# Single-Family Quality Control Inspector Job Task Analysis

Heather Head and Chuck Kurnik
*National Renewable Energy Laboratory*

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**Technical Report**
NREL/TP-7A40-70977
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Contract No. DE-AC36-08GO28308

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# Acknowledgments

The work described in this document was funded by the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) under the Guidelines for Home Energy Professionals project. The authors want to thank the WAP and the home performance industry professionals who participated on the scheme committee and volunteered many hours of their time and expertise to develop the Quality Control Inspector (QCI) advanced Home Energy Professional microcredential.

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# 1 Introduction

The National Renewable Energy Laboratory (NREL) is contracted by the U.S. Department of Energy (DOE) Weatherization Assistance Program (WAP) to develop and maintain the resources under the Guidelines for Home Energy Professionals (GHEP) project. The purpose of the GHEP project is to increase the quality of work conducted for residential energy retrofits in the United States through the WAP network and other residential retrofit programs, as described in the Council of Environmental Quality's (CEQ) *Recovery through Retrofit* October 2009 report. To meet the CEQs goal of "Establishing National Workforce Certifications and Training Standards," NREL was tasked with developing the GHEP resources that include the standard work specifications (SWS) and four advanced, competency-based home energy professionals (HEP) personnel certifications. From 2010 to 2011, NREL recruited more than 40 volunteer subject matter experts (SME) from the WAP network and the home performance industry to serve on committees to develop certification schemes and their requisite job task analysis (JTA) as the foundation of standardized certification and training programs.

As part of the GHEP strategy to increase the quality of work conducted for single-family, residential energy-efficiency retrofits, the HEP JTAs are used as the foundation for quality training programs and trainers. Just as the HEP certifications ensure qualified workers in the field, accredited training programs ensure that individuals receive the proper training to become certified Home Energy Professionals and to do the quality work that is defined in the SWS. DOE contracted with the Interstate Renewable Energy Council (IREC) to develop an accreditation for energy-efficiency training programs based on the four HEP JTAs. This accreditation is a third-party validation that an organization is qualified to teach the knowledge, skills, and abilities (KSA) outlined in the JTAs. This accredited training component of the GHEP project guarantees the existence and availability of high quality standardized training programs within the home energy upgrade industry. As of December 2017, 22 Weatherization Training Centers (WTC) held active IREC accreditations specific to the HEP certifications.

# 2 Definition of a Job Task Analysis

A Job Task Analysis is a foundation for any valid credentialing program and helps identify the core knowledge areas, critical work functions, and/or skills typically found across a representative sampling of current practitioners or job incumbent workers. Empirical results from a job analysis provide examinees and the public with a valid, reliable, fair, and realistic assessment that reflects the knowledge, skills, and abilities required to competently perform a job.

# 3 Background

In 2013, NREL completed the development of four single-family, full-scope, International Standard Organization (ISO) and International Electrotechnical Commission (IEC) 17024:2012 accredited HEP certifications for the specific job categories of Quality Control Inspector (QCI), Energy Auditor (EA), Crew Leader (CL), and Retrofit Installer Technician (RIT). Upon developing the ISO/IEC 17024:2012 schemes, NREL entered into a nonexclusive license with Building Performance Institute, Inc. (BPI) to manage and administer the four HEP certifications.

In 2014, the WAP implemented Weatherization Program Notice 15-4, Quality Work Plan (QWP) requiring that "(a)ll measures and incidental repairs performed on client homes must meet the specification, objectives, and desired outcomes outlined in the SWS...Quality Control Inspectors (QCI) working for, or contracted by, the WAP must possess the KSAs in the National Renewable Energy Laboratory (NREL) Job Task Analysis (JTA) for Quality Control Inspectors…QCI competency is demonstrated by certification as a Home Energy Professional (HEP) Quality Control Inspector" (DOE, WPN 15-4 2014).

As of March 1, 2018, there are more than 1,600 certified QCIs throughout the nation with residential utility programs, implementers and low-income programs requiring the QCI credential and using the SWS. In accordance with the certification industry and ISO/IEC 17024:2012 best practices, JTAs need to be reviewed and revised as necessary every 5–7 years to ensure that they align with current competencies needed on the job. The following section describes the process of revising the 2013 QCI certification scheme and developing an improved 2018 QCI microcredential program. Sections 6and 7 provide the content of the revised 2018 QCI microcredential JTA.

# 4 Quality Control Inspector Certification Scheme Revision Process

To improve the quality of residential retrofits and increase energy savings in the residential market through QCI training and certification, from 2013 to 2017 DOE collected feedback from the WAP network and the home performance industry on the successes and barriers to implementing the QCI certification program. The most frequently cited barriers regarded the QCI JTA, the major component of the certification scheme. The barriers described were that the QCI JTA included competencies that ranged from foundational to advanced, included interpersonal skills( or "soft skills"), and that the JTA did not demonstrate how the QCI certification required higher competency levels than the other HEP certifications. In practice, the QCI must inspect the work of the EA and the final installed measures of the RIT, yet this level of competency required of each job category was not clearly delineated from one job category to the next. Another major barrier to implementing the certifications was the management and administration time required of the major stakeholders and training and testing centers to maintain four full-scope certifications. The large range of competencies, the soft skills, and undefined competency levels made it difficult for WTCs to develop curriculum and the exam developers to develop questions that assessed the soft skills adequately.

To decrease the previously mentioned barriers and ensure that the contents of the QCI and EA JTA and certification scheme were current, aligned with best practice, and continued to adhere to the ISO/IEC 17024:2012 standard, the QCI and EA scheme committees engaged in the following tasks to review and update the QCI and EA certification schemes. This included the JTA which is the major scheme component.

To identify the soft skills and foundational competencies and define the levels of KSA required to successfully perform the tasks defined in the QCI and EA JTAs, DOE and NREL used the Department of Labor's (DOL) Competency Model Clearinghouse resources to develop a QCI and EA Competency Model. According to the DOL's competency model resources, foundational competencies include personal, academic, and workplace competencies common across all workers.[1] Please see the QCI and EA Competency Model for more information.

NREL held virtual meetings with the QCI and EA scheme committees in the fall of 2017 to identify and remove the foundational competencies in both the QCI and EA JTAs. Once the foundational competencies were removed, the scheme committees completed a high-level cross-walk of the QCI and EA JTAs domains and tasks, to identify and remove any obvious duplications. Because the QCI needs to inspect the work completed by the EA, it was determined that the QCI's competencies included the competencies described in the EA, plus a smaller set of competencies specific to quality assurance work conducted by a QCI.

In February 2017, NREL assembled a panel of 17 SMEs from the QCI and EA scheme committees for a three-day in-person meeting. The panel worked with Castle Worldwide, Inc., a

[1] A Guide For Developing Competency Models, Page 6 of https://www.careeronestop.org/CompetencyModel/Info_Documents/Guide-for-Developing-CompetencyModels.pdf

certification and licensure design, development, and administrative services company, to develop new QCI and EA JTAs and certification scheme components.

## 4.1 JTA Revision Process

During the in-person meeting the panel went through the following process to revise the QCI JTA.

The first step in developing the new QCI JTA was to evaluate the major responsibilities or duties (i.e., performance domains) characterizing the practice of a QCI that were developed in the previous JTA study. As a group, panelists were asked to assess the currency and relevance of the domains and add, edit, or remove domains as needed. Additionally, the panel was instructed to remove any content that was redundant with the EA JTA. Next, the panel was asked to review and revise the task statements from the previous QCI JTA. Tasks underwent revision to varying degrees. Some tasks were reworded, removed, or moved to more appropriate domains based on the domain revision. Tasks identified as being too similar were combined to form a single task.

The final major undertaking of the panel was to identify knowledge, skill, and ability statements for each of the six tasks. In some cases, a knowledge, skill, or ability statement was assigned to multiple tasks. In developing and assigning knowledge and skill statements, the panel made use of the knowledge and skill statements from the prior test specifications, and many previous statements were either reused without modification or modified slightly. Some of the previous statements were discarded, however, because they represented knowledge or skills that were not necessary to perform some of the newly revised tasks.

At the conclusion of the meeting, panelists were asked to rate the task statements that were developed in the meeting on the scales of point in career, criticality, and frequency to identify the weighting of each task on the exam.

## 4.2 JTA Phase II: Validations Study

To corroborate the work of the panel, an online validation consisting of two sections was designed and sent to current EA certification holders in July 2017. The first section asked respondents to rate each of the tasks on three rating scales: point in career, criticality, and frequency. The second section asked respondents to provide demographic information used to evaluate the representativeness of the respondents. The weighting of the tasks in the exam blueprint is the result of the validation process.

## 4.3 Results

During the in-person meeting and subsequent virtual meetings with the entire 22 QCI and EA scheme committee members, the committees also provided the necessary updates to the other certification scheme components. These included the prerequisite and recertification requirements, minimal competencies, job scope and descriptions, and other relevant aspects of the QCI and EA certification schemes.

Through this work, the QCI and EA scheme committees determined that a new model for the QCI and EA certifications was needed. With the EA job requiring many performance domains and tasks, the EA would remain a full-scope, accredited certification under the ISO/IEC

17024:2012 standard. However, because the EA competencies were required of QCIs, the EA would serve as a prerequisite to the QCI certification. Because the QCI JTA defined a smaller subset of competencies, the QCI credential did not require a full-scope, ISO/IEC 17024:2012 accredited credential and the concept of a microcredential was implemented for the QCI credential. The purpose of microcredentials is to assess a more specific or discrete set of knowledge and skills than a traditional, full scope certification. The microcredential concept fit the QCI job requirements with the EA certification as a prerequisite to the QCI microcredential, as part of the HEP multicredential framework.

The following sections of this report are the results of the scheme committees' work toward improving the 2011 QCI JTA, a major component of the new QCI micro-credential program. The following sections include the scope of certification; the JTA content outline; performance domains, tasks, and KSAs; and the exam blueprint which provides the ideal percentage of exam questions that should be asked for each task.

# 5 Quality Control Inspector Job Scope and Description

A QCI is a residential energy-efficiency expert who ensures the completion, appropriateness, and quality of energy upgrade work by conducting a methodical inspection of the building and performing safety and diagnostic tests.

# 6 Energy Auditor Content Outline

## 6.1 DOMAIN I: In-Process Evaluation

### *6.1.1 D1-Task 1: Verify worker compliance with safety regulations.*

Ability to:

- Evaluate the work practices for compliance with safety regulations
- Evaluate the job site for compliance with safety regulations
- Document observations.

Knowledge of:

- Basic construction techniques and practices
- Codes and standards adopted by the authority having jurisdiction
- Safety regulations (e.g., OSHA, EPA)
- Information contained in a Safety Data Sheet (SDS).

### *6.1.2 D1-Task 2: Evaluate in-process work quality.*

Ability to:

- Compare the work performed to the work plan
- Determine if correct materials are being installed
- Verify the condition and capacity of the tools and equipment (e.g., calibration dates, blowing machine pressure)
- Determine needed diagnostic tests
- Document potential missed opportunities
- Evaluate job site management and scheduling (e.g., sequencing, material and equipment staging).

Knowledge of:

- Basic building science
- Codes and standards adopted by the authority having jurisdiction
- Building materials
- Construction work practices
- Installation methods
- Standards and specifications
- Test protocols.

### *6.1.3 D1-Task 3. Verify on-site documentation.*

Ability to:

- Determine if required documentation is present on the job site (e.g., work order, permits, Safety Data Sheet [SDS], installation specifications)
- Determine which job site worker credentials are necessary (e.g., licenses, certifications).

Knowledge of:

- Documentation procedures
- Credentialing requirements for workers
- Program and agency guidelines
- Required job site documents.

## 6.2 DOMAIN II: Postwork Evaluation

### *6.2.1 D2-Task 1: Verify installed measures and initial assessment details.*

Ability to:

- Determine which diagnostic tests are needed (e.g., health, safety, air leakage)
- Visually inspect installed measures
- Confirm housing characteristics used for initial assessment (e.g., insulation levels, heating equipment, square footage)
- Identify potential missed opportunities.

Knowledge of:

- Building science
- Codes and standards adopted by the authority having jurisdiction
- Standards and specifications
- Testing protocols.

### *6.2.2 D2-Task 2: Evaluate installed measures for compliance with standards.*

Ability to:

- Compare results of sensory inspection to expected outcomes
- Determine code or program compliance of installed measures (e.g., insulation certificate, installation standards)
- Determine if installed measures meet job specifications
- Determine if a problem is a material problem or a work problem
- Compare inspection results to previous test data
- Compare inspection results to work plan projections
- List actions necessary to bring installed measures up to compliance (i.e., punch list)
- Interpret diagnostic test results
- Verify pressure and thermal boundary alignment.

Knowledge of:

- Building science
- Codes and standards adopted by the authority having jurisdiction
- Industry standards
- Program requirements.

## 6.3 DOMAIN III: Project Compliance and Completion

### *6.3.1 D3-Task 1: Confirm whether policy requirements have been satisfied.*

Ability to:

- Identify questionable costs
- Determine accuracy of initial building evaluation (e.g., software modeling inputs, existing equipment)
- Identify omissions or inappropriate measures in the work scope
- Ensure that all punch-list items have been completed
- Prepare completion reports (e.g., checklists, required reports, recommended training).

Knowledge of:

- Policy requirements
- Basic heat load principles
- How inputs affect installed measures.

# 7 Quality Control Inspector Exam Blueprint

| Domain and Tasks | % Exam |
|---|---|
| DOMAIN I: In-Process Evaluation | 48.6% |
| Task 1: Verify worker compliance with safety regulations | 18.2% |
| Task 2: Evaluate in-process work quality | 16.8% |
| Task 3. Verify on-site documentation | 13.5% |
| DOMAIN II: Postwork Evaluation | 36.4% |
| Task 1: Verify installed measures and initial assessment details | 18.7% |
| Task 2: Evaluate installed measures for compliance with standards | 17.8% |
| DOMAIN III: Project Compliance and Completion | 15.0% |
| Task 1: Confirm whether policy requirements have been satisfied | 15.0% |

*Note:* Percentages were rounded to the nearest tenth of a percent.