



**High Performance Building Technicians
Training and Certification
Research Report
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Developed for
NSF BEST Center
Building Efficiency for a Sustainable Tomorrow





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1 Executive Summary

The goal of this research project is to provide information to the BEST Center regarding the training and certification of high performance technicians involved in the maintenance and operations of commercial buildings, and to explore the potential for a national certification that would complement a two-year associate's degree. The methodology included working with high-level facility managers to make them aware of the mission and strategic focus of the BEST Center, understand their challenges for facility managers in hiring technicians with appropriate technical preparation, and set the stage for future collaboration between the BEST Center and key industry stakeholders. Additional goals included obtaining an increased understanding of the facility operations field including industry structure, government data on the profession, and details on existing certificates, and certifications.

Overall, the results of the project are consistent with past research in the area of High Performance Building Technicians.¹ High Performance Buildings (HPB)² can be operationally defined as those that provide enhanced efficiency, comfort and productivity while a High Performance Building Technician (HPBT) can be described as someone with training on all facets of facility operations and maintenance including skills pertaining to whole-systems analysis and energy management that are essential for meeting future policy guidelines regarding energy, emissions, indoor environmental quality, and sustainability. The results indicate the challenges faced by the HPBT and the industry which include:

- Lack of formal recognition of the technician as a professional with an important role
- Limited availability of relevant occupational data from sources such as the Bureau of Labor Statistics
- Limited availability of appropriate training for technicians
- No recognized national certification for high performance building technicians
- Large projected workforce shortages in the sector due to the growth of the industry and anticipated retirements³

While there are a number of existing efforts in place to provide both certificates and certifications for areas such as facility and energy managers none of these are focused on recognizing the HPBT. Most also do not follow the "best practices" for certifications described by international standards.

It is also important to note that the industry is in the later stages of transition process in which many owners are electing to hire specialized contractors for the management of their facilities. The BEST Center will need to pay special attention to forging alliances with these service providers on a national basis.

¹ See <http://www.bestctr.org/research-reports/>

² Per EISA 2007. "The term "high- performance building" means a building that integrates and optimizes on a life cycle basis all major high performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations". See <http://www.gpo.gov/fdsys/pkg/BILLS-110hr6enr/pdf/BILLS-110hr6enr.pdf>

³ See http://www.careersinhvacr.org/Portals/_Appleseed/documents/Executive%20Summary.pdf

2 Problem Statement

This research focused primarily on three areas: (1) to identify and confirm potential high level corporate and public agency stakeholder support for the proposed High Performance Building Technician certification; (2) to identify and assess the potential national labor market demand for this certification; (3) to research and assess an ISO or alternative certification process and describe a certification strategy. Key activities of this work included:

- Conduct primary research with various industry stakeholders including: heads of large property management firms; owners and operators of high performance building such as data centers and hospitals; building systems manufacturers; and large public sector commercial-scale property owners including federal and state governments, universities, and school districts. The primary research consisted of:
 - Online survey of facility managers with invitations sent to approximately 120 candidates nationally.
 - Telephone interviews with leaders from regional and national facility management firms and organizations.
- Conduct secondary research utilizing public sources of information from the U.S. Department of Labor as well as industry associations such as the International Association of Facility Managers.
- Prepare this research report analyzing the national job market, determining the potential acceptance of key industry stakeholders for national certification, and analyzing the best certification strategy.

3 Key Findings and Recommendations

3.1 Summary of Key Findings

Details from the secondary research are shown in sections four through seven. Section eight and the appendix have details on the results from the surveys and interviews conducted as part of the primary research. A summary of the key findings and supporting quotes from the interviews are as follows:

- There is a **trend to outsource facility management functions** to regional or national facility management firms. BEST Center needs to connect with these firms.
 - “Moving to more outsourcing and contracts.”
 - “Especially good for owners where facility management is not a core skill.”
 - “Reduces risk, but may, or may not reduce cost.”
 - “Provides for added benefits such as using services “on demand” such as project management, contracts, etc.”
- **Aging workforce will result in the need for new and better-prepared entrants.** Yet many potential entrants do not see this, as a career and key workforce tracking organizations such as the Bureau of Labor Statistics does not have informative data.
 - “Half of my staff is under 35 and the other half are over 50, so we anticipate a lot of retirements over the next few years.”
 - “We need to improve tech schools – maybe start in high school.”
 - “Systems are getting more complex and we need more from our techs.”

- “Average age of our technicians is between 47 and 52.”
- “It is a dying art and most folks don’t see it as a career.”
- **Technicians in the field need a path to improve their skills** to better deal with issues related to energy efficiency and a healthy indoor environment. The Federal Buildings Personnel Training Act helps to illustrate this challenge.
 - “Developing an internal certification process that starts with a diagnostic assessment.”
 - “ We have “playbooks” that are standard processes for hands-on qualifications and competencies.”
 - “Focus on efficiency and sustainability.”
 - “Movement to predictive and preventive maintenance.”

The following recommendations are based upon the research and results documented in this report.

3.2 National Advisory Panel

Community colleges have a history of successfully developing industry alliances focused on aligning college program outcomes with specific skills needed by industry. Typically this partnership occurs on a regional or local basis with cooperation between industry stakeholders and one or more community colleges serving the area. The development of advanced community college programs for HPBT can and should follow a similar path, except that in aiming for a national certification a national network of colleges led by the BEST Center would work with a national and broadly representative body of stakeholders following a recognized certification process.

There also is the opportunity for the BEST Center to forge alliances on a national level with the larger national facility management companies that comprise a key and growing segment of industry that can help catalyze broad stakeholder participation. This process would start with the creation of an industry advisory board that would include representatives from some of the large national or regional FM service providers, such as CBRE and JLL, representatives from industry associations such as IFMA, IREM, and BOMA as well as public sector stakeholders. This advisory panel could focus on key issues such as critical skill requirements, recognition of HPBT as a career pathway, certification strategy, and re-training requirements for the existing workforce.

While it may not be realistic to do outreach to the myriad of individual facility managers, coordination with the larger regional and national firms, industry associations, and large public sector stakeholders has the potential to provide numerous benefits for all parties. These include:

- **BEST Member Benefits:**
 - Enhanced visibility and support from those involved with hiring a large number of students.
 - Ability to develop a hiring preference for students who complete BEST recognized programs and those that are awarded national certification.
 - Creation of allies in development and support for national certification programs.
 - National recognition of the HPBT certification, which can help drive consistency in educational programs, and ultimately, in the workforce.
 - Strategy for developing programs for re-training (or “up-skilling”) of those already in the workforce.

- Industry Member Benefits:
 - Access to job candidates who have the necessary skills to do both today's tasks and those needed in the future.
 - Educational training partners who can assist with evaluating skills and providing the necessary continuing education for technicians.
 - Ability to hire technicians with a nationally recognized certification and consistent skills.

3.3 Pursue National Certification for HPBT

The research results show a continued challenge in finding and retaining qualified employees for commercial facility operation and maintenance. This challenge is anticipated to increase as existing workers retire from the workforce and as the need for building energy and operational efficiency increases. There are many efforts needed to meet these challenges including a focused effort on workforce development, training both new entrants and retraining those already in place. To support this effort requires better recognition of HPBT as a profession. One key tool for both employers and potential employees is a national certification program. A certification provides a standard that current and future job seekers can endeavor to attain. It also allows employers to recruit candidates with a documented skill set.

The recommendation is that the BEST Center should pursue a national certification program. Ideally, this could be done in cooperation with other allied organizations that could share in the costs and benefits of developing and administering the program.

3.4 Importance of Including a Skill Upgrade Path for the Incumbent Workforce

It is recommended that the BEST Center focus on opportunities both for both the training of new technicians and also for the re-training of those already in the field. Up skilling is a clear requirement under the Federal Training Act (see section 7) and is also the focus of the BOC program today along with other industry programs including those from BOMI and IFMA. Community colleges have the ability to deliver this training more effectively and cost efficiently.

4 Industry Structure and Support for HPBT

4.1 Structure of the Facility Management Industry ⁴

Traditionally, facility management has been a task that was, by necessity, “self performed”. In other words, the building owner hired and “trained” the staff responsible for the safe and efficient operation of the facility. Commercial real estate investors and developers, whose core business is to acquire a facility and then rent the space to one or many tenants, have also followed this model. Over the years, however, there has been a trend toward outsourcing the facility management function. There are several reasons behind this trend including:

- Outsourcing allows the owner to focus on their core business or mission without having the effort diluted by other tasks. This is the same reason that firms outsource other functions as well such as food service, custodial, transportation, etc.
- By outsourcing facility management, an owner should be able to retain a firm with additional expertise, potentially beyond what in-house staff could provide.
- Outsourcing may also be used as part of a broader strategy to reduce risks and costs. For example, an outsourcing firm may be better able to deal with personnel costs such as training, benefits, unions, pensions, etc. than the owner is able to do on his own.

Today there is a mix of facility management models, with some owners providing their own facility management and others outsourcing this function. Some of the earliest owners to move to outsourcing were real estate owners and developers – primarily of office buildings. Today though, this group includes a broad range of owners including government, data centers, and health care. As the outsourcing industry has grown and matured, it has also consolidated, with several large, national and international firms which possess dominant market share.

Note that there does not seem to be any accurate measurement of the percentage of buildings managed by in-house staff versus outsourced staff. Most of the research indicates that outsourcing is a significant and growing trend, especially in sectors where operations are not mission critical (i.e. office buildings, government, etc.). While outsourcing does occur in critical facilities (for example, data centers), it is less common; many institutional owners such as universities and hospitals continue to view operations as critical and are unlikely to outsource this function. Requirements to utilize union labor may also impact the decision to perform work in-house or outsource.

Many different tasks are involved in facility management and some or all of these may be done internally or outsourced. Examples of the range of tasks include:

- Custodial
- Food service
- Security

⁴ See KPMG Global Real Estate and Facility Management Outsourcing Pulse Survey and Denali Intelligence Facility Management Market Intelligence Report (2013).

- Facility operations and maintenance (O&M)
- Property management (leasing, tenant relations, processing payments, etc.)
- Repairs
- Retrofits and other capital improvement programs
- Project management
- Brokerage services

While this research project is mainly focused on facility operations tasks, most industry research (and the outsourcing companies) focus on the larger picture of all tasks involved in operating a facility.

The leading national suppliers in Facility Operations are:

- CB Richard Ellis (CBRE)
- Jones Lang LaSalle (JLL)
- Cushman and Wakefield (CW)
- Hines

In addition to the large outsourcing firms, there are also numerous local and regional firms. Some of these firms mainly manage their own real estate while others provide services for owners such as REITS, corporations, government, and insurance companies. Examples of regional and local providers include:

- Able Engineering (Northern California and other regions)
- VIOX Services (Southwest Ohio)
- Tri-Properties (Durham NC)
- Meridian Management (Southeast)

4.2 Industry Interest in BEST

As part of this research, interviews were conducted with senior members of firms that either performed facility operations on their own, or provided these services for clients. The findings were fairly consistent with past research⁵ in this area including:

- Challenges in finding qualified candidates to hire:
 - Few good training program available
 - Potential job seekers are not aware or do not view building operations as a career path
 - Community colleges viewed as a potential partner, but firms may not be actively working with them to find job candidates
 - Candidates often hired with some skills and learn the rest on the job (OJT)
- Need to assess and develop skills for current hires:
 - Either recognize that there is a need or are already developing tools to evaluate skills
 - Few seem to have a good plan for training those already in their workforce
 - Technicians generally are neither motivated nor incentivized to pursue training on their own outside of the job

⁵ See <http://www.bestctr.org/research-reports/>

- Challenges in retaining technicians:
 - As the economy improves, technicians are leaving building operations and going into more lucrative jobs such as construction where they are paid more and qualify for overtime pay
 - Expect a large number of retirements. For example, one interviewee stated that half of the technicians in that firm are under 35 and the other half are over 55 and expected to retire within the next ten years
- Certification:
 - Most have not given much thought to the idea of a national certification program for HPBT but seem supportive of the idea
 - Not really familiar with the certification paths
 - View organizations such as BOMA, IFMA, IREM, and ASHRAE as good partners for a certification program

5 Job Prospects for Building Technicians

To justify the investment in new (or existing) programs, BEST Center member institutions are looking for the number of students who will participate and the job prospects for these graduates. This is the same justification used by community college administrators for any new or expanded program. As part of this research project, data was evaluated from existing sources on job prospects as well as qualitative data from industry leaders.

5.1 Government Data

Nationally, the starting point for looking at job descriptions, anticipated earnings, number of positions and growth rate is the Occupational Outlook Handbook from the Bureau of Labor Statistics (BLS)⁶. This online guide provides information on a broad range of occupations and includes the needed statistics on jobs, wages, etc.

While the occupation of a “building technician” is not new, the enhanced role of a HPBT is not recognized; even within the BLS data, building technicians are combined with maintenance workers. In actuality, the HPBT role could encompass several traditional occupational categories, including:

- Building Maintenance Mechanics
- General Maintenance and Repair Workers
- Electrical and Electronics Installers and Repairers
- Facility Managers

The BLS occupational listing that most closely relates to a High-Performance Building Technician is the “Heating, Air Conditioning, and Refrigeration Mechanics and Installers”, although this role is clearly more focused on the construction than on the operations side of the business. See Figure 1 below.




	Electrical and Electronics Installers and Repairers	Electrical and electronics installers and repairers install, repair, or replace a variety of electrical equipment in telecommunications, transportation, utilities, and other industries.	Postsecondary non-degree award	\$51,220
	General Maintenance and Repair Workers	General maintenance and repair workers fix and maintain machines, mechanical equipment, and buildings. They work on plumbing, electrical, and air-conditioning and heating systems.	High school diploma or equivalent	\$35,210
	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Heating, air conditioning, and refrigeration mechanics and installers—often called <i>HVACR technicians</i> —work on heating, ventilation, cooling, and refrigeration systems that control the temperature and air quality in buildings.	Postsecondary non-degree award	\$43,640

Figure 2: Data from BLS Website

⁶ See <http://www.bls.gov/oo/>

Based on the assumption that the BLS data for HVAC technicians reflects the job prospects that overlap with HPBT, this looks positive. To summarize this job (see Figure 2):

- Optimistic job outlook based on HVAC Mechanics and Installers forecast – 21% growth rate.
- Workers have a variety of employment opportunities due to variety of facilities that require technicians on a regular basis.
- Occupational Outlook states “...employers generally prefer applicants with postsecondary education or those who have completed an apprenticeship. Some states and localities require technicians to be licensed.”

Realistically though, the role of a HPBT and a HVAC technician are not identical. The HPBT is expected to have many of the same skills as an HVAC technician but is also expected to be more focused on whole building systems such as energy, occupant satisfaction, and areas beyond HVAC. It is also important to keep in mind that the pay of a HVAC technician varies dramatically based upon the type of work performed (residential pays less than commercial) and union versus non-union status.

Quick Facts: Heating, Air Conditioning, and Refrigeration Mechanics and Installers	
2012 Median Pay ?	\$43,640 per year \$20.98 per hour
Entry-Level Education ?	Postsecondary non-degree award
Work Experience in a Related Occupation ?	None
On-the-job Training ?	Long-term on-the-job training
Number of Jobs, 2012 ?	267,600
Job Outlook, 2012-22 ?	21% (Faster than average)
Employment Change, 2012-22 ?	55,900

Figure 3: BLS Data on HVAC Technicians

Other organizations such as HVACR Workforce Development Foundation⁷ (HVACR WDF) and HVAC Excellence⁸ are also very focused on the HVAC technician. These groups are largely supported by industry and are focused on many facets of workforce development. The HVACR WDF research report on industry demand starts with the BLS data then adds in the impact of anticipated retirements, concluding that there will be a need for an additional 115,070 new hires by 2022. This research report was based largely on data gleaned from “online job postings,” and used a much broader definition of job descriptions than used by the BLS and as a result believes that the job opportunities are greater than stated by the BLS. The HVACR WDF demand report appears to recognize the role of a “Maintenance Technician” as an HVACR occupation and job title. That would appear to fit with what would be considered an HPBT, but there is no clear research provided as to the number of jobs, or a breakout of the anticipated growth for this role.

⁷ See www.careersinhvacr.org

⁸ See www.hvacexcellence.org

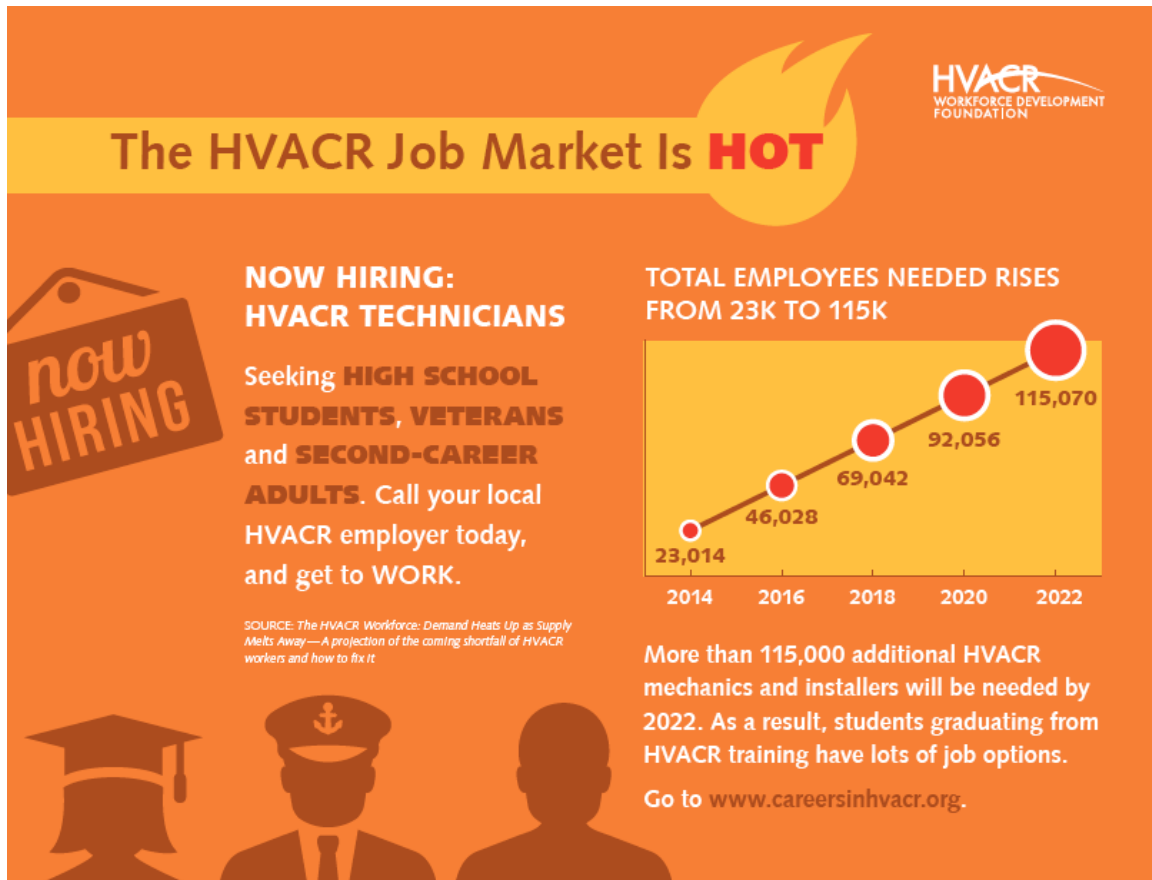


Figure 4: Info Graphic from Careers in HVACR

5.2 Primary Research Results on Job Prospects

As part of the research, inquiries were made about the future of the job prospects in facility management and operations. The data obtained was not intended to be quantitative yet provides a general view into the prospects for this field. Key comments include:

- “Half of staff expected to retire within the next ten years.”
- “Looking at a big gap. Lots of folks retiring with few to fill in the gaps.”
- “Was easier to find staff during the recession; now that construction has picked up we are not able to find or retain technicians.”
- “Have lots of folks retiring and the need is growing.”

These results were consistent with the conclusions of the HVACR WDF studies that indicated that the BLS data may not be entirely accurate and that there is a strong demand for both better-trained technicians as well as for replacements for those retiring from the workforce.

One rough estimate as to the number of technicians needed for commercial buildings would be to utilize data from the Energy Information Administrations - Commercial Building Energy Consumption Survey

(CBECS)⁹. Table 1 below utilizes the 2012 CBECS data then estimates based on one technician per 50 small buildings (under 25,000 square feet) and one per 100,000 square feet of medium buildings (25,000 – 50,000 square feet) and one per 75,000 square feet of large building (above 50,000 square feet). The total resulting estimate is in the range of 800,000 technicians.

Building Size Range (square Feet)	Number of Buildings (thousands)	Total Square Feet (Millions)	Estimated Number of Techs
1,001 to 25,000	4,890	32,151	97,800
25,001 to 50,000	332	11,915	119,150
50,001 to 100,000	199	13,914	185,520
100,001 to 200,000	90	12,425	165,667
200,001 to 500,000	38	10,718	142,907
Over 500,000	8	7,053	94,040
Total	5,557	88,176	805,083

Table 1: Estimated Building Technician Employment

5.3 Next Steps

The BEST Center should reach out to national facility management organizations and key industry members (see Section 3) to work together cooperatively to better define the role of HPBT and to develop better estimates as to the number of jobs for new technicians and replacements over the next decade. Improved skills, ideally would result in increased pay for this role as well. BEST Center college network members may also want to work with local advisory members to better understand their local markets.

6 Certificates, Certifications and Process

6.1 Certificates vs. Certifications

The distinction between certificates and certifications can be confusing. Many community colleges offer programs where certificates may be earned upon completion of a series of classes. Oftentimes, students go on to finish an associate’s degree that generally requires additional classes and pre-requisites. Certificates are generally provided in recognition of successful completion of specific training.

Certifications, on the other hand, are generally not specifically linked to training but rather are intended to measure and recognize the attainment of specific level of skills. In many ways, certifications are similar to licenses, requiring the participant to complete the following:

- Prove that they meet a set of qualifications that may include a combination of qualified educational programs, work experience, and other demonstrable skills.

⁹ See <http://www.eia.gov/consumption/commercial/data/2012/index.cfm?view=microdata>

- Successfully complete a certification exam that tests key skills as identified through JTA and as documented in a DACUM. These exams are intended to fairly test the required skills and may include a practical component.
- Follow a specified code of ethics.
- May require ongoing completion of continuing education units to maintain the certification.

A certifying body that holds to specific professional standards generally administers certifications, while licenses are generally administered by government agencies.

Certifications provide the following benefits to employers, employees, and purchasers, an important part of workforce development:

- **Employers:** By recruiting employees with a specific certification, the employer is hiring someone with a known skill set. This allows the employer to be fair and impartial in hiring and also allows them to improve the skill level of their workforce and considerable expenditure for post hire training. Employers can also use certifications as a pathway to re-train existing employees for improved performance and recognition.
- **Employees:** With a specific certification, a job candidate should be more readily employable. Holding a certification demonstrates knowledge and skills.
- **Purchasers:** Since many owners are outsourcing facility management services, they need a method to be able to fairly select qualified contractors. Requiring the contractor to have technicians with specific certificates or certifications provides a readily traceable quality metric in making purchasing decisions.

Assessment-based Certificate Program	Professional or Personnel Certification Program
Provides instruction and training (either degree or non-degree granting)	Assesses knowledge, skills, and/or competencies previously acquired
Goal is for participants to acquire specific knowledge, skills, and/or competencies.	Goal is to validate the participant's competency through a conformity assessment system.
Assessment is used to evaluate mastery of the intended learning outcomes, linked directly to the learning event.	Assessment is best used to assure baseline competencies and to differentiate professionals, independent of a specific learning event.
Assessment content may be narrower in scope.	Assessment content is usually broad in scope.
Awards a certificate to recognize mastery of the specific learning outcomes; it is NOT a certificate of attendance or participation, which is awarded to individuals who have attended or participated in a course or training program but did not have to demonstrate mastery of the intended learning outcomes.	Awards designations to recognize achievement.
To earn accreditation, complies with the <i>ICE 1100 Standard</i> and follows the ACAP application procedures.	To earn accreditation, complies with the <i>NCCA Standards for the Accreditation of Certification Programs</i> and follows the NCCA application procedures.

Table 2: Comparison Chart from the Institute for Credentialing Excellence¹⁰

¹⁰ See <http://www.credentialingexcellence.org/p/cm/ld/fid=4>

- The movement in certifications is to follow some sort of process. The two that seem to be prevalent are the NCCA and the ISO 17024. Between these, the ISO / ANSI standard is newer and appears to be the direction that most organizations are moving to adopt.
- There is an effort going on within ICE (parent of NCCA) to follow ISO 17024 and to allow for joint recognition¹¹;
- Some organizations (such as ASME) are modeling their process off of ISO 17024 but not seeking to formally comply.
- Unless it is somehow deemed untenable or economically unviable there is not a fundamental reason why certification should not follow a recognized process. Following the ISO process would likely convey greater recognition and acceptance of an HPBT certification.
- It is unclear whether the NCCA process is any less arduous than the ISO process.

6.2 ANSI/ISO 17024 - 2012¹²

The DOE / NIBS “Better Buildings Workforce” project (see section 7.1 for details) focused on the use of an international standard for the management of certification programs for several jobs in the energy efficiency field. This standard is ANSI/ ISO 17024-2012, “Conformity Assessment - General requirements for bodies operating certifications of persons.” Initially, the recommendations in this standard may appear to be somewhat onerous, and are generally inconsistent with how many organizations have traditionally managed their programs. For example some organizations require a candidate to attend their classes, or become a member of the organization as a requirement to achieve a certification, but this is prohibited under the standard. Further investigation though shows that the intent of the standard, clearly written in 28 pages, is to provide a process for managing these certifications; the premise is as follows: to have an organization in charge of providing certifications that is fair and impartial. These seem like critical precepts for any sort of certification activity and the details in the standard do not seem overly onerous. Here are some specifics:

- Certification cannot be restricted through means such as a high cost or requiring membership in a particular organization.
- Information on those certified has to be maintained with appropriate confidentiality.
- The certifying organization can offer training, but in order to not threaten impartiality, there are a series of rules regulating how such training can be tied to the certification. Note that none of these rules preclude the certifying organization from offering training.
- Specific requirements are provided for items such as confidentiality, qualification of examiners, etc. Also provided are requirements to follow ISO style management practices.
- There is a requirement to develop and document a certification scheme such as those which the DOE / NIBS project completed for their recommended certification schemes. Part of this schemes include the scope, Job Task Analysis (JTA), competence, prerequisites, etc.
- The process towards certification is well defined, including application, examination, certification and renewal processes.
- This standard offers a simpler process to follow than try to define such process individually. Note that there is nothing in the standard that would necessarily result in extensive cost or the need to use a specialized firm to develop the certification scheme although utilizing an experienced consultant (or an experienced partner) would simplify the process.

¹¹ See <http://www.credentialingexcellence.org/p/cm/ld/fid=377>

¹² See http://www.iso.org/iso/catalogue_detail?csnumber=52993

7 Industry Efforts for Certificates and Certification

7.1 DOE / NIBS Better Buildings Workforce¹³



In 2013 – 2014, the U.S. Department of Energy (DOE) worked with the National Institute of Building Sciences (NIBS) to create a series of certification schemes for “green jobs” related to buildings and energy efficiency. This project was started partially by a need to develop new jobs, and partially in recognition that there were not recognized certification programs currently in place that met international standards. It is not that certification programs do not exist, but rather that some of the ones in existence may not follow “best practices” and are not well recognized when it comes to those selecting these services. The Better Buildings program was premised on the idea that having recognized certifications in place would help to improve the quality of the workforce.

The project focused on several job titles including:

- Building energy auditor
- Building commissioning professional
- Building operations professional
- Energy auditor
- Federal facility manager (not finalized)

The project leadership decided to follow industry best practices for certifications as defined in ANSI/ISO standard 17024 (see Section 6.2 for more details on this standard). The process involved recruiting and convening groups that would provide input for a Job Task Analysis (JTA), development and review of a DACUM. Following these tasks, they then recruited and convened a Certifying Committee for each job, responsible for defining the overall experience, determining what was to be covered by exam or other documentation, defining the code of ethics, etc. The final result of this effort was the publication of a certifying document that could be used by one or more certifying organizations.

Although the process proceeded smoothly for most job titles, the role of the “Building Operations Professional” (BOP) , the one most closely aligned with the HPBT, emerged as the role for a senior position in facility operations such as a senior chief engineer or facility manager. Some of the 590 identified competencies would be required by a HPBT, but many are beyond what might be needed for a new HPBT hire. To date, no organization has elected to certify BOPs.



Figure 5: DOE Better Buildings Workforce Process Diagram

¹³ See <https://www4.eere.energy.gov/workforce/node/7>.

7.2 Existing Certificates, Designations and Certifications

In addition to the work completed by DOE (see above), there are a number of existing industry certifications in place although none of these is exactly what is envisioned for HPBT.

Institute for Real Estate Management (IREM)¹⁴

- CPM (Certified Property Manager)
- ARM (Accredited Residential Manager)
- ACom (Accredited Commercial Manager)

The IREM certifications are generally intended for the “business” side of facility management, focused on the specific skills needed by property managers. IREM offers a number of paths to certification including a series of classes, completion of a degree program, or demonstration of experience. All of the certificates require that the candidate pass an exam and comply with a code of ethics. They also require that the candidate hold membership in IREM.

Building Owners and Management Association (BOMA) / Building Owners and Management Institute (BOMI)¹⁵

Technically BOMA and BOMI are independent organizations, but in reality, they work closely together to provide a series of certificates and designations for the real estate industry. Note that all of these are issued through BOMI and that none are actually referred to as a certification.

- Designations
 - RPA (Real Property Administrator)
 - FMA (Facility Management Administrator)
 - SMA (Systems Maintenance Administrator)
 - SMT (Systems Maintenance Technician)
 - RPA|HP (Real Property Administrator – High Performance)
 - FMA|HP (Facility Administrator – High Performance)
- Certificates
 - PAC (Property Administrator)
 - PMFP (Property Management Financial Proficiency)
 - FMC (Facilities Management)
 - SMC (Building Systems Maintenance)
 - HP (High Performance)

The BOMI website defines that designations require 5 – 8 classes while certificates require 3 classes. Classes are offered online and in seminars. Students must successfully pass the classes through an assessment to receive their designation or certificate.

¹⁴ See www.irem.org

¹⁵ <http://www.bomi.org>

Note that the “High Performance” certificate (or added to an RPA or FMA designation) are new and not all of the classes may yet be available. Like the other certificates, this consists of 3 classes focused on investments, practices and principles.

The BOMI designations and certificates do not appear to meet the definition of a certification and also do not follow the practices detailed in the ISO 17024 standard.

International Facility Managers Association (IFMA)¹⁶:

Credentials

- FMP (Facility Management Professional)
- SFP (Sustainable Facility Professional)
- CFM (Certified Facility Manager)

The IFMA programs are all essentially certificates that are awarded after the student purchases a series of classes, reviews reading material, participates in some online (or classroom) training, and then successfully completes an assessment.

Note that these are not certifications and do not appear to follow the practices detailed in ISO 17024. IFMA does, however, claim to have earned ANSI recognition.

NEEC – BOC¹⁷

The Northwest Energy Efficiency Council (NEEC) has developed the “Building Operators Certification Program” (BOC) as a tool for providing additional training to operators already in the field. There are currently two levels of the BOC:

- Level 1: Building Systems Maintenance
- Level 2: Equipment Troubleshooting and Maintenance

To receive these certificates, students must attend a series of all-day classes delivered by BOC qualified trainers using prescribed presentation material. Students then must pass a test administered by the trainer. In some regions, local utilities are providing an incentive to help fund the cost of completing the BOC.

The BOC focuses on the building technician. Still, it is really a certificate program that is earned as a result of specific training and not actually what would be considered a certification. BOC is currently upgrading its methodology for training and testing.

Federal Buildings Personnel Training Act (FBPTA)¹⁸

In 2010 federal legislation passed that required specific levels of training for technicians who were providing building services in federal facilities. These requirements applied both to government employees and contractors providing facility management services. (Note that most federal facilities are outsourcing operations.)

¹⁶ <http://www.ifma.org>

¹⁷ See <http://www.theboc.info>

¹⁸ See <http://www.fbpta-training.org>

The General Services Administration (GSA) administers this act and has identified twelve competency areas (See Figure 4). Each of these competency areas is then further defined into a series of core competencies.

It appears that the GSA has decided to rely on “industry” to provide the conformance with this act. To support this, the GSA has created a website (<http://www.fmi.gov>) with resources and developed cross mapping for the FBPTA to various existing certificates and certifications. Additional industry websites have been developed that provide resources and links to online and classroom training offered by vendors (for example, controls courses from Schneider Electric).

★ Competency Areas

Select a Competency Area to see the competencies associated with it.

Competency Area
1. Management of Facilities Operations and Maintenance
2. Performance of Facilities Operations and Maintenance
3. Technology
4. Energy Management
5. Safety
6. Design
7. Sustainability
8. Water Efficiency
9. Project Management
10. Business, Budget and Contracting
11. Leadership and Innovation
12. Performance Measures

Figure 6: Federal Training Competency Areas

8 Summary of Primary Research

Overview

The primary research began with an online survey that was intended to collect information and also to identify potential candidates for more in-depth interviews. Survey recipients were invited to participate via an e-mail that provided an introduction to the BEST Center. This e-mail was sent to lists developed by Building Intelligence Group as well as those provided by members of the BEST National Visiting Committee. In total, approximately 300 recruiting e-mails were sent, resulting in 26 survey responses and 8 in-depth interviews.

Survey Results:

The primary intent of the survey was to identify interested and qualified candidates for interviews. It also allowed for the collection of data, providing a glimpse into the experience and perspective of facility managers. Full results of the survey can be found in the Appendix but key items observed include:

- Q1: Most of our survey respondents identified themselves as “Facility Managers,” meaning they have both technical and business responsibility. This is a very desirable group for BEST Center members to be looking to for support and advice.
- Q3: The majority manages large portfolios of space – 76% of them dealt with over 500,000 square feet of space. Note that this is in aggregate and may represent a portfolio of buildings.
- Q4: Responses provided a good cross section of different types of commercial buildings including offices, higher education, health care and government. The only area not well represented was K-12 education.
- Q5: Respondents were asked to rate the responsibility for tasks that had previously been identified in the JTA for building technicians. There is a strong correlation (over 50%) on almost all tasks – which provides important feedback about the selection of these tasks for the JTA. See Figure 5.
- Q6 / Q7: 60% of the respondents indicated that they had at least a bachelor’s degree and had been in the field for over 20 years. Since respondents were mostly facility managers, this is not surprising.
- Q8: Survey responses included a variety of licenses and certifications which included electrical, HVAC, real estate and professional engineer. Certification results are shown in Table 2.

Organization	Certification	Notes
BOMI	FMA, SMA	
IFMA	FMP, CFM	
IREM	CPM	
NEEA	BOC I and II	
AEE	CEM	Certified Energy Engineer
PMI	PMP	Project Management Professional
USGBC	LEED AP	
Other: EPA, Lighting Auditor		

Table 3: Survey Respondents Certificates

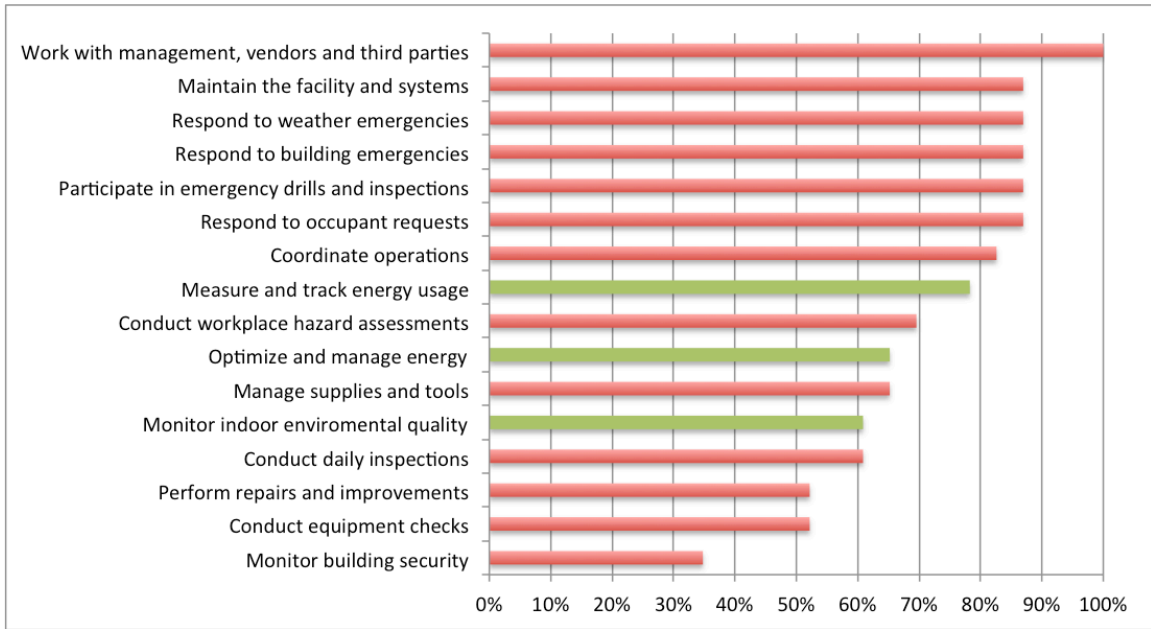


Figure 7: Question 5 Results – tasks related to HPBT shown in green

Interview Results:

The goal of the in-depth interviews was to get input from decision-makers and to understand their perspectives on training and certifications for technicians. In total, 8 telephone interviews, each 30 minutes in duration, were conducted. Respondents were selected to cover a broad variety of building types and owners as well as firms that outsourced operations. Key findings from the interviews are reflected in this research document and are summarized below:

- Types of buildings / organizations covered in interviews:
 - Office buildings (corporate and tenant occupied)
 - Health care (Hospitals)
 - Data centers
 - Labs and research centers
 - Federal government
 - Outsourcing firms
- Geographic
 - Washington, Utah, North Carolina, Florida, National
- Key Results:
 - View on outsourcing:
 - Growing area – will continue in the future.
 - Especially good for owners where facility management is not a core skill.
 - Reduces risk but may or may not reduce cost.
 - Provides for added benefits such as using services “on demand” such as project management, contracts, etc.
 - Structure for facility operations
 - Everyone has unique naming (engineers, techs, etc.).

- Most have a structure of a chief, supervisor, then one or two levels of technician (senior / junior, apprentice / experienced, etc.).
- Some organizations (such as health care) are looking for licensed staff for tasks such as electrical, while others may outsource this function.
- Looking to promote through these roles.
- Note that there is a “business side (Facility Management or Property Management) that is generally over all of facility operations.
- What are they looking for in a technician?
 - “Look for general skills and for those with licenses such as electrical.”
 - “We look for a jack of all trades. Ideally some experience in HVAC and electrical. Doesn’t need to be licensed. Should have EPA certificate and at least a high school degree.”
 - “Computer and soft skills as well as HVAC and electrical.”
 - “Experienced techs who are more of a troubleshooter than an installer.”
 - “Try to recruit those from union programs.”
 - “Work ethic is key – we can train them on the hard skills.”
 - “Ask them ‘what kind of car would you be and why’.”
 - “Old dogs do know something – value in hiring experienced staff.”
- Recruiting and finding technicians
 - “Two years ago, it wasn’t hard but it is tough today as the economy has improved.”
 - “Not too hard to find – we hire them away from other firms.”
 - “Very hard to find especially in specific areas.”
 - “Hard to find needed skills.”
 - “Can’t even find folks to do basic things like changing light bulbs.”
 - “Need to do a lot of interviews to find the right folks.”
- Do you see the role of the technician changing over the next decade?
 - “Half of my staff is under 35 and the other half are over 50, so we anticipate a lot of retirements over the next few years.”
 - “Businesses are going to need to be more creative to attract and retain technicians.”
 - “We need to improve tech schools – maybe start in high school.”
 - “Unions are putting custodians through their programs.”
 - “Systems are getting more complex and we need more from our techs.”
 - “Average age of a tech is between 47 and 52.”
 - “It is a dying art and most folks don’t see it as a career.”
 - “Hard to keep technicians – we train them, then they leave.”
- Do you have a program internally to certify, and train?
 - “Developing an internal certification process that starts with a diagnostic assessment.”
 - “We have ‘playbooks’ that are standard processes for hands-on qualifications and competencies.”
 - “We have developed our own set of proprietary training programs.”
 - “Will fund staff to get training from groups such as BOMI.”
- What is the career path for technicians?
 - “Move into supervisor then as a chief.”
 - “Willing to prepare them for new roles.”
 - “We like to promote from within when possible.”
 - “Seven of our top managers came up through the ranks.”
- Would there be value in having a specialized training program for technicians?

- “Absolutely.”
- “Currently we look to the military and will bring in a level D6 or higher.”
- “Today’s buildings require a high level of knowledge but we can’t afford to have a licensed engineer on site. We need to train technicians who know how to run building efficiently.”
- “Traditional trades don’t really fit with what we need. It would be valuable to have a program that provides the needed skills.”
- “Community colleges are where this needs to happen. There are limits to OJT and what you can effectively learn.”
- “We need to talk to our local community college and see if they have a program.”
- Would you give preference to hiring someone who came out of a specialized program?
 - “Definitely – but want to make sure that they want to stay.”
 - “Would want them to have specialized training in healthcare.” (Also heard this for labs and data centers as well.)
- Do you see value in a national certification?
 - Note that all were generally positive on this idea – but it is a tough question since it doesn’t exist today.
 - Asked many about the BOC but only one respondent was familiar with it.
- Who would you recommend do the certification?
 - ASHE for healthcare
 - I2SL for labs
 - IFMA, BOMA, AFE, ASHRAE, NFPA, NEEA, IREM
 - Recognition that there might be specialized areas such as commercial, labs, healthcare, residential.
- Future of facilities management?
 - “Need to have more recognition of the field as a profession.”
 - “Moving to more outsourcing and contracts.”
 - “Building systems and technology are moving together.”
 - “More IT skills needed.”
 - “Facility management is going to become a business unit instead of an expense.”
 - “Focus on efficiency and sustainability.”
 - “Movement to predictive and preventive maintenance.”

Abbreviation	Definition
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BEST Center	Building Efficiency for a Sustainable Tomorrow
BLS	Bureau of Labor Statistics
BOMA	Building Owners and Managers Association
BOMI	Building Owners and Managers Institute
CB ECS	Commercial Energy Consumption Survey
CBRE	CB Richard Ellis
DACUM	Developing a Curriculum
DOE	Department of Energy
EPA	Environmental Protection Agency
GSA	General Services Administration
HPBT	High Performance Building Technician
HVACR – WDF	Heating, ventilating, air conditioning, refrigerating- workforce development foundation
I2SL	International Institute for Sustainable Labs
IFMA	International Facility Managers Association
IREM	Institute of Real Estate Management
ISO	International Organization for Standardization
JLL	Jones Lang LaSalle
JTA	Job Task Analysis
LEED	Leadership in Energy and Environmental Design (from USGBC)
NCCA	National Commission for Certifying Agencies (Part of the Institute for Credentialing Excellence)
NEEC	Northwest Energy Efficiency Council
NIBS	National Institute of Building Science
NSF	National Science Foundation
OJT	On the job training
USGBC	US Green Building Council

Table 4: Abbreviations and Acronyms

9 Appendix

Interview Questions

1. Welcome and background
2. About participant
 - a. Name –
 - b. Employer -
 - c. Title / Job –
 - d. Experience –
3. Views on outsourcing
 - a.
4. Technician Hiring and Training:
 - a. In your organization how is FM structured?
 - i.
 - b. What do you look for when hiring a new technician?
 - i.
 - c. Do you have any challenges with recruiting and finding qualified candidates?
 - i.
 - d. Do you see this as a role that is expanding or contracting over the next decade?
 - i.
 - e. Do you have a program to certify, and provide CE and OJT for your techs?
 - i.
 - f. What is the career path for your techs?
 - i.
5. Certificates and Certifications:
 - a. Would there be value in having specialized training programs for building technicians?
 - i.
 - b. Would you give preference to hiring someone with a certification from such a program?
 - i.
 - c. Would you see value in having a national certification (give examples)?
 - i.
 - d. What type of organization or process would you look for to provide this certification?
 - i.
6. How do you see the role of the facility operations evolving?
 - i.
7. Other concerns and thoughts you would like to share?
8. Can we contact you for further participation such as surveys or interviews?

Organization	Title	Notes
McKinstry	Operations Manager	Outsourced operations of data center
General Services Administration	Information Technology	Public Buildings Sector
CBRE	National Operations Manager	Large national facility management firm
Max Plank Institute	Facility Manager	Cancer research center
Hines	Facility manager and chief engineer	Commercial office building management - Charlotte
CIM Group	Property Manager	Regional facility management firm
Novant Healthcare	Senior Director of Plant Engineering	Regional healthcare organization
Hines	Facility Manager	Focused on large account in Seattle

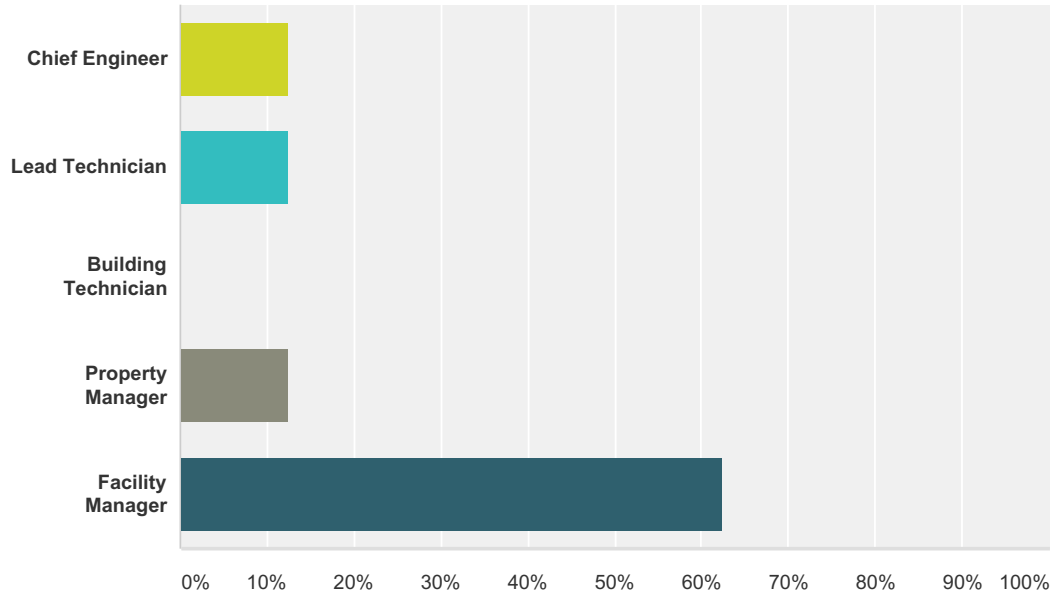
Table 5: Organization and Title for Interviewees

Survey Results:

The following pages contain a summary of the survey results conducted in May – June of 2015. Survey invitations were sent to approximately 150 candidates identified as facility engineers, managers, or supervisors. The survey was intended to both provide input from this broader group as well as to recruit candidates to participate in the interviews.

Q1 Please select the job title that most closely defines your role in the facility operations and/or management industry:

Answered: 24 Skipped: 0

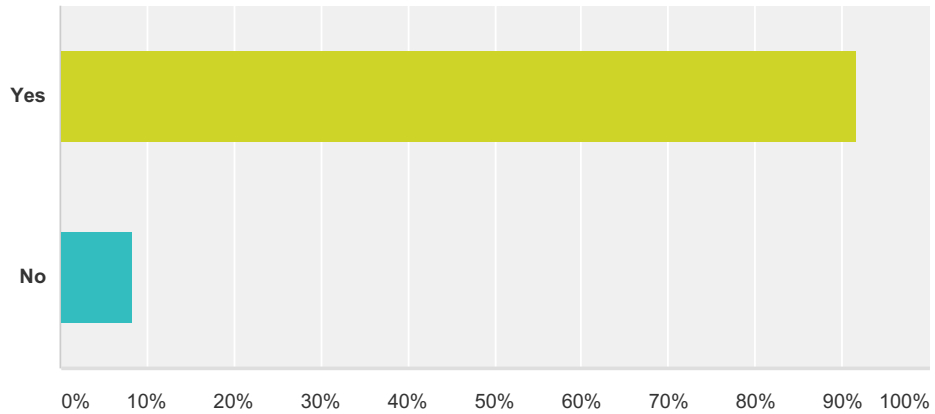


Answer Choices	Responses
Chief Engineer	12.50% 3
Lead Technician	12.50% 3
Building Technician	0.00% 0
Property Manager	12.50% 3
Facility Manager	62.50% 15
Total	24

#	Other (please specify)	Date
1	Energy management, building automation systems	6/1/2015 10:30 AM
2	Facility Director	5/29/2015 1:46 PM
3	General Manager	5/27/2015 2:16 PM

Q2 Are you involved in the supervising, hiring, and/or training of building technicians or employees in HVAC, mechanical, electrical or plumbing industries?

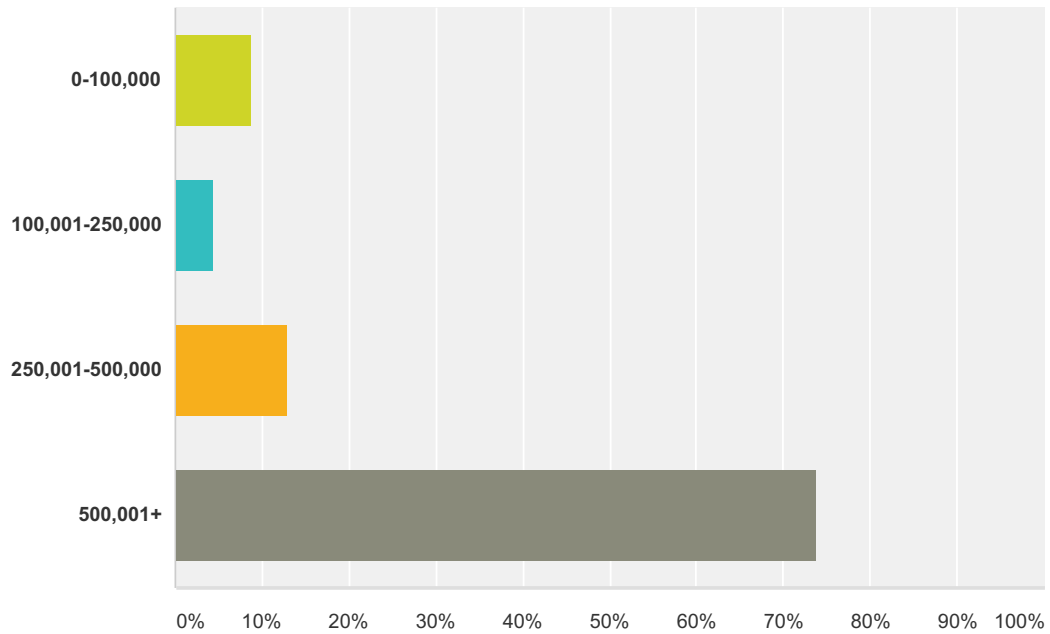
Answered: 24 Skipped: 0



Answer Choices	Responses
Yes	91.67% 22
No	8.33% 2
Total	24

Q3 Please select from the following list the total square footage of building space you currently manage, oversee or work in?

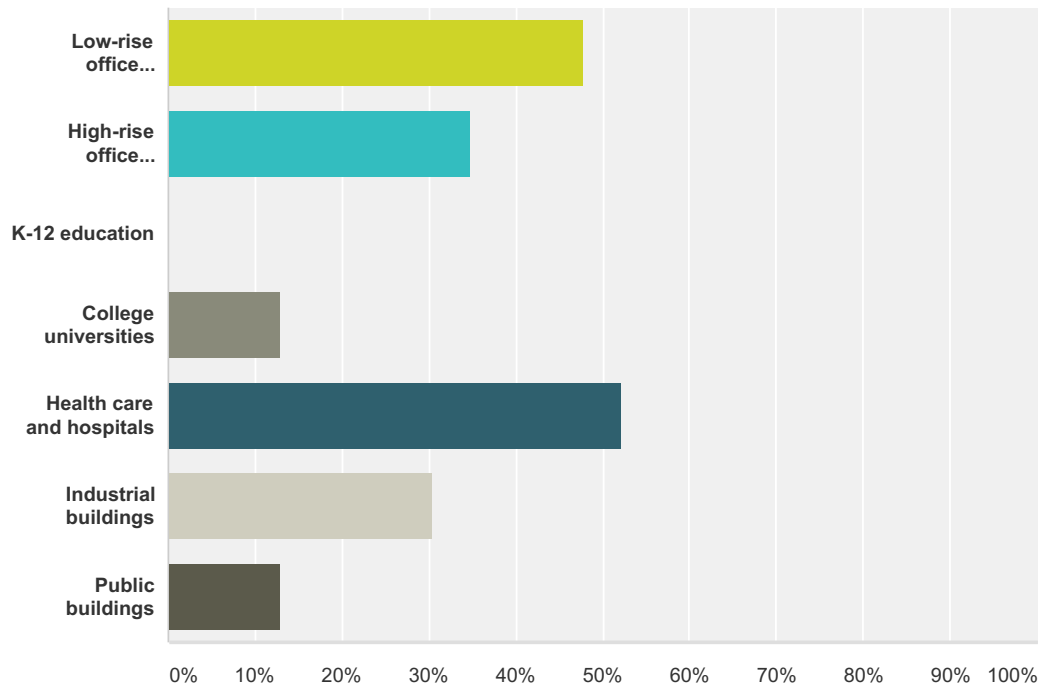
Answered: 23 Skipped: 1



Answer Choices	Responses
0-100,000	8.70% 2
100,001-250,000	4.35% 1
250,001-500,000	13.04% 3
500,001+	73.91% 17
Total	23

Q4 Please select from the following building types those that you are involved with (select all that apply)

Answered: 23 Skipped: 1



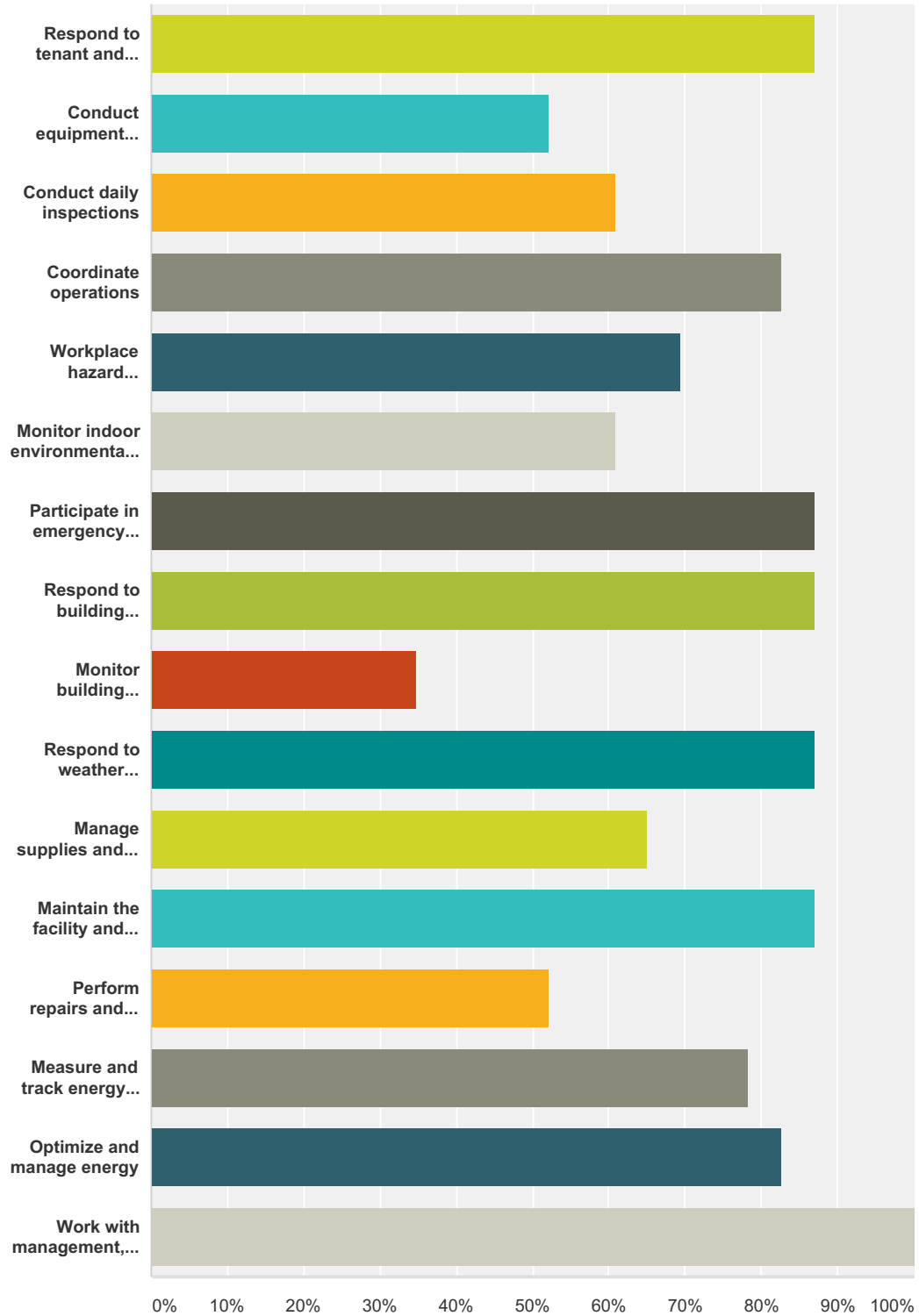
Answer Choices	Responses
Low-rise office buildings (6 floors and below)	47.83% 11
High-rise office buildings (7 floors and above)	34.78% 8
K-12 education	0.00% 0
College universities	13.04% 3
Health care and hospitals	52.17% 12
Industrial buildings	30.43% 7
Public buildings	13.04% 3
Total Respondents: 23	

#	Other (please specify)	Date
1	Hospitality Buildings (Hotels)	5/29/2015 10:06 AM
2	Bio Med research	5/28/2015 10:21 AM
3	Life Science Research	5/28/2015 8:13 AM
4	wet lab research	5/28/2015 6:53 AM
5	Research Laboratories	5/28/2015 5:33 AM

6	Parking Garages	5/27/2015 3:48 PM
7	R&D Buildings	5/27/2015 3:09 PM

Q5 Please indicate which of the following tasks you are in charge of on a daily basis? (select all that apply)

Answered: 23 Skipped: 1

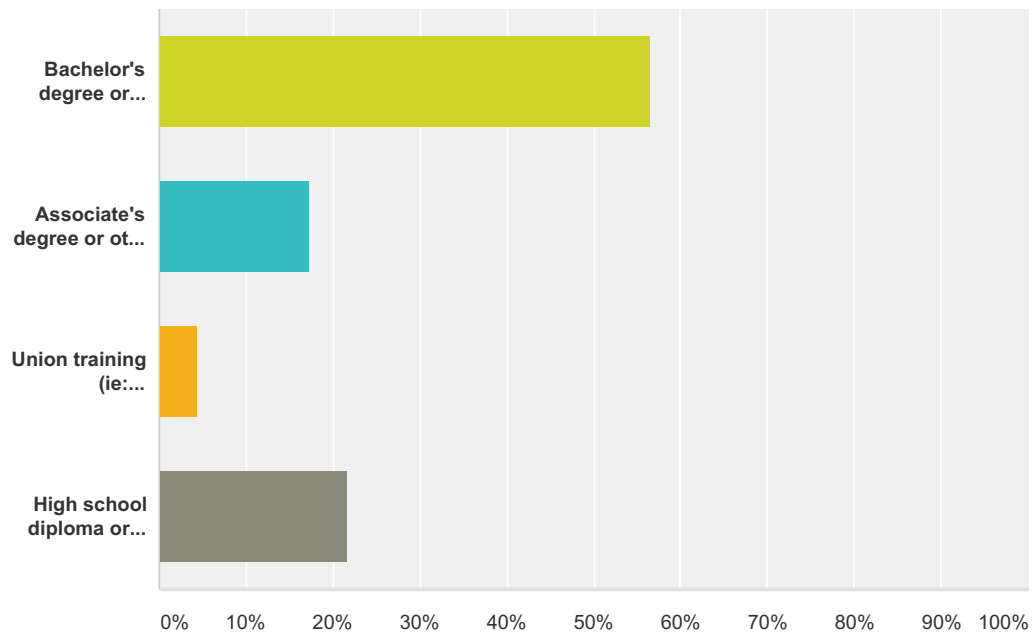


Answer Choices	Responses
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Respond to tenant and occupant requests	86.96%	20
Conduct equipment checks	52.17%	12
Conduct daily inspections	60.87%	14
Coordinate operations	82.61%	19
Workplace hazard assessments	69.57%	16
Monitor indoor environmental quality	60.87%	14
Participate in emergency drills and inspections	86.96%	20
Respond to building emergencies	86.96%	20
Monitor building security	34.78%	8
Respond to weather emergencies	86.96%	20
Manage supplies and tools	65.22%	15
Maintain the facility and systems	86.96%	20
Perform repairs and improvements	52.17%	12
Measure and track energy usage	78.26%	18
Optimize and manage energy	82.61%	19
Work with management, vendors and third parties	100.00%	23
Total Respondents: 23		

Q6 Please indicate the highest level of education you have received:

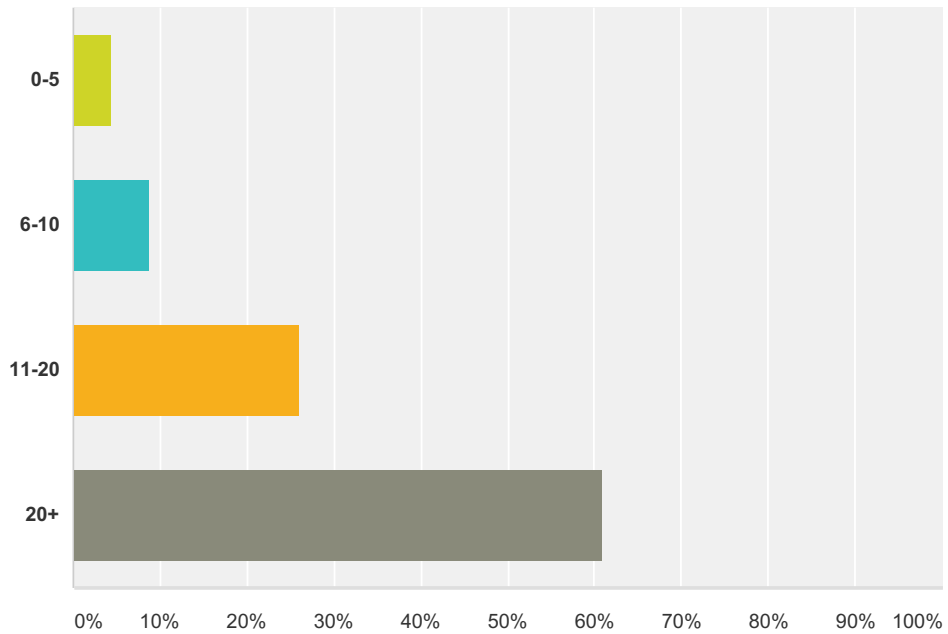
Answered: 23 Skipped: 1



Answer Choices	Responses
Bachelor's degree or higher	56.52% 13
Associate's degree or other community college degree	17.39% 4
Union training (ie: journeyman, etc.)	4.35% 1
High school diploma or equivalent	21.74% 5
Total	23

Q7 Please indicate how many years experience you have in the facility operations and/or management industry:

Answered: 23 Skipped: 1



Answer Choices	Responses	
0-5	4.35%	1
6-10	8.70%	2
11-20	26.09%	6
20+	60.87%	14
Total		23

Q8 Do you currently hold any professional certifications, licenses or other accreditations? Please list below:

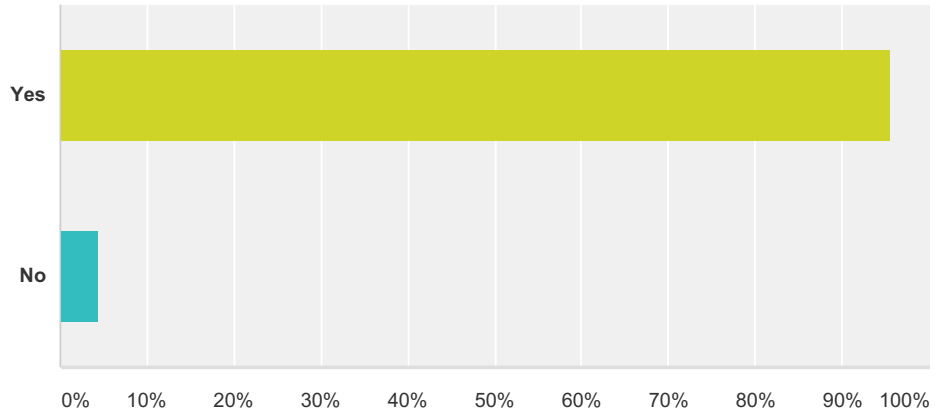
Answered: 16 Skipped: 8

Answer Choices	Responses
Certifications	87.50% 14
Licenses	50.00% 8
Other	6.25% 1

#	Certifications	Date
1	BOC I & II, Facilities Management, Commercial Lighting Auditor	6/3/2015 6:33 PM
2	LEED AP	6/2/2015 6:17 PM
3	CEM	6/1/2015 10:31 AM
4	BOMI FMA and SMA and AMLA CEOE	5/29/2015 10:07 AM
5	FMP, CFM	5/28/2015 11:07 AM
6	ARRT CT	5/28/2015 10:06 AM
7	Leed Ap, CFM	5/28/2015 8:14 AM
8	CFM, LEED-AP	5/28/2015 5:34 AM
9	CFM, SFP	5/27/2015 3:49 PM
10	CFM	5/27/2015 3:10 PM
11	CPM, CCIM, LEED AP	5/27/2015 2:33 PM
12	Universal EPA Certification	5/27/2015 2:25 PM
13	CPM & RPA	5/27/2015 2:17 PM
14	CFM	5/27/2015 1:26 PM
#	Licenses	Date
1	Grade 3 Boiler, Grade C HVAC, Electrician 07	6/3/2015 6:33 PM
2	PE	6/1/2015 10:31 AM
3	HVAC	5/28/2015 12:53 PM
4	WA Rad tech	5/28/2015 10:06 AM
5	Professional Engineer	5/28/2015 6:53 AM
6	Professional Engineer	5/28/2015 5:34 AM
7	Real Estate	5/27/2015 2:33 PM
8	PE	5/27/2015 1:26 PM
#	Other	Date
1	NWEEC BOC level 1 and 2	5/29/2015 10:07 AM

Q9 Do you feel that there is a need for training and certification for building technicians?

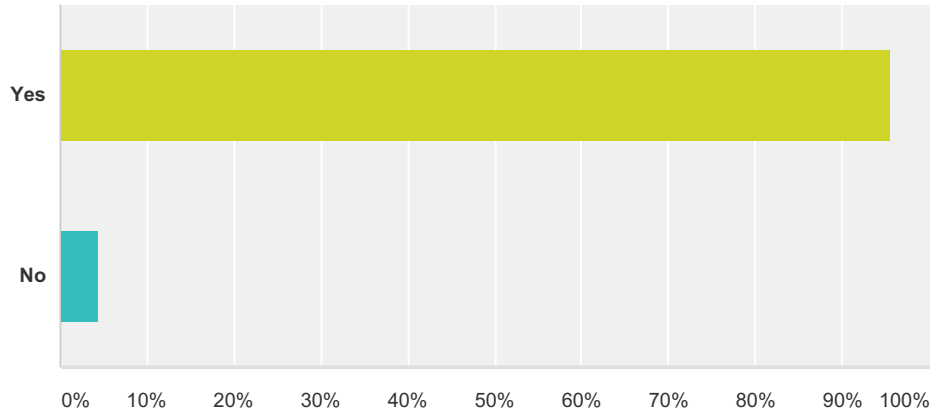
Answered: 23 Skipped: 1



Answer Choices	Responses
Yes	95.65% 22
No	4.35% 1
Total	23

Q10 Would you be willing to participate in an additional surveys or interviews related to improving facility operations?

Answered: 23 Skipped: 1



Answer Choices	Responses	
Yes	95.65%	22
No	4.35%	1
Total		23