

National Weatherization Training & Technical Assistance Plan



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**National Weatherization Training and Technical Assistance Plan
Weatherization Assistance Program**

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National Weatherization Training and Technical Assistance Plan

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I. WEATHERIZATION ASSISTANCE PROGRAM BACKGROUND

Weatherization Assistance Program Overview

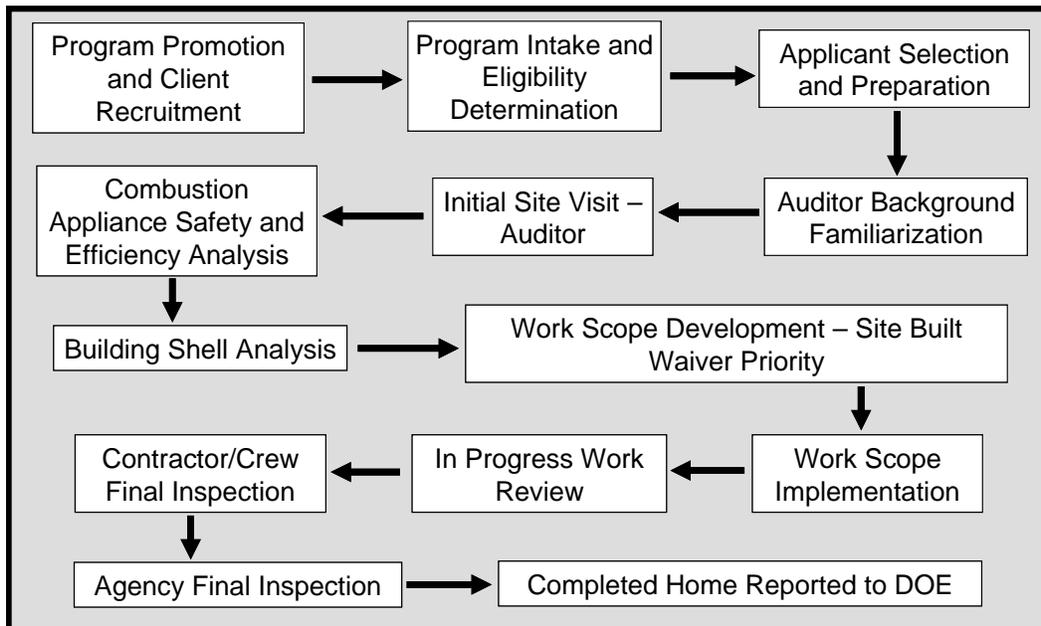
The U.S. Department of Energy's (DOE's) Weatherization Assistance Program (WAP) reduces energy costs for low-income families by increasing the energy efficiency of their homes, while ensuring their health and safety.

Weatherization service providers install energy efficiency measures in qualifying homes free of charge. In a comprehensive process that has developed over time, professionally-trained crews use computerized energy audits and advanced diagnostic equipment to determine the most cost-effective measures that are then installed, and work is inspected for quality and completeness (see Figure 1 below). Many of the building energy efficiency techniques considered standard procedure today were first developed and tested by the WAP. Typical measures can include installing insulation; sealing ducts; tuning, repairing, or replacing heating and cooling systems; mitigating air infiltration; and reducing electric base load consumption. These upgrades are cost-effective and inexpensive – historically, the average allowable expenditure limit has been \$2,500¹ per home – and pay for themselves in a few years. DOE documents the savings and compares them to costs, allowing the Federal government to determine the efficacy of installed measures over time.

Weatherization works to:

- Reduce energy costs and alleviate high energy burden for low-income families;
- Decrease the nation's energy consumption and avoid related emissions;
- Improve housing stock and neighborhood conditions;
- Provide an economic boost in low-income communities; and
- Educate consumers about energy efficiency practices.

Figure 1: The Weatherization Assistance Program Process



¹ Many weatherization programs leverage additional funds through utility programs and other related Federal and state programs. By leveraging additional funds, weatherization programs can increase the average expenditure per home above the allowable DOE limit.

Weatherization programs operate in all 50 states and the District of Columbia, among Native American tribes, and in the U.S. territories. DOE provides funding and technical guidance to these “Grantees,” which run their own programs and sub-contract to service providers – usually nonprofit agencies that serve families in their communities. Working together, this network delivers weatherization services to eligible residents in every county in the nation.

The WAP has served more than 6.3 million households since its inception more than 30 years ago. About 38 million households are currently eligible for weatherization services. The program prioritizes services to the elderly, people with disabilities, and families with children; high energy users or households with a high energy burden may also receive priority.

Weatherization Workforce

With a reputation for quality, the WAP has helped grow an energy efficiency industry for residential buildings. The industry employs thousands of people who work for low-income weatherization programs and companies that help homeowners increase their energy efficiency through low-cost measures.

A variety of people and skills are needed for weatherization programs to function effectively. In general, the weatherization workforce includes, but is not limited to, the following:

- **Auditors**, who assess eligible dwelling for potential weatherization services; visually inspect building shell and mechanical systems; conduct diagnostic, health, and safety tests; use computerized energy audit or priority list to select cost-effective measures; and prepare work orders to ensure the most appropriate measures are installed properly;
- **Installers**, who install weatherization measures (can be contractors or crew members);
- **Crew Chiefs**, who supervise crews of installers and direct their efforts;
- **Quality Control Inspectors**, who verify the proper selection, installation, and effectiveness of measures; review documentation; visually inspect; and perform diagnostic, health, and safety testing;
- **Trainers**, who provide training to weatherization staff;
- **Technical Monitors**, who monitor local agencies to ensure work quality, and often identify training needs and provide or recommend training;
- **Intake Eligibility Staff**, who determine the eligibility of prospective clients; and
- **State and Local Program Managers**, who manage day-to-day operations.

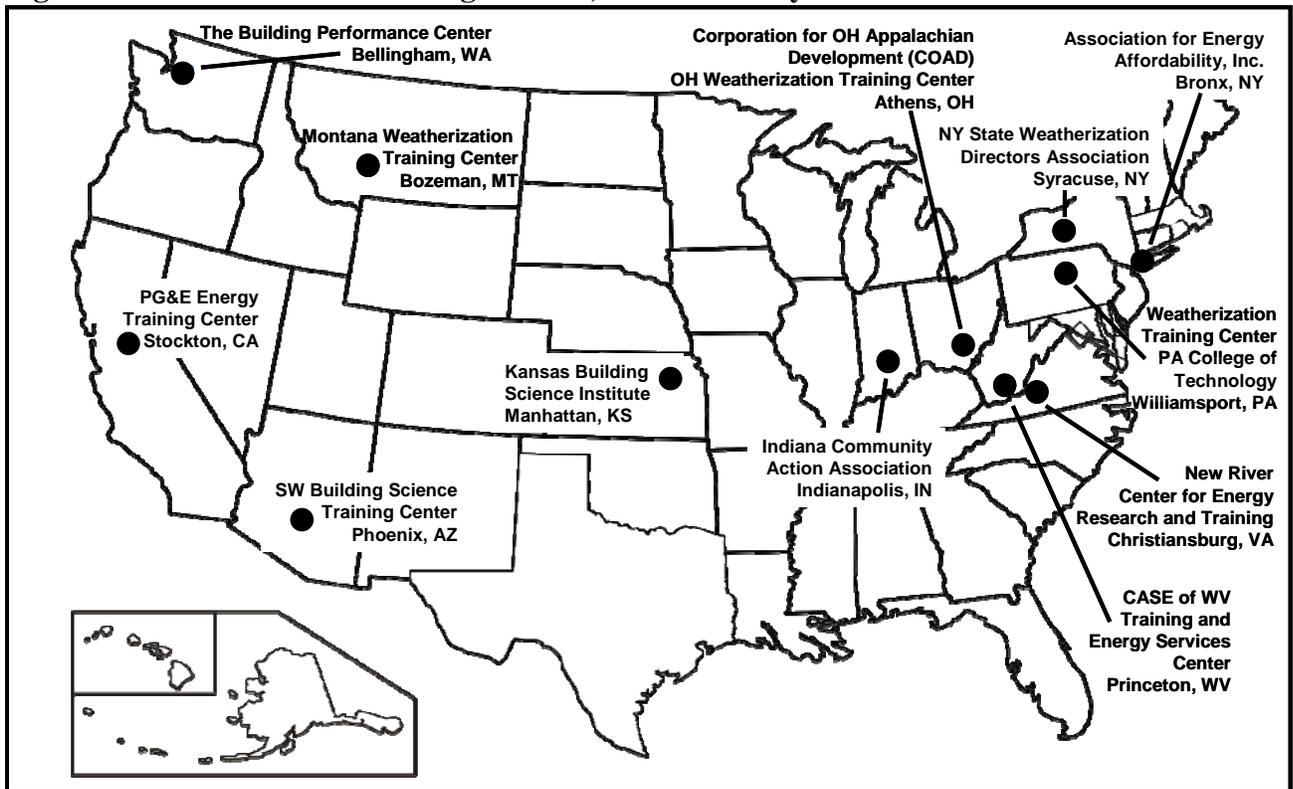
Weatherization Training and Technical Assistance

In addition to funds for weatherizing homes (also called “production”), the program statute has allowed up to 10% of the WAP annual appropriation to be used for training and technical assistance (T&TA) activities. Collectively, Grantees have received 8.5%; they decide how much to retain at the Grantee level and how much to provide to subgrantees. DOE has reserved 1.5% for national T&TA activities that benefit all Grantees.

WAP T&TA funds support a range of program operations activities including measuring and documenting performance, monitoring programs, promoting advanced techniques and collaborations to further improve program effectiveness, and training, including developing tools and information resources. Training can cover everything from program management to technical topics.

Historically, WAP Grantees and subgrantees have used T&TA funds to train individuals they have already hired, and they make their own decisions about how training is provided. While this creates variability across the country, it allows for tailored training programs that best suit individual needs. Some states benefit from a local weatherization training center, others may send workers to a weatherization training center in a neighboring state or a training facility that specializes in a particular training topic (e.g., heating, ventilating, and air conditioning), and still others may work with an expert training organization not housed in an actual center with ready access to weatherization training props and related equipment. Some states hire independent trainers with recognized weatherization expertise, and some use agency staff to provide training. Typically, Grantees choose to rely on a combination of training methodologies to meet their needs (see Appendix 1 for a comparison of methodologies). As of February 2009, prior to the passage of the Recovery Act, approximately 90% of states used state agency staff for training, approximately 75% used local agency peers for training, and approximately 70% of states used independent trainers. There were just twelve recognized weatherization training centers (see Figure 2).²

Figure 2: Weatherization Training Centers, as of February 2009²



Grantees also make their own decisions regarding certification. Some require technical staff at local agencies to obtain certification from a national organization, while others have developed their own certification programs. Some Grantees have no formal certification requirements and

² Source: Weatherization Assistance Program Technical Assistance Center (WAPTAC), www.waptac.org, accessed July 2009

example, the core competencies for an auditor build on those needed for a crew chief, which build on the skills needed for an installer.

II. VISION AND PURPOSE

The American Recovery and Reinvestment Act

Through the American Recovery and Reinvestment Act (Recovery Act), the Obama Administration made an unprecedented commitment to weatherizing and retrofitting our nation's residential building stock. In addition to investments in other Federal programs for residential energy efficiency and green workforce development, the Recovery Act provides the WAP \$5 billion to significantly accelerate its efforts and expand the availability of weatherization services to low-income Americans. The White House Council on Environmental Quality coordinates related Federal efforts through a "Recovery through Retrofit" interagency taskforce, helping to ensure that these investments are the first step in creating a thriving market for home retrofits.³

The Recovery Act changed the WAP in several ways (see box). Among them, it raised the allowable allocation for WAP T&TA activities from 10% to 20%, with 17% provided for Grantee-directed activities and 3% for DOE-directed, national activities. Therefore, of the \$5 billion provided for WAP under the Recovery Act, Grantees may collectively use a total of \$854 million for T&TA, and DOE is allocated \$146 million.

The Recovery Act amended the WAP statute in several fundamental ways:

- *Increased income eligibility from 150% to 200% of poverty level;*
- *Changed the allowable costs from \$2,500 to \$6,500 per home;*
- *Increased the allowable T&TA funds from 10% to 20% of the total program allocation;*
- *Changed the date for assistance for previously weatherized units from September 30, 1993 to September 30, 1994; and*
- *Required compliance with the Davis-Bacon Act for use of prevailing wages.*

Weatherization, the Changing Training Landscape, and Building a National Energy Efficiency Retrofit Market

The program's Recovery Act expansion requires a significant growth in training capacity beyond that of the current network. States and local agencies must very rapidly ramp up their production, which means they (or their contractors) must recruit, hire, and train workers to meet their needs quickly, while at the same time being careful to ensure the same level of quality service for which the WAP is well known.

The Recovery Act brings opportunities for innovative partnerships among network participants and between weatherization programs and external partners to leverage training resources and share best practices. Many states are developing or expanding training centers and conducting training boot camps to help ensure the availability of an adequate workforce. Grantees are also pursuing new ways to supplement their traditional training approaches, partnering with community college networks, state workforce investment boards, apprenticeship programs, and labor union programs. DOE seeks to facilitate and help replicate these kinds of partnerships to

³ http://www.whitehouse.gov/the_press_office/Vice-President-Biden-Calls-for-Report-on-Green-Opportunities-for-the-Middle-Class/

not only leverage the nation's existing infrastructure and quickly build the training capacity needed for Recovery Act ramp up, but also better engage education and labor organizations capable of providing weatherization training to a larger audience over the long term.

DOE also seeks to ensure Recovery Act investments help build a better, stronger weatherization network that provides the foundation needed for a national energy efficiency retrofit market. Recovery Act funds allow the opportunity to develop and provide national baseline technical curricula anchored in sound building science and take advantage of technology to accelerate the pace of training and make it available to a much larger, national audience. Technology-enabled learning tools such as simulations and immersive environments can make learning more productive, compelling, personal, accessible, and adaptable to local needs. With stackable and transferable credentials, the new and growing green workforce can have the freedom of movement up a career ladder or mobility of a career lattice between the WAP and market-rate home energy retrofit or related renewable energy technology installation work. Training accreditation will help to ensure transparency of the training market and maintain quality assurance for workers seeking entry into the green, energy efficiency retrofit job market. New web-based tools will greatly increase the availability and accessibility of data and program results, allowing the WAP to communicate its progress quickly and easily – an advanced, online auditing tool will support a national database of retrofit measures with related costs and projected energy savings, and new national, web-based weatherization program management capability will increase the efficiency and ease of reporting across the network.

Inherent in this unprecedented opportunity afforded by Recovery Act funding is the responsibility to coordinate efforts with related programs and leverage both new and existing resources through partnerships that can extend Recovery Act investments well into the future. Within DOE's Office of Energy Efficiency and Renewable Energy, the Building Technologies Program (BTP) funds research and technology development to reduce residential building energy use. BTP's Building America Program provides best practices and case studies for major climate zones that can inform WAP technical training materials. The activities described in this plan will bring together weatherization and other technical experts to develop content delivered through a new national training platform that enhances traditional training methodologies. The activities in this plan are also intended to foster partnerships with related Federal residential retrofit programs and new efforts to building a green workforce through energy efficiency, as well as leverage labor union and technical college workforce training capabilities and infrastructure.

Over its more than 30 years of operation, the weatherization network has demonstrated its ability to improve the health, comfort, and safety of millions of low-income persons by increasing the energy efficiency of their homes. Recognizing the program's unique ability to quickly reduce energy use and carbon emissions, provide real dollar savings that can be reinvested in the economy, and stimulate growth of the green job market, the Recovery Act provided for a significant ramp up of WAP efforts. In response to this challenge and opportunity, the weatherization network is increasing its production while maintaining the quality workmanship for which it is known. Through the strategic use of Recovery Act investments outlined in this plan, DOE will build on Grantee and subgrantee activities to support weatherization and lay the

foundation for a national retrofit industry with ready access to a well-trained workforce and opportunities for worker mobility and career pathways.

III. DOE WEATHERIZATION PLAN

Goal

The overarching goal of DOE's training and technical assistance effort is the following: Build the training capacity to support the weatherization network Recovery Act ramp up and lay the foundation for a sustainable national retrofit industry with ready access to a well-trained workforce and opportunities for worker mobility and career pathways.

Tasks

The tasks, activities, and milestones described below are designed to support weatherization network ramp up and program implementation over the Recovery Act period, and also leverage WAP expertise to lay the foundation for a national energy efficiency retrofit market as described in Section II. As program implementation proceeds, new training needs may arise. *This plan is intended to be a living document with the flexibility to adjust tasks, activities, and milestones, as appropriate, to best serve the weatherization network, Recovery Act objectives, and national priorities for energy efficiency retrofit market development.*

Task Overview

Task 1: Enhance communications, information exchange, and planning.

- Project 1.1: STREAMLINE COMMUNICATIONS
- Project 1.2: FORM A DOE WORKING GROUP TO FACILITATE COORDINATION
- Project 1.3: CONDUCT WEATHERIZATION OUTREACH
- Project 1.4: FORM AND MANAGE NATIONAL ADVISORY COMMITTEE

Task 2: Develop baseline technical training content and provide traditional training resources.

- Project 2.1: MAKE AVAILABLE NATIONAL WAP BUILDING SCIENCE FUNDAMENTALS
- Project 2.2: DEVELOP STANDARDIZED TECHNICAL TRAINING MATERIAL CONTENT AND TRADITIONAL TECHNICAL TRAINING MATERIALS

Task 3: Develop and deploy a national platform for weatherization training.

- Project 3.1: DEVELOP AND DEPLOY A NATIONAL PLATFORM FOR WEATHERIZATION TRAINING (NPWT)
- Project 3.2: PROVIDE OUTREACH ON THE NPWT
- Project 3.3: PROVIDE TRAINING AND TECHNICAL ASSISTANCE TO SUPPORT THE DEPLOYMENT AND USE OF THE NPWT

Task 4: Support the creation or expansion of comprehensive weatherization training centers and/or programs

Task 5: Support weatherization train-the-trainer, peer-mentoring, and peer-exchange activities.

- Project 5.1: DEPLOY TRAIN-THE-TRAINER PROGRAMS
- Project 5.2: SUPPORT PEER-MENTORING AND PEER-EXCHANGE OPPORTUNITIES
- Project 5.3: ESTABLISH A COMMUNITY OF PRACTICE AMONG WEATHERIZATION TRAINING PROVIDERS

Task 6: Develop national requirements for weatherization certification and accreditation standards.

- Project 6.1: DEVELOP AND IMPLEMENT A NATIONAL WEATHERIZATION WORKER CERTIFICATION FRAMEWORK
- Project 6.2: DEVELOP A NATIONAL WEATHERIZATION TRAINING ACCREDITATION AND TRAINER CERTIFICATION PROGRAM

Task 7: Provide expert services, technical assistance, and training to directly support the WAP network.

- Project 7.1: DELIVER PROGRAM OPERATIONS TRAINING AND TECHNICAL ASSISTANCE
- Project 7.2: DELIVER FISCAL/PROCUREMENT TRAINING AND TECHNICAL ASSISTANCE
- Project 7.3: PROVIDE TARGETED TECHNICAL ASSISTANCE AND TRAINING
- Project 7.4: PROVIDE TARGETED LEVERAGING ASSISTANCE AND TRAINING

Task 8: Support WAP Grantee-directed pilots that advance the use of state-of-the-art technologies and protocols.

- Project 8.1: ISSUE OPEN CALL FOR PROJECTS
- Project 8.2: EVALUATE AND INCORPORATE PROJECT RESULTS INTO WAP TRAINING AND ACTIVITIES

Task 9: Conduct comprehensive WAP impact and process evaluations.

- Project 9.1: COMPLETE RETROSPECTIVE EVALUATION
- Project 9.2: COMPLETE RECOVERY ACT EVALUATION

Task 10: Develop and deploy an advanced online energy audit tool.

- Project 10.1: PROVIDE ONGOING GRANTEE SUPPORT OF AUDIT PROTOCOLS
- Project 10.2: MAINTAIN FIELD VERSIONS OF NEAT AND MHEA
- Project 10.3: DEVELOP A NEW, ONLINE AUDITING TOOL

Task 11: Develop and implement a National Online Weatherization Management Information System.

- Project 11.1: DEFINE SCOPE OF NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM

- Project 11.2: DEVELOP NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM
- Project 11.3: DEPLOY NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM

Task 12: Provide for other services required during WAP Recovery Act implementation.

- Project 12.1: SUPPORT DATA ACCEPTANCE, ANALYSIS, AND RECONCILIATION
- Project 12.2: ENSURE QUICK RESPONSE RESEARCH/ANALYSIS ON “HOT TOPICS”
- Project 12.3: FACILITATE PROGRAM IMPLEMENTATION AND FUNCTION

Task Details

Task 1: Enhance communications, information exchange, and planning.

Project 1.1: STREAMLINE COMMUNICATIONS.

- **Project 1.1.1:** Maintain and update the Weatherization Assistance Program Technical Assistance Center (WAPTAC), www.waptac.org.
 - Upgrade the WAPTAC structure and platform to increase the site’s usability and accessibility. Upgrades will clearly organize information, support online communities, and encourage connections to related programs and new content delivery mechanisms.
 - Provide maintenance and updating of current WAPTAC resources including program notices, public information materials, Grantee contact information, new information and training materials available to the network, health and safety protocols, tool-kits, presentation materials, training curricula, brochures, fact sheets, and other resources. WAPTAC will host all approved State Weatherization Plans (excluding detailed Grantee budgets and budget justifications).

(Milestone: Launch new WAPTAC web site; Date: Q2 FY10)

- **Project 1.1.2:** Update DOE/EERE WAP website to highlight key communications from DOE to the WAP network; make use of links to align with and complement WAPTAC.

(Milestone: Complete initial EERE/WAP web site update; Date: Q1 FY10)

- **Project 1.1.3:** Host a monthly webinar series (or similar technology-enabled vehicle) for WAP Grantees on “hot topics.”

(Milestone: Host first Hot Topics Webinar; Date: Q1 FY10)

- **Project 1.1.4:** Establish regular communication with other Federal agencies involved in workforce development for energy efficiency retrofits.

Project 1.2: FORM A DOE WORKING GROUP TO FACILITATE COORDINATION.

Establish regular working group meetings between the DOE WAP and the DOE Building

Technologies Program (BTP) to facilitate coordination of related training and technical assistance activities, as well as share research results and lessons learned from technology implementation. The working group will develop a comprehensive coordination plan and may have sub-groups that involve other stakeholders to focus on specific issues such as training material and certification.

(Milestone: Establish working group; Date: Q1 FY10)

(Milestone: Complete WAP-BTP coordination plan; Date: Q3 FY10)

Project 1.3: CONDUCT WEATHERIZATION OUTREACH.

- **Project 1.3.1:** Create communications materials for use by Grantees and DOE to articulate the goals and achievements of the program for both internal and external audiences; these materials will also include pieces that help the public understand “what weatherization is.” Work with the BTP and other Federal agencies to share stories on energy efficiency upgrades.

(Milestone: Create promotional video clips as well as clips that demonstration weatherization technologies and processes; Date: Q1 FY10)

- **Project 1.3.2:** Support Grantees that want to increase outreach about their programs but do not have adequate management staff available to ensure successful outreach events. Grantee outreach can inform the community about the availability of weatherization services.

(Milestone: Support first Grantee public outreach event; Date: Q2 FY10)

Project 1.4: FORM AND MANAGE NATIONAL ADVISORY COMMITTEE. Form an advisory committee of private sector business leaders (e.g., home service professionals) that includes WAP, BTP, and other residential energy efficiency retrofit stakeholders, as well as Federal agencies representatives of the Recovery through Retrofit interagency task force. In compliance with Federal Advisory Committee Act guidelines, the committee will provide recommendations on issues related to weatherization and home energy retrofits.

(Milestone: Announce selection of advisory committee; Date: Q3 FY10)

Task 1 Expected Outcomes:

- Significantly upgraded technical web site
- Better coordination with EERE/BTP; coordination plan
- DOE webinar series for regular communication with WAP network
- Grantee public outreach events, communications resources/tools for DOE and Grantee use
- Federal advisory committee providing recommendations on key issues related to weatherization and coordination with the national retrofit community

Task 2: Develop baseline technical training content and provide traditional training resources.

Project 2.1: MAKE AVAILABLE NATIONAL WAP BUILDING SCIENCE

FUNDAMENTALS. Provide technically-accurate resources based on sound building science, including peer-reviewed best practices, in a format that states can adapt to meet their needs.

- **Project 2.1.1:** Analyze the WAP and related residential retrofit programs to identify and understand the differences in program protocols, technology implementation, and training requirements.

(Milestone: Complete analysis; Date: Q2 FY10)

- **Project 2.1.2:** Immediately inventory training materials, best practices, and other resources from national, state, and local weatherization and related retrofit and construction programs. Make materials available as appropriate. Efforts must be coordinated with other efforts to develop materials inventories as noted in this plan.

(Milestone: Complete inventory; Date: Q2 FY10)

- **Project 2.1.3:** Using materials from the inventory (Project 2.1.2), develop and make available climate-specific, baseline best practice manuals for use among weatherization and home energy retrofit practitioners.

(Milestone: Complete baseline best practice manuals; Date: Q3 FY10)

Project 2.2: DEVELOP STANDARDIZED TECHNICAL TRAINING MATERIAL CONTENT AND TRADITIONAL TECHNICAL TRAINING MATERIALS. Develop technical training content and traditional training materials based on sound building science and leveraging WAP, BTP, and other resources (e.g., EPA Lead-Safe Work Practices).

- **Project 2.2.1:** Develop baseline technical content for a comprehensive and scientifically-based national, standardized training curricula that covers the following:
 - Weatherization of –
 - Single-family homes
 - Mobile and manufactured homes
 - Multi-family residents
 - Train-the-Trainer
- **Project 2.2.2:** Provide the technical content drafts to the technical training sub-group formed under Project 2.1 for review, as appropriate.
- **Project 2.2.3:** Using the technical content, develop training curricula materials suitable for traditional, in-person content delivery. Work with the Weatherization Trainers Consortium to review materials and work with Grantees and others to pilot test it before official rollout.

Work with DOL and DOE to evaluate the effectiveness of the weatherization technical training materials in this project.

(Milestone: Release first three modules of single-family curricula: Installer Fundamentals; Installer Intermediate; and Energy Auditor; Date: Q1 FY10)

(Milestone: Release Mobile Home Installer's Module; Date: Q1 FY10)

(Milestone: Release second three modules of single-family curricula: Crew Chief Training, Train the Trainer, and Technical Monitor/Inspector; Date: Q2 FY10)

(Milestone: Release supplemental modules for multi-family curricula: Auditor; Heating Systems for Auditors and Inspectors; and Heating and Cooling Systems for HVAC Contractors; Date: Q3 FY10)

(Milestone: Release last two modules of single-family curricula: Heating System Training for Energy Auditors and Inspectors; and Heating and Cooling System Training for HVAC Contractors; Date: Q3 FY10)

- **Project 2.2.4:** Develop supplementary technical training tools, including but not limited to videos and simulations that can be used stand-alone, integrated into, or delivered through a technology platform.

(Milestone: Upload first video segments to WAPTAC; Date: Q1 FY10)

Task 2 Expected Outcomes:

- Analysis of WAP and related programs' protocols and technologies
- Weatherization best practice manuals for multiple climates
- Comprehensive technical content and curricula (installer fundamentals and intermediate, mobile home installer, auditor, crew chief, train-the-trainer, technical monitor/inspector, supplemental modules for multi-family weatherization, heating and cooling systems, etc.)

Task 3: Develop and deploy a national platform for weatherization training.

The National Platform for Weatherization Training (NPWT) will take advantage of information technology (IT) tools for delivering training and providing performance-based testing that have been used successfully by the Department of Defense and innovative private sector companies. The NPWT will support interactive online instruction, computer simulations, and 3-D visualization tools that are appropriate for energy retrofitting work and will allow participants access to information and training on a wide variety of building types, HVAC systems, insulation materials, and other energy features without traveling to dozens of building locations. It will consist of two components:

1. An IT-enabled platform, which is a virtual analogy of a building with classrooms, services, and staff; and
2. IT-enabled modules, which are the software equivalent of training courses.

The NPWT is meant to enhance – not replace – traditional in-person, hands-on, and on-the-job training. It has been shown that IT-enabled training tools can reduce instruction time and improve student performance. While the NPWT will be open-source and available to everyone,

the training providers with which DOE partners (see below) will play a pivotal role in deploying these tools. DOE intends to introduce the NPWT in a phased approach.

Project 3.1: DEVELOP AND DEPLOY A NATIONAL PLATFORM FOR WEATHERIZATION TRAINING (NPWT). DOE will develop and deploy the NPWT in a phased approach as described below.

Phase 1 Development and Deployment

- **Project 3.1.1:** Develop a national platform that offers an enhanced web-based learning and content management system to manage training records and facilitate access to online courses for weatherization training.

(Milestone: Complete the development of the phase 1 national platform; Date: Q2 FY10)

- **Project 3.1.2:** Using the standardized technical training content developed in task 2, develop interactive web-based training modules to be made available on the national platform. DOE will work with WAP Grantees and trainers to pilot test the modules as part of the development process.

(Milestone: Complete the development of web-based training modules for installer fundamentals, installer intermediate, and energy auditor training and deploy on the phase 1 national platform; Date: Q2 FY10)

Phase 2 Development and Deployment

- **Project 3.1.3:** Increase the functionality of the phase 1 platform to accommodate immersive and experiential learning content. Development will include rapid prototyping, user testing and evaluation. Users will be able to access training that simulates the range of buildings, equipment, and other elements required to provide weatherization training. Tools will enable users to –
 - Collaboratively create, modify, and use digital materials;
 - Peer review;
 - Upload, access and store digital materials, behaviors and metadata;
 - Contact and manage development teams (link subject matter experts to experts in creating virtual objects);
 - Create and rate learning modules and assessments (e.g. a performance based challenge); and
 - Manage intellectual property and other rights.

(Milestone: Begin iterative cycles of testing and evaluation of the phase 2 platform; Date: Q3 FY10)

(Milestone: Complete development of the phase 2 IT-enabled platform; Date: Q2 FY11)

- **Project 3.1.4:** Develop a series of IT-enabled modules to be delivered via the phase 2 platform. Development of the modules will build on the web-based training developed in phase 1 and rely on the standardized technical training content developed in task 2. The modules will include computer simulations, 3-D visualization tools, and immersive

environments. DOE will work with WAP Grantees and trainers to pilot test phase 2 modules as part of the development process. Work will also be conducted in coordination with the Departments of Labor and Education to evaluate the effectiveness and increase the interoperability of the national training platform and curricula developed in this task to ensure it can become a national training system.

(Milestone: Begin iterative cycles of user testing of the phase 2 modules; Date: Q3 FY10)

(Milestone: Launch IT-enabled modules on the phase 2 platform; Date: Q2 FY11)

Project 3.2: PROVIDE OUTREACH ON THE NPWT. Outreach should promote the availability of the NPWT and its ability to increase the availability of training to a large audience and accelerate training in advance of hands-on and in-field training.

(Milestone: Complete development of NPWT outreach strategy; Date: Q2 FY10)

Project 3.3: PROVIDE TRAINING AND TECHNICAL ASSISTANCE TO SUPPORT THE DEPLOYMENT AND USE OF THE NPWT. Building on the outreach strategy developed under Project 3.3, DOE will establish a technical assistance team to support the launch, deployment, and use of technical training via the NPWT. The team will focus its initial efforts on weatherization training centers, both existing centers supporting the WAP and new centers or programs.

(Milestone: Establish NPWT training and technical assistance team; Date: Q2 FY10)

Task 3 Expected Outcomes:

- National, open-source, virtual learning system that rapidly accelerates the pace and expands the availability of weatherization training
- An easy-to-use set of tools and services that allows students and trainers to create, use, share, continuously-update, and collaboratively-improve training materials, as well as safely maintain student training records

Task 4: Support the creation or expansion of comprehensive weatherization training centers and/or programs.

DOE will form partnerships with training entities to expand existing or develop new weatherization training centers or programs that provide accelerated, holistic, standardized, and multi-tiered weatherization training. Through this effort, DOE will seek to support regions with the greatest need; develop training centers and/or programs that provide a combination of classroom, online, and hands-on learning; and to the greatest extent possible, facilitate partnerships with existing vocational training resources, including but not limited to DOL green workforce efforts, related retrofit training efforts, community or technical college programs, apprenticeship programs, and other union or organized labor programs. The training centers or programs developed under this effort will be encouraged to use the standardized technical training content developed under task 2 and integrate with the technology-enabled training system developed under task 3 to the greatest extent possible.

(Milestone: Announce new training center projects; Date: Q3 FY10)

Task 4 Expected Outcome: Expanded national network of comprehensive weatherization training centers/programs

Task 5: Support weatherization train-the-trainer, peer-mentoring, and peer-exchange activities.

Project 5.1: DEPLOY TRAIN-THE-TRAINER PROGRAMS. Focusing first on areas of greatest need, work with established training providers to offer train-the-trainer programs that include hands-on training, mentoring, and other professional development opportunities for instructors. To the greatest extent possible, this training will be designed to incorporate the standardized technical training content developed under task 2 and integrate with the technology-enabled training system developed under task 3.

(Milestone: Launch train-the-trainer programs in up to 6 different regions; Date: Q4 FY10)

Project 5.2: SUPPORT PEER-MENTORING AND PEER-EXCHANGE OPPORTUNITIES. Work with Grantees to expand the availability of on-the-job peer-training, peer-mentoring, and peer-exchange opportunities, with an emphasis on in-field and hands-on learning. These efforts could also include the use of technology enabled training systems and success stories from the deployment of technology-enabled programs.

(Milestone: Launch new peer-mentoring or peer-exchange activities in up to 6 different regions; Date: Q4 FY10)

Project 5.3: ESTABLISH A COMMUNITY OF PRACTICE AMONG WEATHERIZATION TRAINING PROVIDERS. Create a Community of Practice (CoP) that brings together weatherization trainers (representing training centers, training programs, and other relevant entities) to share what they know and learn from one another through online communities, focused conferences, and other means of networking and sharing information. The CoP will help to develop participants' weatherization training expertise and persist as long as there is an expressed interest in improving the practice.

(Milestone: Establish Weatherization Training Provider Community of Practice; Date: Q2 FY10)

Task 5 Expected Outcomes:

- Expanded network of expert trainers
- More “informal trainers” who teach through peer mentoring
- Better opportunities for trainers to learn from each other, share best practices and lessons learned

Task 6: Develop national requirements for weatherization certification and accreditation standards.

Project 6.1: DEVELOP AND IMPLEMENT A NATIONAL WEATHERIZATION WORKER CERTIFICATION FRAMEWORK.

- **Project 5.1.1:** Inventory and analyze all current weatherization-related worker certifications, including state-developed certifications, third-party certifications, and others. The analysis should identify any state-specific needs related to the implementation of worker certification programs and comparison of standards within each state.

(Milestone: Publish a status document showing how each WAP Grantee addresses worker certification; based on analysis, the document will include recommendations for certification best practices; Date: Q2 FY10)

- **Project 6.1.2:** With WAP network representatives and participants from the DOE working group established in Project 1.2, bring together technology experts and stakeholders to form a certification sub-group to do the following:
 - Review top-of-class standards to identify standards that are consistent across the WAP and other related retrofit programs.
 - Develop a national weatherization worker certification framework that includes –
 - Types of weatherization worker certifications that should comprise a national certification framework, possibly focusing initially on auditors, inspectors, and crew chiefs; and
 - National performance-based minimum standards, to which Grantees will build their certifications. These standards will be tied to the national benchmark training materials developed in Task 2 of this plan. (Note: Grantees may choose to raise the standards beyond the minimum established by DOE.)
 - Determine the feasibility of a secured national database of certified workers.

(Milestone: Distribute draft national certification framework for peer review; Date: Q4 FY10)

- Recommend to DOE – (1) a process similar to the existing WAP audit approval process by which DOE determines whether existing certifications meet determined national baseline criteria, and (2) protocols for ongoing review of the certification process as well as procedures for certification approval renewal and audit and evaluation of the national certification framework.

(Milestone: Issue working group report on national weatherization worker certification; Date: Q4 FY10)

- **Project 6.1.3:** Issue program notice announcing new national certification criteria and framework; the notice will:
 - Describe the vision and purpose;

- Require Grantees with existing certification programs to submit their certification protocols and applicable standards for DOE approval; approval package would also include the available training to achieve certification;
- Require Grantees that do not have existing certifications to develop a certification process based on the DOE baseline certification criteria, and submit for DOE approval a certification process document that describes the Grantee's new certification effort, including how it will manage and enforce the program;
- Describe plans for a phased approach for the implementation of the national certification framework.

(Milestone: Issue program notice on worker certification; Date: Q1 FY11)

- **Project 6.1.4:** Provide technical assistance to Grantees to support worker certification program development and implementation.

(Milestone: Establish technical assistance team; Date: Q4 FY10)

- **Project 6.1.5:** Develop a matrix that describes the national certification baseline and state certifications (state-developed or third-party certification that a particular state uses); the matrix will provide the information needed for a national certification database that allows users to:
 - Compare state certifications to the national baseline;
 - Compare state certifications against each other; and
 - Identify any additional requirements for certification on a state-by-state basis (based on comparisons to the national baseline and comparisons between states), and link those requirements to specific training.

(Milestone: Publish national certification program database on (or linked to) WAPTAC; Date: Q2 FY11)

Project 6.2: DEVELOP A NATIONAL WEATHERIZATION TRAINING ACCREDITATION AND TRAINER CERTIFICATION PROGRAM.

- **Project 6.2.1:** Identify models and best practices for training program accreditation and trainer certification. Analyze pros and cons of different accreditation and certification processes. Identify potential industry and/or association partners as appropriate.

(Milestone: Complete training program accreditation and trainer certification analysis and best practices document; Date: Q2 FY10)

- **Project 6.2.2:** Through a collaborative process involving DOE WAP experts and others, as appropriate, develop criteria for (1) training program accreditation (that includes audits to assure quality) and (2) trainer certification and distribute for peer review by related Federal agencies (including the Recovery through Retrofit task force), industry professionals, and state programs.

(Milestone: Distribute criteria for peer review; Date: Q4 FY10)

- **Project 6.2.3:** Using the analysis completed in Project 5.2.1, establish a process by which weatherization training programs are accredited (and subject to quality control/assurance audits) and weatherization trainers are certified.

(Milestone: Announce new process; Date: Q1 FY11)

Task 6 Expected Outcomes:

- National weatherization worker certification framework and program in which WAP Grantees must meet DOE-developed criteria
- National database that connects specific state certification requirements to training, allowing for worker mobility via career ladders and lattices
- National weatherization training accreditation and trainer certification programs that increase transparency of the training market and provide quality assurance to workers

Task 7: Provide expert services, technical assistance, and training to directly support the WAP network.

Project 7.1: DELIVER PROGRAM OPERATIONS TRAINING AND TECHNICAL ASSISTANCE. Provide training and technical assistance to Grantee program staff to ensure consistent understanding and implementation of program requirements including performance monitoring, reporting and recordkeeping, contract compliance, health and safety, inspection requirements, policies and procedures, installation standards, and resource documents.

- **Project 7.1.1:** Identify the programmatic and regulatory competencies and skills required to implement weatherization assistance programs.

(Milestone: Publish competencies document; Date: Q2 FY10)

- **Project 7.1.2:** Inventory programmatic training materials and other resources and make available, as appropriate; example topics include program management and operations, recruiting and managing contractors, monitoring, reporting, regulations, and client education. Efforts must be coordinated with other efforts to develop materials inventories as noted in this plan.

(Milestone: Publish initial training materials inventory on WAPTAC site; Date: Q2 FY10)

- **Project 7.1.3:** Develop comprehensive manual and best practices guide for training employees in the primary tasks required for managing weatherization programs.

(Milestone: Publish manual/best practices guide; Date: Q4 FY10)

- **Project 7.1.4:** Provide technical assistance and support to the weatherization network at multiple levels with the integration of Recovery Act requirements including Davis-Bacon provisions, national historic building provisions, monitoring/oversight requirements, etc.

Project 7.2: DELIVER FISCAL/PROCUREMENT TRAINING AND TECHNICAL ASSISTANCE. Provide the information necessary to help WAP Grantees implement their Recovery Act programs using appropriate and/or required financial management and procurement practices

- **Project 7.2.1:** Identify and make available current procurement best practices via DOE, WAPTAC and other relevant websites. Efforts must be coordinated with other efforts to develop materials inventories as noted in this plan.

(Milestone: Publish initial training materials inventory on WAPTAC site; Date: Q2 FY10)

- **Project 7.2.2:** Create a procurement tool kit to clearly explain Federal procurement requirements and provide best practices for selecting procurement methods, developing solicitations, and managing activities to meet program purchasing needs while complying with Federal regulations.

(Milestone: Announce availability of procurement toolkit; Date: Q3 FY09)

Project 7.3: PROVIDE TARGETED TECHNICAL ASSISTANCE AND TRAINING.

Support the weatherization network by providing targeted technical assistance as needed and through recurring training opportunities at various forums to ensure accurate dissemination of technical information and continual skill development.

- **Project 7.3.1:** Provide and/or support training on a host of topics, including but not limited to health and safety, technical topics, technical training for non-technical staff, monitoring practices for field workers, and integration of baseload measures, at various recurring forums, as appropriate.
- **Project 7.3.2:** Create a T&TA team to assess needs. Provide specialized training and technical assistance targeted to specific regions/states/locales to ensure integration of best practices and support of hiring and training needs. The T&TA team will prioritize target areas and work with Grantees to develop comprehensive T&TA plans that meet their needs. Can include technical assistance related to training center development and operation. Efforts will require strong coordination between the T&TA team, DOE staff, Grantees, and entities involved in Task 3.

(Milestone: Complete initial outreach and work with new Grantees (e.g., territories) to establish weatherization programs; Date: Q4 FY09)

(Milestone: Establish technical assistance team; Date: Q2 FY10)

(Milestone: Complete T&TA needs assessment that includes prioritized target areas; Date: Q2 FY10)

Project 7.4: PROVIDE TARGETED LEVERAGING ASSISTANCE AND TRAINING.

Support the weatherization network by providing targeted technical assistance to the Grantee and subgrantee network through developing fee-for-service mechanisms and other leveraging-focused assistance for the purpose of maintaining current funding/production levels for Weatherization Programs.

- **Project 7.4.1:** Provide and/or support training and expert technical assistance to assist agencies in developing the framework necessary to continue providing services. This may include, but is not limited to instruction for developing “fee for service” mechanisms in non-profit agencies, assisting in leveraging activities to secure future investments by non-federal sources, researching synergies between the Weatherization Program and other investment mechanisms, or any other leveraging activity that can sustain the ARRA investment in workers and help sustain the current ARRA level of production.

Task 7 Expected Outcomes:

- WAP programmatic and fiscal/procurement training materials inventory and best practices documents
- Procurement tool kit that clearly explains requirements and best practices
- Expert technical assistance team to assess needs and provide specialized training that can prevent problems before they occur
- Develop mechanisms and leverage resources that will allow the agencies to sustain current funding levels in post-ARRA environment

Task 8: Support WAP Grantee-directed pilots that advance the use of state-of-the-art technologies and protocols.

Project 8.1: ISSUE OPEN CALL FOR PROJECTS. Support pilots that evaluate new technologies and protocols with the potential to be highly cost-effective.

(Milestone: Announce new projects; Date: Q4 FY10)

Project 8.2: EVALUATE AND INCORPORATE PROJECT RESULTS INTO WAP TRAINING AND ACTIVITIES. Manage the WAP System for Reviewing Techniques and Technologies (SIRTT, www.wapsirtt.org) to evaluate project results (achieved through 7.1). Promote results to ensure information is broadly available to the weatherization community and incorporated in curricula, best practices, and other resources, including technology-enabled content delivery tools.

(Milestone: Integrate SIRTT with WAPTAC for broad reach to WAP network; Date: Q2 FY10)

Task 8 Expected Outcomes:

- Evaluation and confirmation of cost-effective weatherization technologies and protocols
- Web site that documents and broadly shares cost-effective technologies and protocols
- Mechanism for helping to ensure WAP procedures remain based on sound and state-of-the-art building science

Task 9: Conduct comprehensive WAP impact and process evaluations.

Conduct national, statistically-valid impact evaluations to assess the energy savings of weatherized households of different types in different regions and the relationship between program procedures, structure, and effectiveness.

Project 9.1: COMPLETE RETROSPECTIVE EVALUATION. Complete study by analyzing utility billing data and program information from 2006-2008.

(Milestone: Publish initial WAP 2006-2008 evaluation report; Date: Q3 FY10, with additional reports periodically through 2012)

Project 9.2: COMPLETE RECOVERY ACT EVALUATION. Design and implement an impact and process evaluation of the WAP for the Recovery Act period including randomized assignment design; include studies of alternative delivery mechanisms, alternative delivery networks, and alternative training systems.

(Milestone: Publish WAP Recovery Act evaluation report; Date: Q3 FY11, with additional reports through 2013)

Task 9 Expected Outcome: National, statistically-valid impact evaluations – (1) for 2006-2008, and (2) for the Recovery Act period – that describe the energy savings of weatherized households of different types in different regions as well as the relationship between program procedures, structure, and effectiveness

Task 10: Develop and deploy an advanced online energy audit tool.

A new online advanced energy audit tool, currently under development at Lawrence Berkeley National Laboratory using non-WAP funds, will be supported by a national database of retrofit measures with their related costs and projected energy savings, and updates to the audit tool will be universal. The new online audit tool will be highly user-friendly and will facilitate rapid reporting of energy audit results.

Project 10.1: PROVIDE ONGOING GRANTEE SUPPORT OF AUDIT PROTOCOLS.

Support Grantees in establishing, reviewing, and renewing energy audit protocols to ensure the most cost-effective measures are installed and the procedures in place concur with the state-established standards for installation.

Project 10.2: MAINTAIN FIELD VERSIONS OF NEAT AND MHEA. Continue to support the energy auditing tools currently made available to all Grantees (National Energy Audit Tool and Manufactured Home Energy Audit tool).

Project 10.3: DEVELOP A NEW, ONLINE AUDITING TOOL.

- **Project 10.3.1:** Develop a plan to assist users with the transition to the new online audit tool. Establish a “WAP users group” to ensure WAP network needs are met with the integration to an online tool.

(Milestone: Complete assistance plan; Date: Q1 FY10)

- **Project 10.3.2:** Conduct multiple pilot testing phases with WAP auditors and use their feedback to improve the audit tool usability and functionality. (Note: Using non-WAP funds, DOE will also improve the audit tool based on pilot testing with home inspectors.)

(Milestone: Conduct standard audit review outlined in Weatherization Program Notice 01-4 to ensure new tool meets current WAP requirements; Date: Q1 FY10)

(Milestone: Initiate first phase of pilot testing with a small pool of users; Date: Q1 FY10)

(Milestone: Initiate second phase of pilot testing with a larger pool of users; Date: Q1 FY10)

- **Project 10.3.3:** Incorporate health and safety inputs (such as fire detectors and CO detectors) into the online audit tool.

(Milestone: Incorporate health and safety inputs into online audit tool; Date: Q1 FY10)

- **Project 10.3.4:** Announce launch of new, online auditing tool and provide technical assistance to WAP network to support its use.

(Milestone: Host initial webinar series on new, online audit tool use; Date: Q2 FY10)

- **Project 10.3.5:** Expand the functionality of the online audit tool to perform audits for small multifamily units and large multifamily units.

(Milestone: Complete development of small multifamily and large multifamily audit functionality; Date: Q4 FY10)

Task 10 Expected Outcomes:

- An advanced, user-friendly, online auditing tool that supports a national database of retrofit measures with related costs and projected energy savings
- Increased availability and accessibility of WAP data and energy audit results

Task 11: Develop and implement a National Online Weatherization Management Information System.

The National Online Weatherization Management Information System will be a web-based program management system built using the existing PAGE system as a core component, to capture information from all WAP Grantees to increase the efficiency and ease of reporting from local agencies to Grantees and to DOE. The system will cover most WAP work areas, from Grantee and financial auditors to program and inventory managers, and from technical inspectors to field staff.

Project 11.1: DEFINE SCOPE OF NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM. Draft a scoping document to address the system architecture, design, and policies, as well as integration into DOE, Grantee, and

subgrantee operations. The document, to be developed with significant input from WAP Grantees, will address integration of existing DOE and Grantee tools and resources. It will also define user groups, user tasks, user policies, messaging standards, reporting standards, and other relevant standards, specifications, and policies.

(Milestone: Complete scoping document that also defines user groups, tasks, and standards;
Date: Q2 FY10)

Project 11.2: DEVELOP NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM. Build the components needed to address the requirements for the National Online Weatherization Information System users and tasks, as defined in Project 10.1. For example, this may include building support tools and functionality to allow for the integration of third-party tools, plug-ins, and modifications. And, based on the outcomes of Project 10.1, this may include creation of a component to support information management between Grantees and sub-grantees. Perform quality assurance and stress testing, and work with Grantees, and potentially, subgrantees to pilot the system.

(Milestone: Complete first version of project management and user management system; Date: Q3 FY10)

Project 11.3: DEPLOY NATIONAL ONLINE WEATHERIZATION MANAGEMENT INFORMATION SYSTEM. In stages, roll out the portal to all Grantees. Provide training and technical assistance to Grantees for the adoption and use of the management portal.

(Milestone: Establish training and technical assistance mechanism; Date: Q3 FY10)

(Milestone: Issue program notice with new guidance on the system and reporting requirements, and begin system roll out to Grantees; Date: Q3 FY10)

Task 11 Expected Outcomes:

- A web-based program management system that covers most WAP work areas, from Grantee and financial auditors to program and inventory managers, and from technical inspectors to field staff
- Increased efficiency and ease of reporting across the WAP network

Task 12: Provide for other services required during WAP Recovery Act implementation.

Project 12.1: SUPPORT DATA ACCEPTANCE, ANALYSIS, AND RECONCILIATION. Verify, update, and reconcile the data received from field to ensure the data integrity.

Project 12.2: ENSURE QUICK RESPONSE RESEARCH/ANALYSIS ON “HOT TOPICS.” Provide immediate response to questions that may include development of white papers and convening working groups, as needed, to discuss topics and provide DOE critical information.

Project 12.3: FACILITATE PROGRAM IMPLEMENTATION AND FUNCTION. Plan and facilitate conference calls, small working groups, and committees, specifically supporting ad hoc and staffing special quick response projects that include collaboration among DOE headquarters and field personnel, outside agencies, state/local stakeholders, associations, etc.

Task 12 Expected Outcomes:

- Well-coordinated, seamless program operation
- Rapid response capability

Appendix 1: Training Methodologies (in alphabetical order)

| Types | Advantages | Disadvantages | Student-Teacher Ratio |
|---|---|--|---|
| <p>Conferences: Typically held in large meeting spaces. Primary training delivered lecture-style but can include some demonstration and/or hands-on training, as well as “crew competitions.”^{1, 2}</p> | <ul style="list-style-type: none"> Classrooms can accommodate large numbers of trainees; Cost per trainee can be low; Opportunity for trainees to meet with experts and exchange with peers; Can offer many different training topics simultaneously; Participants are exposed to new ideas; and Controlled environment minimizes disruptions and distractions. | <ul style="list-style-type: none"> A less effective way to teach mechanical and hands-on skills; Challenge to engage all participants, particularly those used to field work; Time constraints limit depth and detail of training; and May only serve to expose trainees to a topic rather than provide competency levels or test-out opportunities. | <p>Class size should be kept below 20 trainees per trainer.</p> |
| <p>Field Training: Typically conducted on an eligible home to demonstrate skills or follow protocols in a real world environment.</p> <p>Trainers must choose a house that represents the typical housing stock on which trainees will work. Homes that provide good training opportunities have a gas or propane furnace to allow for combustion appliance safety testing; homes with forced-air heating systems allow training on duct leakage testing and duct sealing.³</p> | <ul style="list-style-type: none"> Training takes place on WAP-eligible home, using actual equipment and techniques; Some production is accomplished as a result of training; Trainees usually travel short distances from surrounding communities; Hands-on experience is most effective for learning and retaining skills; Trainees can practice client education with real clients; and Can be combined with local or regional classroom training. | <ul style="list-style-type: none"> If local agency equipment is used, training may be compromised by inadequate or poorly-maintained equipment; Significant planning is required to select and prepare a good training house; May try to demonstrate too much; Trainers may become crew members to complete work in time; Class size is very limited; and Unforeseen problems (e.g., structural, human, weather) may disrupt training. | <ul style="list-style-type: none"> Activities outside the home: 8 to 1 Activities inside the home: 5 to 1, depending on activity and house layout |

¹ In crew competitions, participants demonstrate their competency in a specific skill. Standardized tests include props. Judges score participants on predetermined assessments of important skills or knowledge.

² Typical training topics include introduction to energy conservation principles; fundamentals of air exchange, air barriers, air sealing, and ventilation; basic auditor training and/or audit protocol introduction; overviews of energy-saving measures for building components or service delivery; health and safety overview including carbon monoxide and lead based paint policies; client education methods and examples; and administrative topics for overall program management.

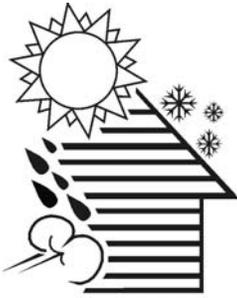
³ Topics well-suited to field training include sidewall insulation; air sealing; attic insulation; blower door and pressure diagnostics; duct testing, repair, and sealing; mobile home weatherization techniques; carbon monoxide testing; combustion appliance safety testing; and mechanical ventilation.

| Types | Advantages | Disadvantages | Student-Teacher Ratio |
|--|---|---|---|
| <p>Hiring Outside Trainers: States without full-time training staff may hire outside trainers to provide skills enhancement. Considerations include –</p> <ul style="list-style-type: none"> • Trainers must possess adequate skills (e.g., Can they conduct a training needs analysis? Can they effectively present and relate to adult learners?); • Trainers must be familiar with state policies to ensure consistency of message; and • Hiring agency and trainer must agree to the agenda, course outline, facility expectations, access to materials after the training (including for new employees), and trainee follow up. | <ul style="list-style-type: none"> • Curricula are already developed; • Outside trainers can bring new ideas, concepts, and techniques that can benefit the program; and • Can enhance local staff acceptance of new procedures. | <ul style="list-style-type: none"> • Can be costly; • Can be a one-time effort with no follow-up or support; and • Consultants can create confusion by conducting training that conflicts with current standards or approaches. | <ul style="list-style-type: none"> • Classroom: 20 to 1 • Hands-on training (props): 6 to 1 • Activities outside the home: 8 to 1 • Activities inside the home: 5 to 1 depending on activity and house layout |
| <p>Mobile Training Unit: Trainers use props, equipment, tools, and materials. Can be combined with field training at a home being weatherized. Like field training, a mobile training unit can support classroom training if adequate meeting space is available nearby.</p> | <ul style="list-style-type: none"> • Trainers arrive with adequately-sized, properly-maintained equipment; • Trainers can have new or unusual materials in stock; • Training can take place on actual WAP-eligible homes, using actual equipment and techniques; • Some production can be accomplished as a result of training; • Trainees usually travel short distances; • Hands-on experience is effective for learning and retaining skills; • Trainees can practice client education with real clients; and • Can be combined with local or regional classroom training. | <ul style="list-style-type: none"> • Constant travel can lead to trainer burnout; • Requires planning to select and prepare a training house; • Class size very limited; • Cost of vehicles and equipment can be significant; • Temptation to completely weatherize house during training; • Trainers may supplant crew members to finish work on time; • Mobile training unit must be cleaned, reorganized, and restocked after every training; • May still require a home and a meeting room; and • Unforeseen problems (e.g., structural, human, weather) may disrupt training. | <ul style="list-style-type: none"> • Activities outside the home: 8 to 1 • Activities inside the home: 5 to 1 depending on activity and house layout • Classroom: 20 to 1 |

| Types | Advantages | Disadvantages | Student-Teacher Ratio |
|---|--|--|--|
| <p>Mobile Training Unit (Single Purpose): A self-sufficient unit that concentrates on a single topic or skill.</p> | <ul style="list-style-type: none"> Trainers arrive with properly-maintained equipment; Trainer is familiar with equipment so there are fewer surprises and disruptions; Trainees usually travel shorter distances since training comes to them; Offers hands-on learning opportunities without an actual house; and Can be combined with local or regional classroom training. | <ul style="list-style-type: none"> Constant travel can lead to trainer burnout; Cost of vehicle and equipment can be significant; Does not require the identification and preparation of a training house; Variety of training opportunities is limited; and May still require a meeting room. | <ul style="list-style-type: none"> Heating labs: 6 to 1 Classroom: 20 to 1 |
| <p>Online Training and Distance Learning: Similar to lecture-style classroom training but available via the web or at video conferencing facilities. Distance learning classes can be hour-long overviews of a single topic or months-long to cover topics in depth.</p> | <ul style="list-style-type: none"> Aside from bandwidth, there is no limitation on class size; No travel required; most communities have access to a video conferencing facility; Content and instruction can be consistent across country; Trainees may be able to repeat content until mastered; and Can be used as an introduction to allow hands-on training to start at a higher level. | <ul style="list-style-type: none"> No hands-on component; and Online training often requires a broadband connection. | <p>Classroom size limited only by bandwidth.</p> |
| <p>Peer Training: Expert staff from within the agency or from another local agency typically provide peer training. Field training is the typical delivery mechanism. In some cases, the peer trainer comes to the local agency to work on its housing stock; in others, the local agency crew will travel to the peer trainer's location to see how an experienced crew implements a particular measure or technique.⁴</p> | <ul style="list-style-type: none"> Trainees may be more comfortable with their peers and accept training more readily; Training takes place on actual WAP-eligible homes, using actual equipment and techniques; Some production is accomplished as a result of training; Usually does not require trainees to travel; and Hands-on experience is most effective for learning and retaining skills. | <ul style="list-style-type: none"> Frequent travel by trainers can lead to burnout; If local agency equipment is used, training can be compromised by inadequate or poorly maintained equipment; Class size very limited; and Unforeseen problems (e.g., structural, human, weather) may disrupt training. | <ul style="list-style-type: none"> Activities outside the home: 8 to 1 Activities inside the home: 5 to 1 depending on activity and house layout |

| Types | Advantages | Disadvantages | Student-Teacher Ratio |
|---|---|--|---|
| <p>Technical Fairs: Focus on hands-on activities rather than classroom, lecture-style sessions. Trainees learn specific skills using materials, tools, and equipment common in field applications. Some rely solely on demonstrations; others feature “crew competitions” as an added component.¹</p> | <ul style="list-style-type: none"> • Great opportunity for peer exchange; • Hands-on activities reinforce classroom learning; • Competition creates interest in improving techniques and skills; and • Feedback between judges and competitors is high-value training. | <ul style="list-style-type: none"> • Logistics of building large numbers of props can be a challenge; • Cost of building props can be significant; • Judging each event requires knowledgeable staff, clear criteria, and time; and • Inconsistent acceptance of results can be a disincentive for some crewmembers. | <p>Ideally set at 10 – 15 to 1</p> |
| <p>Training Centers: Typically have classroom/laboratory space that allows for the long-term set-up of training aids and props. Also can include labs for shell and mechanical retrofits, computer application, and health and safety protocols, which allow for a mix of lecture-style workshops and hands-on training in a controlled environment.⁴</p> | <ul style="list-style-type: none"> • Allows for standardized learning environment; • Standardization makes a certification program easier to implement; • Hands-on training is more effective for retaining skills; • Can increase trainee-to-trainer ratio over field training; • Can be cost-effective when a large number of participants need ongoing training; and • Required attendance is easier to enforce. | <ul style="list-style-type: none"> • Cost to establish and maintain can be significant; and • Single location may not be convenient for all trainees and may require travel within the state or region. | <ul style="list-style-type: none"> • Heating labs: 6 to 1 • Computer labs: 15 to 1 • Classroom: 20 to 1 • Hands-on training (props): 6 to 1 |

⁴ Training topics well-suited to training center curricula include installation skills training in insulation techniques, air sealing, and duct sealing and insulation; heating system inspection, installation, and repair; combustion appliance safety testing; computerized energy audit; blower door set-up and use; pressure pan, manometer, infrared camera, and other diagnostic equipment; base-load metering; lead-safe weatherization work practices; electrical safety; and equipment maintenance and safety.



*Weatherization
Works*

CORE COMPETENCIES FOR THE WEATHERIZATION ASSISTANCE PROGRAM

**DEVELOPED
BY:**

THE WEATHERIZATION TRAINERS CONSORTIUM

FOR:

**U.S. DEPARTMENT OF ENERGY
WEATHERIZATION ASSISTANCE PROGRAM**

**CREATED: MARCH 26, 2007
UPDATED: DECEMBER 2, 2009**

OVERVIEW

The Weatherization Trainers Consortium developed this document for the U.S. Department of Energy's (DOE's) Weatherization Assistance Program for Low-Income Persons. The Weatherization Trainers Consortium represents weatherization training centers, independent trainers, state program managers, and state monitors from across the country.

The Weatherization *Plus* Committee is a group the weatherization stakeholders charged with helping DOE to strategically plan the evolution of the Weatherization Assistance Program. A Weatherization Plus subcommittee organized a conference call among a group of weatherization trainers to obtain their input on a Weatherization *Plus* initiative to ensure the consistent delivery of high-quality weatherization services nationwide. The trainers saw the benefit of regular communication to network and share training resources. An initial face-to-face meeting of weatherization trainers was organized at the 2005 National Weatherization Technical Training Conference in Atlanta, Georgia, and monthly conference calls have been conducted ever since.

From these conversations, the Weatherization Trainers Consortium was formalized and the need identified for a set of core competencies for the various staff positions that implement the Weatherization Program. The Consortium believes this working document can:

- Increase awareness of the specialized skills and knowledge that are required to run an effective weatherization program;
- Help state and local weatherization agencies hire staff with a strong potential to perform well and prosper in the program;
- Serve as a foundation in establishing standardized curricula to ensure the consistent delivery of high-quality weatherization services nationwide; and
- Put upward pressure on salaries to reduce staff turnover.

As a working document, suggestions for improvement are continually sought. Please forward suggestions to:

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CORE COMPETENCIES FOR THE WEATHERIZATION ASSISTANCE PROGRAM

INTRODUCTION

Specialized knowledge and skills are required at the local, state, and federal level to run an effective Weatherization Program. While there is a general understanding of the competencies required, these have not been articulated on a national scale.

As part of the Weatherization *Plus* effort to plan the continued evolution of the Weatherization Program, a subcommittee was formed to increase the consistency of quality weatherization services delivered to low-income homes across the country. The goal is that every house that is weatherized receives all appropriate, cost-effective measures installed properly to provide long-term savings.

As a first step, this means recognizing the varying approaches states use to train staff.

- Some states require technical staff at local agencies to obtain certification from an organization such as the Building Performance Institute, while other states have developed their own certification criteria.
- Many states do not have formal certification requirements, but instead require local weatherization staff to attend standardized training courses offered on a regular basis.
- Others have no standardized certification or training requirements, but offer training periodically as the need is perceived and funds allow.

Technical weatherization training for auditors, technicians, and monitors is available from many training centers and independent trainers across the country. Only a few states have developed administrative training for weatherization program managers at the local level. In-depth administrative training for state weatherization staff is even harder to find outside National Association for State Community Services Programs (NASCSPP) conference “newcomer” sessions.

The Weatherization *Plus* subcommittee and the Weatherization Trainers Consortium believe that publishing a set of core competencies will increase awareness and raise expectations. Not all the competencies will be appropriate for every state. Workers repairing or replacing heating and cooling systems often require certification or licensing from the state. Therefore, this work may be subcontracted to licensed contractors outside the Weatherization Program. However, just because a heating, ventilation, and air conditioning (HVAC) contractor is licensed by the state does not mean they possess the HVAC competencies required by the Weatherization Program. Someone at the local agency must be competent to specify what work the contractor is to do and to verify that the completed work complies with state and local codes as well as the technical standards of the Weatherization Program.

The competencies that a weatherization worker should possess depend on their position. For example, an auditor needs to conduct diagnostic testing that may not be required of an installer. The point of entry also dictates which core competencies are required. An

entry-level installer requires a minimum set of competencies. This installer must acquire additional skills to become a crew chief, and still more to become an auditor. A new auditor hired off the street must already possess auditor-level competencies as a condition of hire. These increasing levels of competency also provide a career or development path for agency and contractor personnel.

The following core competencies were compiled from course offerings of several weatherization training centers and from the technical program standards of a handful of states. Core competencies for the following topical areas are listed:

- Basic competencies,
- Safe work practices,
- Building evaluation,
- Measure installation,
- Final inspection,
- Consumer education,
- Monitoring,
- Program management, and
- Training.

Definitions

- **Competency** means the possession of a minimum level of knowledge and proficiency required to collect appropriate information, make informed decisions, and physically take the needed actions to deliver the high-quality weatherization service in question.
- **Possess a working knowledge of** means to:
 - ◆ Know how a particular topic impacts the weatherization process;
 - ◆ Have the relevant information committed to memory or be able to locate it in readily available sources; and
 - ◆ Use the knowledge to make informed decisions and guide weatherization work.
- **Demonstrate the ability to** means to:
 - ◆ Physically conduct a test, procedure, or technique on an actual house, a prop, or in a training lab in the presence of someone qualified to assess the particular competency.

BASIC COMPETENCIES

All weatherization workers must possess the following Basic Competencies:

- Ability to read and write legibly;
- Basic verbal and written communication skills;
- Basic construction knowledge;
- Basic math skills (see appendix for a test to verify basic math skills); and
- Basic computer skills (see appendix for a test to verify basic computer skills).

Depending on the position of the weatherization worker, the following Core Competencies help ensure the delivery of effective weatherization services.

SAFE WORK PRACTICES

All field workers must exhibit safe work practices by possess the following competencies.

- Possess a working knowledge of:
 - ♦ U.S. Department of Energy (DOE) program regulations/policy and Environmental Protection Agency (EPA) guidelines for asbestos, lead, mold, and other health hazards;
 - ♦ Material Safety Data Sheets; and
 - ♦ Occupational Safety and Health Act (OSHA) standards:
 - Ladder safety;
 - Fall protection;
 - Personal protective equipment;
 - Respiratory protection;
 - Motor vehicles;
 - Power-operated hand tools;
 - Fire prevention;
 - Permit-required confined spaces;
 - Other worker-related OSHA standards.
- Demonstrate the ability to:
 - ♦ Select, fit, and use the appropriate Personal Protection Equipment for a particular task;
 - ♦ Safely use basic hand and power tools;
 - ♦ Use a basic first aid kit to treat common job-site injuries;
 - ♦ Work lead safe;
 - ♦ Identify serious mold conditions; and
 - ♦ Assess work area safety hazards.

INSTALLER

The following competencies are required by workers that install weatherization measures.

- ***Prerequisites***
 - ♦ Possess *Safe Work Practices* competencies
- ***Air Sealing***
 - ♦ Possess a working knowledge of:
 - Proper materials selection based on location of leakage areas
 - Minimum ventilation rates.
 - ♦ Demonstrate the ability to:
 - Use the blower door to locate leakage sites within the building
 - Seal attic and floor bypasses at penetrations for plumbing, electrical wiring, flue vents, ducts; dropped soffits, and balloon-framed walls;
 - Seal typical bypasses in kneewalls and finished attic spaces;
 - Seal basement band joists;
 - Properly apply caulk and spray foam insulation;

- Identify, select, and install weatherstripping on doors, windows, and attic hatches;
- Cut glass, replace broken window panes, and apply glazing compound;
- Repair plaster and sheetrock (drywall); and
- Modify or install mechanical ventilation to ensure acceptable indoor air quality for post-air-sealing conditions.
- **Duct Sealing**
 - ◆ Demonstrate the ability to:
 - Properly seal duct connections with mastic and fiberglass mesh tape or other approved material; and
 - Repair or modify duct systems as specified in a work order.
- **Insulation**
 - ◆ Possess a working knowledge of:
 - Properties and appropriate application of different insulation materials; and
 - Potential hazards of insulating around knob-and-tube wiring.
 - ◆ Demonstrate the ability to:
 - Install blown and batt attic insulation;
 - Access closed wall cavities and properly install dense-packed wall insulation including removing and replacing siding;
 - Install blown insulation and batt insulation in a floor;
 - Install water heater insulation blankets;
 - Install insulation on ducts, hydronic distribution pipes, and domestic hot water pipes; and
 - Safely operate and properly maintain insulation blowing machines and generators.
- **Base-Load Measures**
 - ◆ Demonstrate the ability to:
 - Replace incandescent light bulbs with compact fluorescent lamps while maintaining or improving lighting levels; and
 - Install low-flow showerheads and faucet aerators;
 - Assess the existing condition of plumbing pipes and faucets that may prohibit these measures.

CREW CHIEF

Personnel that supervise field workers such as *Installers* must possess the following competencies.

- **Prerequisites**
 - ◆ Possess *Safe Work Practices* and *Installer* competencies.
 - ◆ Possess a working knowledge of building science principles.
- **Project Management**
 - ◆ Demonstrate the ability to:
 - Manage a crew of *Installers* so weatherization work is conducted safely, effectively, and efficiently;
 - Ensure that the job site and *Installers* comply with the *Safe Work Practices* described previously;

- Maintain quality control of weatherization work and ensure it meets program standards;
- Understand a work order;
- Order and obtain materials, supplies, and equipment in time to avoid delays and wasted time on the job site; and
- Warehouse materials as necessary to avoid delays in completing weatherization work.
- ***Inspection and Measurement***
 - ♦ Possess a working knowledge of:
 - Air and heat flow in buildings;
 - Factors that affect building heat loss;
 - Construction features and critical junction points of common housing types;
 - Insulation R-values;
 - Different insulation materials and installation techniques;
 - Various air-sealing techniques and appropriate materials;
 - Causes of and remedies for existing and potential moisture problems;
 - Causes of and remedies for other existing and potential indoor air quality problems;
 - Residential mechanical ventilation systems;
 - Minimum ventilation rates/building tightness limits based on the appropriate ASHRAE 62 standard; and
 - Electric base-load usage.
 - ♦ Demonstrate the ability to:
 - Measure the dimensions of floors, walls, ceilings, windows, and doors, and compute surface areas;
 - Compute the volume of conditioned space of a building;
 - Define the thermal envelope of a building; and
 - Assess the effectiveness of existing insulation and the effective R-values.
- ***Diagnostic Testing***
 - ♦ Blower door
 - Possess a working knowledge of:
 - Principles of air movement and how they relate to building heat loss;
 - Typical air leakage problems in common housing types; and
 - Minimum ventilation rates.
 - Demonstrate the ability to:
 - Set up a blower door;
 - Prepare a building for a blower door test; and
 - Take blower door reading and interpret results.
 - ♦ Zone pressure diagnostics
 - Possess a working knowledge of:
 - The air barrier of a building and the importance of aligning it with the thermal barrier; and
 - Primary and intermediate zones of a house.
 - Demonstrate the ability to:
 - Conduct zone pressure diagnostics and interpret results; and
 - Determine the location and effectiveness of the air barrier of a house.

- ◆ Duct testing
 - Possess a working knowledge of:
 - Problems associated with different types of duct leakage.
 - Demonstrate the ability to:
 - Determine dominant duct leakage;
 - Determine the amount of duct leakage or at least the existence of significant duct leakage by conducting pressure pan, duct blaster, or delta Q tests.
 - Measure room pressure imbalances in houses with forced-air systems.
 - Resolve room pressure imbalances.
- **Combustion Appliance Safety**
 - ◆ Possess a working knowledge of:
 - CO action levels;
 - Common code requirements related to:
 - Vent system sizing, materials, clearances, and installation;
 - Safety shut-off devices;
 - Gas line sizing; and
 - Combustion air;
 - Causes of and remedies to common vent system problems.
 - ◆ Demonstrate the ability to:
 - Measure the CO level in ambient air;
 - Measure the CO level of vented and unvented combustion appliances;
 - Measure the CO levels of gas- or propane-fired cook stoves (oven and burners) and remedy high CO levels through basic cleaning and adjustments;
 - Understand the difference between as-measured and air-free CO readings;
 - Detect gas, propane, and fuel oil leaks; and
 - Conduct a worst-case draft test of a combustion appliance zone; and
 - Measure the steady-state efficiency of a vented combustion appliance.
- **Insulation**
 - ◆ In addition to the insulation-related *Installer* competencies, possess a working knowledge of:
 - Local codes relating to attic ventilation.
- **Training**
 - ◆ Possess a working knowledge of:
 - Adult learning concepts; and
 - Benefits of cross training on-site personnel.
 - ◆ Demonstrate the ability to:
 - Provide on-site training to *Installers* in a positive environment to strengthen competency in existing skills and increase the number of skill areas.

AUDITOR

- **Prerequisites**
 - ♦ Possess *Safe Work Practices, Installer, and Crew Chief* competencies.
 - ♦ Possess a working knowledge of building science principles.
- **Inspection and Measurement**
 - ♦ Possess a working knowledge of:
 - Air and heat flow in buildings;
 - Factors that affect building heat loss;
 - Construction features and critical junction points of common housing types;
 - Insulation R-values;
 - Different insulation materials and installation techniques;
 - Various air-sealing techniques and appropriate materials;
 - Causes of and remedies for existing and potential moisture problems;
 - Causes of and remedies for other existing and potential indoor air quality problems;
 - Residential mechanical ventilation systems;
 - Minimum ventilation rates/building tightness limits based on the appropriate ASHRAE 62 standard; and
 - Electric base-load usage.
 - ♦ Demonstrate the ability to:
 - Measure the dimensions of floors, walls, ceilings, windows, and doors, and compute surface areas;
 - Compute the volume of conditioned space of a building;
 - Define the thermal envelope of a building;
 - Assess the effectiveness of existing insulation and the effective R-values; and
 - Analyze utility bills including breaking out base-load usage from heating and cooling usage.
- **Diagnostic Testing**
 - ♦ Blower door
 - Possess a working knowledge of:
 - Principles of air movement and how they relate to building heat loss;
 - Typical air leakage problems in common housing types; and
 - Minimum ventilation rates.
 - Demonstrate the ability to:
 - Set up a blower door;
 - Prepare a building for a blower door test; and
 - Take blower door reading and interpret results.
 - ♦ Zone pressure diagnostics
 - Possess a working knowledge of:
 - The air barrier of a building and the importance of aligning it with the thermal barrier; and
 - Primary and intermediate zones of a house.
 - Demonstrate the ability to:
 - Conduct zone pressure diagnostics and interpret results;
 - Determine the location and effectiveness of the air barrier of a house; and
 - ♦ Duct testing

- Possess a working knowledge of:
 - Problems associated with different types of duct leakage.
- Demonstrate the ability to:
 - Determine dominant duct leakage; and
 - Conduct pressure tests. Potential tests include:
 - , Pressure pan
 - , Duct Blaster
 - , Delta-Q
 - Seal duct leaks with appropriate materials and good workmanship.
 - Measure room pressure imbalances in houses with forced-air systems.
- ◆ Steam and hot water distribution system testing
 - Possess a working knowledge of:
 - The components of typical steam and hot water distribution systems and the characteristics of their proper operation.
 - Demonstrate the ability to:
 - Test air vents, steam traps, thermostatic radiator valves, and hot water zone valves; and
 - Estimate the energy impacts of existing overheating problems.
- ◆ Base-load systems
 - Demonstrate the ability to:
 - Meter electrical devices to determine their annual energy consumption.
- **Combustion Appliance Safety**
 - ◆ Possess a working knowledge of:
 - CO action levels;
 - Common code requirements related to:
 - Vent system sizing, materials, clearances, and installation;
 - Safety shut-off devices;
 - Gas line sizing; and
 - Combustion air;
 - Causes of and remedies to common vent system problems.
 - ◆ Demonstrate the ability to:
 - Measure the CO level in ambient air;
 - Measure the CO level of vented and unvented combustion appliances;
 - Measure the CO levels of gas- or propane-fired cook stoves (oven and burners);
 - Understand the difference between as-measured and air-free CO readings;
 - Detect and natural gas, propane, and fuel oil leaks;
 - Conduct a worst-case draft test of a combustion appliance zone;
 - Measure the CAZ to assure sufficient volume for combustion air;
 - Clock a gas meter to determine the actual input of a gas-fired combustion appliance;
 - Conduct basic temperature-rise and static-pressure-drop tests on forced-air furnaces;
 - Measure the steady-state efficiency of a vented combustion appliance; and
 - Assess the potential inadequacy of supply and return plenum and duct sizes for forced-air systems.

- **Measure Selection**
 - ◆ Possess a working knowledge of:
 - What materials are allowed to be installed based on 10 CFR 440 Appendix A;
 - The regulatory and policy requirements for selecting weatherization measures using DOE-approved energy audit software or priority lists; and
 - The interaction between typical weatherization measures (e.g., the impact of air-sealing and insulation measures on the potential savings of heating efficiency improvements).
 - ◆ Demonstrate the ability to:
 - Use a DOE-approved energy audit to input accurate building data and recommend appropriate, cost-effective weatherization measures;
 - If required, use a DOE-approved priority list to select appropriate, cost-effective weatherization measures;
 - Prioritize air-sealing efforts;
 - Estimate the heating and/or cooling load of a dwelling to ensure proper equipment sizing if the heating or cooling system is to be replaced;
 - Select the proper CFL to replace an incandescent lamp while maintaining or improving lighting levels; and
 - Meter an existing refrigerator or locate its DOE tested usage in a database to estimate annual energy consumption.
- **Work Scope Development**
 - ◆ Demonstrate the ability to:
 - Accurately estimate the type and quantity of materials required to cost-effectively weatherize an eligible dwelling unit; and
 - Prepare clearly written work orders for work crews or contractors.

CONTRACTOR

Contractors hired by local weatherization agencies to perform weatherization work must possess the following competencies. See *HVAC Installer/Contractor* for the competencies required of these specialty contractors.

- **Prerequisites**
 - ◆ Possess *Safe Work Practices, Installer, and Crew Chief* competencies.
 - ◆ Possess a working knowledge of building science principles.
- **Business Management**
 - ◆ Demonstrate the ability to:
 - Maintain the licenses required by the state and local jurisdiction for the type of work the *Contractor* is hired to perform;
 - Possess adequate insurance;
 - Employ U.S. citizens or properly documented aliens; and
 - Bid, negotiate, and sign contracts, as necessary.

- **Project Management**
 - ◆ Demonstrate the ability to:
 - Manage a crew of *Contractor*-employed *Installers* so weatherization work is conducted safely, effectively, and efficiently;
 - Ensure that the job site and *Contractor*-employed *Installers* comply with the *Safe Work Practices* described previously;
 - Understand a work order;
 - Maintain quality control of weatherization work and ensure it meets program standards;
 - Order and obtain materials, supplies, and equipment in time to avoid delays and wasted time on the job site; and
 - Warehouse materials as necessary to avoid delays in completing weatherization work.

Depending on the type of work the *Contractor* is hired to perform, the following inspection, diagnostic testing, combustion appliance safety, and/or insulation competencies may be required.

- **Inspection and Measurement**
 - ◆ Possess a working knowledge of:
 - Air and heat flow in buildings;
 - Factors that affect building heat loss;
 - Construction features and critical junction points of common housing types;
 - Insulation R-values;
 - Different insulation materials and installation techniques;
 - Various air-sealing techniques and appropriate materials;
 - Causes of and remedies for existing and potential moisture problems;
 - Causes of and remedies for other existing and potential indoor air quality problems;
 - Residential mechanical ventilation systems;
 - Minimum ventilation rates/building tightness limits based on the appropriate ASHRAE 62 standard; and
 - Electric base-load usage.
 - ◆ Demonstrate the ability to:
 - Measure the dimensions of floors, walls, ceilings, windows, and doors, and compute surface areas;
 - Compute the volume of conditioned space of a building;
 - Define the thermal envelope of a building; and
 - Assess the effectiveness of existing insulation and the effective R-values.
- **Diagnostic Testing**
 - ◆ Blower door
 - Possess a working knowledge of:
 - Principles of air movement and how they relate to building heat loss;
 - Typical air leakage problems in common housing types; and
 - Minimum ventilation rates.
 - Demonstrate the ability to:
 - Set up a blower door;
 - Prepare a building for a blower door test; and

- Take blower door reading and interpret results.
 - ◆ Zone pressure diagnostics
 - Possess a working knowledge of:
 - The air barrier of a building and the importance of aligning it with the thermal barrier; and
 - Primary and intermediate zones of a house.
 - Demonstrate the ability to:
 - Conduct zone pressure diagnostics and interpret results; and
 - Determine the location and effectiveness of the air barrier of a house.
 - ◆ Duct testing
 - Possess a working knowledge of:
 - Problems associated with different types of duct leakage.
 - Demonstrate the ability to:
 - Determine dominant duct leakage;
 - Determine the amount of duct leakage or least the existence of significant duct leakage by conducting pressure pan, duct blaster, or delta Q tests;
 - Measure room pressure imbalances in houses with forced-air systems; and
 - Resolve room pressure imbalances.
- **Combustion Appliance Safety**
 - ◆ Possess a working knowledge of:
 - CO action levels;
 - Common code requirements related to:
 - Vent system sizing, materials, clearances, and installation;
 - Safety shut-off devices;
 - Gas line sizing; and
 - Combustion air;
 - Causes of and remedies to common vent system problems.
 - ◆ Demonstrate the ability to:
 - Measure the CO level in ambient air;
 - Measure the CO level of vented and unvented combustion appliances;
 - Measure the CO levels of gas- or propane-fired cook stoves (oven and burners) and remedy high CO levels through basic cleaning and adjustments;
 - Understand the difference between as-measured and air-free CO readings;
 - Detect gas, propane, and fuel oil leaks; and
 - Conduct a worst-case draft test of a combustion appliance zone; and
 - Measure the steady-state efficiency of a vented combustion appliance.
- **Insulation**
 - ◆ In addition to the insulation-related *Installer* competencies, possess a working knowledge of:
 - Local codes relating to attic ventilation.

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) INSTALLER/CONTRACTOR

• *Heating and Cooling Equipment*

- ◆ Prerequisites:
 - Possess *Auditor/Combustion Appliance Safety* and *Safe Work Practices* competencies; and
 - Possess the HVAC certifications and licenses required by the state and local jurisdiction.
- ◆ Possess a working knowledge of:
 - The components of typical steam and hot water distribution systems and the characteristics of their proper operation.
- ◆ Demonstrate the ability to:
 - Maintain quality control of weatherization work and ensure it meets program standards;
 - Repair or replace heating and cooling equipment in a code-compliant manner;
 - Estimate the heating and/or cooling load of a dwelling per Manual J to ensure proper sizing of replacement heating or cooling systems;
 - Repair or replace vent systems of combustion appliances in a code-compliant manner;
 - Repair or replace a water heater in a code-compliant manner (some states may require a licensed plumber to replace a water heater);
 - Ensure proper sizing of gas lines;
 - Assess the adequacy of supply and return plenum and duct sizes for forced-air systems;
 - Add return and supply plenums and ducts as required;
 - Determine dominate duct leakage;
 - Conduct duct pressure tests, which could include:
 - Pressure pan;
 - Duct Blaster; and
 - Delta-Q;
 - Measure and solve room pressure imbalances in houses with forced-air systems;
 - Test air vents, steam traps, thermostatic radiator valves, and hot water zone valves;
 - Bleed unwanted air from a hot water distribution system;
 - Estimate the energy impacts of existing overheating problems in steam and hot water heating systems;
 - Warehouse materials as necessary to avoid delays in completing weatherization work; and
 - Test out to assure system is operating properly and safely.

INSPECTOR

- Prerequisites:
 - ♦ Inspectors should possess *Safe Work Practices, Installer, and Auditor* competencies.
- Possess a working knowledge of:
 - ♦ Relevant DOE Weatherization Program regulations and policy;
 - ♦ Building science principles; and
 - ♦ Relevant local codes.
- Demonstrate the ability to:
 - ♦ Verify that the weatherized house is safe by conducting all appropriate combustion appliance safety tests;
 - ♦ Evaluate the allowability and appropriateness of the installed weatherization measures taking into consideration program regulations, policy, energy audit results, and/or priority lists;
 - ♦ Assess whether the measures were installed with good workmanship, proper materials, and in such a manner to comply with local code and ensure long-term energy savings over the life of the measures;
 - ♦ Ensure that all measures charged to the job were actually installed; and
 - ♦ Verify the effectiveness of air-sealing efforts by conducting a blower door test and zone pressure diagnostics.

CONSUMER EDUCATION

- Competency
 - ♦ Principles of adult education
- Possess a working knowledge of:
 - ♦ What actions can be taken to reduce energy use in the home;
 - ♦ The basic steps in the Weatherization process from auditing, testing, installation, inspection, and monitoring;
 - ♦ The purpose of the basic equipment involved in weatherizing a house, including a blower door, pressure pan, combustion analyzer, gas leak detector, insulation blowing machine, and generator; and
 - ♦ What actions need to be taken to maintain a healthful indoor environment.
- Demonstrate the ability to:
 - ♦ Estimate the economic impacts of suggested actions to bolster customer commitment to change.

MONITOR (TECHNICAL)

- Prerequisites:
 - ♦ Monitors should possess all *Safe Work Practices, Auditor, and Inspector* competencies.
 - ♦ Monitors should be knowledgeable of *Installer* competencies.
- Possess a working knowledge of:
 - ♦ Principles of building science; and
 - ♦ Principles of adult education.
- Demonstrate the ability to:
 - ♦ Produce written reports that clearly identify weaknesses and provide sound solutions;
 - ♦ Provide on-site training and technical assistance; and
 - ♦ Solve complex technical problems.

MONITOR (ADMINISTRATIVE)

- Possess a working knowledge of:
 - ♦ Principles of adult education;
 - ♦ Enabling legislation governing the U.S. Department of Energy's (DOE's) Weatherization Assistance Program;
 - ♦ DOE program regulations 10 C.F.R. 440;
 - ♦ DOE program guidance and policy issued via Weatherization Program Notice or memoranda;
 - ♦ Federal, state, and local budget processes;
 - ♦ Federal financial assistance regulations 10 C.F.R. 600 and relevant OMB circulars;
 - ♦ Applicable state procurement regulations; and
 - ♦ State and local approaches to monitoring, training, and technical assistance.
- Demonstrate the ability to:
 - ♦ Produce written reports that can clearly identify weaknesses and provide sound solutions; and
 - ♦ Provide on-site training and technical assistance;

PROGRAM MANAGER

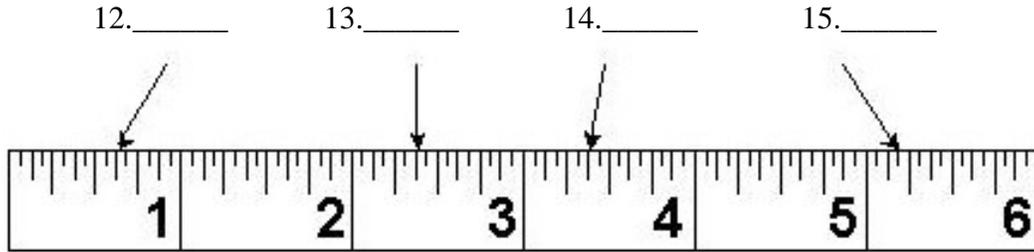
- Possess a working knowledge of:
 - ♦ Enabling legislation governing the U.S. Department of Energy's (DOE's) Weatherization Assistance Program;
 - ♦ DOE program regulations 10 C.F.R. 440;
 - ♦ DOE program guidance and policy issued via Weatherization Program Notice or memoranda;
 - ♦ Federal, state, and local budget process;
 - ♦ Federal financial assistance regulations 10 C.F.R. 600 and relevant OMB circulars;
 - ♦ Applicable state procurement regulations;
 - ♦ State and local approaches to monitoring, training, and technical assistance;

- ◆ Applicable computer databases and tracking systems and the importance that they remain up-to-date, are secured and backed-up, and are used effectively to manage the program; and
- ◆ Building science principles.
- For state staff:
 - ◆ Demonstrate the ability to:
 - Prepare an annual state plan;
 - Prepare an annual weatherization grant application;
 - Submit accurate financial and production reports in a timely manner;
 - Develop, maintain, and enforce state technical program standards;
 - Provide adequate technical and administrative training for coordinators, auditors, technicians, and inspectors directly employed by local agencies, and ensure that subcontractors receive appropriate technical training;
 - Develop and manage an effective monitoring program;
 - Coordinate resources;
 - Develop and implement innovative leveraging strategies; and
 - Process reimbursement requests in a timely manner.
- For local agency weatherization coordinators:
 - ◆ Demonstrate the ability to:
 - Effectively communicate and manage weatherization staff and subcontractors;
 - Prepare and track a budget for implementing a local weatherization program;
 - Maintain a purchase order system to track contracted services and materials and tool requisitions;
 - Maintain a coding system to assure expenditures are charged to the correct budget category;
 - Maintain inventory tracking system for materials, tools, and equipment;
 - Submit accurate financial and production reports in a timely manner;
 - Comply with federal limits on administrative expenses;
 - Manage a small construction/production-focused operation;
 - Ensure rigorous, unbiased, and accurate final inspection of all completed units;
 - Provide adequate technical training for auditors, technicians, and inspectors directly employed by the local agency, and ensure that subcontractors receive appropriate technical training;
 - Ensure that weatherization work complies with state technical program standards;
 - Coordinate resources; and
 - Develop and implement innovative leveraging strategies.

TRAINER

- Prerequisites:
 - ♦ Trainers should possess *Safe Work Practices, Auditor, and Inspector* competencies;
 - ♦ Trainers should be knowledgeable of *Installer* competencies;
 - ♦ Completion of adult education training program; and
 - ♦ Certification in subject areas of presented training.
- Possess a working knowledge of:
 - ♦ Principles of building science;
 - ♦ Principles of adult education;
 - ♦ Benefits of cross-training;
 - ♦ Building codes, especially energy and health/safety-related codes;
 - ♦ Allowable activities at the location of training (e.g., knob-and-tube wiring requirements); and
 - ♦ Available resources to aid students in future understanding and application.
- Demonstrate the ability to:
 - ♦ Develop curriculum based on student needs;
 - ♦ Tailor each class to the experience and needs of the students;
 - ♦ Motivate students through inspirational presentations;
 - ♦ Provide hands-on training;
 - ♦ Use technology to enhance the learning experience, especially as related to adult education principles; and
 - ♦ Direct students to other resources to get answers beyond the capacity of the trainer to provide.

12-15. Write in the measurement indicated by the arrow pointing at the tape measure.



Appendix B: Computer Skills Pre-Test

Basic Computer Skills Survey

1. Have you used a computer before? Yes No
2. Do you own a computer? Yes No
3. How well can you type? Good OK Not Good
4. What software programs have you used?
 - a. Microsoft Word or other word processor? Yes No
 - b. Excel or other spreadsheet program? Yes No
 - c. Outlook or other email program? Yes No
 - d. Internet Explorer or other Internet browser? Yes No
 - e. NEAT, MHEA, or other energy audit software? Yes No

Windows Basics Test

Perform the following tasks on the computer.

1. Open three different software programs, resize and position the windows so you can see all three applications on the screen at once.
2. Minimize all three programs and create a new folder on the desktop.
3. Create a word-processing file and save it on the desktop
4. Move this new file into the new folder using drag and drop.
5. Open the folder and confirm you successfully moved the file.
6. Using the Windows Help menus locate instructions for cut and paste and drag and drop. Point to what tutorials come with windows for learning file management. (copy, delete, move, rename, view properties)

File Management Basics Test

Nearly everything you'll do with computers revolves around creating content in the form of different types of files using different software programs. You'll need to be comfortable with creating, saving, opening, and editing files. Then you'll need to understand storing, organizing, renaming, moving, copying, deleting and backing up your important files. Plan on learning by doing. Mistakes are considered positive learning experiences and are an essential part of using and learning computers. Trouble-shooting gets easier with practice.

Begin by drafting a personal list of the computer skills you have and the skills you want to learn. Then complete the following tests.

1. Create a new folder on the desktop named “Test Folder #1” and save a simple word processing document to this folder.
2. Create a folder named “Test Folder #2” within “Test Folder #1” and move the word processing file into this new folder.
3. Put a copy of this file into the first folder you created.
4. Rename this file.
5. Create another new folder on the desktop named “Test Folder #3” and move Test Folder #2 into this folder.
6. Delete all these folders and files.

Copy and Paste Basics Test

Perform the following tasks on the computer.

1. Highlight a section of text in a document and copy it to another location.
2. Highlight a section of text in a document and move it to a new location.
3. Highlight an image in a document and copy it to another location. Then, move the image to new location.

Spreadsheet Basics Test

Circle the letter of the best answer.

1. Spreadsheets:
 - a. Are large amounts of information
 - b. Organize text and numbers into columns and rows
 - c. Are usually graphics
2. Columns are:
 - a. Labeled with numbers
 - b. Not labeled
 - c. Labeled with letters
3. Rows are:
 - a. Labeled with numbers
 - b. Not labeled
 - c. Labeled with letters

4. What are the intersection of a column and a row?
 - a. Formulas
 - b. Entries
 - c. Cells

5. The column and row label combined at the point of intersection is known as the:
 - a. Active cell
 - b. Cell name
 - c. Formula

6. What are the sets of instructions that produce a value for a cell?
 - a. Addresses
 - b. Spreadsheets
 - c. Formulas

7. What character should start any formula?
 - a. Plus sign (+)
 - b. Any operator (+,-,*,/)
 - c. Equals sign (=)

8. Which formula will produce the total cost of all weatherization measures?

| | A | B | C | D | E | F |
|----------|---------------------|--------------|-------------|--------------|------------------|--------------|
| 1 | Measure | Hours | Rate | Labor | Materials | Total |
| 2 | Air sealing | 4 | \$30 | \$120 | \$200 | \$320 |
| 3 | Attic insulation | 3 | \$30 | \$90 | \$324 | \$414 |
| 4 | Sidewall insulation | 8 | \$30 | \$240 | \$312 | \$552 |
| 5 | Water heater wrap | 0.5 | \$30 | \$15 | \$14 | \$29 |

- a. =SUM(F2:F5)
- b. =F2+F3+F4+F5
- c. =SUM(B5:F5)
- d. Both a and b

Appendix C: Glossary

Air Barrier – The air barrier of a dwelling, also known as the pressure boundary, is the building shell surface that limits airflow between inside and outside. For maximum energy efficiency and comfort, the air barrier and thermal barrier should be continuous and in contact with each other.

ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers

ASHRAE 62 – ASHRAE 62 is a group of ASHRAE standards for minimum building ventilation requirements. ASHRAE 62.1-2004, entitled Ventilation for Acceptable Indoor Air Quality, cover general topics and requirements for commercial and high-rise residential buildings. ASHRAE 62.2-2004, Ventilation for Acceptable Indoor Air Quality in Low-Rise Residential Buildings, has a self-explanatory title.

Attic Ventilation – Building codes require attic openings to outside to induce airflow that cools the attic in summer and exhausts moisture. There is a growing consensus that unvented attics have energy benefits and that in hot, humid climates attic ventilation brings in more moisture from outside than it purges.

Auditor – An auditor is a weatherization worker that assesses an eligible dwelling for potential weatherization services. Auditors visually inspect the building shell and mechanical systems; conduct diagnostic, health, and safety tests; record the location, condition, and dimensions of walls, ceilings, floors, windows, doors, and mechanical systems; enter data into computerized energy audit or use a priority list to select cost-effective measures; and prepare clear and accurate work orders to ensure the most appropriate measures are installed properly.

Balloon-Framed Walls – Balloon-framed walls are built without top or bottom plates. This type of framing often provides an air channel from the basement or crawlspace to the attic that allows outside air to flow through the walls resulting in excessive heat loss/gain.

Band Joist – Band joists are the floor joists that run around the perimeter of the house. There are two types of band joists - header joists that run perpendicular to the floor joists and rim joists that run parallel. A typical weatherization measure involves insulating the header joist spaces between floor joists and along the rim joists.

Base Load – Base loads are energy loads from appliances that are on most of the time and do not vary with changing climate. Base loads include refrigerators, water heaters, and lights. Base loads are often thought to be primarily electric loads, but can be fueled by other energy sources.

Batt Insulation – Batts are insulation manufactured in rolls precut to standard widths to fit snugly between framing (joists, rafters, or studs) on 16-inch or 24-inch centers in ceilings, floor, and walls. While often made with a “Kraft” paper facing designed to

retard vapor transmission, batt insulation is also available without the paper facing (unfaced batts).

Blower Door – A blower door is a device for testing the airtightness of a building. A blower door consists of a calibrated fan for measuring an air flow rate and a pressure sensing device to measure the pressure created by the fan flow. The combination of pressure and flow can be used to estimate the airtightness.

Building Performance Institute (BPI) – BPI is an organization that supports the development of a professional building performance industry through individual and organizational credentialing and a quality assurance program. BPI offers certification of individuals in evaluation, mechanical, envelope, mobile home, and multi-family designations, as well as accreditation of organizations committed to using a quality management system.

Building Science – Building science is the collection of scientific knowledge that focuses on the analysis and control of the physical phenomena affecting buildings. This includes the detailed analysis of building materials and building envelope systems.

Building Tightness Limit – Also known as the minimum ventilation rate, the building tightness limit is the least amount of fresh air that must be drawn through a house (by either natural or mechanical means) to ensure acceptable indoor air quality.

Bypass – A bypass is a hole between conditioned and unconditioned space that allows air leakage through the pressure boundary, or air barrier, of a dwelling.

CAZ – A combustion appliance zone, or CAZ, is any zone containing a combustion appliance.

CO – Carbon monoxide

Combustion Air – Complete combustion of fossil fuels such as natural gas, propane, and fuel oil requires an adequate supply of air. Inadequate combustion air causes incomplete combustion, which generates carbon monoxide.

Combustion Appliance – A combustion appliance is a furnace, boiler, space heater, wood stove, water heater, cook stove, or other device that burns wood or fossil fuel such as natural gas, propane, or fuel oil.

Compact Fluorescent Lamp – A compact fluorescent lamp (CFL) is a type of fluorescent lamp that screws into a regular light bulb socket or plugs into a small lighting fixture. In comparison to incandescent light bulbs, CFLs have a longer rated life and use less electricity.

Competency – Competency means the possession of a minimum level of knowledge and proficiency required to collect appropriate information, make informed decisions, and

physically takes the needed actions to deliver the high-quality weatherization service in question.

Consumer/Client Education – Consumer or client education includes discussion, instruction, brochures, and pamphlets that explain the weatherization process, the measures installed in the client’s house, how to use certain measures (such as programmable thermostats), and low-cost/no-cost ways to save energy and reduce energy costs.

Crew Chief – A crew chief is a weatherization worker that supervises a crew of installers and directs their efforts to weatherize eligible dwellings.

Critical Junction Point – Critical junction points are areas in building construction that typically exhibit air leaks or are inadequately insulated. Critical junction points include the intersection of ceilings and walls, cantilevers, and finished-attic kneewalls.

Cross Training – Training every member of a crew to be able to do every job is known as cross training. While certain crew members may specialize in specific tasks, a cross-trained crew understands how their specialty impacts all others and can adjust to staff turnover.

Delta Q – Delta Q is a testing protocol to measure duct leaks to the outside under actual operating conditions.

Demonstrated Ability – A demonstrated ability is the physical performance of a test, procedure, or technique on an actual house, a prop, or in a training lab in the presence of someone qualified to assess the particular competency.

Dense-Packed Insulation – Loose-fill insulation (cellulose or fiberglass) is blown into closed building cavities (usually walls, but also floor and roof/ceiling cavities) to a density of 3½ or 2 ½ pounds per cubic foot¹, respectively, to air seal as well as insulate.

DOE – U.S. Department of Energy

Dropped Soffit – A dropped soffit (or simply drop soffit) is built from framing and drywall over kitchen cabinets to give a more finished appearance than just hanging wall cabinets with a foot or so gap between the top of the cabinet and the ceiling. From the attic, a dropped soffit looks like a big hole in the floor and often causes breaks in the attic thermal and air barriers.

Duct Blaster – A Duct Blaster is a calibrated airflow measurement system designed to test and document the air tightness of forced-air duct systems. Duct Blaster is the trade name of the device manufactured by the Energy Conservatory of Minneapolis,

¹ Guidelines are based on infiltration reduction lab and field results and subject to change as more data becomes available.

Minnesota. Other competing companies such as Infiltec and Retrotec manufacture similar systems.

EPA – U.S. Environmental Protection Agency

HVAC – Heating, ventilation, and air conditioning

HVAC Installer/Contractor – A HVAC installer/contractor is a crew member or contractor trained and licensed to repair and replace furnaces, boilers, air conditioners, and related equipment.

Hydronic Distribution Pipes – Hydronic distribution pipes deliver hot water or steam from a water heater or boiler to baseboard convectors or radiators located throughout a house.

Inspector – An inspector verifies the proper selection, installation, and effectiveness of weatherization measures installed in eligible dwellings through review of documentation, visual inspection, and performance of diagnostic, health, and safety testing.

Installer – An installer is a crew member or contractor that installs weatherization measures in eligible dwellings.

Knob-and-Tube Wiring – Older homes may have “knob-and-tube” electrical wiring, where two separate wires run through ceramic posts (knobs) attached to the top of ceiling joists or through ceramic tubes inserted into holes drilled in the wall or roof framing. Since this type of wiring was designed to dissipate heat to the attic air, insulating over knob-and-tube wiring can cause dangerous overheating.

Lead-Safe Work Practices – Lead-safe work practices are the use of specific precautions in the conduct of weatherization activities designed to avoid contaminating homes with lead-based paint dust and debris, and to avoid exposing the clients, weatherization workers, and their families to this hazard.

Mastic – Mastic is a material used to seal duct leaks. It is the consistency of drywall joint compound when applied, but dries to a hard, durable finish. To seal duct leaks larger than ¼ inch, mastic is applied over a specially made fiberglass mesh tape.

Material Safety Data Sheet (MSDS) – A material safety data sheet or MSDS describes the properties of a particular substance (e.g., caulk, mastic, sealant). An important component of workplace safety, it is intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner.

Mechanical Ventilation – Mechanical ventilation is the controlled exhaust of indoor air, intake of fresh outdoor air, or a combination of both through the use of fans, controls, passive air intakes, and sometimes ducts, registers, and air-to-air heat exchangers.

Minimum Ventilation Rate – Also known as the building tightness limit, the minimum ventilation rate is the least amount of fresh air that must be drawn through a house (by either natural or mechanical means) to ensure acceptable indoor air quality.

Monitor (Administrative) – An administrative monitor is someone employed or contracted by a state to review the administrative and programmatic activities of local weatherization agencies (subgrantees) to ensure compliance with applicable laws and programmatic and financial regulations.

Monitor (Technical) – A technical monitor is someone employed or contracted by a state to review the technical and field activities of local weatherization agencies (subgrantees) to ensure compliance with the enacting federal legislation, federal program regulations, and state technical program standards.

NASCSP – National Association for State Community Services Programs is a national association charged with advocating and enhancing the leadership role of states in preventing and reducing poverty. NASCSP's members are state administrators of the U.S. Department of Health and Human Services' Community Services Block Grant (CSBG) and the U.S. Department of Energy's Weatherization Assistance Program. NASCSP keeps its members, the federal government, and other interested parties informed about issues related to CSBG and the Weatherization Program through its publications and training.

OSHA – The Occupational Safety and Health Administration's mission is to assure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health.

Personal Protective Equipment – Equipment such as respirators, safety goggles, disposable coveralls, and hard hats worn by weatherization workers to protect them from jobsite hazards.

Plenum – A plenum is the initial duct on the supply and return side of an air handler.

Pressure Pan – A pressure pan resembles a cake pan and is used to locate duct leakage with a digital manometer while a blower door is running.

Priority List – A priority list is a list of weatherization measures appropriate for typical housing stock ordered by descending cost effectiveness. DOE-approved energy audit software is used to verify the cost effectiveness of the measures and account for the interaction between measures.

R-Value – R-value is a measure of resistance to heat flow. Insulation with an R-value of R-38 resists heat loss better than R-19 insulation.

Room Pressure Imbalances – Pressure imbalances happen when the conditioned air supplied to a room does not equal the airflow returned to the furnace or air conditioner. In dwellings with forced-air distribution and a central return system, closing bedroom doors can cause the bedrooms to experience a positive pressure and rooms that are open to the return grille see a negative pressure. Atmospherically vented combustion appliances can backdraft if they are located in a zone with negative pressure.

Steam Trap – Steam traps are automatic valves used in steam heating systems to remove condensed steam (hot water) from the steam pipes and return it to the boiler.

Temperature-Rise Test – A temperature-rise test is conducted on a furnace by measuring the temperature of air entering the furnace and of the air exiting the furnace. The difference between these two temperatures is known as the temperature rise and is compared to the normal range indicated on the nameplate to verify proper operation of the furnace.

Thermal Barrier – The thermal barrier of a dwelling is the building shell surface that limits heat flow. For maximum energy efficiency and comfort, the air barrier and thermal barrier should be continuous and in contact with each other.

Unvented Combustion Appliance – An unvented combustion appliance vents combustion gases to the living space instead of outside as does a vented appliance.

Weatherization *Plus* – The U.S. Department of Energy’s effort to plan the continued evolution of the Weatherization Program for the next five years through activities designed to expand resources (leveraging and partnerships), share relevant information with the weatherization network, and increase the consistent delivery of high-quality weatherization services nationwide.

Work Order – A work order describes what weatherization measures are to be installed in an eligible dwelling and includes a list of the type and quantity of materials that are required to complete the job.

Working Knowledge – Working knowledge of means to:

- Knowing how a particular topic impacts the weatherization process;
- Having the relevant information committed to memory or being able to locate it in readily available sources; and
- Using the knowledge to make informed decisions and guide weatherization work.

Worst-Case Draft Test – A worst-case draft test is procedure used to verify the ability of a combustion appliance to safely exhaust combustion gases outside even when exhaust fans, pressure imbalances, and the stack effect are fighting its ability to properly draft.

Zone Pressure Diagnostics – Test procedures used with the blower door to locate air leakage are known as zone pressure diagnostics.

