NREL
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Multifamily Building Operator 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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Office of Energy Efficiency & Renewable Energy
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Subcontract Report
NREL/SR-7A40-60536
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 it 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 building operators.

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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, a JTA 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 (i.e., KSAs) of a job.

A well-defined JTA includes participation by a representative group of subject matter experts (SMEs) who reflect as much diversity as possible within the job. Diversity refers to regional or job context factors and to SME factors, such as years of experience, education, and industry perspective. JTAs are a valuable resource for multiple development and evaluation purposes including, but not limited to, job descriptions, job classifications, job evaluations, performance appraisals, trainings, 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 and SMEs in a specific occupation come together for a multiday workshop to provide input about the specific tasks, knowledge, and skills needed to perform their job. Modified small-group brainstorming techniques are used to obtain the collective expertise and consensus of the group. 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 and competencies involved in the occupation being studied. The DACUM analysis can be used as a basis for various aspects of education, training, and certification programs, including curriculum development, student learning, training needs assessments, worker performance evaluations, and competency test development.

Process for Selecting Subject Matter Expert

Professional Testing, Inc. helped establish the criteria for selecting the panel of SMEs and practitioners. Active practitioners and SMEs interested in participating in the study were invited to submit their credentials through a publically 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 29 applicants were considered for the multifamily building operator JTA workshop.

To create a representative panel of participants, Professional Testing, Inc. used specific ranking 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 building operator 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; it helps define the core knowledge areas, critical work functions, and 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.

Professional Testing, Inc. conducted a JTA workshop with a group of twelve SMEs to identify the duties, tasks, steps and essential knowledge, skills, and attributes associated with the job performed by a multifamily building operator.

Following the JTA workshop, Professional Testing, Inc. developed an online study to validate the initial results of the study and finalize a content outline. The online study was started by 57 participants and completed by 39 multifamily building operators across the United States.

Job/Tasks Analysis Workshop

The multifamily building operator JTA workshop was held in Lakewood, Colorado, May 9–11, 2013.

The first day of the workshop consisted of an introduction to the DACUM process. A 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 building operators, 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 building operator 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 the duty areas 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

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**

statements. The facilitators asked the SMEs, while looking at the projected task list, to list the steps that occur under each task and to 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.

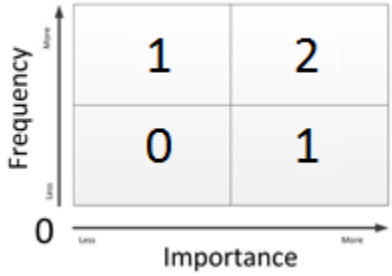

Figure 1. Two-dimensional scale for rating duties and tasks

The SMEs were asked to consider each task in terms of frequency and importance. For frequency, they considered whether they did the task more or less often and for importance they considered whether the task was more or less important to perform successfully as a minimally competent multifamily building operator. 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 and a preliminary content outline was developed at the end of the 3-day workshop.

As a final activity, the SMEs reviewed and finalized the following overarching job description for multifamily building operators.

> A multifamily building operator efficiently operates and maintains building systems, addresses tenant concerns, improves building performance, and complies with regulations to support a comfortable, healthy, and safe living environment.

The job profile that results from the JTA workshop is a detailed and graphical portrayal of a multifamily building operator and was 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

Clifford E. Babson CEM,
CMVP, CEA, LEED AP
Principal
Four Points Energy Solutions
Lansing, NY

Andrew Kinaci
Senior Energy Analyst
CNT Energy
Chicago, IL

Renardon Calhoun
Single/Multifamily Energy Auditor
KB Energy, Inc.
South Holland, IL

Rick Meinking
Business Program Manager
Efficiency Maine Trust
Augusta, ME

Howard Feldman
Principal
Coastal Green Building Solutions
Hilton Head, SC

F.L. Andrew Padian
Vice President for Energy Initiatives
The Community Preservation Corporation
New York City, NY

Matthew Holden, P.E.
President
Sparhawk Group
Yarmouth, ME

Asit Patel
President
ANP Energy Consulting Services Corp.
Bellmore, NY

Thomas Holmes
Director, Energy Performance Group
Remediation Specialists, Inc.
Hamilton, NJ

Andy Wildenberg
President
e3 Power
Denver, CO

Luke Ilderton
Director of Energy Efficiency Programs
Energy Outreach Colorado
Denver, CO

Chris Wolken
Principal
Peninsula Group
Menlo Park, CA

Meeting Facilitation

Professional Testing, Inc.

Corina Owens, Ph.D.
Merrianne Bryan

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 at the workshop had been reviewed by NREL, the online study validation was launched to collect feedback on the 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 building operator.

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 identify key demographic questions to capture the representativeness of respondents and help evaluate the validity of responses. Each participant was asked ten 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 building operator (total combined years)?
7. How many years of total experience do you have in the multifamily 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 building operator. 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 in the online 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 the validation 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 the 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.

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

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) 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 multifamily building operators consisted of 33 job tasks separated into 6 content domains (or duty areas). A copy of the online 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 help determine how representative the study sample is of the population of interest. The multifamily building operator study sample consisted of 57 respondents, with 39 completing the survey.

Fifty-seven participants answered the question about the size of their organizations. Of the 57 participants, 67% worked at organizations with less than 50 people while 23% worked at organizations having 51–500 people, and 10% worked at organizations with more than 500 people. Figure 2 visually displays these results.

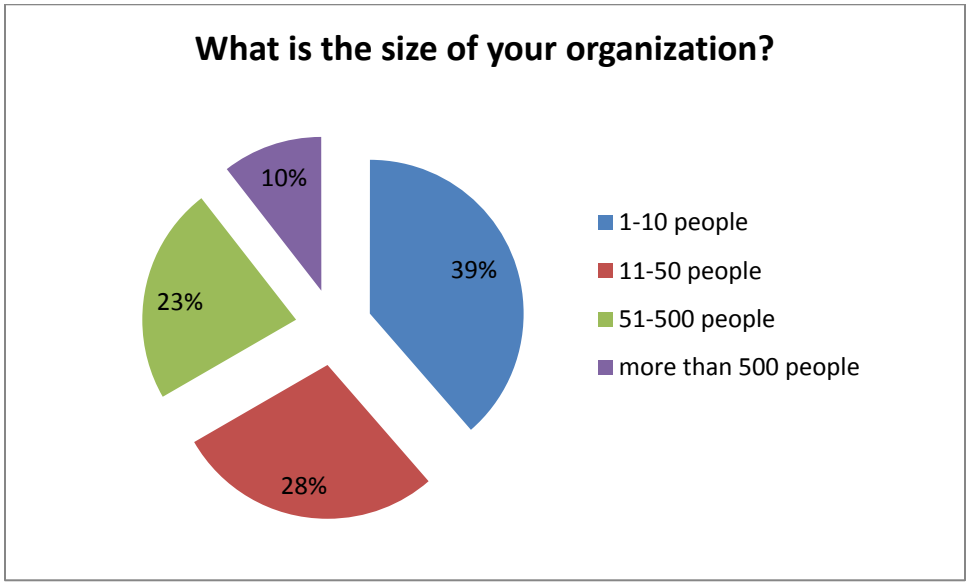

Figure 2. Sizes of organizations of respondents

The 57 study respondents represented 10 states, with 4 respondents indicating they worked in multiple states. Despite a lower than desired number of states being represented, it was determined these states resulted in an adequate representation for the industry as 5 of the 8 U.S. mainland climate regions were represented by respondents. Table 2 shows the geographic distribution of study respondents.

Table 2. States in which Respondents Reported Working

States	Number of Respondents
California	8
Colorado	3
Illinois	3
Maine	4
Massachusetts	1
Missouri	1
Nevada	1
New York	29
Virginia	1
Wisconsin	2
Multiple States	4
Grand Total	57

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

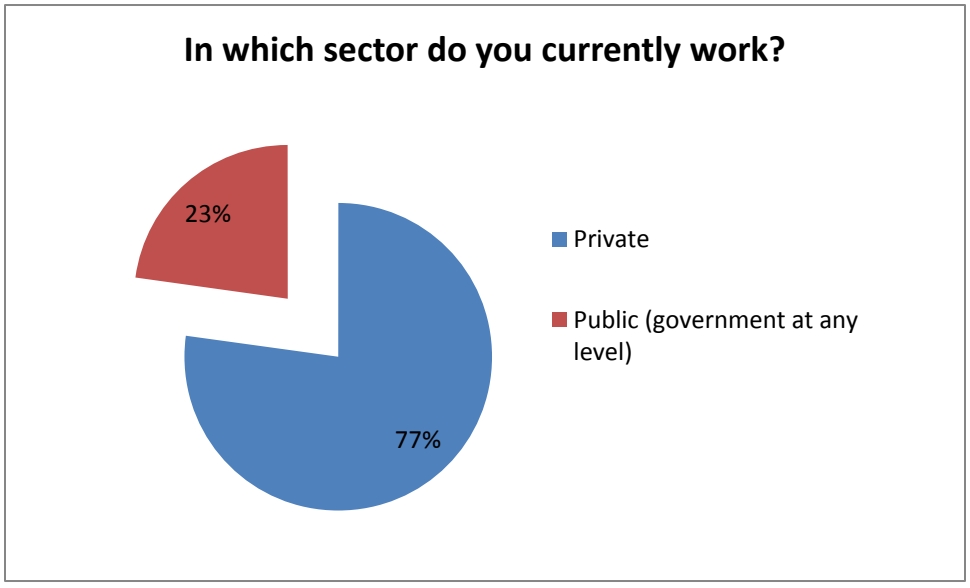

Figure 3. Sectors in which respondents were working

Study respondents were then asked what jobs they had held in the multifamily building sector. Most respondents (61%) indicated they had worked as building operators 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%).

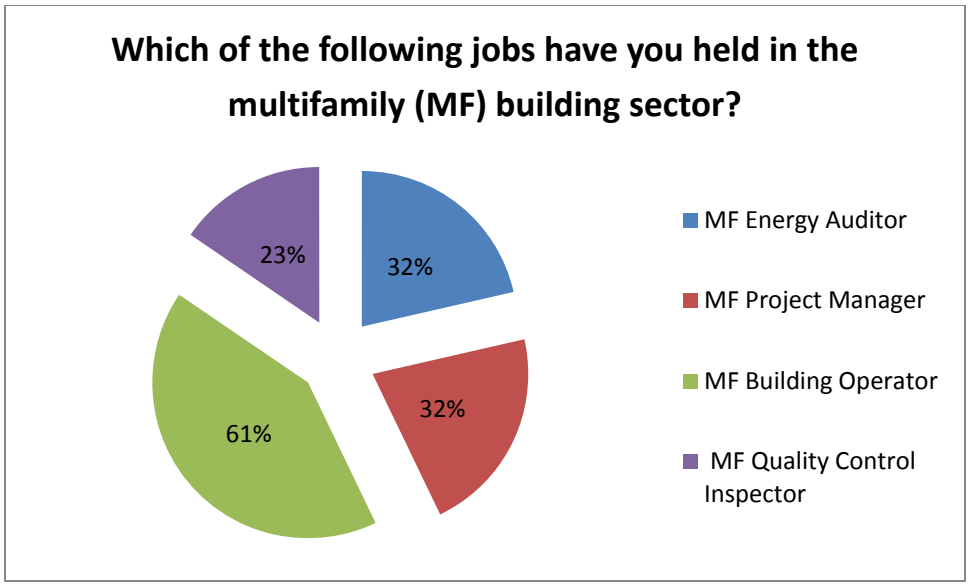

Figure 4. Jobs held by respondents in the multifamily building sector

When respondents were asked to categorize their current positions, most (47%) selected "MF Building Operator Practitioner." The distribution of job categories is displayed in Figure 5.

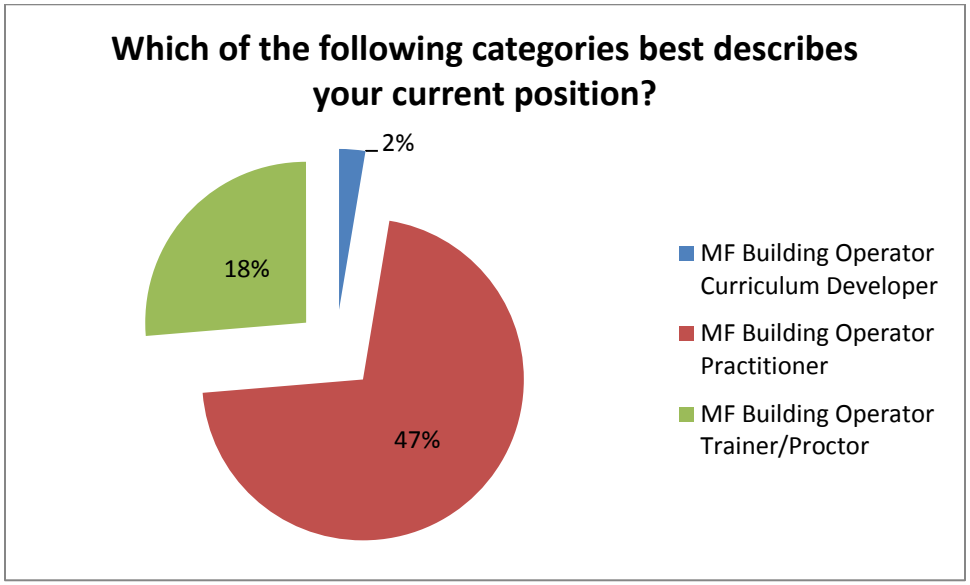

Figure 5. Categories of current jobs held by respondents

The study results suggest a wide range of experience from the participants working as multifamily building operators. While the largest percentage of study respondents (52%) reported working 10 years or fewer as multifamily building operators there was considerable experience represented with 23% of respondents stating that they had over 20 years of experience as multifamily building operators. Figure 6 displays these results.

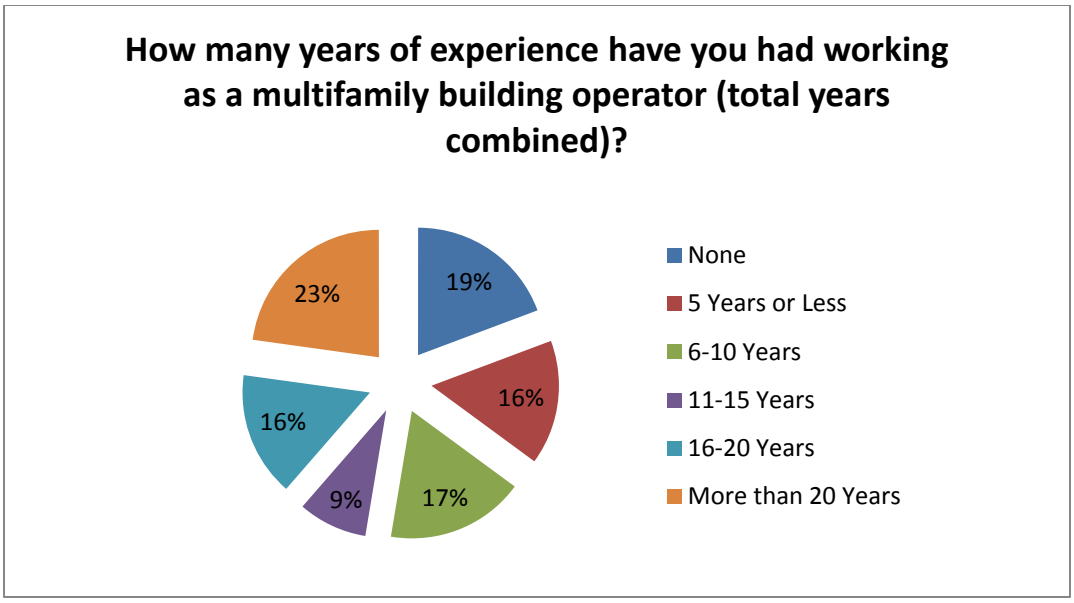

Figure 6. Years of experience respondents had as multifamily building operators

The largest number of respondents (32%) indicated they had more than 20 years of total experience in the multifamily building industry (all jobs). However, study respondents were well represented across all levels of experience in the multifamily building industry as a whole. Figure 7 displays these results.

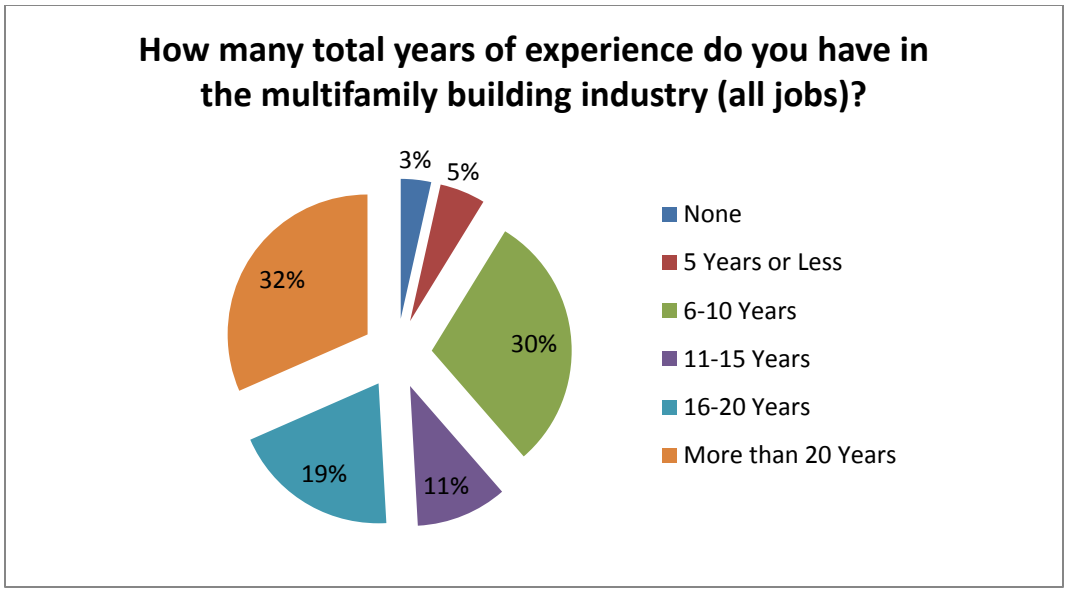

Figure 7. Years of experience respondents had in industry

Next, study respondents were asked to report their highest levels of completed education. The largest percentage of study respondents (35%) indicated a bachelor's degree was their highest level of education; this category was closely followed by the "some college" category (27%). Figure 8 displays these results.

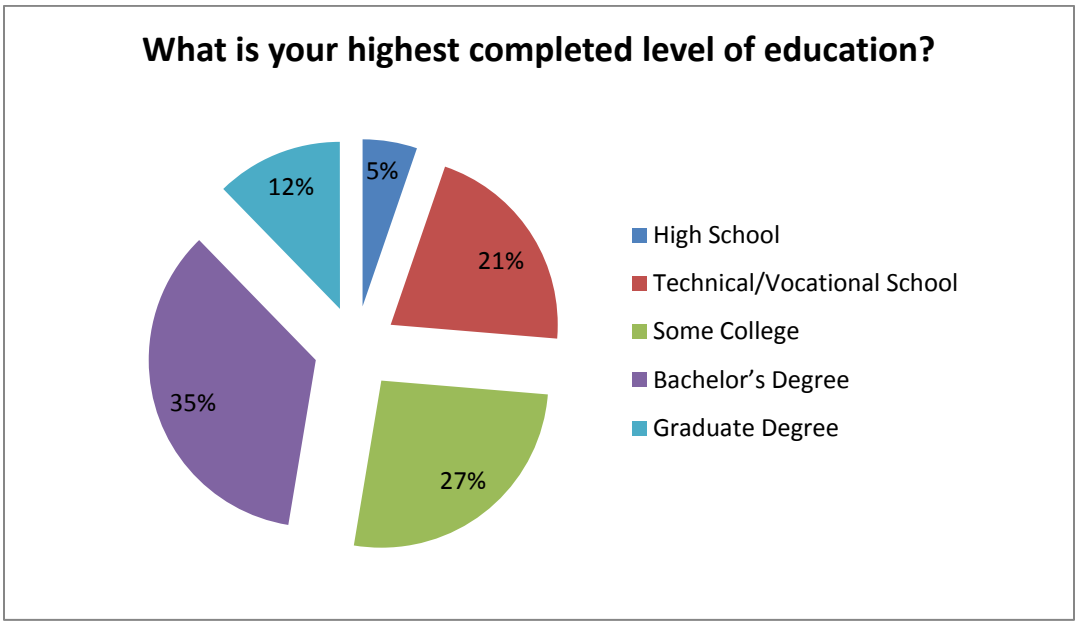

Figure 8. Highest levels of education completed by respondents

Study respondents were asked to report the professional societies and organizations they belonged to, and they were allowed to select more than one. The largest number of respondents (15) indicated they belonged to the U.S. Green Building Council while 11 respondents indicated they belonged to the Association of Energy Engineers, as illustrated by Table 3.

Table 3. Professional Societies and Organizations to which Respondents Belonged

Society or Organization	Number of Respondents
None	21
AABC Commissioning Group (ACG)	0
American Institute of Architects (AIA)	0
American Society of Civil Engineers (ASCE)	0
American Society of Mechanical Engineers (ASME)	1
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	7
APPA	0
Association for the Advancement of Cost Engineering (AACE)	0
Association for Facilities Engineering	0
Association of Energy Engineers (AEE)	11
Building Commissioning Association (BCA)	1
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)	0
International Union of Operating Engineers (IUOE)	0
Institute of Electrical and Electronics Engineers (IEEE)	0
Laborers' International Union of North America (LIUNA)	0
National Fire Protection Association (NFPA)	2
National Institute of Building Sciences (NIBS)	0
Service Employees International Union	5
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)	1
United Brotherhood of Carpenters	0
United Steelworkers (USW)	0
U.S. Green Building Council (USGBC)	15
Other Professional Organizations	13

Study respondents were also asked about their current building credentials. The largest number of respondents (29) indicated they held the BPI Building Analyst credential, and 28 candidates indicated they held the BPI Multifamily Professional credential. Table 4 provides the complete list of credentials and number of respondents who held each.

Table 4. Multifamily Building Credentials of Respondents

Credential	Number of Respondents
None	11
AABC Commissioning Group Certified Commissioning Authority (CxA)	0
A18ABC Commissioning Group Certified Commissioning Technician (CxT)	0
American Society of Heating, Refrigerating and Air- Conditioning Engineers Building Energy Modeling Professional (BEMP)	0
American Society of Heating, Refrigerating and Air- Conditioning Engineers Commissioning Process Management Professional (CPMP)	0
American Society of Heating, Refrigerating and Air- Conditioning Engineers Operations and Performance Management Professional (OPMP)	1
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)	1
Association of Energy Engineers Certified Building Commissioning Professional (CBCP)	0
Association of Energy Engineers Certified Energy Auditor (CEA)	2
Association of Energy Engineers Certified Energy Manager (CEM)	5
Association of Energy Engineers Existing Building Commissioning Professional (EBCP)	1
Association of Energy Engineers Energy Manager in Training (EMIT)	0
Association of Energy Engineers/Efficiency Valuation Organization Certified Measurement and Verification Professional	1
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
Building Commissioning Association Certified Commissioning Professional (CCP)	0
BPI Energy Auditor	9
BPI Retrofit Installer	2
BPI Crew Leader	2
BPI Quality Control Inspector	1
BPI Building Analyst	29
BPI Envelope Professional	10
BPI Residential Building Envelope Whole House Air Leakage Control Installer	6
BPI Manufactured Housing Professional	0
BPI Heating Professional	3

Credential	Number of Respondents
BPI Air Conditioned Heat Pump Professional	1
BPI Multifamily Professional	28
Building Operator Certification – Level I (BOC Level I)	11
Building Operator Certification – Level II (BOC Level II)	3
The City University of New York Energy Management and Indoor Air Quality Certification	0
Energy Audit Institute Commercial Energy Audit Certification	1
General Professional Accreditations Licensed Architect	0
General Professional Accreditations Professional Engineer (PE)	0
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
National Environmental Balancing Bureau Building Systems Commissioning Certified Professional	0
National Environmental Balancing Bureau Retro Commissioning Certified Professional	0
Northwest Energy Education Institute Energy Management Certification (EMC)	0
Testing, Adjusting, and Balancing Bureau Certified Commissioning Contractor (CCC)	0
Testing, Adjusting, and Balancing Bureau Certified Commissioning Supervisor (CCS)	0
University of California, Davis Professional Certification in Energy Resource Management	0
The University of Wisconsin, Madison Commissioning Process Certification	0
U.S. Green Building Council LEED AP BD+C	2
U.S. Green Building Council LEED AP Homes	0
U.S. Green Building Council LEED AP ID+C	0
U.S. Green Building Council LEED AP ND	1
U.S. Green Building Council LEED AP O+M	5
U.S. Green Building Council LEED Green Associate	8
Other Building performance credential	10

Lastly, study respondents were asked how they heard about the study. Most study respondents (82%) indicated they heard about the study through direct email invitations, as illustrated in Figure 9.

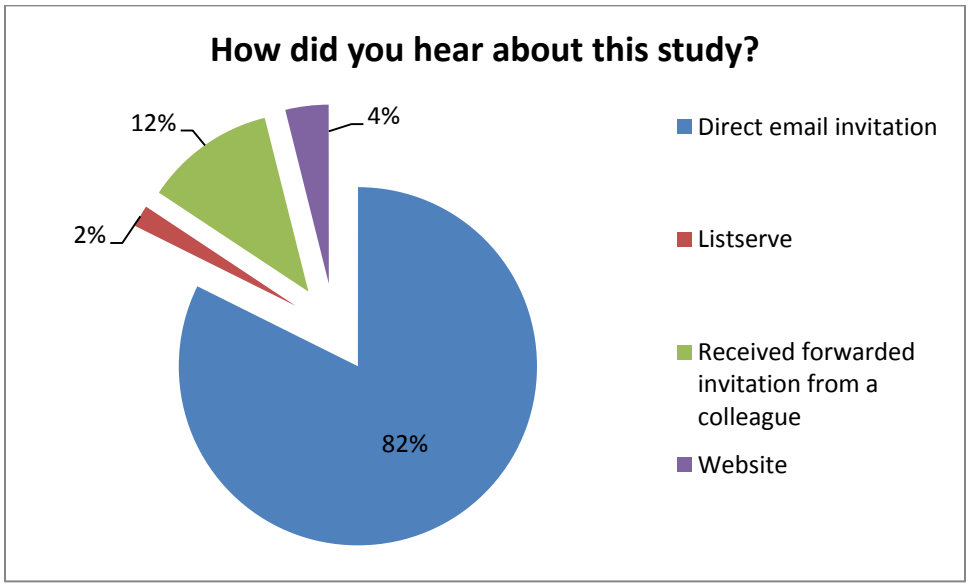

Figure 9. How respondents heard about the study

Overview of Study Respondents Ratings for Task Statements

The mean ratings for task frequency ranged from 1.68 to 3.45, and the mean importance ratings ranged from 2.14 to 3.59. 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 ratings of all tasks had a standard error of 0.15 (frequency ratings) and 0.16 (importance ratings), indicating that if the study were repeated with a different sample of study respondents similar 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
Facilitating Stakeholder Communication						
Respond to Building Decision Maker Expectations	3.11	1.04	0.16	3.39	0.97	0.15
Respond to Tenants' Concerns	3.45	0.90	0.14	3.59	0.82	0.12
Develop an Operations and Maintenance Communication Plan	2.07	0.87	0.13	2.57	1.15	0.17
Manage Vendor Relations	2.89	1.10	0.17	2.67	0.99	0.15
Manage Contractor Relations	2.84	1.10	0.17	2.79	1.06	0.16
Establish Community Connections	2.14	1.05	0.16	2.14	0.85	0.13
Coordinate Building Access	3.18	1.06	0.16	3.00	1.01	0.15
Monitoring Current Building Performance						
Perform Resource Accounting	1.89	0.89	0.13	2.29	0.97	0.15
Evaluate Operating Parameters	2.20	0.85	0.13	2.53	1.01	0.15
Establish Water Management Plan	1.98	0.85	0.13	2.53	1.01	0.15
Inspect Current Building Condition	3.41	0.92	0.14	3.45	0.90	0.14
Operating and Maintaining Building Systems						
Create Operations and Maintenance Plan	2.23	0.91	0.14	2.70	1.00	0.15
Create Waste Management Plan	1.89	0.81	0.12	2.50	0.95	0.14
Procure Goods and Services	2.75	1.08	0.16	2.67	0.99	0.15
Train Operations and Maintenance Staff	2.61	1.10	0.17	2.84	1.16	0.17
Implement Work Order Systems	2.66	1.12	0.17	2.70	1.04	0.16
Implement Sustainability Site Plan	1.93	0.87	0.13	2.21	0.95	0.15
Ensuring Regulatory Compliance						
Identify Regulatory Compliance Requirements	2.24	1.00	0.16	2.57	1.04	0.17
Educate Stakeholders about Regulatory Compliance	1.92	0.94	0.15	2.32	0.94	0.16
Ensure Regulatory Compliance	2.32	1.02	0.16	2.65	1.03	0.17
Improving Health and Safety						
Create Workplace Safety Plan	2.33	1.06	0.17	2.84	1.15	0.19
Implement Workplace Safety Plan	2.59	1.12	0.18	2.89	1.16	0.19
Meet Occupational Safety and Health Administration (OSHA) requirements	2.79	1.10	0.18	2.74	1.06	0.17
Test Personal Protective Equipment	1.68	0.74	0.12	2.22	0.95	0.16
Establish Building Security Plan	2.18	1.02	0.16	2.66	0.99	0.16
Develop Indoor Environmental Quality Plan	1.82	0.88	0.14	2.45	1.06	0.17

Duties and Tasks	Frequency			Importance		
	Mean	SD	SEM	Mean	SD	SEM
Implement Integrated Pest Management Plan	2.38	1.02	0.16	2.82	1.04	0.17
Establish Emergency Preparedness Plan	2.10	0.99	0.16	2.79	1.07	0.17
Improving Building Performance						
Manage Operations and Maintenance Budget	2.11	1.16	0.19	2.70	1.05	0.17
Review Building Operations Benchmarks	1.92	0.85	0.14	2.49	0.96	0.16
Identify Building Performance Improvement Measures	2.13	0.80	0.13	2.87	1.00	0.16
Support Capital Needs Assessment	1.84	0.79	0.13	2.27	0.99	0.16
Manage Unit Turn-Overs	2.97	1.26	0.20	3.11	1.09	0.18

Reliability of Tasks Ratings

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 0.90, and the alpha for the importance scale was 0.93. 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.

Results of Post-Validation Review Meeting

A subgroup of the original SME panel that attended the multifamily building operator workshop was convened via webinar and conference call on August 8, 2013 to conduct the following activities:

- Ensure that appropriate and representative individuals responded to the study as understood by the SME panel subgroup
- Review the tasks identified as having lower combined ratings (thus indicating they were ranked low in frequency, 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:

- Babson, Clifford
- Calhoun, Renardon

- Holden, Matthew
- Ilderton, Luke
- Kinaci, Andrew
- Meinking, Rick
- Patel, Asit
- Wildenberg, Andy
- Wolken, Chris.

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 lower by the study respondents and to discuss those tasks to ensure they belonged 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. Nineteen tasks received a criteria rating below 8 (listed in italics in Table 6) and 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 delete one task (noted with strike-through), edit the wording of six tasks (edits noted), and keep the other twelve low ranked tasks, as they were determined to be important to the job of a multifamily building operator and should therefore remain in the final content outline.

Table 6. Combined Means and Frequencies of Duties and Tasks

Duties and Tasks	Frequency Mean
Facilitating Stakeholder Communication	
Respond to Building Decision Maker Expectations	9.89
Respond to Tenants' Concerns	10.64
Develop an Operations and Maintenance Communication Plan Edit = "Assist in the development of an Operations and Maintenance Communication Plan"	*7.20*
Manage Vendor Relations	8.24
Manage Contractor Relations	8.42
~~*Establish Community Connections*~~	~~*6.41*~~
Coordinate Building Access	9.18
Monitoring Current Building Performance	
Perform Resource Accounting	*6.46*
Evaluate Operating Parameters	*7.27*
Establish Water Management Plan	*7.05*
Inspect Current Building Condition	10.32
Operating and Maintaining Building Systems	
Create Operations and Maintenance Plan Edit= "Assist with creation of an Operations and Maintenance Plan"	7.64
Create Waste Management Plan Edit = "Assist with creation of a Waste Management Plan"	*6.89*
Procure Goods and Services	8.10
Train Operations and Maintenance Staff	8.30
Implement Work Order Systems	8.05
Implement Sustainability Site Plan	*6.36*
Ensuring Regulatory Compliance	
Identify Regulatory Compliance Requirements	7.37
Educate Stakeholders about Regulatory Compliance	*6.57*
Ensure Regulatory Compliance	7.61
Improving Health and Safety	
Create Workplace Safety Plan	8.02
Implement Workplace Safety Plan	8.38
Meet Occupational Safety and Health Administration (OSHA) requirements	8.27
Test Personal Protective Equipment	*6.12*
Establish Building Security Plan	*7.50*

Duties and Tasks	Frequency Mean
Edit= “Assist with implementing a Building Security Plan”	
Develop Indoor Environmental Quality Plan Edit= “Monitor indoor environmental quality”	*6.72*
Implement Integrated Pest Management Plan	8.02
Establish Emergency Preparedness Plan Edit= “Comply with Emergency Preparedness Plan”	*7.68*
Improving Building Performance	
Manage Operations and Maintenance Budget	*7.51*
Review Building Operations Benchmarks	*6.89*
Identify Building Performance Improvement Measures	*7.87*
Support Capital Needs Assessment	*6.38*
Manage Unit Turn-Overs	9.18

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.

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

Missing Tasks
General Contractor
There needs to be more focus on the traditional building operator role.
I did not see the bulk of the tasks a TYPICAL building operator would need to perform: - Are they knowledgeable of the proper way to repair the various components in the building that require routine maintenance so as to ensure expected lifetime/durability? - Do they understand BASIC building science (heat, moisture, airflow properties) as it relates to the no-no's of building repair and maintenance? - Do they understand material choices from a green building/indoor air quality/durability perspective (low-emitting carpet vs standard, recycled content, etc)? - Do they understand how building systems operate and the required maintenance items of those systems (this can be high level where maintenance is typically performed by an outside contractor, such as elevator maintenance). - Ability to oversee outside maintenance contractors' work (did the boiler mechanic actually do what he said he did?) - They need to understand basic building code, and be knowledgeable of what they can/can't repair given their experience and licensing (ie: can replace light fixture but shouldn't run new electrical) - Do they understand what typical conservation measures are, how to implement, and how to maintain those measures? - Are they familiar with hazardous materials handling/storage and disposal (paints, fluorescent bulbs)? - Do they understand what can/can't be recycled, thrown away, composted? - Do they know how to read and interpret a utility bill? - Etc.
Tenant Relations Manager; Community Relations Manager; Public Relations Manager; Govt Relations Manager
O & M of building systems, particularly heating and cooling.
jobs clasifications

[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. Seven 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 addressed by the proposed content outline.

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

Additional Comments
The tasks described in this survey are not as targeted to building operators as they should be. It seems the tasks described here are a mixture of building operators, property mangers, resident managers, and asset managers.
Building operator staff are very busy and dedicated personnel. The industry does not value their time enough to support many of these tasks. Better to focus effort on property management and organization operations staff.
So far, the preceding items very clearly describe an ASSET MANAGER role, not a building operator. However, the building operator may be responsible for implementing, working under, and usually giving feedback for some of the items developed by the asset manager. Note, where the role did not seem appropriate for the operator, I said it was never or occasionally performed but that it was important or somewhat important. I want this to be interpreted that it is important to happen, and the operator needs to understand at least some of these aspects, but the operator is NOT responsible for these aspects. Remember, in most multifamily buildings the operator is the person replacing light bulbs, fixing toilets, and doing routine maintenance. This is not the operator you find in a large commercial building who is creating and implementing strategic plans.

Most of the tasks in the Validation study seem better suited for a Asset and/or Property Manager, and less so for an on-site MF Building Operator. Development of Plans and Budgets is rarely the responsibility of an onsite MF Building Operator
While all of these tasks are elements of providing O & M services in a Multifamily Building, as building operators we are the doers/implementers. Building Operators don't really function as "Managers" so the tasks are not done by Building Operators, but the tasks are valid and important.
The job tasks are performed almost daily, but the plans are occasionally reviewed. Because the Bldg Operator juggles many tasks/jobs and wears many hats, has little support, few resources, etc, the plans are reviewed only occasionally, less frequently mostly according to whenever problems arise or a crisis occurs.
Here in NYC what you call a Building Operator we call a Building Superintendent or a Resident Manager. Overall, your questions betray a singular lack of understanding of what such a person has as his daily job requirements. You need someone like me who is very familiar with such things as one of your SMEs in order to bring some reality to the proceedings.

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 them to the proposed content outline that resulted from the original JTA meeting. Table 9 contains the content outline and task weights proposed by the JTA panelists (column labeled SME Weights) and the content outline resulting from the validation study (column labeled Study Weights). The strike-through text indicates tasks that were re-worded or deleted, or for which task weights were changed.

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

Duties and Tasks	Overall Ratings	Study Weights	SME Weights
Facilitating Stakeholder Communication		21.4%	25%
Respond to Building Decision Maker Expectations	9.89	3.9%	5%
Respond to Tenants' Concerns	10.64	4.2%	5%
~~Develop an Operations and Maintenance Communication Plan~~ Assist in the Development of an Operations and Maintenance Communication Plan	7.20	2.9%	3%
Manage Vendor Relations	8.24	3.3%	~~3%~~4%
Manage Contractor Relations	8.42	3.4%	~~3%~~4%
~~Establish Community Connections~~			~~2%~~
Coordinate Building Access	9.18	3.7%	4%
Monitoring Current Building Performance		12.4%	10%
Perform Resource Accounting	6.46	2.6%	2%
Evaluate Operating Parameters	7.27	2.9%	2%
Establish Water Management Plan	7.05	2.8%	2%
Inspect Current Building Condition	10.32	4.1%	4%

Duties and Tasks	Overall Ratings	Study Weights	SME Weights
Operating and Maintaining Building Systems		18.1%	30%
Create Operations and Maintenance Plan	7.64	3.1%	5%
~~Create Waste Management Plan~~ Assist with Creation of a Waste Management Plan	6.89	2.8%	4%
Procure Goods and Services	8.10	3.2%	6%
Train Operations and Maintenance Staff	8.30	3.3%	5%
Implement Work Order Systems	8.05	3.2%	6%
Implement Sustainability Site Plan	6.36	2.5%	4%
Ensuring Regulatory Compliance		8.6%	10%
Identify Regulatory Compliance Requirements	7.37	3.0%	3%
Educate Stakeholders about Regulatory Compliance	6.57	2.6%	3%
Ensure Regulatory Compliance	7.61	3.0%	4%
Improving Health and Safety		24.3%	10%
Create Workplace Safety Plan	8.02	3.2%	1%
Implement Workplace Safety Plan	8.38	3.3%	2%
Meet Occupational Safety and Health Administration (OSHA) requirements	8.27	3.3%	2%
Test Personal Protective Equipment	6.12	2.5%	1%
~~Establish Building Security Plan~~ Assist with Implementing a Building Security Plan	7.50	3.0%	1%
~~Develop Indoor Environmental Quality Plan~~ Monitor indoor environmental quality	6.72	2.7%	1%
Implement Integrated Pest Management Plan	8.02	3.2%	1%
~~Establish Emergency Preparedness Plan~~ Comply with Emergency Preparedness Plan	7.68	3.1%	1%
Improving Building Performance		15.1%	15%
Manage Operations and Maintenance Budget	7.51	3.0%	4%
Review Building Operations Benchmarks	6.89	2.8%	2%
Identify Building Performance Improvement Measures	7.87	3.1%	2%
Support Capital Needs Assessment	6.38	2.5%	2%
Manage Unit Turnovers	9.18	3.7%	5%

After much discussion, the content outline was finalized, taking into consideration the results of the JTA meeting and the weighting and comments from the validation study. The SMEs decided to keep the SME weighting while adjusting the percentages in the duty area, "Facilitating

Stakeholder Communication" to reconcile the deletion of the task statement, "Establish Community Connections." 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; it also provides curriculum developers with a model for aligning training with the core needs of the occupation.

Table 10. Final Content Outline for Multifamily Building Operators

Duties and Tasks	Weighting
Facilitating Stakeholder Communication	25%
Respond to Building Decision Maker Expectations	5%
Respond to Tenants' Concerns	5%
Assist in the development of an Operations and Maintenance Communication Plan	3%
Manage Vendor Relations	4%
Manage Contractor Relations	4%
Coordinate Building Access	4%
Monitoring Current Building Performance	10%
Perform Resource Accounting	2%
Evaluate Operating Parameters	2%
Establish Water Management Plan	2%
Inspect Current Building Condition	4%
Operating and Maintaining Building Systems	30%
Create Operations and Maintenance Plan	5%
Assist with creation of a Waste Management Plan	4%
Procure Goods and Services	6%
Train Operations and Maintenance Staff	5%
Implement Work Order Systems	6%
Implement Sustainability Site Plan	4%
Ensuring Regulatory Compliance	10%
Identify Regulatory Compliance Requirements	3%
Educate Stakeholders about Regulatory Compliance	3%
Ensure Regulatory Compliance	4%
Improving Health and Safety	10%
Create Workplace Safety Plan	1%
Implement Workplace Safety Plan	2%
Meet Occupational Safety and Health Administration (OSHA) requirements	2%
Test Personal Protective Equipment	1%
Assist with implementing a Building Security plan	1%

Duties and Tasks	Weighting
Monitor indoor environmental quality	1%
Implement Integrated Pest Management Plan	1%
Comply with emergency preparedness plan	1%
Improving Building Performance	15%
Manage Operations and Maintenance Budget	4%
Review Building Operations Benchmarks	2%
Identify Building Performance Improvement Measures	2%
Support Capital Needs Assessment	2%
Manage Unit Turn-Overs	5%
Total	100%

The validation study confirmed that the job description for a multifamily building operator developed and compiled by the 12 SME panelists was accurate and thorough. Specifically, the study validated the job-related tasks for a multifamily building operator 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 building operator JTA process can be used with confidence to develop credentialing programs and/or curriculum.

References

Raymond, M.R. (2001). "Job Analysis and the Specification of Content for Licensure and Certification Examinations." *Applied Measurement in Education 14*(4); pp. 369–415

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. (1999, April). *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.

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.

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 multifamily-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 Building Operator

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 building operator, and may also be used to develop training or examination content.

Multifamily Building Operator Job Description

A multifamily building operator efficiently operates and maintains building systems, addresses tenant concerns, improves building performance, and complies with regulations to support a comfortable, healthy, and safe living environment.

A proposed content outline resulting from this Job/Task Analysis follows.

Multifamily Building Operator Duty Areas

A	Facilitating Stakeholder Communication
B	Monitoring Current Building Performance
C	Operating and Maintaining Building Systems
D	Ensuring Regulatory Compliance
E	Improving Health and Safety
F	Improving Building Performance

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 funded by DOE's Weatherization Assistance Program (WAP).

Introduction

The National Renewable Energy Laboratory secured the services of Professional Testing to help develop a job/task analysis (JTA) for multifamily building operators.

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 job.

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 building operator. 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 building operator as currently practiced.

Subject Matter Expert Selection Process

Professional Testing helped to establish the criteria for selecting the DACUM panel of subject matter experts (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 to create the multifamily building operator 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 building operator JTA workshop was held in Lakewood, Colorado, May 9-11, 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 building operators, 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 building operator 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 building operators.

Results

This appendix presents aspects of a multifamily building operator, as captured by the 12-member panel during the May 9-11, 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, Refrigeration, and Air Conditioning Engineers
CBA	Cost benefit analysis
DACUM	Developing a curriculum
EPA	Environmental protection agency
FEMA	Federal Emergency Management Agency
HVAC	Heating, Ventilation, and Air-Conditioning
HUD	Department of Housing and Urban Development
IEQ	Indoor environmental quality
IPM	Integrated pest management
JTA	Job/task analysis
LEED	Leadership in Energy and Environmental Design
MSDS	Material safety data sheets
NFPA	National Fire Protection Association
O&M	Operations and Maintenance
OSHA	Occupational Safety & Health Administration
PPE	Personal protective equipment
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 Building Operators

	Duties and Tasks	Weighting	SME Suggested Weighting
A	Facilitating Stakeholder Communication	26.17%	25%
1	Respond to Building Decision Maker Expectations	4.59%	5%

	Duties and Tasks	Weighting	SME Suggested Weighting
2	Respond to Tenants' Concerns	4.59%	5%
3	Develop an Operations and Maintenance Communication Plan	3.20%	3%
4	Manage Vendor Relations	3.80%	3%
5	Manage Contractor Relations	3.80%	3%
6	Establish Community Connections	1.80%	2%
7	Coordinate Building Access	4.39%	4%
B	Monitoring Current Building Performance	11.19%	10%
1	Perform Resource Accounting	2.40%	2%
2	Evaluate Operating Parameters	2.20%	2%
3	Establish Water Management Plan	2.00%	2%
4	Inspect Current Building Condition	4.59%	4%
C	Operating and Maintaining Building Systems	18.23%	30%
1	Create Operations and Maintenance Plan	3.20%	5%
2	Create Waste Management Plan	2.40%	4%
3	Procure Goods and Services	3.99%	6%
4	Train Operations and Maintenance Staff	3.20%	5%
5	Implement Work Order Systems	3.70%	6%
6	Implement Sustainability Site Plan	1.74%	4%
D	Ensuring Regulatory Compliance	9.79%	10%
1	Identify Regulatory Compliance Requirements	3.00%	3%
2	Educate Stakeholders about Regulatory Compliance	2.60%	3%
3	Ensure Regulatory Compliance	4.19%	4%
E	Improving Health and Safety	19.85%	10%
1	Create Workplace Safety Plan	2.40%	1%
2	Implement Workplace Safety Plan	3.30%	2%
3	Meet Occupational Safety & Health Administration (OSHA) requirements	3.40%	2%
4	Test Personal Protective Equipment (PPE)	2.40%	1%
5	Establish Building Security Plan	2.60%	1%
6	Develop Indoor Environmental Quality Plan	1.55%	1%
7	Implement Integrated Pest Management Plan	1.80%	1%
8	Establish Emergency Preparedness Plan	2.40%	1%
F	Improving Building Performance	14.77%	15%
1	Manage Operations and Maintenance Budget	3.60%	4%

	Duties and Tasks	Weighting	SME Suggested Weighting
2	Review Building Operations Benchmarks	2.40%	2%
3	Identify Building Performance Improvement Measures	2.40%	2%
4	Support Capital Needs Assessment	2.40%	2%
5	Manage Unit Turn-Overs	3.97%	5%
		100.00%	100%

Knowledge

The SMEs identified and categorized specific types of knowledge needed to be a proficient multifamily building operator (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 building operator.

Table B-3. Specialized Knowledge Required of Multifamily Building Operators

Specialized Knowledge	
Analyze water usage	ASHRAE ventilation
Basic accounting	Building automation systems
Building management	Building resilience plan
Building science	Building systems
Business management	Cost benefit analysis
Certification requirement	Codes, standards, and regulations
Community culture	Company culture
Condition indicators	Construction management
Cost benefit analysis	Cultural context of building tenants
Data normalization	Emergency management
Energy efficiency	Energy efficient measures
Energy improvement measures	Environmentally friendly products
EPA	Fair housing law
Finance	General building
General construction	General operations of a multifamily building
General security	Hazardous materials
Hazardous waste	Human resources
HVAC	Integrated pest management references
Irrigation reduction	Landscaping
Level-1 audit	Life cycle analysis
Local regulatory requirements	Local vendor market conditions
Marketing	Moisture control

Specialized Knowledge	
OSHA regulations	Pests
PPE	Procurement policies
Purchasing contracts	Rain water harvesting
Regulatory compliance	Regulatory requirements
Risk hazard analysis	Space heating
Supply chain	Tenant/owner law
Typical apartment water usage	Utility rate structure
Waste management	Water conservation measures
Xeriscaping	

Table B-4. General Knowledge Required of Multifamily Building Operators

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 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 the dimensions of an object from a scale drawing
Measure area (square inches, square centimeters, etc.)	Measure board feet
Measure length to 1/32 of an inch	Measure linear distances (length, width, etc.)
Measure temperature to within 1 degree Fahrenheit	Measure volume (cubic inches, liters, etc.)
Measure weights using devices calibrated in ounces	Measure weights using devices calibrated in pounds
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.)

General Knowledge	
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
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.	Read and follow directions found in equipment manuals and code books
Communications	
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 drawings and specifications sheets
Read information from tables and graphs (bar, circle, etc.)	Read flowcharts
Read information from tables and graphs (bar, circle, etc.)	Research information
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 building operator 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 Building Operators

Skills, Abilities, and Attributes	
Accurate/Precise	Adaptable/Flexible
Analytical	Attention to detail
Basic accounting	Basic math
Budgeting	Caring
Common sense	Computational
Confident	Conscientious
Contract negotiating	Cooperative
Courteous	Critical thinking
Customer-oriented	Data analysis
Data collection	Dependable
Detail-oriented	Eager to learn new things
Empathetic	Enthusiasm
Ethical	Focused
Free of substance abuse	Friendly
Goal-oriented	Helpful
Honest	Industrious
Initiative	Integrity
Interpersonal	Lack of prejudice (bias)
Leader	Listening
Manage stress/pressure	Management
Meter reading	Meticulous
Multitasking	Neat
Negotiating	Non-aggressive
Observational	Open-minded to change
Organizational	Patience
Persistence	Personal hygiene
Physical stamina	Positive attitude
Pride in job	Prioritizing
Problem solving	Professional
Punctual	Quality assurance
Reading	Record keeping

Skills, Abilities, and Attributes	
Research	Respectful
Responsible/accountable	Safety
Safety conscious	Self-control
Self-discipline	Self-motivated
Sensitive to thoughts of others	Social skills
Tactful	Team player
Technical reading	Time management
Tolerant	Trouble shooting
Trustworthy	Verbal communication
Work efficiently (resources)	Work efficiently (time)
Work in teams	Written communication

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 building operator should possess.

Table B-6. Physical Conditions Recommended for Multifamily Building Operators

Physical Conditions	
Bend forward frequently	Carry heavy objects while climbing (ladders, scaffolding, etc.)
Carry Objects of up to 50 pounds	Climb ladders, stairs, poles, etc. using legs and/or arms
Crawl or creep	Detect abnormal noises
Feel size, shape and temperature or texture of objects with the hands	Handle hot or cold objects
Handle toxic materials	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	Lay on back
Lift 50 pounds maximum	Lift objects from ground to overhead level
Lift objects from ground to waist level	Lift objects from waist to overhead level

Physical Conditions	
Pull objects with arms or hands	Push objects with arms or hands
Reach with arms and hands in any direction	See and discriminate colors
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 all of the time
Stand at all (could the work be performed from a sitting position?)	Stand part of the time
Stoop kneel or crouch	Talk
Use digging or chopping motion while working	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 in a squatting position for more than 5 minutes per hour
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 in sub-zero temperatures (0 and lower)	Work inside
Work on slippery surfaces	Work outside
Work while sitting or standing on high roofs, overhangs, or I-beams	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
Work with or near plastic resins	

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 Building Operators

Tools, Equipment, and Resources	
General Tools, Equipment, and Resources	
ADA	ASHRAE
Benchmarking software	Building blueprint
Building decision maker	Building decision maker's expectations
Building decision maker's goals	Building organizational flow chart
Building plans	Building system logs
Camera	Capital budget
Capital needs assessment	Codes, standards, and regulations
Communication device	Community outreach programs
Computer	Contract
Contractor logs	Contractor schedules
Copier	Data collection templates
Energy Consultant	EPA regulations
Equipment inventories	Equipment manuals
Equipment technical manuals	FEMA
Fire department	Flow bag
Health and safety manual	HUD IEQ for multifamily
HUD IPM Guidebook	HUD IPM manual
Human resources	IEQ manual
Inspection instruments	Inspection schedules
Inspection tools	Internet
IPM Plan	Job site posters
Labor agreements	Lease
LEED	Lobbying organizations
Local codes	Local jurisdictions
Locked key box	Maintenance budget
Maintenance management system	Maintenance manual
Manufacturer's technical manuals	Measurement instruments
Medical facilities	MSDS sheets
New Building Institute	NFPA standards
Office supplies	Operational budget
Operations manual	Organization's contract templates
Organization's health and safety plan	Organization's policies and procedures
Organization's procurement policy	OSHA

Tools, Equipment, and Resources	
OSHA handbook	OSHA training
General Tools, Equipment, and Resources	
OSHA training facilities	OSHA training publications
Pest control equipment	Phone
Physical needs assessment	Police department
PPE	Printed materials from regulatory agencies
Printed materials from trade associations	Procurement policy
Professional network	Recycling resources
Related signage	Security company
Security systems	Site IPM
Spreadsheet software	Third party verification
Trade associations	Trend data
Utility data	Vendor logs
Vendor schedules	Visitor logs
Weather data	Work order forms
Work order log	Workplace safety plan
www.dsireusa.org	www.waterworks.org
Inspection Tools	
Anemometers	Binoculars
Borescope camera	Camera
Clamp-on amp meters	CO monitor
Combustion analyzers	Contact thermometer
Data loggers	Digital multimeter
Duct blaster	Electrical line testers
Flashlight	Gas leak detector
Hygrometers	Infrared Camera
Inspection mirror	Ladders
Laser distance meters	Laser thermometer
Moisture meters	Refrigerant leak detectors
Smoke stick	Tape measure
Building Systems	
Electrical Systems	Elevator Systems
Envelope Systems	HVAC Systems
Life Safety Systems	Plumbing Systems

Tools, Equipment, and Resources	
Renewable Energy Systems	Snow Melt Systems
Structural Systems	Telecommunication Systems
Waste Systems	
Personal Protective Equipment (PPE)	
Booties	Personal carbon monoxide detector
Dust Mask	Respirator mask
Gloves	Safety glasses
Hard hat	Supportive footwear
Kneepads	Tyvek suit

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 Building Operators

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
A	Facilitating Stakeholder Communication			
1	Respond to Building Decision Maker Expectations			
a	Obtain building decision maker's goals	General operations of a multifamily building	Basic accounting Management Negotiating Verbal communication Written communication	Computer Phone
b	Establish building decision maker's communication protocol			
c	Determine building decision maker's roles and responsibilities			
d	Determine building decision maker's level of involvement			
e	Identify the building operator's roles and responsibilities			
f	Communicate building needs to decision maker			
g	Establish building decision maker's response expectations			
h	Establish building decision maker's goal review process			
i	Establish a procurement process			
2	Respond to Tenants' Concerns			
a	Develop tenants' communication protocol	Cultural context of building tenants Fair housing law Tenant/owner law	Interpersonal Negotiating Problem solving Verbal communication	Computer Lease Maintenance management system Phone Work order log
b	Create response timeline protocol			
c	Communicate level of service offered to tenants			
d	Track response to tenants' concerns			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
3	Develop an Operations and Maintenance Communication Plan			
a	Formalize organizational flow chart	Company culture	Verbal communication Written communication	Building decision maker Building organizational flow chart
b	Create a phone tree			
c	Designate emergency contacts			
d	Determine level of emergency			
e	Disseminate communication plan to operations and maintenance staff			
f	Update communication plan			
4	Manage Vendor Relations			
a	Identify vendors	Local vendor market conditions Purchasing contracts Supply chain	Negotiating Verbal communication Written communication	Organization's health and safety plan Organization's procurement policy OSHA handbook MSDS sheets
b	Identify vendor terms and conditions			
c	Review vendor performance			
5	Manage Contractor Relations			
a	Identify contractors	Construction management General construction Regulatory compliance	Management Quality assurance Verbal communication Written communication	Building plans Camera Codes, standards, and regulations Contract Equipment manuals Health and safety manual IEQ manual Job site posters Maintenance manual
b	Identify contractors terms and conditions			
c	Identify management company's policies and procedures			
d	Communicate management company's policies and procedures to contractors.			
e	Coordinate contractors access			
f	Verify contractors' license			
g	Verify contractors' insurance			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
h	Verify work permit			Operations manual Organization's contract templates OSHA Third party verification
i	Notify tenants of contractors presence			
j	Verify contractors met work requirements			
k	Communicate contract status to stakeholders			
l	Implement a formal closeout procedure			
6	Establish Community Connections			
a	Identify building neighbors	Community culture	Interpersonal Negotiating Verbal communication Written communication	Building decision maker's goals Community outreach programs Local codes
b	Mitigate neighborhood risks to building operation			
c	Identify community resources			
d	Identify local community based organizations			
e	Mitigate building operation risks to neighborhood			
f	Verify property line			
7	Coordinate Building Access			
a	Establish hours of operation	Company culture	Interpersonal Organizational Verbal communication Written communication	Contractor logs Contractor schedules Inspection schedules Organization's policies and procedures Vendor logs Vendor schedules Visitor logs
b	Enforce protocols for building access			
c	Define tenant access privileges			
d	Manage access codes and keys			
e	Maintain contractor inspector logs			
B	Monitoring Current Building Performance			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
1	Perform Resource Accounting			
a	Identify resources to measure	Data normalization Utility rate structure	Analytical Basic math	Benchmarking software Computer Spreadsheet software Utility data Weather data
b	Collect utility usage and bills			
c	Collect water usage and bills			
d	Allocate metered services to user			
e	Identify billing rate structure			
f	Organize yearly usage and bills			
g	Establish building performance benchmarks			
f	Determine trends in metered usage			
h	Determine potential for metered usage savings			
2	Evaluate Operating Parameters			
a	Identify building systems to monitor	Analyze water usage Building automation systems Building systems	Data analysis Data collection Technical reading	Data collection templates Manufacturer's technical manuals Measurement instruments
b	Establish key performance indicators			
c	Identify condition indicators			
d	Define target operating range			
e	Establish performance logs			
f	Update performance logs			
g	Collect building systems data			
h	Verify building systems are within operating range			
i	Restore building systems to target operating range			
3	Establish Water Management Plan			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
a	Review water usage	Regulatory compliance Typical apartment water usage	Meter reading	Computer Flow bag Internet www.waterworks.org
b	Review water cost			
c	Calculate water usage per unit at the monthly and annual level			
d	Perform water leak inspection			
e	Investigate storm water retention			
4	Inspect Current Building Condition			
a	Inspect building envelope	Building systems Codes, standards, and regulations Condition indicators Hazardous materials Space heating	Attention to detail Management Reading Verbal communication Written communication	Camera Inspection instruments Measurement instruments
b	Inspect building for health and safety hazards			
c	Inspect structural systems			
d	Inspect mechanical systems			
e	Inspect electrical systems			
f	Inspect plumbing systems			
g	Inspect safety systems			
h	Inspect security systems			
i	Inspect building for regulatory compliance			
C	Operating and Maintaining Building Systems			
1	Create Operations and Maintenance Plan			
a	Create existing equipment inventory	Human resources	Organizational	Building decision maker's expectations Capital budget Equipment technical manuals Maintenance budget
b	Determine staff responsibilities			
c	Determine staffing needs			
d	Review equipment operating parameters			
e	Review building operating parameters			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
f	Identify maintenance needs			Operational budget Professional network
g	Create maintenance schedule			
h	Review budget needs			
i	Establish normal operating procedures			
j	Establish emergency operating procedures			
k	Maintain operations and maintenance plan			
l	Update maintenance logs			
2	Create Waste Management Plan			
a	Identify waste streams	Hazardous waste Local regulatory requirements Waste management	Research Verbal communication Written communication	Recycling resources Related signage
b	Identify regulatory waste management requirements			
c	Identify incentive programs			
d	Quantify waste streams			
e	Identify waste management goals			
f	Arrange waste removal			
g	Identify waste stream diversion opportunities			
h	Identify waste stream reduction activities			
i	Communicate waste management plan to tenants			
j	Maintain waste management plan			
3	Procure Goods and Services			
a	Determine goods and services needs	Procurement policies Purchasing contracts	Verbal communication Written communication	Procurement policy
b	Coordinate good and services needs with vendors			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Track inventory of goods and services			
4	Train Operations and Maintenance Staff			
a	Assess current staff skill levels	Certification requirement Human resources Regulatory requirements	Verbal communication Written communication	Labor agreements
b	Assess staff training requirements			
c	Determine staff certification requirements			
d	Conduct staff training			
e	Assess staff performance			
5	Implement Work Order Systems			
a	Establish maintenance priorities	Building maintenance Building systems	Attention to detail Prioritizing Reading Writing	Communication device Computer Equipment inventories Work order forms
b	Establish work order requirements			
c	Create a formal process for work order generation			
d	Execute work orders			
e	Create a formal process to close out work orders			
f	Track executed work orders			
g	Compare work order system performance to work order requirements			
6	Implement Sustainability Site Plan			
a	Survey existing site conditions	Irrigation reduction Landscaping Rain water harvesting Xeriscaping	Contract negotiating	Health and safety manual HUD IPM manual LEED New Building Institute OSHA Notebook Site IPM
b	Review sustainability best practices			
c	Develop site specific plan			
d	Incorporate sustainability site plan in O & M plan			
D	Ensuring Regulatory Compliance			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
1	Identify Regulatory Compliance Requirements			
a	Create list of regulatory compliance requirements	Codes, standards, and regulations	Reading Writing	ADA IPM Plan MSDS sheets OSHA notebook Workplace safety plan
b	Create list of regulatory agencies			
c	Identify documentation for regulatory compliance requirements			
d	Establish regulatory compliance schedule			
e	Designate responsibility for regulatory compliance			
2	Educate Stakeholders about Regulatory Compliance			
a	Collect regulatory compliance information for dissemination to stakeholders	Codes, standards, and regulations	Interpersonal Verbal communication Written communication	Lobbying organizations Printed materials from regulatory agencies Printed materials from trade associations
b	Notify stakeholders about regulatory compliance			
c	Obtain stakeholder signatures			
d	Reduce non-compliant behavior			
3	Ensure Regulatory Compliance			
a	Maintain records	Codes, standards, and regulations	Attention to detail Organizational Record keeping Time management Verbal communication Written communication	Copier Office supplies
b	Schedule required inspections			
c	Provide building access for compliance inspections			
d	Provide records access for compliance inspections			
e	Post notices in building			
f	File paperwork with regulatory agencies			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
E	Improving Health and Safety			
1	Create Workplace Safety Plan			
a	Identify safety hazards	OSHA regulations Risk hazard analysis Mitigation planning	Verbal communication Written communication	OSHA training PPE
b	Determine mitigation strategy for each safety hazard			
c	Document findings			
2	Implement Workplace Safety Plan			
a	Purchase safety equipment	OSHA regulations	Verbal communication Written communication	Human resources OSHA training publications PPE
b	Train staff on hazard identification			
c	Train staff on mitigation strategy			
d	Ensure compliance with workplace safety plan			
3	Meet Occupational Safety & Health Administration (OSHA) requirements			
a	Create inventory of consumables subject to OSHA	OSHA regulations	Detail-oriented Safety	Computer Internet MSDS sheets OSHA training facilities
b	Compile MSDS forms for OSHA inventory items			
c	Create OSHA notebook			
d	Post notebook in a staff accessible location			
e	Update OSHA notebook			
f	Verify OSHA training of building staff			
4	Test Personal Protective Equipment			
a	Review equipment inventory	OSHA regulations PPE	Detail-oriented	PPE
b	Procure equipment instructions			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Read equipment instructions			
d	Follow equipment instructions			
e	Establish equipment inspection schedule			
f	Repair equipment			
g	Replace equipment			
h	Document completion of inspection			
i	Document frequency of inspection			
5	Establish Building Security Plan			
a	Identify building points of access	General security	Organizational	Building blueprint Locked key box Security company Security systems
b	Identify building points of egress			
c	Compile list of individuals authorized to access building			
d	Test security equipment (i.e. locks, cameras)			
e	Establish a key control strategy			
f	Identify parties involved in developing a building security plan			
g	Verify building security coverage zone			
h	Establish security response protocols			
i	Verify compliance with local codes			
6	Develop Indoor Environmental Quality Plan			
a	Identify IEQ point sources	ASHRAE ventilation Building science Environmentally friendly	Critical thinking Troubleshooting Verbal communication	ASHRAE EPA regulations HUD IEQ for multifamily
b	Review MSDS			
c	Evaluate alternatives to toxic substances			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
d	Determine mitigation strategies to IEQ sources	products EPA HVAC IEQ Moisture control	Written communication	LEED MSDS sheets
e	Educate tenants about IEQ			
f	Determine ventilation requirements			
g	Document findings			
h	Establish environmentally responsible product procedures			
7	Implement Integrated Pest Management Plan			
a	Identify level of pest problems	Building science IPM references Pests	Critical thinking Observational Reading Written communication	HUD IPM Guidebook MSDS sheets Pest control equipment
b	Identify current pest mitigation strategy			
c	Evaluate effectiveness of current pest mitigation strategy			
d	Communicate pest management strategy to building occupants			
e	Document non-compliance with pest management strategy			
f	Identify alternative non-toxic mitigation strategies			
8	Establish Emergency Preparedness Plan			
a	Establish relationships with emergency services	Building resilience plan Emergency management Risk management	Critical thinking Organizational Reading Verbal communication Written communication	FEMA Fire department Local jurisdictions Medical facilities NFPA standards Police department
b	Identify potential threats to the building			
c	Identify potential threats to the occupants			
d	Establish response protocols			
e	Communicate response protocols to stakeholders			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
f	Review building signage			
g	Test emergency equipment			
h	Create emergency equipment test schedule			
i	Identify long term changes to building that affect resilience			
j	Develop building resilience plan			
F	Improving Building Performance			
1	Manage Operations and Maintenance Budget			
a	Track expenditures	Basic accounting Business management Cost benefit analysis Energy efficiency Life cycle analysis Finance	Analytical Budgeting Organizational Troubleshooting	Capital needs assessment Computer Physical needs assessment Spreadsheet software
b	Regulate discretionary spending			
c	Communicate with building decision maker about expenses			
d	Compare estimated and actual costs			
e	Identify cost saving opportunities			
2	Review Building Operations Benchmarks			
a	Review building system logs	CBA Energy efficient measures Risk management	Analytical Computational Data analysis Trouble shooting Verbal communication Written communication	Building system logs Computer Spreadsheet software Trend data
b	Identify improvement opportunities			
c	Prioritize improvement opportunities			
d	Submit improvement opportunities to building decision maker			
3	Identify Building Performance Improvement Measures			
a	Conduct periodic level-1 audit	Building science Energy improvement	Analytical Reading	Energy Consultant Inspection tools
b	Document findings			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
c	Provide recommendations to building decision maker	measures General construction Level-1 audit Water conservation measures	Verbal communication Written communication	Measurement instruments
d	Determine further analysis needs			
e	Identify technological innovations since previous level-1 audit			
f	Incorporate level-1 audit results in O&M budget			
4	Support Capital Needs Assessment			
a	Assist in level-2 audit	General building General construction	Prioritizing Verbal communication	Building system logs Computer Professional network Trade associations www.dsireusa.org
b	Provide O&M logs for review			
c	Plan for future capital costs			
d	Identify building systems near end of service life			
e	Identify external funding sources to building decision maker			
5	Manage Unit Turn-Overs			
a	Identify sustainability improvement opportunities and add to unit turn-over checklist	Building management Building science HVAC IEQ Marketing	Detail-oriented Organizational Verbal communication Written communication	Inspection tools
b	Differentiate between recurring and one-time improvements			
c	Assign checklist responsibilities			
d	Verify checklist completion			
e	Coordinate with building management on time requirements			
f	Ensure unit turn-over improvements conform with IEQ plan			

Duties, Tasks, and Steps		Special Knowledge	Skills and Abilities	Tools, Equipment, and Resources
g	Document unit turn-over improvements			

DACUM PERFORMED FOR: National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401

DACUM PERFORMED BY: Professional Testing, Inc.
7680 Universal Blvd., Suite 300
Orlando, Florida 32819

DACUM FACILITATORS: Merrianne Bryan, M.A.
Professional Testing, Inc.

Corina Owens, Ph.D.
Professional Testing, Inc.

DACUM PANEL:

Clifford E. Babson CEM, CMVP, CEA, LEED AP
Principal
Four Points Energy Solutions
Lansing, NY

Renardon Calhoun
Single/Multifamily Energy Auditor
KB Energy, Inc.
South Holland, IL

Howard Feldman
Principal
Coastal Green Building Solutions
Hilton Head, SC

Matthew Holden, P.E.
President
Sparhawk Group
Yarmouth, ME

Thomas Holmes
Director, Energy Performance Group
Remediation Specialists, Inc.
Hamilton, NJ

Luke Ilderton
Director of Energy Efficiency Programs
Energy Outreach Colorado
Denver, CO

Andrew Kinaci
Senior Energy Analyst
CNT Energy
Chicago, IL

Rick Meinking
Business Program Manager
Efficiency Maine Trust
Augusta, ME

F.L. Andrew Padian
Vice President for Energy Initiatives
The Community Preservation Corporation
New York City, NY

Asit Patel
President
ANP Energy Consulting Services Corp.
Bellmore, NY

Andy Wildenberg
President
e3 Power
Denver, CO

Chris Wolken
Principal
Peninsula Group
Menlo Park, CA

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 Building Operator 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 Building Operators. The goal of the study is to determine the essential tasks that describe the role of today's Multifamily Building Operators.

While Multifamily Building Operators 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 Building Operator.

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 Building Operator.

Task ratings - The second section presents the tasks performed by Multifamily Building Operators. The tasks are organized into six performance domains: Facilitating Stakeholder Communication; Monitoring Current Building Performance; Operating and Maintaining Building Systems; Ensuring Regulatory Compliance; Improving Health and Safety; and Improving Building Performance. 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 in multifamily building operation, 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 the study, please contact us at cowens@proftesting.com or call (800) 330-3776.

To begin, click on the Next button below.

Multifamily Building Operator 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 Project Manager
- ☐ MF Building Operator
- ☐ MF Quality Control Inspector
- ☐ Other (please specify)

Which of the following categories best describe your current position?

- ◯ MF Building Operator Practitioner
- ◯ MF Building Operator Curriculum Developer
- ◯ MF Building Operator Trainer/Proctor
- ◯ Other (please specify)

Multifamily Building Operator JTA Validation Study

How many years of experience have you had working as a Multifamily Building Operator (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)
- [ ] Building Commissioning Association Certified Commissioning Professional (CCP)
- [ ] 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 Conditioned Heat Pump Professional
- [ ] BPI Multifamily Professional
- [ ] 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 Building Operator 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 Building Operator JTA Validation Study

Task Ratings

Below is a list of tasks performed by **Multifamily Building Operators**.

The tasks are organized into six performance domains: Facilitating Stakeholder Communication; Monitoring Current Building Performance; Operating and Maintaining Building Systems; Ensuring Regulatory Compliance; Improving Health and Safety; and Improving Building Performance.

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.)

Facilitating Stakeholder Communication:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Respond to Building Decision Maker Expectations		
Respond to Tenants' Concerns		
Develop an Operations and Maintenance Communication Plan		
Manage Vendor Relations		
Manage Contractor Relations		
Establish Community Connections		
Coordinate Building Access		

Multifamily Building Operator JTA Validation Study

Monitoring Current Building Performance:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Perform Resource Accounting		
Evaluate Operating Parameters		
Establish Water Management Plan		
Inspect Current Building Condition		

Operating and Maintaining Building Systems:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Create Operations and Maintenance Plan		
Create Waste Management Plan		
Procure Goods and Services		
Train Operations and Maintenance Staff		
Implement Work Order Systems		
Implement Sustainability Site Plan		

Multifamily Building Operator JTA Validation Study

Task Ratings

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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.)

Ensuring Regulatory Compliance:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Identify Regulatory Compliance Requirements		
Educate Stakeholders about Regulatory Compliance		
Ensure Regulatory Compliance		

Multifamily Building Operator JTA Validation Study

Improving Health and Safety:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Create Workplace Safety Plan		
Implement Workplace Safety Plan		
Meet OSHA requirements		
Test PPE		
Establish Building Security Plan		
Develop Indoor Environmental Quality Plan		
Implement Integrated Pest Management Plan		
Establish Emergency Preparedness Plan		

Improving Building Performance:

	Frequency - How frequently is this task performed?	Importance - How important is the task to the performance of the job?
Manage O&M Budget		
Review Building Operations Benchmarks		
Identify Building Performance Improvement Measures		
Support Capital Needs Assessment		
Manage Unit Turn-Overs		

Multifamily Building Operator 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 Building Operator 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 Building Operator JTA development process.

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