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NATIONAL RENEWABLE ENERGY LABORATORY

Multifamily Retrofit Project Manager Job/Task Analysis and Report

September 2013

Corina M. Owens, Ph.D.
Professional Testing Inc.
Orlando, Florida

NREL Technical Monitor: Christina Larney

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Subcontract Report
NREL/SR-7A40-60446
September 2013

Contract No. DE-AC36-08GO28308

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Project Overview

The U.S. Department of Energy (DOE) Weatherization Assistance Program (WAP) and the National Renewable Energy Laboratory (NREL) developed the Guidelines for Home Energy Professionals (Guidelines) project to support and promote high-quality energy upgrade work within the WAP.

The development of job/task analyses (JTAs) is one of three components of the Guidelines project and will allow industry to leverage these components to develop training resources, quality assurance protocols, accredited training programs, and professional certifications. The development of these foundational materials for the WAP, and for the home performance industry, will facilitate a growing, skilled home energy upgrade workforce that is able to meet the increasing demand for energy upgrade work while maintaining quality assurance for homeowners and employers.

NREL secured the services of Professional Testing, Inc. to develop JTAs and specifically to identify and catalog all of the tasks performed by individuals in each of the multifamily-specific job categories listed below, as well as the knowledge, skills, and abilities (KSAs) needed to perform the identified tasks.

- Multifamily Energy Auditor
- Multifamily Building Operator
- Multifamily Retrofit Project Manager
- Multifamily Quality Control Inspector

This report describes the JTA development process, provides a summary of the JTA validation study and an analysis of the study data, and contains a content outline and "developing a curriculum" (DACUM) chart for multifamily retrofit project managers.

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Introduction

Job/task analysis (JTA) is a procedure for analyzing the tasks performed by individuals in an occupation, as well as the knowledge, skills, and abilities (KSAs) necessary to perform those tasks. Specifically, JTAs can be defined as "any systematic procedure for collecting and analyzing job-related information to meet a particular purpose" (Raymond 2001, p. 372).

The use of JTAs (also known as job analysis, task analysis, practice analysis, or role delineation) to define the content domain is a critical component in establishing the content validity of a training or examination program. Content validity refers to the extent to which the domain outline of the training or examination program overlaps with the important components (KSAs) of a job.

A well-defined JTA includes participation by a representative group of subject matter experts (SMEs) who reflect the diversity within the job. Diversity refers to regional or job context factors and to SME factors such as years of experience, and education. Demonstration of content validity is accomplished through the practical experience of industry professionals and SMEs. The process is enhanced by conducting a validation study that allows for the inclusion of larger numbers of industry professionals and SMEs

JTAs can be used for multiple purposes, including, but not limited to, job description, job classification, job evaluation, performance appraisal, training, worker mobility, workforce planning, efficiency, safety, and legal and quasi-legal requirements (Brannick et al. 2007). Job analyses are traditionally used by secondary and post-secondary educators, business or industry trainers, government or military trainers, and test developers. Although there are multiple methods for conducting JTAs, this project used the "developing a curriculum" (DACUM) method.

DACUM is an occupational analysis led by a trained facilitator, in which practitioners in a specific occupation come together for a multiday workshop to provide input about the specific tasks, knowledge, and skills needed to perform their jobs. Modified small-group brainstorming techniques are used to obtain the collective expertise and consensus of the committee. DACUM has proven to be a very effective method of quickly determining, at relatively low cost, the competencies or tasks that must be performed by persons employed in a given job or occupational area.

The DACUM chart that results from the DACUM analysis is a detailed portrayal of the skills or competencies involved in the occupation being studied. The DACUM analysis can be used as a basis for various aspects of an education/training or certification program, including curriculum development, student learning, training needs assessments, worker performance evaluations, and competency test development.

Process for Selecting Subject Matter Experts

Professional Testing, Inc. helped establish the criteria for selecting the panel of SMEs. Active practitioners interested in participating in the study were invited to submit their credentials through a publicly announced online submission process. To be eligible for participation in the

JTA workshop, applicants had to be current, active practitioners and available to attend the entire workshop session in person.

A total of 136 applications were received for participation in the multifamily JTA workshops and of these, 126 were qualified as current practitioners in the multifamily energy upgrade industry. When applying, applicants provided rankings as to which job designation they preferred most and each applicant was considered for up to two JTA workshops. A total of 68 applicants were considered for the multifamily retrofit project manager JTA workshop.

To create a representative panel of participants, Professional Testing, Inc. used criteria including:

- Geographic (including regional/climatic) diversity
- Representation of a wide range of experience levels (novice to expert)
- No single organization or organization size dominated the group
- All sectors were represented with no single sector dominating (public versus private)
- Diversity of industry-related credentials, represented by the panelists.

Twelve applicants meeting the above criteria were selected to create the multifamily retrofit project manager SME panel.

A copy of the opportunity announcement that solicited applications for the multifamily JTA workshops is included in Appendix A.

Methods

Overview of Job Analysis Process

A job analysis or practice analysis is a foundational requirement of any valid credentialing program, and it helps define the core knowledge areas, critical work functions, and/or skills that are common across a representative sampling of current practitioners or incumbent workers. Empirical results from the job analysis provide examinees and the public the basis of a valid, reliable, fair, and realistic assessment that reflects the KSAs required for competent job performance. For existing credentials, a job analysis should be performed periodically to maintain the validity of the content on the exam.

The DACUM Philosophy

- **Practitioners can describe and define their jobs more accurately than anyone else.**
- **One of the most effective ways to define a job is to describe the tasks that practitioners perform.**
- **All jobs can be effectively and sufficiently described in the terms of the tasks that successful workers perform.**
- **All tasks, to be performed correctly, demand certain knowledge, skills, abilities, attributes, and tools.**

Professional Testing, Inc. conducted a JTA workshop with a group 12 SMEs to identify the duties, tasks, steps, and essential knowledge, skills, and attributes associated with the job performed by a multifamily retrofit project manager.

Following the JTA workshop, Professional Testing developed an online study to validate the initial results of the study and finalize a content outline. The online validation study was started by 65 participants and completed by 46 multifamily retrofit project managers across the United States.

Job/Tasks Analysis Workshop

The multifamily retrofit project manager JTA workshop was held in Lakewood, Colorado, May 6–8, 2013.

The first day of the workshop consisted of an introduction to the DACUM process. The trained DACUM facilitator explained the JTA process and provided the SME panel with duty and task statement definitions. A duty reflects a large area of work for a specific profession; multiple tasks describe how to perform each duty.

The introduction was followed by a discussion about multifamily retrofit project managers, more specifically the "who, how, what, and why" of the profession. The SME panelists compiled this information into a comprehensive list to capture key multifamily retrofit project manager job components.

The next step was to identify duty (or domain) areas. The SME panelists identified duty areas, and facilitators wrote the duty areas on large index cards and placed them on a wall for the whole group to see. Once panelists reached consensus on the duty areas, they delineated each duty by

identifying the required tasks. After all the tasks were identified, they were ordered sequentially and entered onto a spreadsheet.

On the second day of the workshop, the facilitators projected a spreadsheet that contained the identified duty areas and corresponding task statements. The facilitators asked the SMEs, while looking at the projected task list, to list the steps that occur under each task and identify the KSAs, tools, equipment, and resources required to perform each task. This component of the job analysis process occupied the majority of time on the second day.

On the last day of the workshop, the SMEs finalized the remaining task statements. And, the SMEs were asked to report how much of their time they spent on each of the duty and task areas. The SMEs rated each duty and task on the two-dimensional scale shown in Figure 1.

Figure 1. Two-dimensional scale for rating duties and tasks

The SMEs were asked to consider each task in terms of frequency and importance. Specifically, study respondents were asked to consider whether the tasks were performed more or less frequently as well as whether the tasks were more or less important to perform successfully as a minimally competent multifamily retrofit project manager. The SMEs were asked to select a number from zero to two based on the two dimensions of frequency and importance.

The mean frequency and importance ratings were calculated for all of the SME panelists' responses, and a preliminary content outline was developed.

As a final activity, the SMEs reviewed and finalized the following overarching job description for multifamily retrofit project managers:

> Multifamily retrofit project managers direct and assure the successful completion of the building performance assessment, work scope development, and installation of conservation measures to reduce operating costs and achieve energy savings while ensuring the health and environmental safety of the building occupants.

The job profile that resulted from the JTA workshop is a detailed portrayal of a multifamily retrofit project manager and is initially documented in the form of a draft job and task analyses report. The draft JTA report appears in Appendix B.

JTA Workshop Attendees

SME Panelists

Nathan Aronson
Technical Director
Richard Heath and Associates, Inc.
Chico, CA

Dan Auer
Project Manager for Multifamily Weatherization
King County Housing Authority
Seattle, WA

Dave Bone
Owner/Building Analyst
Bone Energy Services
Philadelphia, PA

Xia Fang
Building Energy Engineer
Group14 Engineering, Inc.
Denver, CO

Duane Ford
Former Technical Assistance Manager
Energy Auditor
South Central Human Resource Agency
Thompson's Station, TN

Larry Hasterok
Principal
The Energy Keep, LLC
Milton, WI

David Hepinstall
Executive Director
Association for Energy Affordability, Inc.
Bronx, NY

Jeff Huntley
Manager Project Analysis and Energy Auditing
The Energy Partners
Asheville, NC

Ted Leopkey
Lead Environmental Engineer
U.S. Environmental Protection Agency
Washington, DC

Mark Lorentzen
Vice President
TRC Energy Services
Ithaca, NY

Lindsay Robbins
Senior Project Manager
NYSERDA
New York, NY

Glen Salas
Sr. Engineer
Simonson Management Services
Albuquerque, NM

Meeting Facilitation

Professional Testing

Reed Castle, Ph.D.
Corina Owens, Ph.D.

Job/Task Analysis Validation Study

Validation of the JTA workshop outcome is perhaps the single most important component of the JTA development process. It provides an opportunity for other industry experts to verify the accuracy of the job profile as defined by the representative sample of practitioners (SME panelists).

Once the JTA document formulated from the workshop had been reviewed by NREL, an online validation study was launched and used to collect feedback on frequency and importance ratings of the job tasks identified by the JTA workshop panelists and to capture any additional tasks and comments believed by respondents to pertain to the job of a multifamily retrofit project manager.

A copy of the validation study announcement is included in Appendix C.

Development of Demographic Questions for the Online Validation Study

The first step in developing the online validation study was to create key demographic questions to capture the representativeness of study respondents and help evaluate the validity of study responses. Each participant was asked 10 demographic questions:

1. What is the size of your organization?
2. In which state do you work?
3. In which sector do you currently work?
4. Which of the following jobs have you held in the multifamily (MF) building sector?
5. Which of the following categories best describes your current position?
6. How many years of experience have you had working as a multifamily retrofit project manager (total combined years)?
7. How many years of total experience do you have in the MF building industry (all jobs)?
8. What is your highest completed level of education?
9. To what professional societies/organizations do you belong?
10. What building performance credentials do you currently hold?

Development of Task-Rating Scales for the Online Validation Study

The second step in developing the online validation study was to identify the rating scales that survey participants use to rate the tasks performed by a multifamily retrofit project manager. There are multiple models of rating scales used in job analyses; however, for the purposes of this study, two study scales were used: task frequency and importance.

Task frequency was chosen because tasks performed more often should receive more emphasis, as reported by Newman, Slaughter, and Taranath (1999). Task importance was chosen because it is the most common scale used to evaluate tasks for licensure or certification job analysis (Newman et al. 1999); moreover, as illustrated in the *Standards for Educational and Psychological Testing* (American Educational Research Association 1999), "the content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential-worthy performance in an occupation or profession" (AERA, APA, NCME, 1999, p. 161). The two rating scales used for the validation study are illustrated in Table 1.

Table 1. Rating Scales

Frequency How frequently is this task performed?	Importance How important is this task to the performance of the job?
1: Never	1: Not important
2: Perform occasionally	2: Somewhat important
3: Perform fairly often	3: Important
4: Perform very often	4: Very important

An overall rating scale was calculated using the following formula:

Overall rating scale = 2*Importance + Frequency

The overall rating scale was used to develop weights for the duties and tasks within the content outline.

Administration of the Online Validation Study

Study participants received an email invitation (with a URL link to the study) from NREL that (1) invited them to participate in a nationwide research study investigating the practices, characteristics, and activities of four multifamily building job categories and (2) encouraged them to take this opportunity to directly contribute to the development of the workforce for multifamily home energy upgrades.

The initial email invitation was sent June 19, 2013 to approximately 3,290 multifamily SMEs either directly from NREL, through the Guidelines e-newsletter mailing list, or through a Building Performance Institute, Inc. (BPI) mailing list. The announcement was also posted to DOE's Weatherization and Intergovernmental Program news website[1] (which received 25 page views during the validation study) and the Home Energy Pros Forum on July 1, 2013 (which received 235 page views on the Home Energy Pros Blog & Forum during study).

Reminder notices were staggered and sent the weeks of July 8, 2013 and July 15, 2013, announcing the closing date of July 19, 2013. Approximately 1,450 reminder emails were sent directly to multifamily SMEs. In addition, Economic Opportunities Studies, Inc. (EOS) posted the announcement on its Facebook page, and it received 194 "likes" and an announcement was made during a DOE/EOS webinar on July 12, 2013 that was attended by 150 individuals.

NREL also made approximately 150 phone calls to the multifamily JTA workshop participants, applicants, and SME list members, encouraging people to participate and to inform other multifamily professionals. These calls were made on Thursday, July 11, 2013 and Friday, July 12, 2013 and on Monday, July 15, 2013 and Tuesday, July 16, 2013.

Notices announcing an extension of the validation study were sent on July 22, 2013 and July 23, 2013. These 6,363 emails were sent directly to SMEs, and several partnering organizations were asked to forward the extension notice; only SPEER (30), BPI (1,964), and EOS (4,300)

[1] http://www1.eere.energy.gov/wip/news.html

confirmed they had forwarded the notice (their estimated numbers are included in the total above).

In addition to NREL's outreach, the Association for Energy Affordability, Inc. (AEA) made approximately 10 phone calls specifically to building operators asking for their participation; AEA's direct links to those working in the multifamily industry drove up the number of participants in the extended week of the study, enabling the minimum participation mark of 40 to be attained in the job designations of building operator, retrofit project manager, and quality control inspector.

In total, approximately 8,667 emails were sent to multifamily SMEs and to industry association members and mailing list affiliated with the multifamily retrofit industry over the course of the validation study. In addition, 604 contacts were made via page views, Facebook "likes," and the DOE/EOS webinar announcement. There is potential for significant overlap in these lists, and the multifamily SME contacts that NREL used are likely to be on at least one or two of the other lists and possibly more.

All of the study participants had access to internet-capable computers via their homes, places of employment, or public libraries. Any computer with a Web browser and a Web connection could be used to access the study.

The online validation study for the multifamily retrofit project manager consisted of 36 job tasks separated into six content domains (or duty areas). A copy of the study is included in Appendix D.

Results

Online Validation Study

Study Respondent Demographics

The validation study respondents make up the study sample. The background and demographic portions of the online validation study assist with determining how representative the study sample is of the population of interest. The multifamily retrofit project manager study sample consisted of 65 respondents, with 46 fully completing the survey.

Sixty-five participants answered the question about the size of their organizations. Of the 65 participants, 60% worked at organizations with fewer than 50 people, as illustrated in Figure 2.

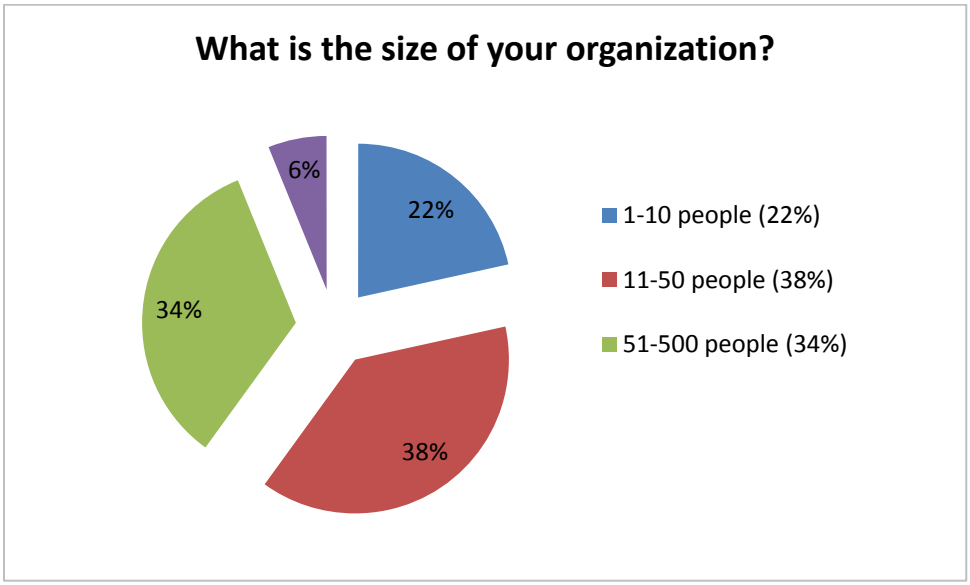

Figure 2. Sizes of organization of respondents

Among the 65 participants who responded to the study, 23 states were represented, with 10 respondents indicating they worked in multiple states. It was determined that these results provided an adequate representation for the industry since 7 of the 8 U.S. mainland climate regions were represented by respondents. Table 2 contains the responses to this question and shows the geographic distribution of study respondents.

Table 2. States in Which Respondents Reported Working

States	Number of Respondents
Alaska	2
Arizona	3
California	7
Colorado	6
Connecticut	1

States	Number of Respondents
Georgia	1
Illinois	1
Maine	1
Maryland	2
Missouri	1
New Jersey	1
New York	8
Ohio	1
Oregon	3
Pennsylvania	2
Rhode Island	1
South Carolina	1
Tennessee	2
Texas	2
Vermont	1
Virginia	2
Washington	4
Wisconsin	2
Multiple States	10
Grand Total	65

Next, study respondents were asked to report the sector in which they worked at the time of the survey. The majority (77%) reported they worked in the private sector. Figure 3 shows the results of this question.

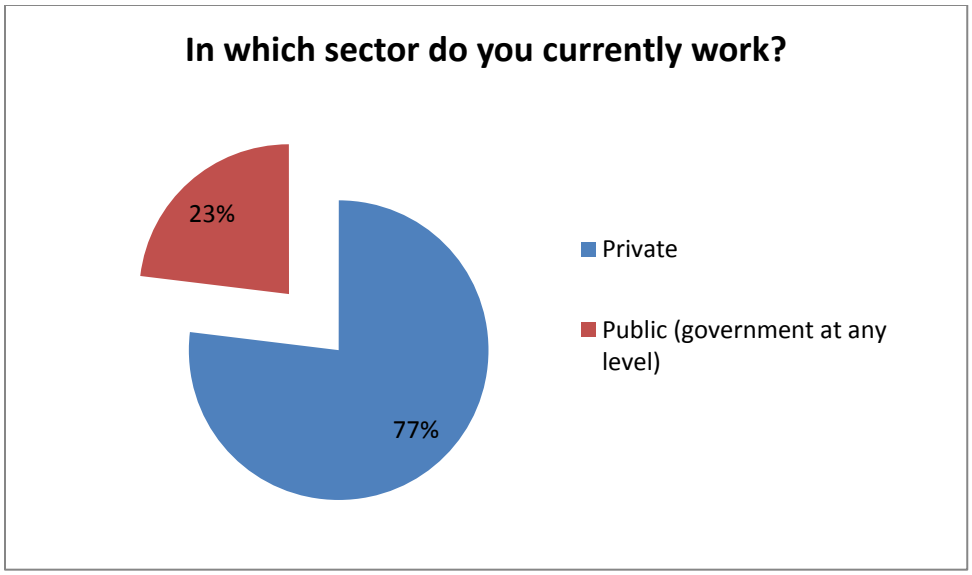

Figure 3. Sector in which respondents were working

Study respondents were then asked what jobs they held in the multifamily building sector. The majority (82%) indicated they had worked as a retrofit project manager in the multifamily building sector. The distribution of different jobs is displayed in Figure 4. (Note that respondents could select multiple jobs, so the total percentage exceeds 100%).

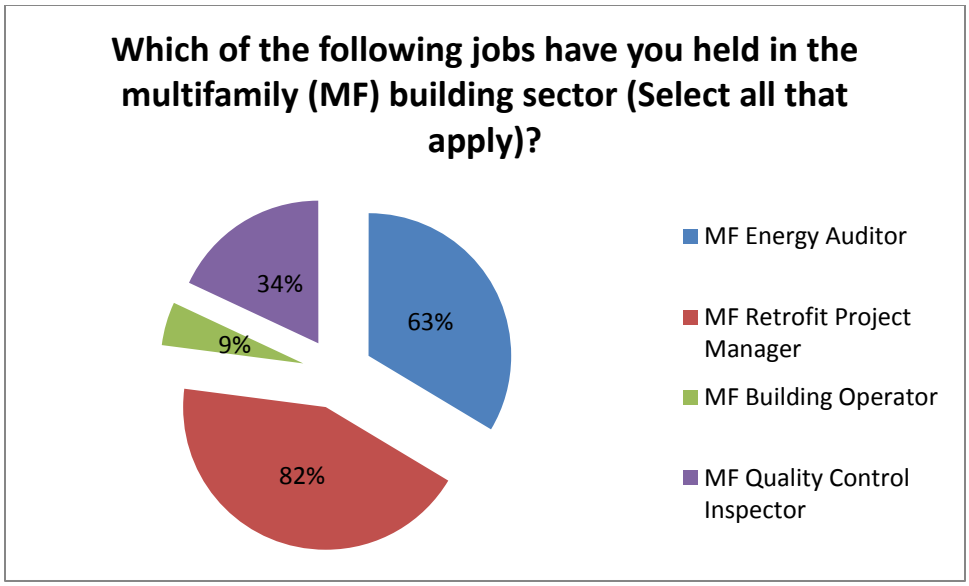

Figure 4. Jobs held by respondents in the multifamily building sector

When respondents were asked to categorize their current position, the majority (54%) selected "MF Building Retrofit Project Manager Practitioner." The distribution of different categories is displayed in Figure 5.

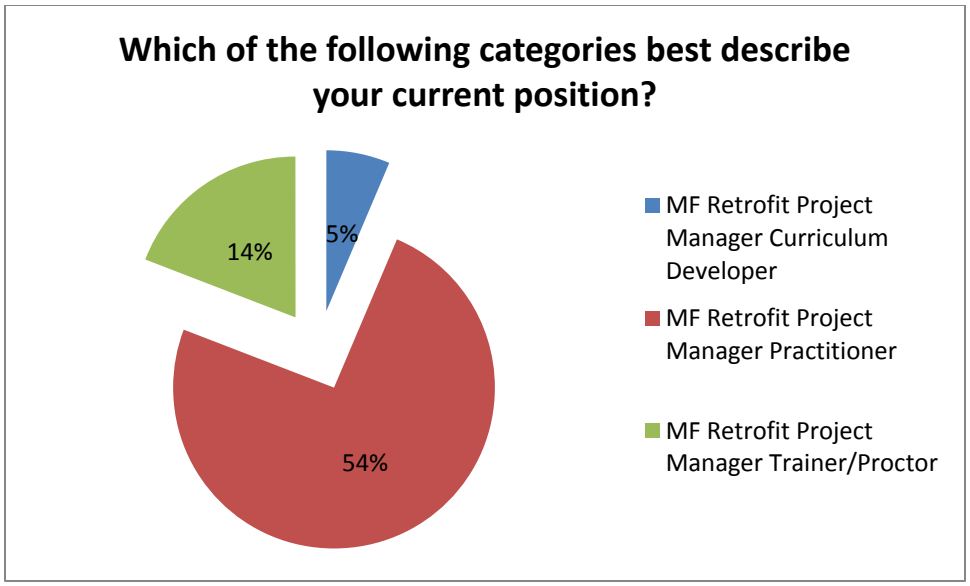

Figure 5. Categories of current jobs held by respondents

The study results suggest a wide range of experience from the participants working as multifamily retrofit project managers. However, the largest percentage of study respondents (48%) reported working five years or less as a multifamily retrofit project manager while 19% of respondents stated that they had more than 20 years of experience. Figure 6 displays the results.

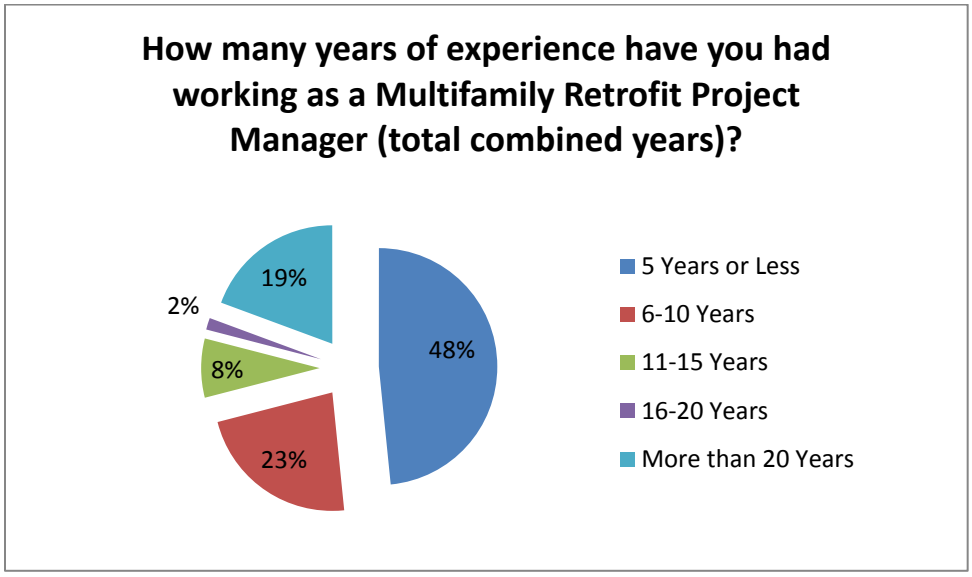

Figure 6. Years of experience respondents had as a multifamily building retrofit project manager

The majority of respondents (52%) indicated they had less than 10 years of total experience in the multifamily building industry (all jobs). However, there was a good representation of study respondents across all levels of experience in the multifamily building industry as a whole. Figure 7 displays the results.

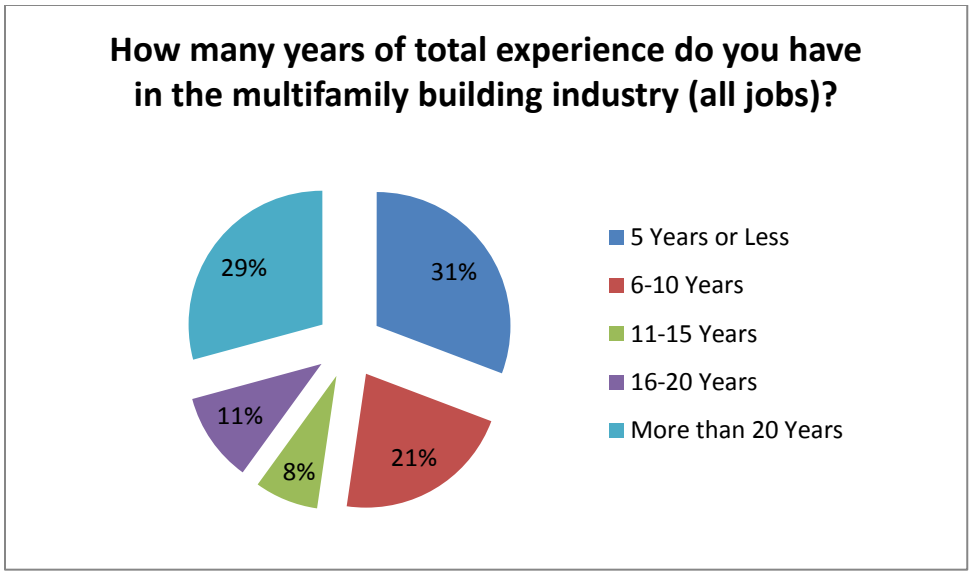

Figure 7. Years of experience respondents had in industry

Next, study respondents were asked to report their highest completed level of education. The majority (41%) indicated a bachelor's degree was their highest level of education, followed by those who reported earning a graduate degree (28%). Figure 8 displays the results.

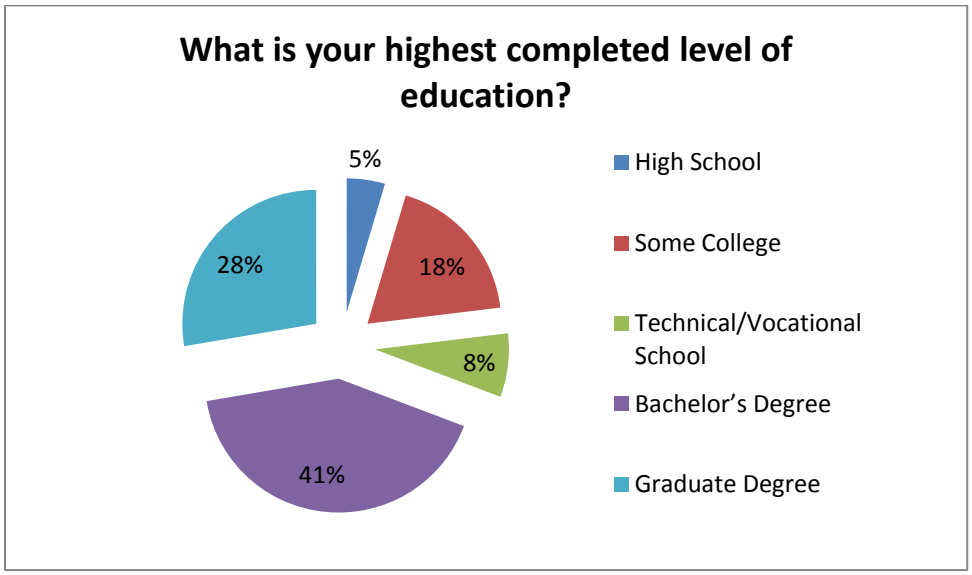

Figure 8. Highest levels of education completed by respondents

Study respondents were asked to report the professional societies and organizations they belonged to and were allowed to select more than one. The largest number of respondents (16) indicated they belonged to the U.S. Green Building Council (USGBC), while the other top two organizations were the Association of Energy Engineers (AEE) with 13 respondents and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) with nine respondents, as illustrated in Table 3.

Table 3. Professional Societies and Organizations to which Respondents Belonged

Society or Organization	Number of Respondents
None	27
AABC Commissioning Group (ACG)	0
American Institute of Architects (AIA)	2
American Society of Civil Engineers (ASCE)	1
American Society of Mechanical Engineers (ASME)	2
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	9
APPA	0
Association for the Advancement of Cost Engineering (AACE)	0
Association for Facilities Engineering	1
Association of Energy Engineers (AEE)	13
Building Commissioning Association (BCA)	2
Building Owners and Managers Association (BOMA)	2
Construction Specifications Institute (CSI)	1
International Association of Plumbing and Mechanical Officials (IAPMO)	0
International Building Performance Simulation Association (IBPSA)	1
International Code Council (ICC)	1
International Facility Management Association (IFMA)	1
International Union of Operating Engineers (IUOE)	0
Institute of Electrical and Electronics Engineers (IEEE)	1
Laborers' International Union of North America (LIUNA)	0
National Fire Protection Association (NFPA)	0
National Institute of Building Sciences (NIBS)	1
Service Employees International Union	1
Sheet Metal Workers' International Association (SMWIA)	0
United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (UA)	0
United Brotherhood of Carpenters	0
United Steelworkers (USW)	0
U.S. Green Building Council (USGBC)	16
Other Professional Organizations	16

Study respondents were also asked about their current building credentials. The top three credentials all belonged to BPI, with the largest number of respondents (28) indicating they hold the BPI Building Analyst credential, 20 respondents indicating they hold the BPI Multifamily

Professional credential, and 11 respondents indicating they hold the BPI Envelope Professional credential. The next highest credential category marked by respondents was AEE's Certified Energy Manager (CEM) designation; this category had seven respondents. Table 4 provides the complete list of credentials and the number of respondents who held each credential.

Table 4. Multifamily Building Credentials of Respondents

Credentials	Number of Respondents
None	15
AABC Commissioning Group Certified Commissioning Authority (CxA)	0
AABC Commissioning Group Certified Commissioning Technician (CxT)	0
American Society of Heating, Refrigerating and Air-Conditioning Engineers Building Energy Modeling Professional (BEMP)	1
American Society of Heating, Refrigerating and Air-Conditioning Engineers Commissioning Process Management Professional (CPMP)	1
American Society of Heating, Refrigerating and Air-Conditioning Engineers Operations and Performance Management Professional (OPMP)	0
Association for Facilities Engineering Certified Plant Engineer (CPE)	0
Association for Facilities Engineering Certified Plant Maintenance Manager (CPMM)	0
Association for Facilities Engineering Certified Plant Supervisor	0
Association of Energy Engineers Certified Building Energy Simulation Analyst (BESA)	0
Association of Energy Engineers Certified Building Commissioning Professional (CBCP)	0
Association of Energy Engineers Certified Energy Auditor (CEA)	1
Association of Energy Engineers Certified Energy Manager (CEM)	7
Association of Energy Engineers Existing Building Commissioning Professional (EBCP)	0
Association of Energy Engineers Energy Manager in Training (EMIT)	1
Association of Energy Engineers/Efficiency Valuation Organization Certified Measurement and Verification Professional	0
BOMI International Facilities Management Administrator (FMA)	0
BOMI International Real Property Administrator (RPA)	0
BOMI International Systems Maintenance Administrator (SMA)	0
BOMI International Systems Maintenance Technician (SMT)	0
BPI Energy Auditor	5
BPI Retrofit Installer	3
BPI Crew Leader	0
BPI Quality Control Inspector	2
BPI Building Analyst	28

Credentials	Number of Respondents
BPI Envelope Professional	11
BPI Residential Building Envelope Whole House Air Leakage Control Installer	0
BPI Manufactured Housing Professional	0
BPI Heating Professional	3
BPI Air Conditioned Heat Pump Professional	2
BPI Multifamily Professional	20
Building Commissioning Association Certified Commissioning Professional (CCP)	0
Building Operator Certification – Level I (BOC Level I)	1
Building Operator Certification – Level II (BOC Level II)	0
The City University of New York Energy Management and Indoor Air Quality Certification	0
Energy Audit Institute Commercial Energy Audit Certification	0
General Professional Accreditations Licensed Architect	0
General Professional Accreditations Professional Engineer (PE)	3
International Facility Management Association Facility Management Professional (FMP)	0
International Facility Management Association Certified Facility Manager (CFM)	0
National Energy and Sustainability Institute Commercial Energy Auditor Certification	0
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Other Building performance credential	13

Lastly, study respondents were asked how they heard about the study. The majority of study respondents (68%) indicated they heard about the study through a direct email invitation, as illustrated in Figure 9.

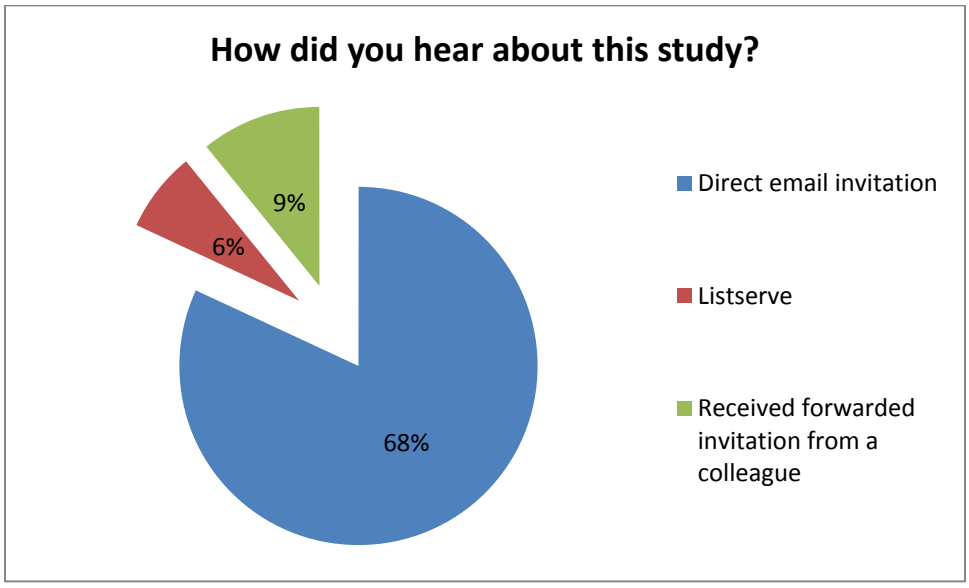

Figure 9. How respondents heard about the study

Overview of Study Respondents' Ratings for Task Statements

The mean ratings for task frequency ranged from 2.18 to 3.64, and the mean importance ratings ranged from 2.71 to 3.78. The standard deviation (SD) of the mean was calculated for each task to illustrate how closely the study responses tracked to each task mean. The smaller the SD, the more clustered the study responses are in relation to the mean and conversely, the greater the SD, the less clustered the study responses are in relation to the mean.

The standard error of the mean (SEM) was also computed for each of the task statements. The average of ratings of all tasks had a standard error of 0.13 (frequency ratings) and 0.11 (importance ratings), indicating that if the study were to be repeated with a different sample of study respondents the same results would be expected. Table 5 contains the results of the frequency and importance ratings as well as associated standard error of the means.

Table 5. Means and Standard Errors of Frequency and Importance Task Ratings

Duties and Tasks	Frequency			Importance		
	Mean	SD	SEM	Mean	SD	SEM
Assessing Project Viability						
Confirm Eligibility for Incentive Programs	3.10	1.07	0.15	3.33	0.93	0.13
Verify that Building Performance Upgrade Opportunities Exist	3.64	0.66	0.09	3.78	0.50	0.07
Verify Decision Maker's Interest in Energy Upgrade Projects	3.46	0.79	0.11	3.67	0.55	0.08
Verify Source of Funding for Energy Upgrade	2.80	1.12	0.16	3.33	0.95	0.13

Duties and Tasks	Frequency			Importance		
	Mean	SD	SEM	Mean	SD	SEM
Verify Internal Capacity to Perform Energy Upgrade Projects	2.98	0.94	0.13	3.25	0.80	0.11
Assess Key Risks to Project Completion	2.94	0.93	0.13	3.18	0.84	0.12
Propose Project Schedule	3.16	0.91	0.13	3.31	0.76	0.11
Develop Initial Services Agreement	3.14	0.97	0.14	3.37	0.72	0.10
Overseeing Building Performance Assessment						
Develop Building Performance Assessment Plan	2.94	1.00	0.14	3.14	0.90	0.13
Schedule Initial Building Performance Assessment	2.98	0.98	0.14	3.16	0.84	0.12
Manage On-Site Building Performance Assessment	3.08	0.92	0.13	3.16	0.77	0.11
Manage Production of Building Performance Assessment Report	3.14	0.95	0.13	3.26	0.69	0.10
Manage Quality Control of Building Performance Assessment Report	3.12	1.02	0.14	3.38	0.73	0.10
Negotiating Statement of Work						
Present Building Performance Assessment Recommendations to Decision Maker	3.44	0.86	0.12	3.71	0.50	0.07
Obtain Design Services	2.57	1.00	0.14	2.88	0.92	0.13
Finalize Program Scope of Work for Installations	3.54	0.68	0.10	3.65	0.48	0.07
Create a Contract for Work	3.20	1.01	0.14	3.47	0.67	0.09
Identify Procurement Requirements	3.18	0.94	0.13	3.38	0.73	0.10
Comply with Funding Approval Requirements	3.28	1.01	0.14	3.58	0.73	0.10
Procuring Installation						
Develop Conservation Measure Specifications	3.18	0.94	0.14	3.32	0.83	0.12
Select Qualified Contractors Based on Procurement Method	3.11	0.91	0.14	3.23	0.86	0.13
Finalize Scope of Work for Installations	3.49	0.66	0.10	3.73	0.50	0.08
Monitoring Construction						
Determine Documentation Requirements	3.18	0.81	0.12	3.22	0.77	0.11
Establish Change Order Process	2.89	1.03	0.15	3.07	0.87	0.13
Conduct Pre-Construction Meeting	3.27	0.72	0.11	3.31	0.73	0.11
Develop Inspection Plan	3.02	0.75	0.11	3.11	0.78	0.12
Perform Inspections	3.42	0.69	0.10	3.56	0.62	0.09
Ensure Installations Meet Requirements	3.60	0.62	0.09	3.69	0.56	0.08
Approve Invoices	3.47	0.79	0.12	3.55	0.63	0.09
Confirming Project Completion						

Duties and Tasks	Frequency			Importance		
	Mean	SD	SEM	Mean	SD	SEM
Perform Final Diagnostic Testing	2.93	0.99	0.15	3.36	0.80	0.12
Reconcile Documentation	3.02	0.81	0.12	3.13	0.76	0.11
Create Post-Monitoring Plan	2.29	0.89	0.13	2.71	0.73	0.11
Create Owner's Manuals	2.18	1.03	0.15	2.75	1.01	0.15
Facilitate Building Staff Training	2.42	0.87	0.13	3.02	0.79	0.12
Facilitate Resident Training	2.20	0.92	0.14	2.73	0.82	0.12
Finalize Payments	3.24	1.09	0.16	3.60	0.72	0.11

Reliability of Task Ratings

In order to determine the reliability of the frequency and importance task ratings, Cronbach's alpha was computed for both the frequency and importance scales. Cronbach's alpha ranges from zero to one and is affected by the number of questions and the number of respondents. An alpha value greater than 0.70 is considered acceptable, one greater than 0.80 is considered good, and one greater than 0.90 is considered excellent. For this study, the frequency scales had an alpha of 0.92 and the alpha for the importance scale was 0.90. These values indicate that the frequency and importance ratings for each of the tasks have excellent reliability and we can be confident that, as a whole, if these tasks were rated again by the same respondents the same results would be obtained.

Post-Validation Review Meeting Results

A subgroup of the original JTA SME panel for the multifamily retrofit project manager workshop was convened via webinar and conference call on Friday, August 9, 2013, to conduct the following activities:

- Ensure that appropriate and representative individuals responded to the study as understood by the JTA SME panel subgroup
- Review the tasks identified as having relatively low combined ratings (thus indicating they were ranked low in frequency or importance or both) to determine whether the tasks should be removed
- Review study respondent comments to determine whether any tasks were missed during the JTA meeting
- Determine the final content outline.

The post-validation study participants were as follows:

- Aronson, Nathan
- Bone, Dave
- Hasterok, Larry
- Lorentzen, Mark

- Hepinstall, Dave
- Robbins, Lindsay
- Salas, Glen

Review of Study Respondent Demographics

The post-validation study meeting participants reviewed the demographic information associated with the study participants and determined that a representative sample of individuals responded to the study. In other words, the post-validation study meeting participants—after reviewing summarized demographic data for the respondents—felt that the group of respondents adequately reflected the profession.

Review of Low-Rated Tasks

The purpose of this activity was to direct SME attention to the tasks that were rated relatively low by the study respondents and to discuss those tasks to ensure they belong on the final content outline. Tasks that had a combined mean frequency and importance rating below 8.00 (implying that the task is performed less than "occasionally" and is less important) were flagged for review during the post-study webinar.

The frequency and importance data was combined to form a single scale using the formula below:

Overall rating scale = 2*Importance + Frequency

Importance ratings were given extra weight in the combined scale. This is because while both frequency of task performance and task importance are both valuable rankings in certification credentialing examinations, importance is often thought of as having more bearing and therefore, should receive greater emphasis in the content outline.

There were three tasks that received a rating under 8 (listed in italics in Table 6). These tasks were reviewed by the reconvened SME panelists. Based on the frequency and importance ratings of the validation study, the post-validation study meeting participants decided to keep all three of the identified tasks, as they were determined to be important to the job of a multifamily retrofit project manager and should therefore be included in the final content outline.

Table 6. Combined Means and Frequencies of Duties and Tasks

Duties and Tasks	Frequency Mean
Assessing Project Viability	
Confirm Eligibility for Incentive Programs	9.77
Verify that Building Performance Upgrade Opportunities Exist	11.21
Verify Decision Maker's Interest in Energy Upgrade Projects	10.79
Verify Source of Funding for Energy Upgrade	9.47
Verify Internal Capacity to Perform Energy Upgrade Projects	9.49
Assess Key Risks to Project Completion	9.29

Duties and Tasks	Frequency Mean
Propose Project Schedule	9.79
Develop Initial Services Agreement	9.89
Overseeing Building Performance Assessment	
Develop Building Performance Assessment Plan	9.22
Schedule Initial Building Performance Assessment	9.30
Manage On-Site Building Performance Assessment	9.40
Manage Production of Building Performance Assessment Report	9.66
Manage Quality Control of Building Performance Assessment Report	9.88
Negotiating Statement of Work	
Present Building Performance Assessment Recommendations to Decision Maker	10.85
Obtain Design Services	8.33
Finalize Program Scope of Work for Installations	10.83
Create a Contract for Work	10.14
Identify Procurement Requirements	9.94
Comply with Funding Approval Requirements	10.44
Procuring Installation	
Develop Conservation Measure Specifications	9.81
Select Qualified Contractors Based on Procurement Method	9.57
Finalize Scope of Work For Installations	10.94
Monitoring Construction	
Determine Documentation Requirements	9.62
Establish Change Order Process	9.03
Conduct Pre-Construction Meeting	9.89
Develop Inspection Plan	9.24
Perform Inspections	10.53
Ensure Installations Meet Requirements	10.98
Approve Invoices	10.56
Confirming Project Completion	
Perform Final Diagnostic Testing	9.64
Reconcile Documentation	9.29
Create Post-Monitoring Plan	*7.71*
Create Owner's Manuals	*7.68*
Facilitate Building Staff Training	8.47
Facilitate Resident Training	*7.65*

Duties and Tasks	Frequency Mean
Finalize Payments	10.44

Review of Missing Tasks and Additional Comments

Study respondents were given an opportunity to identify tasks they felt were missing from the content provided in the online validation study. Six respondents submitted tasks, and all such items are included in Table 7. The post-validation study meeting participants reviewed each task and determined whether the content was already covered in the existing DACUM chart or whether it was outside the scope of professional practice. If it was not covered, the SMEs were asked to add the task to the job description. All missing tasks identified by the study respondents were already addressed or outside the scope of the profession. To that end, no additional tasks were added.

The result of the SME review was that all of the missing tasks identified by the study respondents were already addressed or outside the scope of the profession. To that end, no additional tasks were added based on this review. However, the comment listed in italics resulted in a suggestion to add the step "Review site-specific safety plan for occupants and workers" to the task "Determine Documentation Requirements" under the duty "Monitoring Construction."

Table 7. Tasks Identified by Study Respondents as Missing from the JTA Task List[a]

Missing Tasks
Production work over sight. Tracking phases/stages of each step in the process to ensure they are carried out on schedule.
Ongoing facility mgt. calibration (annual and/or as personnel change); as well as we can design and implement solutions, it is the facilities mgt that must keep it working and address changing conditions
Setting EE and Green Building standards, selecting verification methodology, in-house education for staff and management, personal development plan, building a culture of sustainability, life-cycle cost analysis, building contractor pool, managing consultants, developing management systems, benchmarking, post occupancy evaluation, developing and updating standard specifications, and more but I can't read the list of tasks anymore to review your list the way this survey is organized.
Oversee and manage others who perform similar functions in pursuit of the common goals of retrofit project completion.
Inspection of contractors equipment to ensure capacity
Develop realization monitoring for energy savings and indoor air quality
Training before or during installation for installers to the job particulars. Each job is unique.
More emphasis on creation and enforcement of site-specific safety plan.
ensure defect free work, not quality control, Generally in our world there is a overall PM that communicates with our PM and PM's of other trades on the project. The overall PM was probably not involved in the audit which is viewed as a sales and project development function. The PM's role is to build the project. Our PM's integrate to the overall PM to ensure we are on time, on budget, defect free, well documented. As our scope was developed by us change orders are virtually non-existent. Our PM's additional role is to further our relationship with our client at all levels continuously.
Knowledge of codes and Standards
Verify valid building permits for work

Missing Tasks
Human resource needs and management Code and specification compliance Specialty equipment requirements Project safety requirements Tenant Law requirements
Applying for incentive funds, providing completion verification to incentive provider
Customer survey on meeting building owners expectation.

[a] Tasks are noted in their original format, without edits, to maintain their integrity.

Lastly, study respondents were given an opportunity to provide additional comments. A total of eight study respondents submitted comments, and all such items are included in Table 8. Upon reviewing the submissions, the post-validation study meeting participants determined that the comments specifically related to duties, and tasks were already covered by the proposed content outline.

Table 8. Additional Comments Identified by Study Respondents[a]

Additional Comments
In the private sector, it's all about ROI (if it isn't just an 'emergency'); getting the final assessment results into a format such as a commercial 'HERS Index' can help as it justifies market value ... but even so, the split incentive problem is one that we all have to solve
The list as presented includes individual project functions but missed the long-range planning and educational functions necessary for high levels of achievement.
Thank you for the opportunity to participate in this survey. Developing a certification for this position is important.
Good luck.
This looks really program specific. It would be great if it served the public and private sectors. In the private sector we need to deliver defect free work every day on-time. My impression and experience is that this is not the case within public programs.
Not sure whether Project Management is really often practices a separate activity from the substantive Energy Auditing function.
Some of the roles described here are performed at the auditor level. Developing an assessmant plan, scheduling an assessment, creation of contracts and presentation to decision makers are all important, but these tasks are performed by the professional, experienced auditors, not the poject manager. The project manager comes in when a viable project is ready to be signed and then moves forward.
Been involved as general contractor to build & develop multifamily for 20 yrs. + All energy audits and retrofits now...

[a] Comments are noted in their original format, without edits, to maintain their integrity.

Final Weighting of Task List and Proposed Content Outline

The post-validation study meeting participants reviewed the results of the study and compared the results to the proposed content outline that resulted from the original JTA meeting. Table 9 contains the content outline with the original task weights proposed by the JTA panelists (column labeled SME Weights) and the weights resulting from the validation study (column labeled Study Weights). The strike-through text indicates changes to task weights made by the subgroup of reconvened multifamily SMEs during the post-validation review meeting.

Table 9. Comparison of Validation Study Results with JTA SME Panelists Weights

Duties and Tasks	Overall Ratings	Study Weights	SME Weights
Assessing Project Viability		22.8%	16%
Confirm Eligibility for Incentive Programs	9.77	2.8%	3%
Verify that Building Performance Upgrade Opportunities Exist	11.21	3.2%	3%
Verify Decision Maker's Interest in Energy Upgrade Projects	10.79	3.1%	3%
Verify Source of Funding for Energy Upgrade	9.47	2.7%	1%
Verify Internal Capacity to Perform Energy Upgrade Projects	9.49	2.7%	1%
Assess Key Risks to Project Completion	9.29	2.7%	3%
Propose Project Schedule	9.79	2.8%	1%
Develop Initial Services Agreement	9.89	2.8%	1%
Overseeing Building Performance Assessment		13.6%	20%
Develop Building Performance Assessment Plan	9.22	2.6%	4%
Schedule Initial Building Performance Assessment	9.30	2.7%	4%
Manage On-Site Building Performance Assessment	9.40	2.7%	4%
Manage Production of Building Performance Assessment Report	9.66	2.8%	4%
Manage Quality Control of Building Performance Assessment Report	9.88	2.8%	4%
Negotiating Statement of Work		17.4%	17%
Present Building Performance Assessment Recommendations to Decision Maker	10.85	3.1%	3%
Obtain Design Services	8.33	2.4%	2%
Finalize Program Scope of Work for Installations	10.83	3.1%	3%
Create a Contract for Work	10.14	2.9%	3%
Identify Procurement Requirements	9.94	2.9%	3%
Comply with Funding Approval Requirements	10.44	3.0%	3%
Procuring Installation		8.7%	13% ~~15%~~
Develop Conservation Measure Specifications	9.81	2.8%	4% ~~4.50%~~
Select Qualified Contractors Based on Procurement Method	9.57	2.8%	4% ~~4.50%~~
Finalize Scope of Work For Installations	10.94	3.1%	5% ~~6%~~
Monitoring Construction		20.0%	18% ~~16%~~
Determine Documentation Requirements	9.62	2.8%	3%

Duties and Tasks	Overall Ratings	Study Weights	SME Weights
Establish Change Order Process	9.03	2.6%	2%
Conduct Pre-Construction Meeting	9.89	2.8%	2%
Develop Inspection Plan	9.24	2.7%	2%
Perform Inspections	10.53	3.0%	3% ~~2%~~
Ensure Installations Meet Requirements	10.98	3.1%	3%
Approve Invoices	10.56	3.0%	3% ~~2%~~
Confirming Project Completion		17.5%	16%
Perform Final Diagnostic Testing	9.64	2.8%	3%
Reconcile Documentation	9.29	2.7%	3%
Create Post-Monitoring Plan	7.71	2.2%	1%
Create Owner's Manuals	7.68	2.2%	2%
Facilitate Building Staff Training	8.47	2.4%	2%
Facilitate Resident Training	7.65	2.2%	2%
Finalize Payments	10.44	3.0%	3%

After much discussion, the content outline was finalized, taking into consideration the results of the JTA meeting together with the validation study results. The SMEs decided to modify some of their weightings based on the results of the study. Specifically, adjustments were made to two task areas: "Procuring Installation" and "Monitoring Construction." The final content outline appears in Table 10 and provides an initial basis from which an assessment (e.g., a certification or licensure examination) may be constructed and provides curriculum developers with a model to align training to the core needs of the occupation.

Table 10. Final Content Outline for Multifamily Retrofit Project Managers

Duties and Tasks	Weighting
Assessing Project Viability	16%
Confirm Eligibility for Incentive Programs	3%
Verify that Building Performance Upgrade Opportunities Exist	3%
Verify Decision Maker's Interest in Energy Upgrade Projects	3%
Verify Source of Funding for Energy Upgrade	1%
Verify Internal Capacity to Perform Energy Upgrade Projects	1%
Assess Key Risks to Project Completion	3%
Propose Project Schedule	1%
Develop Initial Services Agreement	1%

Duties and Tasks	Weighting
Overseeing Building Performance Assessment	20%
Develop Building Performance Assessment Plan	4%
Schedule Initial Building Performance Assessment	4%
Manage On-Site Building Performance Assessment	4%
Manage Production of Building Performance Assessment Report	4%
Manage Quality Control of Building Performance Assessment Report	4%
Negotiating Statement of Work	17%
Present Building Performance Assessment Recommendations to Decision Maker	3%
Obtain Design Services	2%
Finalize Program Scope of Work for Installations	3%
Create a Contract for Work	3%
Identify Procurement Requirements	3%
Comply with Funding Approval Requirements	3%
Procuring Installation	13%
Develop Conservation Measure Specifications	4%
Select Qualified Contractors Based on Procurement Method	4%
Finalize Scope of Work For Installations	5%
Monitoring Construction	18%
Determine Documentation Requirements	3%
Establish Change Order Process	2%
Conduct Pre-Construction Meeting	2%
Develop Inspection Plan	2%
Perform Inspections	3%
Ensure Installations Meet Requirements	3%
Approve Invoices	3%
Confirming Project Completion	16%
Perform Final Diagnostic Testing	3%
Reconcile Documentation	3%
Create Post-Monitoring Plan	1%
Create Owner's Manuals	2%
Facilitate Building Staff Training	2%
Facilitate Resident Training	2%
Finalize Payments	3%
Total	100%

The validation study confirmed that the job description for a multifamily retrofit project manager developed and compiled by the 12 SME panelists was accurate and thorough. Specifically, the study validated the job-related tasks for a multifamily retrofit project manager that had been identified by the SME panelist during the 3-day workshop.

Analysis of the study data (study respondents' frequency and importance ratings of these job-related tasks) also provides a benchmark to evaluate the weighting of the content outline that had been developed by the SME panelists. This analysis provides greater assurance that the final content outline produced as part of this multifamily retrofit project manager JTA process can be used with confidence to develop credentialing programs and/or curriculum.

References

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

Brannick, M. T.; Levine, E. L.; Morgeson, F. P. (2007). *Job and work analysis: Methods, research and applications for human resource management*. Thousand Oaks, CA: Sage.

Newman, L.S.; Slaughter, R.C.; Taranath, S.N. (April 1999). *The selection and use of rating scales in task studies: A review of current job analysis practice.* Paper presented at the annual meeting of the National Council of Measurement in Education, Montreal, Canada.

Raymond, M.R. (2001). Job analysis and the specification of content for licensure and certification examinations. *Applied Measurement in Education 14*(4), 369–415.

Appendix A. Opportunity Announcement

The National Renewable Energy Laboratory (NREL) and Professional Testing, Inc. are seeking participants for a **three-day workshop in Denver, Colorado**, to inventory the tasks and skills that best define the common body of required knowledge for workers in the multifamily (MF) housing sector.

To facilitate development of these MF-specific JTAs/KSAs, Professional Testing, Inc. is seeking current industry practitioners who have **the experience and vision to help define and promote energy efficiency in the multifamily housing sector** by participating in these JTA/KSA development workshops. Interested individuals are invited to submit their credentials by Monday, April 1st.

Please note that each JTA/KSA workshop is anticipated to last three full days (excluding travel). Reimbursement for travel costs up to a fixed amount, a travel per diem, and an honorarium will be awarded to individuals selected for participation. Please visit http://proftesting.rapidinsites.com for additional project details, including how practitioners will be selected and where to direct project-related questions.

NREL and Professional Testing, Inc. are excited to facilitate this unique, foundational opportunity for industry practitioners to provide their expertise and insight during this important development process. Thank you for your time.

Sincerely,
The NREL Home Energy Professionals Project Team

If you have any questions or comments about this email bulletin, please contact workforce.guidelines@nrel.gov.

Appendix B. Job/Task Analysis for a Multifamily Retrofit Project Manager

This appendix was developed as a result of the JTA workshop and served as the foundation for building the online validation study.

In addition to providing historical reference, this initial product of the JTA process profiles the job of a multifamily retrofit project manager, and may also be used to develop training or examination content.

Multifamily Retrofit Project Manager Job Description

Multifamily retrofit project managers direct and assure the successful completion of the building performance assessment, work scope development, and installation of conservation measures to reduce operating costs and achieve energy savings while ensuring the health and environmental safety of the building occupants.

A proposed content outline resulting from this analysis follows.

Multifamily Retrofit Project Manager Duty Areas

A	Assessing Project Viability
B	Overseeing Building Performance Assessment
C	Negotiating Statement of Work
D	Procuring Installation
E	Monitoring Construction
F	Confirming Project Completion

This Job/Task Analysis used input from a broad group of industry practitioners and was facilitated by Professional Testing, Inc. for the National Renewable Energy Laboratory (NREL) and was funded by DOE's Weatherization Assistance Program (WAP).

Introduction

NREL secured the services of Professional Testing to help develop a JTA for multifamily retrofit project managers.

JTA is a procedure for analyzing the tasks performed by individuals in an occupation, as well as the knowledge, skills, and abilities required to perform those tasks. Specifically, a JTA can be defined as "any systematic procedure for collecting and analyzing job-related information to meet a particular purpose" (Raymond 2001). JTA can be used to describe, classify, and evaluate jobs; ensure compliance with legal and quasi-legal requirements; develop training, promote worker mobility, plan workforces, increase efficiency and safety, and appraise performance (Brannick et al. 2007).

JTA is traditionally used by secondary and postsecondary educators; test developers; and business, industry, government, and military trainers to help identify core knowledge areas, critical work functions, and skills that are common across a representative sampling of current practitioners.

This project used the "developing a curriculum" (DACUM) method to conduct a JTA. DACUM is an occupational analysis led by a trained facilitator, where practitioners in a specific occupation come together for a multiday workshop to provide input about the specific tasks, knowledge, and skills needed to perform their jobs.

This appendix provides draft results of the analysis and will form the basis for a subsequent "industry validation" phase, where a larger group of industry practitioners will evaluate the list of job-related tasks. This group will ensure that the identified tasks and weighting factors accurately represent the job of a multifamily retrofit project manager. This step will also provide an opportunity for industry to identify any missed tasks or any that were included erroneously.

The content presented in this appendix was created by industry practitioners and is intended to portray the job of a multifamily retrofit project manager as currently practiced.

Subject Matter Expert Selection Process

Professional Testing helped to establish the criteria for selecting the DACUM panel of SMEs. To be eligible for the workshop panel, applicants were required to submit an electronic application and to demonstrate that they were active practitioners in their field. To create a representative panel of practitioners, Professional Testing, with NREL, established criteria to select SMEs from a larger applicant pool to ensure:

- Geographic (including regional/climatic) diversity
- Representation of a wide range of experience levels (novice to expert)
- No single organization or organization size dominated the group
- All sectors were represented with no single sector dominating (public versus private)
- Diversity of industry-related credentials, represented by the panelists.

Twelve applicants meeting the above criteria were selected for the multifamily retrofit project manager SME panel.

The DACUM Philosophy

- **Practitioners can describe and define their jobs more accurately than anyone else.**
- **One of the most effective ways to define a job is to describe the tasks practitioners perform.**
- **All jobs can be effectively and sufficiently described in terms of the tasks successful workers perform.**
- **All tasks, to be performed correctly, demand certain knowledge, skills, abilities, attributes, and tools.**

Job/Task Analysis Workshop

The multifamily retrofit project manager JTA workshop was held in Lakewood, Colorado, May 6–8, 2013.

Day 1 consisted of an introduction to the DACUM process. The trained DACUM facilitator explained the JTA process and provided the SME panel with duty and task statement definitions. (A duty reflects a large area of work for a specific profession; multiple tasks describe how to perform each duty.)

The presentation then shifted to a discussion about multifamily retrofit project managers, more specifically the "who, how, what, and why" of the profession. The SME panelists compiled this information into a comprehensive list to capture key multifamily retrofit project manager job components.

The next step was to identify duty (or domain) areas. Once the SME panelists reached consensus on the duty areas, they delineated each duty by identifying the required tasks.

On Day 2, the facilitator projected a spreadsheet that contained the identified duty areas and corresponding task statements. The SMEs were asked to list the steps under each task and to identify the knowledge, skills, abilities, and tools needed to complete each task.

On Day 3, work concluded with the SMEs finalizing an overarching job description for multifamily retrofit project managers.

Results

This appendix presents aspects of a multifamily retrofit project manager, as captured by the 12-member panel during the May 6–8, 2013, JTA workshop in Lakewood, Colorado. The tables that follow reflect job requirements and are meant to provide a clear understanding and detailed description of the work performed.

References

Brannick, M. T.; Levine, E. L.; Morgeson, F. P. (2007). *Job and work analysis: Methods, research and applications for human resource management*. Thousand Oaks, CA: Sage.

Raymond, M.R. (2001). Job analysis and the specification of content for licensure and certification examinations. *Applied Measurement in Education 14*(4), 369–415

Nomenclature

Table B-1 provides a list of the acronyms and abbreviations used in this appendix. In addition to increasing the efficiency of communications, many technical and process acronyms are useful in memory retention and learning. Occupational acronyms are therefore of interest to trainers and curriculum designers.

Table B-1. List of Acronyms and Abbreviations

Nomenclature	Definition
ADA	Americans with Disabilities Act
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
DACUM	Developing a curriculum
JTA	Job/task analysis
HUD	Department of Housing and Urban Development
OSHA	Occupational Safety and Health Administration
O&M	Operations and maintenance

Nomenclature	Definition
PPE	Personal protective equipment
RFI	Request for information
ROI	Return on investment
ROM	Rough order of magnitude
SME	Subject matter expert

Proposed Content Outline

The SMEs rated the list of job-related tasks composing duties defined during the JTA workshop based on a two-factor scale: the importance of the duty area to overall job performance and the frequency with which duties are performed. The result is a weighted ranking of the duties and tasks known as a *content outline*. After reviewing the results of their ratings, the SMEs made qualitative judgments as to how they would adjust the rating to reflect their practice.

The proposed content outline provides an initial basis from which an assessment (e.g., a certification or licensure examination) may be constructed and provides curriculum developers with a model to align training to the core needs of the occupation.

Table B-2. Proposed Content Outline for Multifamily Retrofit Project Managers

	Duties and Tasks	Weighting	SME Suggested Weighting
A	Assessing Project Viability	22.95%	16%
1	Confirm Eligibility for Incentive Programs	3.05%	3%
2	Verify that Building Performance Upgrade Opportunities Exist	3.21%	3%
3	Verify Decision Maker's Interest in Energy Upgrade Projects	3.05%	3%
4	Verify Source of Funding for Energy Upgrade	2.73%	1%
5	Verify Internal Capacity to Perform Energy Upgrade Projects	2.73%	1%
6	Assess Key Risks to Project Completion	3.21%	3%
7	Propose Project Schedule	2.73%	1%
8	Develop Initial Services Agreement	2.25%	1%
B	Overseeing Building Performance Assessment	14.29%	20%
1	Develop Building Performance Assessment Plan	2.89%	4%
2	Schedule Initial Building Performance Assessment	2.73%	4%
3	Manage On-Site Building Performance Assessment	2.73%	4%
4	Manage Production of Building Performance Assessment Report	2.89%	4%
5	Manage Quality Control of Building Performance Assessment Report	3.05%	4%

	Duties and Tasks	Weighting	SME Suggested Weighting
C	Negotiating Statement of Work	16.85%	17%
1	Present Building Performance Assessment Recommendations to Decision Maker	2.89%	3%
2	Obtain Design Services	1.93%	2%
3	Finalize Program Scope of Work for Installations	3.21%	3%
4	Create a Contract for Work	2.89%	3%
5	Identify Procurement Requirements	2.73%	3%
6	Comply with Funding Approval Requirements	3.21%	3%
D	Procuring Installation	8.51%	15%
1	Develop Conservation Measure Specifications	2.73%	4.5%
2	Select Qualified Contractors Based on Procurement Method	2.73%	4.5%
3	Finalize Scope of Work for Installations	3.05%	6%
E	Monitoring Construction	19.74%	16%
1	Determine Documentation Requirements	3.05%	3%
2	Establish Change Order Process	2.57%	2%
3	Conduct Pre-Construction Meeting	2.57%	2%
4	Develop Inspection Plan	2.73%	2%
5	Perform Inspections	2.89%	2%
6	Ensure Installations Meet Requirements	3.05%	3%
7	Approve Invoices	2.89%	2%
F	Confirming Project Completion	17.66%	16%
1	Perform Final Diagnostic Testing	2.89%	3%
2	Reconcile Documentation	3.05%	3%
3	Create Post-Monitoring Plan	1.77%	1%
4	Create Owner's Manuals	2.25%	2%
5	Facilitate Building Staff Training	2.41%	2%
6	Facilitate Resident Training	2.41%	2%
7	Finalize Payments	2.89%	3%
		100.00%	100%

Knowledge

The SMEs identified and categorized specific types of knowledge needed to be a proficient multifamily retrofit project manager (Table B-3). General knowledge areas (calculations, basic measurements, and communications), although not exclusive to this occupation, were also identified using a group consensus process (Table B-4). The panelists concluded that a

practitioner must master the knowledge in both tables to be competent as a multifamily retrofit project manager.

Table B-3. Specialized Knowledge Required of Multifamily Retrofit Project Managers

Specialized Knowledge	
ADA	Apartment access laws
Assumptions of service agreement	Audit equipment
Audit recommendations	Audit software
Available funds	Average task timelines
Bidding process	Billing analysis
Blueprints	Bonding
Budget	Budgeting
Building financing	Building management structure
Building ownership	Building performance assessment
Building remodeling fund	Building reserve
Building rules	Building science
Building staff	Building systems
Business laws	Change order process
Change order requests	Climate constraints
Codes, standards, and regulations	Conservation measures
Construction management	Construction process
Construction schedule	Construction standards
Construction status	Contract budget
Contract details	Contract execution
Contract laws	Contract requirements
Contract templates	Contractor capacity
Contractor qualifications	Contracts
Control system	Cost estimating
Data logging	Design firms
Diagnostic testing	Emerging technologies
Energy audit assessment	Energy model concepts
Energy modeling	Energy upgrade measures
Engineering contracting	Environmental hazards
Environmental standards	Equipment
Finance	Financial modeling
Financing	Financing programs
Group dynamics	Health and environmental safety standards
Health and environmental safety	Health and environmental safety and comfort

Specialized Knowledge	
Health and environmental safety requirements	Historical review process
Incentive programs	Income documentation
Installation of conservation measures	Installation standards
Insurance	Invoice policies
Invoicing process	Licensing requirements for trades
Liens	Local code requirements
Local regulations for notification	Material properties
Measure installation	Mechanical design concepts
Monitoring	Multifamily building data
Multifamily building systems	Multifamily financing
Multifamily regulatory framework	Multifamily upgrade measures
Normal utility usage	Occupant surveys
Operation and maintenance procedures	Organization's contracts
OSHA	Owner's representative
Payment approval process	Payment schedule
Permitting process	Physical constraints
Policies and procedures	PPE requirements
Pricing of measure	Procurement
Program contracts	Program requirements
Program rules	Project management
Project schedule	Proposal evaluation
Quality control best practices	Range of measures
Regulatory requirements	Rental industry
Resident training	Resident usage
RFIs	Risk management
ROI	Roles and responsibilities
Scope of work	Sequence of operation
Special needs population	Staff capacity
Staff skill set	Status of payments
Steps of building performance assessment	Sub-contractors capabilities
Technical audit terms	Technical specifications
Technical specifications of conservation measures	Tenant laws
Testing procedures	Timeline
Trade requirements	Types of energy used in buildings
Vendor capacity to train	Wage requirements
Weather normalization	

Table B-4. General Knowledge Required of Multifamily Retrofit Project Managers

General Knowledge	
Calculations	
Change numbers from fractions into decimals and back	Change numbers from percentages into decimals and back
Collect information to solve a problem	Compare numbers
Figure averages	Make rough estimates
Perform math operations using signed (positive and negative) numbers	Perform math operations using single and multiple digit numbers
Perform mathematical operations with decimals	Perform mathematical operations with fractions
Perform simple math operations of addition	Perform simple math operations of division
Perform simple math operations of multiplication	Perform simple math operations of subtraction
Solve percent problems	Solve problems with graphs
Solve ratio problems	Transfer number sequences from a source into a column
Use a calculator	
Basic Measurements	
Calculate the perimeter and areas of common figures	Convert measurements from one unit to another (English to Metric, etc.)
Estimate and approximate measurements	Find distances and directions on land maps
Find the dimensions of an object from a scale drawing	Make simple scale drawings
Measure area (square inches, square centimeters, etc.)	Measure board feet
Measure length to 1/4 of an inch	Measure linear distances (length, width, etc.)
Measure temperature to within 1 degree Fahrenheit	Measure volume (cubic inches, liters, etc.)
Read and apply coefficient measurements indicated in a table or chart	Read and use the scale of a drawing
Read measurements taken with common measuring tools	Read, interpret, and use size-scale relationships
Record measurements, using appropriate unit notations (feet, yards, etc.)	Use tools to measure quantities and solve problems involving measurements
Communications	
Apply assertiveness	Ask questions
Communicate using the vocabulary/terminology of a related trade	Communicate with co-workers and/or business people in writing (letters, memos)
Communicate with co-workers and/or business people verbally (face-to-face)	Communicate with co-workers and/or business people verbally (telephone, radio)
Compare names	Evaluate options/alternatives

General Knowledge	
Evaluate solutions	Explain procedures
Find information in catalogs	Find information in references (machinery handbook, tap/drill charts, etc.)
Follow verbal job instructions	Listen
Participate in brainstorming	Present to others
Read and follow a map, chart, plan, etc.	
Communications	
Read and follow directions found in equipment manuals and code books	Read and interpret directions found on labels, packages, or instruction sheets
Read codes (building codes, electrical codes, standards, etc.)	Read drawings and specifications sheets
Read flowcharts	Read information from tables and graphs (bar, circle, etc.)
Read statistical data	Research information
Speak to large groups	Summarize information
Write reports	Write words and numbers legibly

Skills, Abilities, and Attributes

A proficient worker possesses key skills, abilities, and attributes that influence job success. Skills are developed through experience and training and may apply to a wide range of tasks; proper skills enable workers to perform their tasks with precision and quality.

Abilities and attributes are more fundamental than knowledge and skills; they represent underlying, enduring traits, both cognitive and physical, that support the successful performance of a wide range of job tasks.

The panelists identified task-specific skills and abilities, as well as broad attributes (e.g., analytic, creative, patient); to define the recommended traits a multifamily retrofit project manager should possess (Table B-5).

Human resource professionals and job analysts often analyze skills, abilities, and attributes to compare jobs in terms of worker characteristics.

Table B-5. Skills, Abilities, and Attributes Required of Multifamily Retrofit Project Managers

Skills, Abilities, and Attributes	
Accurate/Precise	Adaptable/Flexible
Analytical	Appropriate dresser
Basic accounting	Basic math
Billing analysis	Budgeting
Common sense	Communication

Skills, Abilities, and Attributes	
Computer	Confident
Conflict resolution	Conscientious
Contract writing	Cooperative
Coordination	Courteous
Creative	Creativity
Critical thinking	Customer-oriented
Data collection	Decision-making
Decisive	Dependable
Detail-oriented	Eager to learn new things
Editing	Empathetic
Enthusiasm	Estimating
Ethical	Facilitation
Financing	Flexibility
Focused	Free of substance abuse
Friendly	Goal-oriented
Helpful	Honest
Industrious	Initiative
Inspection	Integrity
Interpersonal	Interviewing
Lack of prejudice (bias)	Leader
Leadership	Listening
Manage stress/pressure	Meeting management
Meticulous	Multi-tasking
Neat	Negotiating
Non-aggressive	Observation
Open-minded to change	Organizational
Patience	Perseverance
Persistent	Personal hygiene
Persuasion	Positive attitude
Presentation	Pride in job
Prioritizing	Problem solving
Professional	Publishing
Punctual	Quality focused
Read mechanical drawings	Reporting

Skills, Abilities, and Attributes	
Research	Respectful
Responsible/accountable	Safety conscious
Sales	Scheduling
Self-control	Self-discipline
Self-esteem	Self-motivated
Sensitive to thoughts of others	Social skills
Tactful	Team player
Technical writing	Thorough
Time estimating	Time management
Timely	Tolerant
Training	Trustworthy
Unbiased	Work efficiently (resources)
Work efficiently (time)	Work in teams

Physical Conditions

In any job, the environment in which tasks are completed and the specific physical requirements necessary to complete each task must be understood. Awareness of physical conditions is useful for a variety of purposes, including ergonomic design, safety analysis, and the identification of job elements that are deemed essential functions for compliance with the Americans with Disabilities Act.

Table B-6 contains the list of panelist-recommended physical conditions a multifamily retrofit project manager should possess.

Table B-6. Physical Conditions Recommended for Multifamily Retrofit Project Managers

Physical Conditions	
Carry objects of up to 25 pounds	Climb ladders, stairs, poles, etc. using legs and/or arms
Crawl or creep	Detect abnormal noises
Hear speech	Hold or move objects using the fingers
Hold or move objects using the hands but not the fingers	Judge depth (the position and distance of objects) with the eyes
Lift objects from ground to waist level	Reach with arms and hands in any direction
See clearly at 20 feet or more (with/without optical assistance)	See clearly at 20 inches or less (with/without optical assistance)
Sit part of the time	Stand at all (could the work be performed from a sitting position?)
Stand part of the time	Stoop kneel or crouch

Physical Conditions	
Talk	Walk
Work around or near high voltage power sources or equipment	Work around or near magnetic equipment or materials
Work at heights of 1 to 25 feet above ground or floor level	Work at heights of 26 to 75 feet above ground or floor level
Work at heights of 76 feet or higher above ground or floor level	Work in changing temperatures (in and out of buildings repeatedly)
Work in confined spaces	Work in damp places (high humidity, some standing water)
Work in dry places (lacking any natural moisture or humidity)	Work in dust, oils, fumes, or smells
Work in high temperatures (85 to 130 degrees Fahrenheit)	Work in low temperatures (0 to 45 degrees Fahrenheit)
Work in noisy places (85 decibels or higher with ear protection)	Work in one place (no change of work location)
Work in stale air (with some oxygen depletion)	Work inside
Work on slippery surfaces	Work outside
Work while standing on portable ladders	Work while standing on scaffolding
Work while wearing protective equipment (respirators, hoods, etc.)	Work with hands and arms over head level
Work with or near fiberglass or asbestos materials	Write or type at a fast speed

Tools, Equipment, and Resources

Each occupation requires a unique set of support materials. It is important to identify the tools, equipment, and other tangible objects, as well as the resources (e.g., information technologies, codes, and standards) required for a worker to effectively accomplish tasks. Table B-7 lists the panelist-identified inventory of tools, equipment, and resources necessary to perform the identified tasks.

Table B-7. Tools, Equipment, and Resources Used by Multifamily Retrofit Project Managers

Tools, Equipment, and Resources	
General Tools, Equipment, and Resources	
Accounting department	Accounting software
Architectural scale	Billing analysis software
Binders	Budget tracking software
Budgeting software	Calculator
Camera	Clip board
Combustion efficiency test	Codes of all authorities having jurisdiction
Computer projector	Computer

Tools, Equipment, and Resources	
Contract documents	Construction contracts
Contracting board	Contract template
Contracts	Debarred list of contractors
Digital camera	Diagnostic equipment
Editor	Energy modeling software
Equipment documentation	Equipment inventory
Equipment manuals	Estimating software
Flashlight	Financial department
Food	Handouts
Health and environmental safety plan	Health and environmental safety procedures
HUD	Infrared camera
Installed equipment manuals	Installed equipment specifications
Internet	Invoice templates
Ladder	Lawyers
List of licensed contractors	Meeting location
Moisture meter	Monitoring equipment
Monitoring software	Office supplies
Organization's health and environmental safety plan	OSHA
OSHA laws	Owner's manual
Personal protective equipment	Phone
Photographs	Policy and procedure manuals
Presentation software	Printer
Procurement manuals	Product sample
Professional network	Program documents
Program requirements	Project management software
Projector	Publishing software
Purchasing manager	Regulations
Scheduling software	Spreadsheet software
Standard testing methodology	Technical specifications
Word processing software	
Personal Protective Equipment (PPE)	
Booties	Personal carbon monoxide detector
Dust Mask	Respirator mask
Gloves	Safety glasses

Tools, Equipment, and Resources	
Hard hat	Supportive footwear
Kneepads	Tyvek suit
Diagnostic Equipment	
Blower door	Duct blower
Carbon monoxide monitor	Flow hood
Combustion analyzer	Infrared camera
Computer	Moisture meter
Data Loggers	Pressure diagnostic tools

DACUM Chart

The DACUM chart (Table B-8) is a tabular representation of the JTA. Capital letters identify major job duty areas. Numbers identify tasks, and lowercase letters identify the steps required to accomplish each task. Moving horizontally across the chart, adjacent columns detail (1) specialized knowledge, (2) skills and abilities, and (3) tools, equipment, and resources required to perform each task. The information contained in these columns is related to each task and does not necessarily correspond to a specific step.

The importance of the DACUM chart is to show the relationship between job tasks and the specialized knowledge, skills and abilities, and tools, equipment, and resources required to perform each task. This concept, called *job-relatedness*, is essential to compliance with key legal and professional validity standards pertaining to the use of JTA information in employee selection. Such information is also critical to the development of high-stakes assessments for occupational licensing and certification examinations.

The DACUM chart depicts the job element relationships associated with each task and can therefore easily be used to assess the relevance of current programs (curriculum), develop instructional objectives and training content, sequence instructional materials, and develop examination, competency, and performance evaluation instruments.

Table B-8. DACUM Chart for Multifamily Retrofit Project Managers

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
A	Assessing Project Viability			
1	Confirm Eligibility for Incentive Programs			
a	Review program requirements	Building ownership Incentive programs Income documentation Multifamily building data Multifamily regulatory framework	Analytical Creativity Data collection Decision-making Detail-oriented Persistent Research	Computer HUD Internet Phone Professional network
b	Collect relevant data on building			
c	Identify relevant incentive programs			
d	Match building with appropriate incentive programs			
2	Verify that Building Performance Upgrade Opportunities Exist			
a	Collect building information necessary for scoping	Building science Environmental hazards Health and environmental safety and comfort Multifamily building systems Multifamily upgrade measures Normal utility usage Types of energy used in buildings	Billing analysis Data collection Detail-oriented Interviewing Persuasion Tactful	Clip board Combustion efficiency test Digital camera Flashlight Infrared camera Ladder Moisture meter PPE
b	Collect energy use data			
c	Collect water use data			
d	Perform scoping session (walk-thru)			
e	Review existing building systems			
f	Benchmark energy data			
g	Benchmark water data			
h	Identify environmental hazards			
i	Define scope of opportunity			
3	Verify Decision Maker's Interest in Energy Upgrade Projects			
a	Identify building decision maker	Available funds Building financing Building management structure	Analytical Communication Interviewing Listening	Computer Photographs Presentation software
b	Interview building decision maker			
c	Communicate initial findings to building decision maker			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
d	Educate decision maker about their responsibilities in implementing projects	Income documentation Multifamily financing Program requirements Project schedule		Printer
e	Determine the building decision maker's capacity to pay for the probable scope of work			
f	Determine decision maker's interest in energy upgrade			
4	Verify Source of Funding for Energy Upgrade			
a	Create preliminary budget	Building remodeling fund Building reserve Finance Financing programs Incentive programs Pricing of measure	Analytical Budgeting Detail-oriented Organizational Research Time management	Budgeting software Calculator Computer Internet Professional network Spreadsheet software
b	Identify financing opportunities			
c	Create the preliminary financing plan			
d	Apply to incentive programs			
e	Apply to financing programs			
f	Identify leveraging opportunities			
5	Verify Internal Capacity to Perform Energy Upgrade Projects			
a	Review back log of staff	Staff skill set	Communication Prioritizing Time estimating Time management	Computer Equipment inventory Professional network Scheduling software
b	Determine if staff has requisite skill set			
c	Review proposed work			
d	Identify need for external resources			
e	Identify staff training needs			
f	Identify equipment needs			
6	Assess Key Risks to Project Completion			
a	Review insurance requirements	ADA Bonding Health and environmental	Detail-oriented Research	Codes of all authorities having jurisdiction OSHA laws
b	Verify liability coverage is in place			
c	Obtain insurance			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
d	Identify health and environmental safety hazards	safety hazards Historical review process Insurance Local code requirements OSHA Wage requirements		Program requirements Regulations
e	Identify code deficiencies			
f	Identify special populations			
g	Identify other planned capital improvements			
h	Identify regulatory approvals			
i	Identify when to defer project			
j	Identify when to refer project to other resources			
7	Propose Project Schedule			
a	Outline project framework	Average task timelines Climate constraints Construction management Contractor capacity Physical constraints Project management Staff capacity	Detail-oriented Estimating Multi-tasking Scheduling	Computer Phone Project management software Scheduling software
b	Determine energy and water audit schedule			
c	Identify constraints to the project schedule			
d	Identify project staff and contractors			
e	Develop procurement schedule			
f	Develop construction schedule			
g	Develop inspection schedule			
8	Develop Initial Services Agreement			
a	Create initial services agreement	Business laws Contracts Cost estimating Sub-contractors capabilities	Negotiating	Calculator Computer Financial department Lawyers Printer Spreadsheet software
b	Create initial services budget			
c	Negotiate initial services agreement with building decision maker			
d	Execute initial services agreement			
e	Create sub-contractor agreements			
f	Execute sub-contractor agreements			
B	Overseeing Building Performance Assessment			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
1	Develop Building Performance Assessment Plan			
a	Identify scope of building performance assessment plan	Assumptions of service agreement Blueprints Emerging technologies Program requirements Steps of building performance assessment	Communication Empathy Interpersonal	Architectural scale Computer Internet Phone
b	Determine sampling protocol based on program requirements			
c	Update utility bill data			
d	Determine diagnostic testing requirements			
e	Determine common areas' auditing requirements			
f	Obtain building plans			
g	Obtain maintenance records			
h	Identify key building occupants			
i	Obtain appliance inventory			
j	Obtain mechanical equipment inventory			
k	Identify key building staff			
l	Identify building access requirements			
m	Identify opportunities for using new technologies			
2	Schedule Initial Building Performance Assessment			
a	Determine staff availability	Apartment access laws Building rules Local regulations for notification Occupant surveys Special needs population	Scheduling Research	Computer Phone
b	Determine legal apartment entry requirements			
c	Notify tenants of building performance assessment schedule according to local regulations			
d	Identify building personnel for interviews			
e	Assure residents are interviewed			
f	Identify building personnel for access			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
g	Coordinate schedule with personnel			
3	Manage On-Site Building Performance Assessment			
a	Determine when to conduct site visits	Audit equipment Building performance assessment Energy audit assessment Conservation measures Technical audit terms	Communication Coordination Facilitation Leadership Reporting	
b	Determine equipment needs			
c	Verify that energy audit plan meets all project requirements			
d	Conduct a kick-off meeting			
e	Track building performance assessment expenses against budget			
f	Track building performance assessment progress against schedule			
4	Manage Production of Building Performance Assessment Report			
a	Check status of energy modeling against schedule	Audit software Cost estimating Energy modeling	Communication Conflict resolution Flexibility Multi-tasking Problem solving Scheduling	Budget tracking software Computer Estimating software Internet Phone Professional network Scheduling software
b	Check status of final building performance assessment report			
c	Resolve conflicts within the report process			
d	Assist in cost estimating			
e	Update building decision maker of report progress			
5	Manage Quality Control of Building Performance Assessment Report			
a	Reconcile recommendations against program requirements	Audit recommendations Health and environmental safety requirements	Detail-oriented Editing Technical writing	Energy modeling software Spreadsheet
b	Ensure engineering quality control was completed			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Review final building performance assessment report	Program requirements Quality control best practices		software Word processing software
d	Review health and environmental safety requirements			
e	Review measure costs estimates			
f	Proofread report			
g	Review billing analysis			
h	Review financial modeling results			
i	Review energy modeling results			
C	Negotiating Statement of Work			
1	Present Building Performance Assessment Recommendations to Decision Maker			
a	Prepare summary level presentation for decision maker	Conservation measures Financing Program requirements Rental industry ROI	Negotiating Presentation Sales	Computer Presentation software
b	Schedule meeting with decision maker			
c	Discuss recommendations with decision maker			
d	Obtain decision maker's input on recommendations			
e	Negotiate installation scope of work			
2	Obtain Design Services			
a	Identify conservation measures that require a design	Design firms Engineering contracting Measure specifications Mechanical design concepts	Communication Read mechanical drawings Scheduling Time management	Computer Scheduling software
b	Engage design firm to perform design specifications			
c	Facilitate contract with design firms			
d	Revise master schedule to accommodate design services			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
e	Manage design firm contract			
3	Finalize Program Scope of Work for Installations			
a	Verify energy model is updated with scope changes	Contracts Energy model concepts Energy upgrade measures Financing Risk management	Budgeting Negotiating Scheduling Technical writing	Budgeting software Computer Phone Scheduling software Spreadsheet software Word processing software
b	Verify cost estimates are updated with scope changes			
c	Verify financial plan is updated			
d	Revise budget to reflect negotiated changes			
e	Update the building performance assessment report			
f	Obtain approvals from stakeholders			
4	Create a Contract for Work			
a	Identify location of work	Business laws Contract laws Contract templates Licensing requirements for trades	Contract writing	Computer Contract template Word processing software
b	Identify contracting entities			
c	Incorporate scope of work into contract			
d	Incorporate project schedule into contract			
e	Incorporate budget into contract			
f	Execute contract			
5	Identify Procurement Requirements			
a	Compare costs to procurement thresholds	Procurement	Communication Research Time management	Computer Phone Purchasing manager
b	Review building decision maker's procurement requirements			
c	Review program procurement requirements			
d	Define procurement plans			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
e	Adjust project schedule to reflect procurement plans			
6	Comply with Funding Approval Requirements			
a	Prepare program submittals	Program rules	Detail-oriented Patience Persistent	Computer Phone Policy and procedure manuals
b	Submit documentation to funding authority			
c	Revise scope of work based on funding authority feedback			
D	Procuring Installation			
1	Develop Conservation Measure Specifications			
a	Determine which conservation measures from the building performance assessment report require specification	Bidding process Conservation measures Installation of conservation measures Procurement Technical specifications	Detail-oriented Research Technical writing	Codes, standards, and regulations Computer Editor Word processing software
b	Research existing measure specification			
c	Write technical specifications			
2	Select Qualified Contractors Based on Procurement Method			
a	Issue technical specification package to bidders	Bidding process Business laws Contractor qualifications Measure installation Procurement Program requirements Proposal evaluation Trade requirements	Analytical Decisive Detail-oriented Integrity Negotiating Organizational Tactful Technical writing Unbiased	Computer Contracting board Debarred list of contractors Estimating software List of licensed contractors Procurement manuals Professional network Spreadsheet
b	Determine required qualifications of bidders			
c	Establish bidding schedule			
d	Advertise bid			
e	Host pre-bid conference			
f	Develop bid documents			
g	Align general conditions with purchasing policies			
h	Respond to bidders questions			
i	Develop selection criteria for contractor			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
j	Evaluate bids			software Word processing software
k	Notify bidders			
l	Negotiate with successful bidders			
m	Determine winning bidders			
n	Establish final measure cost			
3	Finalize Scope of Work For Installation			
a	Review bids with building decision maker	Budgeting Contract execution Contractor qualifications Financial modeling Organization's contracts Program contracts Program requirements	Analytical Budgeting Communication Financing Negotiating Scheduling	Computer Program documents
b	Compile final measure costs			
c	Reconcile measure cost with projected savings			
d	Allocate costs to funding sources			
e	Reconcile actual cost with projected cost			
f	Finalize scope of work with building decision maker			
g	Revise contract to reflect updated scope of work			
h	Execute contract			
i	Execute sub-contractor contracts			
j	Identify construction management plan			
E	Monitoring Construction			
1	Determine Documentation Requirements			
a	Review program requirements	Codes, standards, and regulations Permitting process Program requirements Regulatory requirements	Analytical Detail-oriented	Code, standards, and regulations Health and environmental safety plan
b	Review conservation measures to be installed			
c	Review building management organization			
d	Identify permits			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
e	Review health and environmental safety requirements			Office supplies Program documents
f	Identify construction documentation requirements			
2	Establish Change Order Process			
a	Review program requirements	Change order process Installation of conservation measures Construction process Contract budget Policies and procedures Roles and responsibilities Technical specifications of conservation measures	Problem solving Technical writing	Calculator Computer Word processing software
b	Review contract for change order process			
c	Define stakeholder roles and responsibilities			
d	Write change order process			
3	Conduct Pre-Construction Meeting			
a	Identify attendees	Construction process Contract details Program requirements Scope of work Timeline	Conflict resolution Leadership Meeting management Presentation	Computer PPE Presentation software Projector
b	Schedule pre-construction meeting			
c	Develop agenda for meeting			
d	Create presentation for meeting			
e	Conduct building tour			
f	Verify contractors are present			
g	Discuss health and environmental safety requirements			
h	Document meeting minutes			
4	Develop Inspection Plan			
a	Review results of pre-construction meeting	Building rules Codes, standards, and	Analytical Detail-oriented	Organization's health and environmental safety
b	Review construction schedule			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Review capacity for inspection	regulations Construction standards Environmental standards Health and environmental safety standards OSHA Program requirements Tenant laws		plan OSHA Technical specifications
d	Develop inspection schedule by trade			
e	Develop on-site checklists			
f	Identify required equipment			
g	Identify required documentation			
h	Identify health and environmental safety requirements			
5	Perform Inspections			
a	Review inspection schedule	Building rules Construction schedule Construction standards Conservation measures Owner's representative PPE requirements Program requirements Scope of work	Analytical Coordination Inspection	Camera Diagnostic equipment Installed equipment manuals Installed equipment specifications PPE
b	Coordinate inspection with contractor			
c	Coordinate site visits with stakeholder			
d	Coordinate with third party inspectors			
e	Coordinate with funding source			
f	Follow inspection plan			
g	Document inspection findings			
h	Document extent of construction progress			
6	Ensure Installations Meet Requirements			
a	Compare as-built conditions to contract requirements	Change order requests Construction process Construction schedule Health and environmental safety requirements Installation standards Material properties	Analytical Communication Detail-oriented Negotiating Observation	Camera Computer Construction contracts Diagnostic equipment Equipment documentation
b	Identify deficiencies			
c	Notify sub-contractors of any deficiencies			
d	Collaborate with program representative to resolve any issues			
e	Document inspection deficiencies			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
f	Process change orders	Program requirements RFIs Sequence of operation Testing procedures		Equipment manuals Health and environmental safety procedures Phone PPE
g	Resolve inspection deficiencies with sub-contractors			
7	Approve Invoices			
a	Reconcile invoices against estimates	Invoice policies Payment approval process Payment schedule Scope of work	Basic math Detail-oriented Organizational Perseverance Timely	Accounting department Calculator Computer Contracts Invoice templates Spreadsheet software Program documents
b	Reconcile invoices against payment schedule			
c	Assess penalties			
d	Review inspection documents			
e	Obtain authorization to approve payment			
f	Track invoices			
g	Submit invoices to financial department			
F	Confirming Project Completion			
1	Perform Final Diagnostic Testing			
a	Identify diagnostic testing	Building science Diagnostic testing Health and environmental safety Program requirements	Analytical Detail-oriented Interviewing Research	Diagnostic equipment PPE Program documents Standard testing methodology
b	Identify program quality assurance requirements			
c	Comply with program quality assurance requirements			
d	Schedule diagnostic testing			
e	Conduct diagnostic testing			
f	Finalize diagnostic testing			
g	Review results from diagnostic testing			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
h	Reconcile results against health and environmental safety plan			
i	Reconcile results against program requirements			
2	Reconcile Documentation			
a	Update building performance assessment report	Bonding Contract requirements Liens Permitting process Program requirements	Analytical Detail-oriented Negotiating Organizational Persistent Technical writing Thorough	Codes, standards, and regulations Computer Contract documents Phone Program documents
b	Update documents for program compliance			
c	Track status of construction permits			
d	Obtain material lien releases from contractors			
e	Obtain bond releases for contractors			
f	Verify contract requirements have been met			
g	Obtain required sign-offs			
h	Finalize program documentation			
3	Create Post-Monitoring Plan			
a	Determine program requirements for monitoring	Billing analysis Control system Data logging Monitoring Program rules Weather normalization	Analytical Computer Data collection	Billing analysis software Computer Equipment documentation Internet Monitoring equipment Monitoring software
b	Define monitoring protocol			
c	Identify data sources for monitoring plan			
d	Define roles and responsibilities			
e	Identify necessary documentation for monitoring plan			
f	Review fee schedule			
g	Update fee schedule			
4	Create Owner's Manuals			
a	Obtain equipment documentation	Building staff Equipment	Communication Organizational	Binders Camera
b	Obtain equipment warranties			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Collect as-built documentation	Operation and maintenance procedures Scope of work	Publishing Technical writing	Computer Office supplies Publishing software Word processing software
d	Collect contractor contact information			
e	Present diagnostic results of scope of work			
f	Develop O&M manual			
g	Assemble owner's manual			
h	Deliver owner's manual to owner			
5	Facilitate Building Staff Training			
a	Identify changes in building operations	Building staff Equipment Scope of work Vendor capacity to train	Communication Coordination Presentation Scheduling Training	Computer Handouts Owner's manual Product sample Professional network Projector
b	Identify staff requiring training			
c	Prepare building staff training materials			
d	Identify vendor training resources			
e	Schedule vendor training sessions			
6	Facilitate Resident Training			
a	Determine changes in building systems	Building systems Group dynamics Resident training Resident usage Scope of work	Communication Presentation	Computer projector Food Handouts Meeting location
b	Identify resident needs			
c	Develop resident training materials			
d	Schedule resident training			
e	Identify trainer for resident training			
7	Finalize Payments			
a	Reconcile submitted invoices with paid invoices	Budget Construction status Contracts Invoicing process	Analytical Basic accounting Communication Organizational	Accounting software Computer Spreadsheet software
b	Reconcile punch list with completed work			
c	Review payment schedules in contracts			
d	Reconcile final budget with expenditures			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
e	Approve final invoices	Status of payments		
f	Submit final invoices to financial department			

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Appendix C. Announcement of Multifamily Job Task Analyses Validation Study

June 19, 2013

Professional Testing, Inc. and the National Renewable Energy Laboratory invite you to participate in a nationwide research study validating the practices, characteristics, and activities of four multifamily building job categories. This is your opportunity to directly contribute to the development of the multifamily home energy upgrade workforce.

If you are a **practitioner** in one or more of the four multifamily building job categories listed below, please complete the corresponding study as soon as possible (by the end of June is preferable). Your participation should take approximately 20–30 minutes, and individuals may complete more than one validation study, if applicable.

This validation study is the next step in developing Job Task Analyses (JTAs), which will help define the duties, tasks, and skills needed to perform each of the jobs listed below.

- Multifamily Energy Auditor
- Multifamily Retrofit Project Manager
- Multifamily Building Operator
- Multifamily Quality Control Inspector

Please note: The above studies should only be completed by professionals who have actual job experience or who have trained those performing the job, **specifically for multifamily buildings**.

Your participation is voluntary and individual responses will be kept confidential. Your responses will be combined with those from other respondents and used to improve the job descriptions for the multifamily building energy upgrade workforce.

Additionally, we would greatly appreciate any help you could provide in sharing this request with other individuals and stakeholder groups who also participate in the specified multifamily job categories.

The comment period will remain open until July 19, 2013. You may direct any questions to workforce.guidelines@nrel.gov. Thank you in advance for your participation in this important process.

Sincerely,

The NREL Multifamily JTA Project Team

If you have any questions or comments about this email bulletin, please contact workforce.guidelines@nrel.gov.

Appendix D. Validation Study

Multifamily Retrofit Project Manager JTA Validation Study

Welcome

Professional Testing and the National Renewable Energy Laboratory (NREL) are asking for your participation in an industry study critical to the profession of Multifamily Retrofit Project Managers. The goal of the study is to determine the essential tasks that describe the role of today's Multifamily Retrofit Project Managers.

While Multifamily Retrofit Project Managers work in a variety of settings and specialties, this study depends on your individual experience and opinion relating to your current role as a Multifamily Retrofit Project Manager.

The study is divided into three sections:

Demographic information - The first step in completing this study is to provide demographic information. The information you provide in this section will be used to ensure that a representative sample of responses is received, thus providing a better understanding of the variations that occur in performing the job of a Multifamily Retrofit Project Manager.

Task ratings - The second section presents the tasks performed by Multifamily Retrofit Project Managers. The tasks are organized into six performance domains: Assessing Project Viability; Overseeing Building Performance Assessment; Negotiating Statement of Work; Procuring Installation; Monitoring Construction; and Confirming Project Completion. You will be asked to rate each task on two scales: (1) the frequency of task performance and (2) the importance of the task to overall job performance.

Additional comments - A panel of subject matter experts (SMEs), representing diverse backgrounds, education, and work environment experiences as a multifamily retrofit project manager, identified this list of important tasks. However, if after completing the study you feel that there are critical tasks that were not included, you will have an opportunity to identify additional tasks.

The definition of a multifamily building for purposes of this study is: any dwelling that contains living units, which share one or more building systems.

Your responses will be kept confidential, and we appreciate your participation. If you have any difficulty accessing or completing this study, please contact us at cowens@proftesting.com or call (800) 330-3776.

To begin, click on the Next button below.

Multifamily Retrofit Project Manager JTA Validation Study

Demographics

Please answer the following demographic questions. Your responses will be kept confidential and this information will only be used for statistical purposes.

What is the size of your organization?

- ◯ 1-10 people
- ◯ 11-50 people
- ◯ 51-500 people
- ◯ more than 500 people

In which state do you work?

In which sector do you currently work?

- ◯ Public (government at any level)
- ◯ Private

Which of the following jobs have you held in the multifamily (MF) building sector?

(Select all that apply)

- ☐ MF Energy Auditor
- ☐ MF Retrofit Project Manager
- ☐ MF Building Operator
- ☐ MF Quality Control Inspector
- ☐ Other (please specify)

Which of the following categories best describe your current position?

- ◯ MF Retrofit Project Manager Practitioner
- ◯ MF Retrofit Project Manager Curriculum Developer
- ◯ MF Retrofit Project Manager Trainer/Proctor
- ◯ Other (please specify)

Multifamily Retrofit Project Manager JTA Validation Study

How many years of experience have you had working as a Multifamily Retrofit Project Manager (total combined years)?

- ◯ None
- ◯ 5 Years or Less
- ◯ 6-10 Years
- ◯ 11-15 Years
- ◯ 16-20 Years
- ◯ More than 20 Years

How many years of total experience do you have in the multifamily building industry (all jobs)?

- ◯ None
- ◯ 5 Years or Less
- ◯ 6-10 Years
- ◯ 11-15 Years
- ◯ 16-20 Years
- ◯ More than 20 Years

What is your highest completed level of education?

- ◯ Some High School
- ◯ High School
- ◯ Some College
- ◯ Technical/Vocational School
- ◯ Bachelor's Degree
- ◯ Graduate Degree

To what professional societies/organizations do you belong?

(Select all that apply)

- [ ] None
- [ ] AABC Commissioning Group (ACG)
- [ ] American Institute of Architects (AIA)
- [ ] American Society of Civil Engineers (ASCE)
- [ ] American Society of Mechanical Engineers (ASME)
- [ ] American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- [ ] APPA
- [ ] Association for the Advancement of Cost Engineering (AACE)
- [ ] Association for Facilities Engineering
- [ ] Association of Energy Engineers (AEE)
- [ ] Building Commissioning Association (BCA)
- [ ] Building Owners and Managers Association (BOMA)
- [ ] Construction Specifications Institute (CSI)
- [ ] International Association of Plumbing and Mechanical Officials (IAPMO)
- [ ] International Building Performance Simulation Association (IBPSA)
- [ ] International Code Council (ICC)
- [ ] International Facility Management Association (IFMA)
- [ ] International Union of Operating Engineers (IUOE)
- [ ] Institute of Electrical and Electronics Engineers (IEEE)
- [ ] Laborers' International Union of North America (LIUNA)
- [ ] National Fire Protection Association (NFPA)
- [ ] National Institute of Building Sciences (NIBS)
- [ ] Service Employees International Union
- [ ] Sheet Metal Workers' International Association (SMWIA)
- [ ] United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (UA)
- [ ] United Brotherhood of Carpenters
- [ ] United Steelworkers (USW)
- [ ] U.S. Green Building Council (USGBC)
- [ ] Other (please specify)

What building performance credentials do you currently hold?

(Select all that apply)

- [ ] None
- [ ] AABC Commissioning Group Certified Commissioning Authority (CxA)
- [ ] AABC Commissioning Group Certified Commissioning Technician (CxT)
- [ ] American Society of Heating, Refrigerating and Air-Conditioning Engineers Building Energy Modeling Professional (BEMP)
- [ ] American Society of Heating, Refrigerating and Air-Conditioning Engineers Commissioning Process Management Professional (CPMP)
- [ ] American Society of Heating, Refrigerating and Air-Conditioning Engineers Operations and Performance Management Professional (OPMP)
- [ ] Association for Facilities Engineering Certified Plant Engineer (CPE)
- [ ] Association for Facilities Engineering Certified Plant Maintenance Manager (CPMM)
- [ ] Association for Facilities Engineering Certified Plant Supervisor
- [ ] Association of Energy Engineers Certified Building Energy Simulation Analyst (BESA)
- [ ] Association of Energy Engineers Certified Building Commissioning Professional (CBCP)
- [ ] Association of Energy Engineers Certified Energy Auditor (CEA)
- [ ] Association of Energy Engineers Certified Energy Manager (CEM)
- [ ] Association of Energy Engineers Existing Building Commissioning Professional (EBCP)
- [ ] Association of Energy Engineers Energy Manager in Training (EMIT)
- [ ] Association of Energy Engineers/Efficiency Valuation Organization Certified Measurement and Verification Professional
- [ ] BOMI International Facilities Management Administrator (FMA)
- [ ] BOMI International Real Property Administrator (RPA)
- [ ] BOMI International Systems Maintenance Administrator (SMA)
- [ ] BOMI International Systems Maintenance Technician (SMT)
- [ ] BPI Energy Auditor
- [ ] BPI Retrofit Installer
- [ ] BPI Crew Leader
- [ ] BPI Quality Control Inspector
- [ ] BPI Building Analyst
- [ ] BPI Envelope Professional
- [ ] BPI Residential Building Envelope Whole House Air Leakage Control Installer
- [ ]

- [ ] BPI Manufactured Housing Professional
- [ ] BPI Heating Professional
- [ ] BPI Air Condiditioned Heat Pump Professional
- [ ] BPI Multifamily Professional
- [ ] Building Commissioning Association Certified Commissioning Professional (CCP)
- [ ] Building Operator Certification – Level I (BOC Level I)
- [ ] Building Operator Certification – Level II (BOC Level II)
- [ ] The City University of New York Energy Management and Indoor Air Quality Certification
- [ ] Energy Audit Institute Commercial Energy Audit Certification
- [ ] General Professional Accreditations Licensed Architect
- [ ] General Professional Accreditations Professional Engineer (PE)
- [ ] International Facility Management Association Facility Management Professional (FMP)
- [ ] International Facility Management Association Certified Facility Manager (CFM)
- [ ] National Energy and Sustainability Institute Commercial Energy Auditor Certification
- [ ] National Environmental Balancing Bureau Building Systems Commissioning Certified Professional
- [ ] National Environmental Balancing Bureau Retro Commissioning Certified Professional
- [ ] Northwest Energy Education Institute Energy Management Certification (EMC)
- [ ] Testing, Adjusting, and Balancing Bureau Certified Commissioning Contractor (CCC)
- [ ] Testing, Adjusting, and Balancing Bureau Certified Commissioning Supervisor (CCS)
- [ ] University of California, Davis Professional Certification in Energy Resource Management
- [ ] The University of Wisconsin, Madison Commissioning Process Certification
- [ ] U.S. Green Building Council LEED AP BD+C
- [ ] U.S. Green Building Council LEED AP Homes
- [ ] U.S. Green Building Council LEED AP ID+C
- [ ] U.S. Green Building Council LEED AP ND
- [ ] U.S. Green Building Council LEED AP O+M
- [ ] U.S. Green Building Council LEED Green Associate
- [ ] Other (please specify accreditation and conferring organization)

Multifamily Retrofit Project Manager JTA Validation Study

How did you hear about this study?

- ◯ Listserve
- ◯ Direct email invitation
- ◯ Received forwarded invitation from a colleague
- ◯ BLOG
- ◯ Website
- ◯ Other (please specify)

Multifamily Retrofit Project Manager JTA Validation Study

Task Ratings

Below is a list of tasks performed by **Multifamily Retrofit Project Managers**.

The tasks are organized into six performance domains: Assessing Project Viability; Overseeing Building Performance Assessment; Negotiating Statement of Work; Procuring Installation; Monitoring Construction; and Confirming Project Completion.

In this section you will rate each task on two dimensions – *Frequency* and *Importance* – according to the rating scales below:

FREQUENCY - Rate each task statement based on the average frequency that you perform the task:

Never perform
Occasionally perform
Perform fairly often
Perform very often

IMPORTANCE - Rate each task statement based on how important the task is to the performance of the job:

Not important
Somewhat important
Important
Very important

(To answer, use your mouse to click the down arrow to reveal a set of options. Then select an option for both Frequency and Importance. To change your selection, click on another option in the drop down menu.)

Assessing Project Viability:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Confirm Eligibility for Incentive Programs		
Verify that Building Performance Upgrade Opportunities Exist		
Verify Decision Maker's Interest in Energy Upgrade Projects		
Verify Source of Funding for Energy Upgrade		
Verify Internal Capacity to Perform Energy Upgrade Projects		
Assess Key Risks to Project Completion		
Propose Project Schedule		
Develop Initial Services Agreement		

Multifamily Retrofit Project Manager JTA Validation Study

Overseeing Building Performance Assessment:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Develop Building Performance Assessment Plan		
Schedule Initial Building Performance Assessment		
Manage On-Site Building Performance Assessment		
Manage Production of Building Performance Assessment Report		
Manage Quality Control of Building Performance Assessment Report		

Negotiating Statement of Work:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Present Building Performance Assessment Recommendations to Decision Maker		
Obtain Design Services		
Finalize Program Scope of Work for Installations		
Create a Contract for Work		
Identify Procurement Requirements		
Comply with Funding Approval Requirements		

Multifamily Retrofit Project Manager JTA Validation Study

Task Ratings

Below is a list of tasks performed by **Multifamily Retrofit Project Managers**.

The tasks are organized into six performance domains: Assessing Project Viability; Overseeing Building Performance Assessment; Negotiating Statement of Work; Procuring Installation; Monitoring Construction; and Confirming Project Completion.

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Occasionally perform
Perform fairly often
Perform very often

IMPORTANCE - Rate each task statement based on how important the task is to the performance of the job:

Not important
Somewhat important
Important
Very important

(To answer, use your mouse to click the down arrow to reveal a set of options. Then select an option for both Frequency and Importance. To change your selection, click on another option in the drop down menu.)

Procuring Installation:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Develop Conservation Measure Specifications		
Select Qualified Contractors Based on Procurement Method		
Finalize Scope of Work For Installations		

Multifamily Retrofit Project Manager JTA Validation Study

Monitoring Construction:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Determine Documentation Requirements		
Establish Change Order Process		
Conduct Pre-Construction Meeting		
Develop Inspection Plan		
Perform Inspections		
Ensure Installations Meet Requirements		
Approve Invoices		

Confirming Project Completion:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Perform Final Diagnostic Testing		
Reconcile Documentation		
Create Post-Monitoring Plan		
Create Owner's Manuals		
Facilitate Building Staff Training		
Facilitate Resident Training		
Finalize Payments		

Multifamily Retrofit Project Manager JTA Validation Study

Additional Comments

Are there any tasks that are missing from this survey?

- ◯ No
- ◯ Yes

If yes, what?

Would you like to provide any additional comments?

- ◯ No
- ◯ Yes

If yes, what?

Multifamily Retrofit Project Manager JTA Validation Study

Thank you!

You have completed the study. Professional Testing, Inc. and NREL would like to thank you for taking the time to participate in the Multifamily Retrofit Project Manager JTA development process.

If you have questions about the Multifamily JTA Project, please contact NREL at workforce.guidelines@nrel.gov.