have partnered with several different Original Equipment Manufacturers, including Rivian and Ford, to offer training on specific proprietary hybrid or electric vehicle technologies.

Training providers are encouraged, if feasible, to partner with an Original Equipment Manufacturer to provide hands-on training on specific hybrid and electric vehicle technologies. These partnerships also provide excellent opportunities for trainees to receive on-the-job training and to find employment after completing the training program.

F-3. Equipment needs

Simulators, videos, and virtual reality technology can be used to provide training on high voltage safety basics. Hands-on training on actual hybrid and electric vehicles is also recommended. Work with a local OEM partner to explore training equipment and vehicles that can be used.

Training programs should also have personal protective equipment (safety glasses, HV class zero 1,000-volt gloves), HV digital volt ohm meters that can handle up to 1,000 volts, milliohm meters, electrical-insulated EV tools, and insulation testers.

G. Wind Turbine Construction and Maintenance Training Recommendations

Workforce Hubs, especially those in areas where wind farms have been or are being developed, are encouraged to support or develop new wind training programs to train participants for entry level **wind turbine construction** or maintenance jobs, such as wind technician. Workforce Hubs may connect participants to existing wind training programs, on-the-job training, or apprenticeships offered by employers.

To develop a new wind training program, Workforce Hubs and their training providers must have strong connections to wind employers to assist with curriculum development, work-based learning opportunities, and job placement. There must also be a clear demand for wind technician jobs in the region where the training will be offered.

There are few standardized, up-to-date curricula and certifications for wind turbine technicians and installers, in part because technologies are often proprietary. Therefore, what follows is a set of recommendations for developing a new wind turbine technician training program, rather than a standard curriculum framework for this focus area.

G-1. Program design recommendations

In Illinois and across the country, there are a variety of wind training programs that vary in length and design. Some wind training programs are part of a larger renewable energy program at a community college or technical school. Associate degree programs and shorter vocational certificate programs are both feasible. Larger wind employers often train people on the job rather than requiring people to acquire the training beforehand.

Wind technician curriculum should be developed through strong employer and industry input and based on industry standards, to the extent that they are available.

Safety and electrical fundamentals training

Wind employers that operate in Illinois have indicated that electrical and safety fundamentals would be helpful for entry-level technicians. It is recommended that training programs consider offering a short certificate program that covers these fundamentals to prepare people for entry-level employment and on-the-job training offered by employers. These topics might include:

- Safety
    - First Aid/CPR
    - OSHA 10 and OSHA 30
    - ENSA Climb and Rescue
    - Safe lockout practices
    - NFPA 70E Arc Flash Safety
- Electrical fundamentals
    - Current, voltage and resistance in different configurations of electrical circuits
    - AC/DC
    - Transformers & circuits

  - Electromagnetism and induction
  - Components of electric motors

Longer training programs (such as a renewable energy associate degree program) that have greater access to wind turbine components and systems might cover additional topics, such as:

- Hands-on training on wind turbine components and systems
- Hands-on training on installation, operation, maintenance, troubleshooting, and repair of wind turbine electromechanical systems
- Training on components and process of electrical power generation and delivery systems

G-2. Curriculum examples

- Introduction to Wind Energy; Wind Turbine Maintenance Trainee Guide, Level 1, Volumes 1 and 2 (Contren Learning [Pearson], first edition, 2011). By NCCER.
- Volume 1 Key content areas: Intro to Wind Energy, Intro to Wind Turbine Safety, Climbing Wind Towers, Intro to Electrical Circuits, Electrical Theory, Electrical Test Equipment, and Electrical Wiring.
- Volume 2 key content areas: AC and 3-phase systems, circuit breakers and fuses, switching devices, wind turbine power distribution systems, fasteners and torquing, intro to bearings, lubrication, intro to hydraulic systems.
- Maintenance Fundamentals for Wind Technicians (Cengage, first edition, 2013). By Wayne Kilcollins. Topics include intro to wind energy, tower safety, workplace safety, lubrication, fluid power, bolting practices, test equipment, component alignment, down tower assembly, tower, machine head, drive train, generator, rotor assembly, external surfaces, developing a preventative maintenance program, wind farm management tools.

G-3. Learning environment and format

Technical training may be offered through in-person classroom and lab-based courses, with extensive hands-on components. Access to either a computer lab or a laptop is helpful to support participant evaluation/testing and learning. Portions of this curriculum may be taught using either synchronous or asynchronous e-Learning with the appropriate support systems.

Tools and equipment may include:

- Basic handheld tools (hammer, screwdriver, pliers, wire cutters, etc.)
- Access to power tools
- Access to electrical diagnostic equipment
- Multimeters
- Battery capacity testing devices (e.g., load tester)
- Course materials/books
- Access to training towers or tower simulation stands
- Access to full body harnesses for high-elevation safety training
- Laptops, tablets, and/or computer lab
- Software for estimation of wind turbine power generation and efficiency

- Software for electrical malfunction diagnosis

G-4. Certification

Safety certifications recommended include:

- Climb and Rescue
- OSHA 10 and OSHA 30
- First Aid/CPR/AED
- NFPA 70E Arc Flash Safety

G-5. Other references

- Office of Energy Efficiency & Renewable Energy Career Map: Wind Technician
- Northwest Renewable Energy Institute: Wind Turbine and Telecom Technician Training Program
- O*NET Online: Wind Turbine Service Technicians

Additional resources

See the CEJA Workforce Hubs Partner Guide for the following resources:

- Sample Curriculum Plan
- Sample Instructional Plan
- Sample Student/Participant Feedback Form
- Final Curriculum Form

See also:

- ISBE Computer Literacy Continuum: https://www.isbe.net/Documents/CL-Knowledge-Skills-Continuum-Matrix.pdf
- Illinois workNet Digital Literacy Guide: https://www.illinoisworknet.com/Qualify/Pages/ComputerSkills.aspx
- Illinois Treasurer Financial Literacy Resources: https://www.illinoistreasurer.gov/Financial_Education/Financial_Literacy_Resources

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