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Construction Industry Workforce Shortages:

Role of Certification, Training and Green Jobs in Filling the Gaps

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Construction Industry Workforce Shortages: Role of Certification, Training and Green Jobs in Filling the Gaps SmartMarket Report

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McGraw Hill CONSTRUCTION

About McGraw-Hill Construction

McGraw-Hill Construction (MHC), part of The McGraw-Hill Companies, connects people, projects and products across the design and construction industry, serving owners, architects, engineers, general contractors, subcontractors, building product manufacturers, suppliers, dealers, distributors, and adjacent markets.

A reliable and trusted source for more than a century, MHC has remained North America's leading provider of construction project and product information, plans and specifications, industry news, market research, and industry trends and forecasts. In recent years, MHC has emerged as an industry leader in the critical areas of sustainability and interoperability as well.

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Introduction

As construction recovers from the worst recession in a generation, the industry cannot simply resume business as usual. Key trends that were just emerging before the recession—such as green building, lean construction and greater collaboration—have now only strengthened.

In response to this industry transformation, McGraw-Hill Construction (MHC) conducted two studies that examine workforce issues: an industrywide study with A/E firms, general contractors and specialty trade contractors, and a comparison study of architecture students and practitioners working in firms conducted for the American Institute of Architects (AIA).

These studies reveal that near-term shortages of skilled, experienced workers are a serious concern.

- **Almost one third (32%) of A/E firms and general contractors are concerned about a shortage of specialty trade contractors by 2014.**
- **Nearly half (49%) of general contractors are concerned about finding experienced craftworkers by 2014, and well over one third (37%) of A/E firms are concerned about finding workers with 10 years of experience or more.**
- **79% of architecture firms are not sure that the U.S. student pipeline will suffice to replace people leaving the profession, a problem exacerbated by the 76% of U.S.**

architecture students/recent graduates who indicate that they would consider working abroad.

One factor that can counter these shortages and skill gaps is certification, the benefits of which the study clearly reveals:

- **71% find that having certified employees increases the competitiveness of their firm and its ability to win contracts.**
- **At least three quarters believe that certification offers more job opportunities and valuable, job-applicable knowledge.**

The rise of green jobs in construction has both created opportunities and intensified potential shortages. **In order to gauge their impact, this report provides groundbreaking definitions of green jobs in design and construction that consider the number of green buildings, uniquely green systems and work that requires different skills to achieve green goals. (See page 11 for more information.)**

By these definitions, **green jobs currently represent 35% of the total construction workforce, and we estimate that the percentage of green jobs will grow to 45% by 2014.**

We thank the AIA and the U.S. Green Building Council for their partnership in this project as well as the other organizations that made this report possible. We are pleased to provide these results to help the industry effectively engage in the transformation toward a greener, more collaborative future.



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Executive Summary

Major shifts in the construction industry, as well as demographics, may cause a shortage of skilled workers.

With the current levels of double-digit unemployment, a workforce shortage may seem like an unlikely problem in the design and construction industry. However, the low levels of employment during the recession may actually mask the way that changes in the industry, especially the growing green job market, require new skills and better training. Certification of employees is one effective way in which the industry can respond to these rising needs.

Skilled Worker Shortages Will Be Caused by a Combination of Factors
McGraw-Hill Construction (MHC) forecasts that by 2015 nonresidential construction project starts (including building sectors like commercial, institutional and industrial) will grow 73% over 2011 levels. This rapid level of growth has serious implications for the availability of skilled workers.

The industry recognizes several other factors that, combined with the recovery, contribute to the risk of shortages.

■ Retiring Workers

With the U.S. baby boomer generation now approaching retirement age, 60% of the survey respondents are concerned about the resulting loss of knowledge.

■ Impact of the Recession

Unemployment levels at double the national average have driven many workers in design and construction to seek opportunities in other industries. 58% are concerned about the resulting loss of experience and skills.

■ Pipeline of New Workers is Not Sufficient

The architect firm and student studies conducted by MHC for the American Institute of Architects finds that 79% of architect practitioners expecting a shortage are unsure whether the student pipeline will be sufficient to prevent shortages. And 78% of U.S. architecture students and recent graduates express interest in working abroad, with over half motivated by the perception that more work is available outside the U.S.

Trades firms are also concerned about the pipeline:

- 62% believe that their trade does not appeal to the younger generation.
- 56% find the education of the next generation inadequate.

Expecting Significant Shortages by 2014

High Expectation of Serious Shortage ●
Moderate Expectation of Serious Shortage ◐
Low Expectation of Serious Shortage ○

Reported by	Architect	Engineer	General Contractor	Specialty Trade Contractors
A/E Firms	◐	●	○	◐*
General Contractors	○	○	◐	●**

* Top three trades in which A/E firms expect shortages: carpentry/millwork, HVAC/boilermaker, and electrical

** Top three trades in which GC firms expect shortages: carpentry/millwork, electrical, concrete finisher/cement mason

Skills/Knowledge Needed¹

Skills Widely Needed ●
Skills Needed ◐
Skills Less Frequently Needed ○

Reported by	Project Management	Specialty Knowledge	Technology Proficiency	Business Development	Construction Processes Knowledge	People Management	Safety Awareness	Communication
A/E Firms	●	◐	◐	○	●	○	N/A	N/A
General Contractors	●	◐	○	○	●	◐	N/A	N/A
Specialty Trade Contractors	◐	●	○	○	N/A	N/A	◐	◐

¹ For A/E Firms and General Contractors, skills and knowledge indicated sought from senior staff only

Source: McGraw-Hill Construction, 2012

SHORTAGES AND SKILL GAPS

The industry is most concerned about shortages in the trades and engineering. The skills that A/E firms and general contractors seek include project management and knowledge of construction processes, while trades firms value specialty knowledge the most. The industry needs to address how to supply all the skills sought to its next generation of workers.

Strong Green Market Growth Presents Opportunities for Workers and Challenges for Firms

In addition to the increased construction activity expected in the next few years, there is an even higher level of green market growth. In fact, **green is already 31% of the commercial construction market, and by 2015, it is expected to account for 48% of the market.**

The growth of green jobs directly reflects the growth in green projects.

- **2011: 35% of the industry have green jobs**
- **2014: 45% have green jobs**

In order to measure the percentage of green jobs in the industry, MHC devised a construction-specific definition of green jobs, the first in the industry that considers the work done and skills required in addition to the output of green buildings. (For more information on this definition, see page 11.)

These jobs will continue to grow, not only because of the growth in the market, but because **they are perceived to bring strong benefits compared to traditional design and construction jobs, including greater job availability and better career advancement.**

FINDING GREEN SKILLED WORKERS

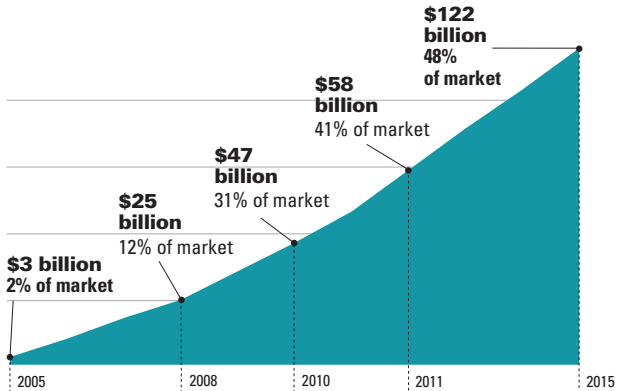
The industry is already experiencing challenges finding green skilled employees.

- **86% of A/E firms and 91% of general contractors find green skilled employees difficult to hire.**
- **A higher percentage at A/E firms find senior (32%) and mid-level (41%) positions the most difficult to fill with green skilled workers, while general contractors are nearly evenly split on the challenge of finding green skilled managers (48%) and craft workers (43%).**

As the green market continues to grow, these gaps may become even more serious.

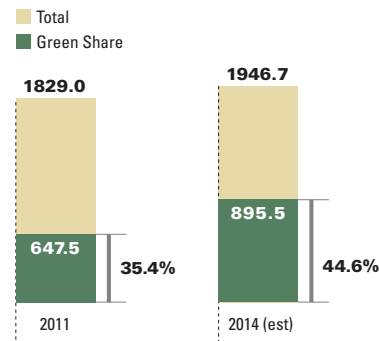
Nonresidential Green Building Market Size (in billions)

Source: Green Market Size, McGraw-Hill Construction, share calculation drawn from McGraw-Hill Construction Dodge project starts; base value of construction market from McGraw-Hill Construction Market Forecasting Service, as of April 2012



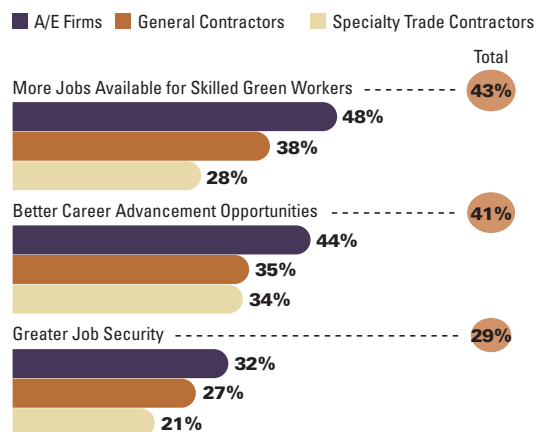
Number of Nonresidential Construction Jobs and Green Share (in thousands)

Source: Total Jobs: U.S. Bureau of Labor Statistics (Through the End of 2011); Green Share: McGraw-Hill Construction, 2012



Benefits of Green Jobs (by Player)

Source: McGraw-Hill Construction, 2012



The top green skills most frequently identified as needed in the industry include general green experience or specific LEED certification experience. In addition, a small but notable group also reported finding a gap in energy modeling, BIM and collaboration skills.

A/E Firms and General Contractors Expect to Have Difficulty Finding Experienced Workers by 2014

In addition to general workforce shortages expected, more A/E firms and general contractors anticipate that their own firms will have difficulty hiring staff with ten or more years worth of experience by 2014 than staff with less than ten years of experience.

Training and certification will need to capitalize on experienced workers to help train the younger workforce. Given the value placed on the real-world experience in the training of new workers, companies already recognize the value of capturing experience through internships and apprentice programs.

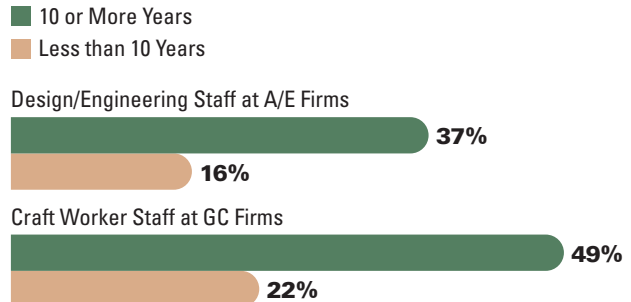
Currently, A/E firms are investing most in training offered by associations and unions for continuing training for their staff, and general contractors most frequently reimburse training at financial institutions. However, all three player groups recognize the critical value of certification.

Certification/Accreditation Provides Necessary Skills and Knowledge that Help Individuals and Firms Succeed 71% of all firms find that having certified/accredited employees in their staff helps them to increase competitiveness and the ability to win contracts, while 68% find that green certified employees allow firms to expand their green business. Strikingly, these direct business benefits are experienced by a larger percentage than reduced training costs or having new employees contribute more quickly. It demonstrates that **certification is recognized in the industry as having an immediate impact on business success**, with architectural firms in particular finding themselves more competitive.

As the industry struggles to deal with the loss of experience and knowledge, the training and recognition offered by certification are likely to become even more important to the industry.

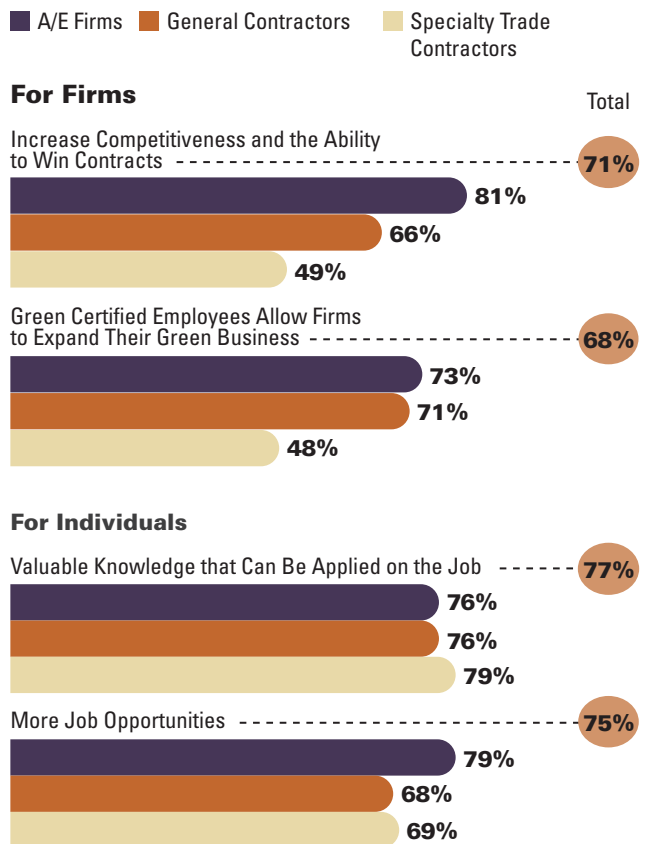
Difficulty Expected Hiring Staff in 2014 (By Level of Experience)

Source: McGraw-Hill Construction, 2012



Benefits of Certification

Source: McGraw-Hill Construction, 2012



Recommendations

As the design and construction industry continues to adapt to new approaches and technologies, the workforce required to do jobs efficiently and profitably will need new skills. Industry players also need to determine how they can tap into existing expertise and attract new workers.

Industrywide

■ Take Green Seriously

If an organization does not already have a green strategy, it needs to develop one. With green projects and green jobs already accounting for one third of the market and still growing, in order to stay competitive, all involved in the industry need to consider their approach to green, including finding green skilled workers, capitalizing on existing green expertise and their internal green experts and emphasizing additional green training.

■ Find Ways to Connect to the Next Generation

Specialty trade contractors are already concerned about the pipeline of new workers and the training they receive. Even though A/E firms express fewer concerns, reports from the students and recent graduates in architectural programs indicate that many will consider working abroad for increased job opportunities. All industry players need to engage the next generation of workers to ensure the demographic eventuality of baby-boomer retirement is addressed. For example, recognize

the technological savvy of the next generation and provide opportunities for them to excel by drawing on these skills.

■ Encourage Certification Among Employees

The results are clear—certified employees bring business benefits to firms. Therefore, in addition to using that as a factor in the hiring process, firms should also actively support certification among their employees.

A/E AND GENERAL CONTRACTORS

■ Encourage Experienced Employees to Stay in the Industry

Both A/E and general contractor respondents express concern about the loss of knowledge and experience due to retirement and layoffs. As the industry recovers, they need to create strategies to encourage input from experienced employees. Flex-time and part-time arrangements may help keep some of those experienced workers engaged.

■ Attract New Employees

Keeping experienced workers engaged is only

half the battle. Firms also need to attract new employees. Strong strategies including emphasizing work on green building and the firm's use of advanced technologies.

SPECIALTY TRADE CONTRACTORS

■ Emphasize Your Reputation for Safety

Specialty trade contractors recognize safety as an important factor in attracting new employees.

■ Focus on technology and green to engage the next generation

These firms express the greatest concern about attracting a younger generation and seeing them properly educated, but put the least value on green and technology. Keeping the next generation engaged may require a different emphasis on tools and approaches to projects.

Industry Professionals

A/E AND GENERAL CONTRACTORS

■ Increase Skills That Relate to Emerging Trends: Green, Collaboration and BIM

Examining new, emerging positions as well as the

skills valued by these players reveals that acquiring skills, knowledge and experience that relate to green, collaboration and BIM may be useful as these trends continue to grow in importance.

■ Emphasize Project Management Skills and Construction Knowledge Over Specialization

Specialty knowledge does not carry the weight for these players that project management skills and general construction knowledge do.

SPECIALTY TRADE CONTRACTORS

■ Focus on Specialized Knowledge and Jobsite Skills

Specialty knowledge is critical in the trades, but there is also an overall emphasis on a collection of skills that improve jobsite efficiency.

Industry Training Recommendations

■ More Green Training

■ More Skills That Promote Collaboration and Use of New Technologies

■ Offer More On-the-Job Experience ■

Data: Introduction

A Transforming Workforce

CONSTRUCTION INDUSTRY WORKFORCE SHORTAGES: ROLE OF CERTIFICATION, TRAINING AND GREEN JOBS IN FILLING THE GAPS DATA

This is a pivotal time in the design and construction industry. Several factors are impacting the industry at once, creating uncertainty about how well prepared the future workforce and pipeline of new workers will be to deal with the changes emerging.

The recession that started in 2008 has had profound implications for the design and construction workforce. Not only has its impact been pronounced and prolonged in the construction industry, but it has also been widely publicized, leading potential future workers to question the viability and stability of a career in this industry. The loss of jobs in the industry may have also masked larger workforce issues, such as attracting and training the next generation, that could increase in importance as the recovery takes hold.

In addition, design and construction faces the same demographic reality facing many American industries—the retiring of baby boomers. The industrywide study demonstrates that the industry is concerned about the loss of leadership and experience as these workers retire. Combine this with concerns about the experienced workers that have left the industry due to the recession, and it becomes clear that capitalizing on the experience of older workers before they retire will be a major concern in the industry.

In addition, new skills and knowledge are required for individuals in the industry to succeed. This report's findings show that the green jobs resulting from the rise of green project activity do require new training, even if some are extensions of more traditional jobs. Transformative industry trends, such as greater collaboration, integrated project delivery and BIM, require workers to draw upon different skills than traditional positions do. The increasing need in construction for greater productivity is likely to drive more rapid adoption of these trends, which will require a different way of looking at the skills a worker has to offer.

This report provides a portrait of an industry in flux and explores the market forces driving the need for workers, the potential shortages anticipated and already being felt, the skill gaps, and the current sources of training used to prepare workers. It reveals how training and certification can help address these concerns, and it explores these issues through the lens of green projects and green jobs. Finally, it provides an important measure of green jobs in the construction industry, the first to be calculated based on the feedback of the workers in the industry rather than on the number of green projects.

Notes on the Data

The data presented in this report are drawn from three studies.

Industrywide Study

McGraw-Hill Construction conducted an industrywide study on workforce issues and green jobs. That survey included the following participants:

- **A/E Firms:** This group includes all architectural and engineering specialties, but it is important to note that 80% of these respondents are architects.
- **General Contractors:** This category includes general contractors, construction managers, design-builders and remodeling firms.
- **Specialty Trade Contractors:** This category includes respondents from multiple trades, with the largest percentage from the electrical, HVAC/sheet metal and drywall trades.

Architecture Student/Recent Graduate and Architecture Firm Gap Studies

This report also features data from two studies conducted by McGraw-Hill Construction for the American Institute of Architects—the Architect Firm and Student Gap Studies. Conducted together, these studies explore the differential between student and recent graduate perceptions of the architectural profession compared to those of currently practicing architects on issues including green building drivers, methods for networking, job opportunities, technologies and other areas.

Unlike the industrywide survey, these studies were confined solely to architectural students, recent graduates and practitioners.

For more information on both studies, see the Methodology on page 64.

Data: Construction Market

Influences on Workforce

Impact of Construction Activity on Workforce

Construction Market Influences on Workforce

Many factors have an impact on workforce needs including new and growing trends in the industry and changing demographics. However, the single most influential factor is construction market activity. In order to understand current and future workforce needs, it is critical to understand the impact of the down economy, the expected recovery and the specific market sectors expected to grow. It is also important to note that hiring is a constant activity in this industry, even during the recent past, a time of high, double-digit unemployment. Therefore, as the economy improves, and construction activity with it, the workload for firms will increase and have serious implications on the workforce.

The rise of green construction is also important. Not only do the number of green projects suggest that the workforce needs to make sure they are prepared for green, but the larger perception that green is becoming a norm in the industry is also critical. With the majority of emerging new jobs identified in the industry directly related to green building or sustainability, this is one of the most significant workforce shifts underway.

Construction Market Activity

According to McGraw-Hill Construction's construction market forecast, the total value of nonresidential building starts dropped 34% from its high point in 2008 to the low point in 2011.¹ One of the most serious factors contributing to this prolonged period of decline was the challenge of tight project financing.

McGraw-Hill Construction's forecast for the next few years shows a delayed, but sustained recovery. In the near-term, it will be slow. A nominal drop of 1% in the value of construction starts is expected in 2012 compared to 2011. The real burst of construction start activity is expected to occur from 2013 to 2015. In fact, the amount of nonresidential building starts in current dollar terms is estimated to climb 10% to 25% per year during the 2013–2015 period. For A/E employment, activity should increase earlier as these projects enter design.

The improvement expected for construction activity will increase demand for construction workers, gradually at first and then more sharply as the construction recovery becomes more broad-based. With levels of unemployment topping 20% during the recession, many workers have left the industry entirely. Also, the initial wave of baby boomers are now entering retirement

age. Many who may have put off retirement during the downturn could see an opportunity to retire as the economy recovers. This combination of workers lost due to economic conditions and the aging demographics of the workforce could have serious implications in the face of a healthier construction market in as few as two years.

STRONGEST SECTORS FOR GROWTH

McGraw-Hill Construction predicts that new commercial building starts will show steady growth through 2015. The upward trend has already begun; in 2011 commercial building advanced 10% in dollar terms, marking a change from the steep declines reported during the 2008–2010 period. Leading the way in 2011 were warehouses and hotels, climbing 23% and 58% respectively. For 2012, commercial building is forecast to rise 11%, and more substantial gains are forecast for 2013 through 2015, with construction climbing by more than 20% per year.

Another structure type on the upward track is multifamily housing, which jumped 27% in dollar terms during 2011. A similar 25% increase is anticipated for multifamily housing in 2012, to be followed by more gains through 2015.

Institutional building sector, including publicly-funded project types as schools and hospitals, fell 12% in dollar terms during 2011, and another 4% decline is forecast for 2012. This sector is being restrained in the near term by the tough fiscal environment for states and localities; as this fiscal stress eases over the next year or so, construction should be able to strengthen moderately.

Delayed Projects

One indicator of the pent-up demand created by the recession is the volume of delayed projects. For general building projects, the dollar value of delayed projects McGraw-Hill Construction tracks in its Dodge project database has dropped from \$23.2 million in 2009, \$14.0 million in 2010 and \$10.7 million in 2011.

To date, this trend appears to be continuing in 2012. The average monthly value of delayed projects in the Dodge project database in the first quarter of 2012 was \$7.8 million, compared to \$12.8 million in 2010 and \$17.5 million in 2009. These numbers support the notion that the recession is beginning to take hold and that pent-up demand is slowly re-emerging.

The Green Building Market

The green building market is transforming the ways buildings are designed and constructed—not only

Construction Market Influences on Workforce

Impact of Construction Activity on Workforce CONTINUED

through the products and practices used in those buildings, but also in the way the work is done, such as the use of more collaborative processes.

Therefore, as green construction activity increases, so does the need for new skills and training. McGraw-Hill Construction's nonresidential green building market sizing, based on its Dodge construction starts data and construction market forecast, reveals 41% of construction starts were green in 2011 (see page 11 for definition of a green project), up from 31% in 2010 (a 50% increase) and from only 2% in 2005.

McGraw-Hill Construction expects to see this share continue to rise, comprising nearly half of all nonresidential building by 2015—equating to \$122 billion in construction activity. And this growth is not just in new construction. New green home activity is also on the rise, with McGraw-Hill Construction estimating its market share rising from 2% in 2005 to 17% in 2011.

This shift in the way buildings are designed and constructed also fundamentally shifts the skills and training needed in the workforce. (See page 54 for the number of green construction jobs.)

Labor Statistics by Profession

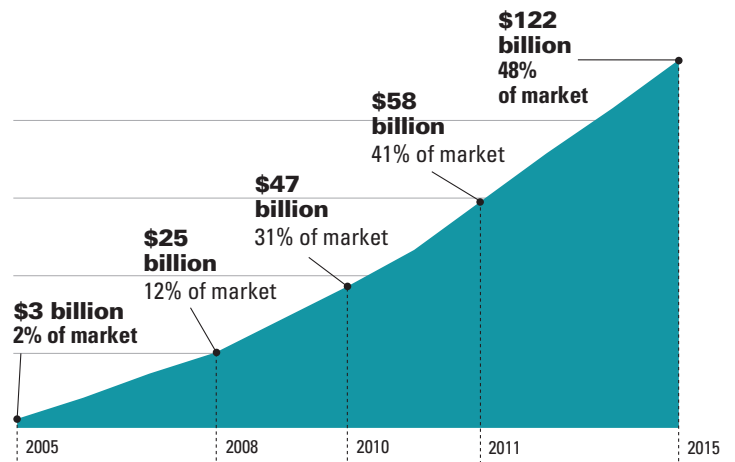
Along with the drastic decrease in construction activity, construction employment also plummeted. From 2008 to 2011, the U.S. Bureau of Labor Statistics reported that construction employment decreased 19%, from 4.7 million workers to 3.8 million. General and specialty trade contractors have seen a steeper decrease than architects and engineers, with both experiencing a 21% decline,

nearly double the 12% decline experienced by architects and engineers. However, for the most part, the drop-off occurred between 2008 and 2010, with all three groups showing only nominal differences between 2010 and 2011.

These numbers suggest that a rapid and aggressive recovery would have serious implications on the workforce over recent years. Since firms are more likely to hire due to increased work they already have contracted than work they expect (see page 17), a sustained recovery could lead to significant workforce shortage.

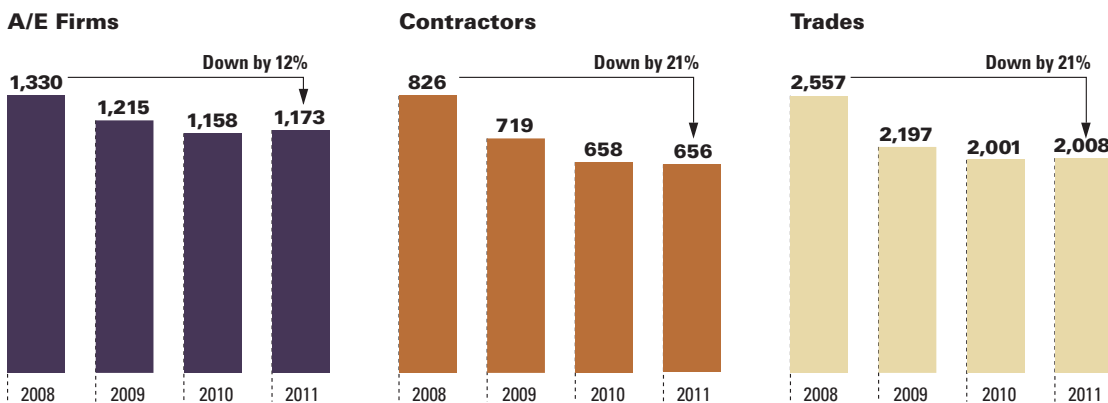
Nonresidential Green Building Market Size (in billions)

Source: Green Market Size, McGraw-Hill Construction, share calculation drawn from McGraw-Hill Construction Dodge project starts; base value of construction market from McGraw-Hill Construction Market Forecasting Service, as of April 2012



Nonresidential Construction Employment (in thousands)

Source: Bureau of Labor Statistics (Through the End of 2011)



Data: MHC Green Definitions

McGraw-Hill Construction Definitions

of Green Projects and Green Construction Jobs

McGraw-Hill Construction's (MHC) industry-leading analysis of the green project and green job markets are based on the definitions developed by MHC for green projects and green jobs. These definitions offer the construction industry clear, measurable standards for determining whether projects and jobs are green that are industry-specific.

MHC Green Project Definition

In order to begin tracking the size of the green construction market, in 2005 MHC created a definition of a green project that included projects that were not attempting to achieve green certification.

This definition has played a critical role in helping to establish a baseline of green activity and then accurately tracking how that activity has developed over time. It is based on factors recognized across the construction industry as critical to a green project.

According to MHC, a project can be considered green if it is either:

- **Built to LEED or another recognized green building standard, or**
- **A project that is energy-efficient and water-efficient and addresses improved indoor air quality and/or material resource conservation.**

MHC Green Job Definition

There are many established definitions of green jobs that are not industry-specific. Furthermore, many definitions of green jobs are both broad and vague.

In order to conduct this research, MHC realized that green jobs in the construction industry needed to be specifically defined in order for them to be benchmarked and tracked over time. Therefore, in consultation with

the U.S. Green Building Council, Green Building Certification Institute and other independent experts, MHC crafted a specific definition of green for the construction professions—architects, engineers, contractors and specialty trade contractors.

Unlike in other industries, where green work can be measured by the output of green products, workers who specialize in green systems, like highly efficient HVAC systems, may install them in buildings that do not include enough other green elements to qualify as a green building. Thus, measuring green jobs solely through the production of green buildings is not sufficiently inclusive.

In addition, many green jobs in the design and construction industry are extensions of existing jobs, with the same basic functions (creating design documents, coordinating a team of subcontractors, painting or roofing) but with a different approach, skills or knowledge required to achieve the best results. No existing green job definitions captured these important distinctions effectively.

Therefore, one critical result of this research is the creation of a definition of green jobs that is a truly applicable and accurate measure of green workers in the construction industry professions. Because of the need to capture the distinctions mentioned above, MHC defined green jobs in two different ways.

A green job in the design of buildings involves:

- **More than 50% work on green projects, or**
- **Designing uniquely green systems on any building.**

Examples include solar energy systems, geothermal systems and green roofing systems.

A green job in the construction of buildings:

- **Involves installing a uniquely green system.** Examples include solar panels, composting toilets and green roofs.
- **Requires different skills to meet green goals.** Examples include using products that require different ventilation techniques, and salvaging and reusing building components in new structures.

For both the design and construction of buildings, a green job does not involve:

- **Administrative or non-construction professionals**
Examples include procurement officers, accountants and green cleaning staff.
- **Manufacturing or production of green products** ■

Green Share of Company Project Activity

In 2011, 88% of respondents report they were working on at least some green projects, and by 2014, nearly all (96%) think they will be. The percentage of green projects as part of their overall work is also expected to rise significantly, with firms doing over 50% green work expected to grow from 26% of all respondents to nearly half (44%).

These results demonstrate that green has already penetrated into work at the majority of firms, and that the growth in green projects is expected to continue at a vigorous pace, similar to its growth rate over the last five years (see page 10 for the green building market size).

The steady increase in a firm's level of green work has important implications on the need for green skilled workers. There has been sufficient green work to enable creation of a cadre of experienced green workers in the industry who could provide leadership as the green market continues to grow. However, the high rate of growth of the overall green market also demonstrates that firms will need access to more workers who are trained to efficiently and cost-effectively execute green projects.

Previous McGraw-Hill Construction research shows that, as a larger percentage of the work done by firms becomes green, the degree of sustainability achieved in those projects typically increases. Firms doing more than 50% green projects may not only need more green workers than firms doing less than 25% green, but they may also need workers with greater experience and sophistication in producing sustainable outcomes in buildings. Thus, the need for more green skilled workers in the next three years may be even greater than the growth expected by the survey respondents suggests.

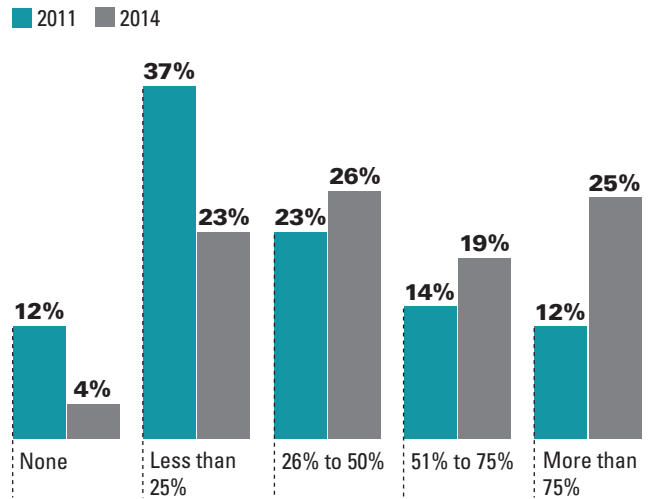
Variation by Firm Type

Architects and engineers report doing higher levels of green work compared to general contractors or specialty trade contractors. In fact, **50% of A/E respondents report that by 2014 more than half of their projects will be green, compared to 38% of general contractors and 31% of specialty trade contractors.** Previous studies by McGraw-Hill Construction on green and sustainability have consistently demonstrated that A/E firms have been earlier adopters of green than contracting firms, and these results bear out that general trend.

These results could have multiple implications. First, the gap in the percentage of green work between design and construction firms could suggest that some green elements

Green Share of Company Project Activity (2011 and 2014)

Source: McGraw-Hill Construction, 2012



designed by A/E firms are not always implemented in the construction phase. Alternatively, they could suggest that for A/E firms, involvement with green is becoming a far more standard trend, whereas green involvement with construction firms may be more concentrated among a few firms doing a large volume of largely green projects. Most likely, both of these factors are influencing the industry.

Variation by Years in Profession

A significantly higher percentage of respondents (16%) with 20 years in their profession are currently doing no green projects compared to those with less experience (9%). Conversely, far more respondents with less than five years of professional experience (24%) report that more than 75% of their projects are green compared to those with five years of experience or more (13%).

The gap remains consistent in their estimates of the amount of green work they will do in 2014. Respondents with 20 years or more experience account for 78% of those who expect to be doing no green work in 2014, even though they comprise only 51% of the total respondents.

This result is probably impacted by the importance that the younger generation places on environmental issues, suggesting they may be going to work for firms more engaged in green work. More research is needed to determine the extent to which this interest is drawing younger professionals into design and construction. (See

Construction Market Influences on Workforce

Green Share of Company Project Activity CONTINUED

page 14 for reasons that architecture students and recent graduates from architecture programs want to pursue green work.)

Variation by Region

In 2011, a much larger percentage of respondents from the West (16%) had more than 75% green projects, compared to the Midwest and the Northeast (both at 9%). However, by 2014, there is no statistically significant differential by region among firms with more than 75% green projects, although the Northeast does average fewer green projects overall than the other regions. This result indicates that as green becomes the norm, regionality is shrinking in importance in terms of overall adoption.

Variation by Project Sector

Not surprising, firms focused in the institutional sectors are doing the highest levels of green work. These projects, including schools and hospitals, have strong green building programs and policies in place.

■ More than 75% Green Projects in 2011

- Institutional: 14%
- Industrial Sector: 9%
- Commercial Sector: 13%

Conversely, the industrial sector has the lowest level of penetration, with 54% of them doing 0%–14% of work

green compared to 47% of commercial and 45% of institutional sectors.

In 2014, the differential between sectors is more muted, confirming McGraw-Hill Construction's projection that the industry at large is shifting toward green. By 2014, the sectors doing more than 75% of projects green are 29% of institutional, 27% of commercial and 22% of industrial.

Variation by Accreditation

Not surprisingly, far more respondents who have some accreditation (including possibly LEED) have a higher percentage of green projects in 2011 than individuals with no accreditation and an even higher percentage in 2014:

■ More Than 50% Green Projects in 2011

- Accredited: 49%
- Not Accredited: 14%

■ More Than 50% Green Projects in 2014

- Accredited: 71%
- Not Accredited: 32%

Variation by Gender

A greater percentage of women report that they do more than 75% green projects compared to men. In 2011, 19% of women versus 12% of men report that more than 75% of their projects are green. In 2014, the gap continues with 35% of women versus 25% of men.

Green Share of Company Project Activity (by Profession)

Source: McGraw-Hill Construction, 2012



Data: Construction Market

Influences on Workforce

Influences Promoting Green Design:

Results from the Architect Firm Gap and Student Studies

Architects have been leaders in sustainability, and their influential role at the beginning of the design process has been and will continue to be critical to the growth of green building. Understanding what influences them and the next generation of architects to choose green design is critical to gauge the future direction of the green market.

The survey of practicing architects reveals that the factor most likely to increase their sustainable practice is greater client demand. This is in striking contrast to the survey responses from architecture students and recent graduates, who believe that they are more likely to increase their green practices and procedures because of a personal sense of environmental responsibility.

Architects have been important change leaders for sustainability in the construction industry, adopting early and, for some firms, advocating for greener projects. However, practitioners recognize that encouraging owner demand will have the greatest impact on increasing their ability to do more sustainable design because the owner ultimately determines the project budget and priorities.

The passion that the younger generation have for sustainability may help push green activity further as they gain leadership positions within firms and deal with clients directly.

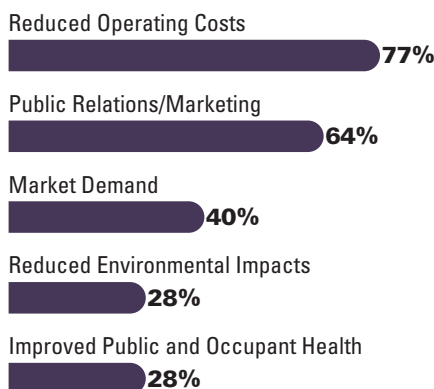
Factors that impact the owner's immediate costs or requirements on a project are also given a strong weight by architectural practitioners. These include rising energy costs and mandates. When asked what influences client interest in green, in addition to reduced operating costs, practitioners also regard strategies to increase business such as marketing and public relations as important

motivators. They clearly believe that it is necessary for green design to demonstrate its bottom-line benefits to increase in practice.

Students, however, believe that the long-term return on investment should carry weight, and many in the industry believe that this factor is critical to continued future growth of green in construction. To encourage this, many are seeking ways to help owners realize those benefits in the market value of their green buildings as well as their operating savings. ■

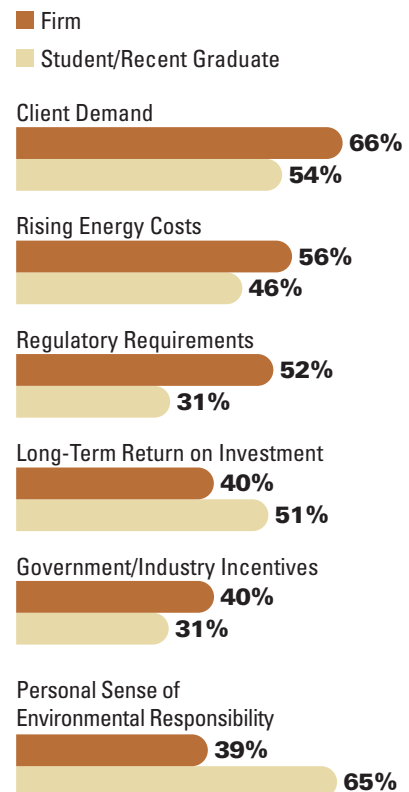
Client Interest in Green (According to Architectural Firms)

Source: AIA/MHC Studies 2012



Factors Influencing Green Design

Source: AIA/MHC Studies 2012



Expectation of Green as a Norm for Firm/Industry by 2016

66% of all respondents believe that green will be the norm for their firm by 2016, and 70% believe it will be the norm for their profession or trade. This result demonstrates the strong need for professionals in design and construction with effective green skills, experience and training. It supports the general trend that the industry is continuing to grow in terms of green. As green becomes the norm, the ability to do green work will continue to gain importance as a differentiator for workers in the design and construction professions. And eventually, it will become a necessity—folded into the basic skills needed for the different professions.

More respondents in all three of the firm types, A/E firms, general contractors and specialty trade contractors, believe that green will be a norm in their profession than in their individual firm. This finding is interesting because it suggests that the awareness of green in the industry is acute and may in fact slightly exceed the actual level of green adoption levels as share of a firm's work. The high level of industry awareness of LEED and Energy Star ratings, the continued popularity of green conferences, and the active promotion of green best practices and other elements may have created the impression that the industry as a whole is going green faster than individual firms are able to.

Variation by Firm Type

While roughly two thirds to three quarters of A/E firms and general contractors see green as a norm in their firm and the industry within five years, trade contractors hover at 50%. These results demonstrate the penetration of green in the industry, with design firms as early adopters, general contractors adopting in response to industry demands, and the trades following behind the contractors. Earlier adoption of green by design professionals compared to contractors has been demonstrated in other *SmartMarket Reports* on green building published in the last five years, and this result further confirms that trend.

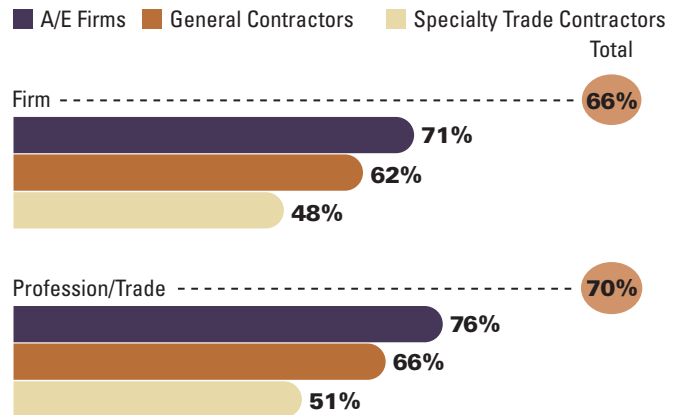
Despite the differential, it is important to note that over 50% of trade contractors do expect green to be the norm in five years for their trade—a substantial figure that should be noted by educational institutions, unions, certification programs and others who provide trade employees with the skills they require.

Variation by Years in Profession

Workers with fewer than five years in the profession are more likely to see green as a norm for their firm and profession than those with 20 years of experience or more. This is consistent with various findings in this study regarding the passion and commitment of the younger professionals to sustainability.

Green Construction Will Be the Norm by 2016 in Firm and Profession (According to Industry Players)

Source: McGraw-Hill Construction, 2012



■ Green Will Be the Norm for Their Firm

- Less Than Five Years: 75%
- 20 Years or More: 64%

■ Green Will Be the Norm for Their Profession

- Less Than Five Years: 82%
- 20 Years or More: 67%

A lower percentage of those who make hiring decisions (67%) believe green will be a norm in the industry compared to those who do not make hiring decisions (75%). This may be directly tied to the finding that those who have been in the profession longer are less likely to see green as a norm.

Variation by Level of Green Involvement

Over 90% of firms with at least 50% green projects think green will be a norm in the profession in the next five years.

While it would be reasonable to expect that those doing more green work would anticipate that it will be a norm, this high level of expectation is striking and demonstrates that familiarity with green work leads firms to expect that the industry as a whole will be adopting it within five years.

Variation by Gender

More women (75%) than men (70%) think green will be a norm in their profession in five years.

Employment Activity in the Last Three Years

Over three quarters of respondents report that their firm has experienced a change in employment, with nearly equal amounts reporting that they had hired or laid off employees. Also, almost two thirds report that employees have elected to leave the firm.

This result demonstrates that the design and construction industry is experiencing a dramatic amount of staff turnover. Even in a down economy, firms are hiring employees in addition to laying them off. In such an active market, potential employees need to be able to differentiate their skills and expertise effectively.

Interestingly, there is no statistically meaningful variation in employment among firms working in different project sectors.

Variation by Firm Type

General contractors are the only firm type in which a higher percentage of respondents report laying off employees (84%) as opposed to hiring employees (82%). General contractors often hire workers on a project-by-project basis. As the projects are completed, workers can be laid off. Given the dramatic decline in construction starts in 2011 compared to 2008 (see page 9 for more information), it is not surprising that these firms report slightly higher levels of employee layoffs compared to A/E firms or specialty trade contractors.

Variation by Region

A higher percentage of firms in the West (80%) report laying off employees compared to firms in the Northeast (74%) or Midwest (72%). This corresponds to some of the regions that report the highest declines in their construction markets, including Las Vegas and some cities in the Southwest. The South, another region with sections with dramatic declines in construction, also had

a slightly higher percentage reporting layoffs (79%), but not enough to be considered statistically significant.

Variation by Firm Size

Firms that have billings of \$5 million or more report significantly higher levels of employment activity—93% have hired employees, 86% have laid off employees, and 83% had employees elect to leave the firm in the last five years. This no doubt relates to the larger likelihood of changes among a larger group of employees, but it also underscores the need for these firms to be able to quickly find and evaluate potential candidates for employment.

A lower percentage of firms with less than \$250,000 in billings report hiring employees (32%) or laying off employees (52%) compared to those with higher billings. This indicates that currently larger firms offer more opportunity. It would be interesting to track whether this changes when the recovery takes hold in the industry.

Variation by Level of Green Involvement

Firms with less than 25% green projects report hiring fewer employees and having more employees elect to leave compared to those doing more than 75% green projects. This results again underscores the strength of the green building portion of the market.

■ Hired Employees

- More Than 75% Green Projects: 87%
- Less Than 25% Green Projects: 79%

■ Employees Elected to Leave

- More Than 75% Green Projects: 75%
- Less Than 25% Green Projects: 65%

Employment Activity in the Last Three Years

Source: McGraw-Hill Construction, 2012

Hired Employees



Laid Off Employees



Employees Elected to Leave Firm



Factors Impacting the Decision to Hire

The most common reason for all of the industry firms to hire employees is because of an increased current workload. This demonstrates that their demand for new workers is likely to coincide with the recovery of construction in their markets and project sectors rather than precede it, since projected increases in workload finish a distant second.

Variation by Firm Type

While the rankings by importance are similar, there are significant differences in the percentages of the players that find these factors to have a major impact.

A/E FIRMS

During hiring, a much higher percentage are motivated by current workload increases and the need to replace staff who are leaving compared to general contractors. The specialty trade contractors match the architects in the influence these factors have on their hiring practices.

GENERAL CONTRACTORS

A higher percentage are concerned with replacing retiring workers compared to the other two professions.

SPECIALTY TRADE CONTRACTORS

A higher percentage consider the need for experienced workers a strong motivation for hiring compared to the other two professions.

Variation by Project Sector

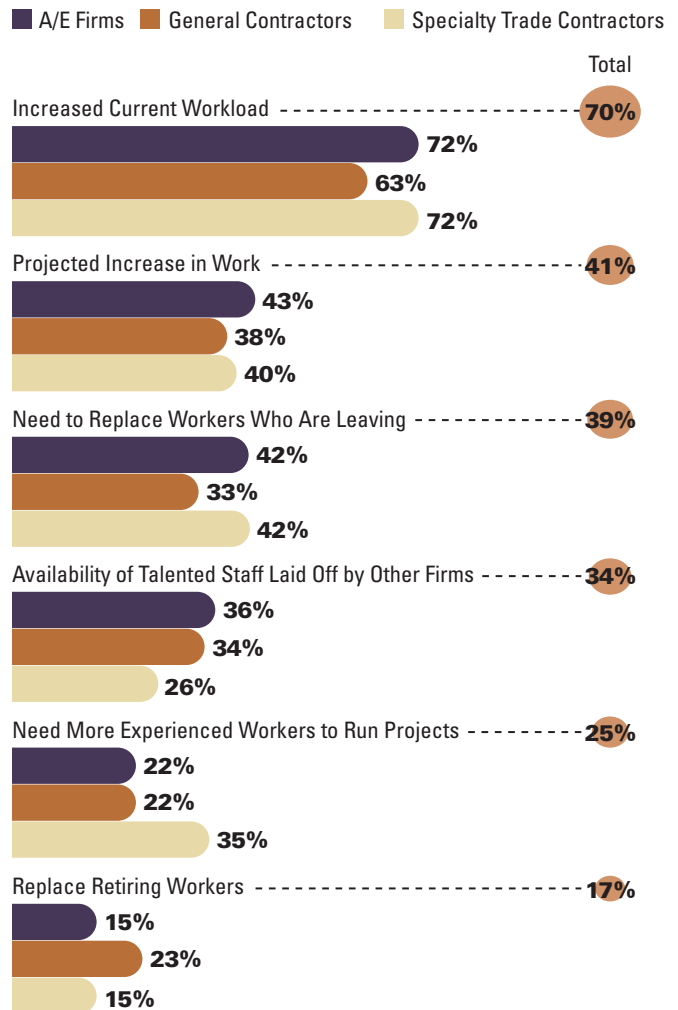
Replacing retiring workers motivates hiring for a higher percentage of design and construction firms doing industrial design (23%) compared to commercial (17%), industrial (17%) or residential (16%) work. This may be influenced by the recent spurt of growth in construction in the manufacturing sector. Because manufacturing work has been largely reduced in the last several decades, most of the expertise in this area may lie with an older generation of workers getting ready to retire.

Variation by Region

52% of respondents from the Midwest find the need to replace workers leaving construction to play a role in their hiring decisions, second only to increased current workload at 65%. This suggests that in the Midwest, the number of workers leaving the industry may be far larger than in the other regions, which average only 34% for this factor.

Factors Impacting Decision to Hire Employees (by Player)

Source: McGraw-Hill Construction, 2012



Variation by Level of Green Involvement

30% of firms with more than 50% green projects find that the need to find more experienced workers to run projects is compelling them to hire new employees, compared to 18% of those who do less than 50% green. This result, combined with the fact that those doing a majority of green projects also tend to be newer to the profession (see page 12), suggests that there may be a need for employees that can combine green skills with project leadership experience.

Emerging New Jobs

Despite the very different types of jobs held by A/E, general contractor and specialty trade contractor respondents, their responses are generally in agreement when presented with an open question about the types of new jobs they think are currently emerging due to industry trends. In general, all three player groups see new jobs emerging in two main areas: green (including energy efficiency) and building information modeling (BIM).

New Green Jobs

Three quarters of the A/E and general construction respondents identified jobs emerging in the area of green construction and sustainability. 47% of the trade contractors also saw new jobs emerging in the green sector.

SPECIALISTS

One of the top areas in which A/E, general contractor and specialty trade contractor respondents expect to see new jobs emerging is in specialization, in green and specifically in LEED. As green projects become a larger part of the overall construction market (see page 10), it is not surprising that more firms are looking for employees that have a deep knowledge of green.

Interestingly, a higher percentage of specialty trade contractors identify green specialists compared to the other players, while general contractors have the largest percentage who name LEED specialists as a new emerging position. This may be impacted by the fact that specialty contractors are more likely than general contractors to identify their job as green because they work on a specific green system, thus making them more focused on the specific work they do and less focused on elements like third-party certification for green projects.

CONSULTANTS

In addition to new internal expertise on green, many of the respondents also expect to see a rise in green and sustainability consultants. No doubt this is also due to the perception of a growing green market.

PROJECT COORDINATION/MANAGEMENT

There is some recognition that coordinating and managing a green project can be a different process than managing a traditional project. Thus, all three players name green project coordinators and LEED project managers as new positions they expect to emerge.

INTERNAL BUSINESS MANAGERS

In addition to positions that help make projects greener, a few of the respondents indicate that they expect positions to emerge that will make their firms greener as well. These include sustainability managers and energy management positions.

NON-CONSTRUCTION POSITIONS THAT ENCOURAGE GREEN BUILDING

While the rise of green projects is driven most by the benefits these projects offer, regulations continue to play a critical role in encouraging green projects. In addition to green codes, the emerging trend of reporting building energy use may also impact the construction industry. Thus, some new positions expected include those involving code compliance/inspection and energy auditing.

REDUCING ENERGY USE

In addition to the positions mentioned above that encourage energy conservation, A/E and general contractor respondents also identify emerging jobs in energy modeling, while all three players report expecting to see positions generally addressing energy efficiency.

New BIM Jobs

21% of the A/E and general construction respondents and 7% of the specialty trade contractor respondents identify new positions emerging to help firms maximize their use of BIM. These include many of the same kinds of positions emerging in green including specialists and managers for BIM. A few general contractors expect to see more BIM engineers, and all three players expect to see more BIM modeling jobs emerge as well as general BIM-related positions that they didn't specify.

Other

Over 5% of the A/E and general construction respondents also see jobs emerging in design, building commissioning and technology. For the trades, other emerging job areas include technology, solar and engineering.

Interview: Thought Leader



Elizabeth J. Heider, AIA, LEED AP, Senior Vice President Green Markets, Skanska

Heider's 33-year career encompasses all phases of design and construction as architect, construction manager, cost manager and VE facilitator. She has presented papers on cost, value, eco-efficient building and program management at international conferences and serves as 2012 Chair of USGBC's Board of Directors.

How do you think green building changes what is required from the current construction workforce?

HEIDER: What it boils down to is education and awareness. We need broader awareness that there are technologies that are not so difficult and can provide solutions that really enhance environmental performance in buildings ... [We need the] builders and trades to identify solutions that perform better.

What is the best way to increase education and awareness about green in construction?

HEIDER: On the supply side, the construction and trade organizations [need to] celebrate [green] and educate people, saying this is important, this will allow you to differentiate yourself [in a tight market]. Then you have the demand side ... the extent to which firms that commit to educating their staff and collaborating are rewarded by projects being awarded to them [by owners and architects]. It will just ignite the market.

Do you experience a challenge in finding subcontractors with green skills?

HEIDER: Some markets are more mature than others ... We really rely on the regional supply of expertise, so when we go into a [less mature] market, we provide coaching to the subs so that they can be successful from a safety and sustainability

standpoint. We look for suppliers and subcontractors who have the desire to learn and expand their capacity. That is one way we attempt to transform the market ourselves.

How do changing workforce demographics impact the skills you see at Skanska?

HEIDER: People who are more seasoned professionals bring different skill sets to the table than emerging professionals. Those of us who came into the industry before CAD have perhaps greater depth and experience in the craft of delivering a project to market. Emerging professionals have a lot of innovative ideas and perhaps a stronger command of the latest IT technology. They certainly have experience with social networking and other aids that can enhance productivity. I think that bringing those capabilities together creates a potent combination for market transformation.

What are the skills you think are necessary given the rise of collaboration in construction?

HEIDER: It is important that we develop strong interpersonal skills in all stakeholders. We have to engage in a dialogue and be aware of [our partner's] gifts, what brings them to the table, what drives them, what their risk profile is, what their ambitions are for the project, and how you have constructive conversations about this.

What trends concern you about the availability of a skilled workforce?

HEIDER: The biggest challenge is that we have been at the bottom of the recession for three, four years now, and outside of ongoing construction, there will be pent-up demand once the market begins to recover ... Hopefully, the recovery is not rocketing up but rises in a way that allows companies to bring staff on board, train them and give them the job skills that allow the company ... to proceed with confidence, instead of bringing on board a whole lot of folks who are new to the industry and then expecting that they will have the skills that are necessary to develop.

How can industry firms best respond to the challenge to become more diverse and inclusive?

HEIDER: There is a real need for the design and construction community to grow tomorrow's leaders ... We [at Skanska] are aware of the need to bring a diverse workforce into the company to create tomorrow's leaders and create a legacy that will deliver a much more robust, more diverse community ... You want to make sure that you develop people so that they can be successful, instead of promoting people beyond where they are ready ... [Skanska is] very committed to growing that capability and leaving that as a legacy to the workforce. ■

Interview: Thought Leader

CONSTRUCTION INDUSTRY WORKFORCE SHORTAGES: ROLE OF CERTIFICATION, TRAINING AND GREEN JOBS IN FILLING THE GAPS



Carole C. Wedge, FAIA, LEED AP,
President, Shepley Bulfinch

Carole has led a transformation of Shepley, with the creation of an open culture and work environment in new office space in Boston; the rebranding of the firm and its institutional identity; and the addition of offices in Phoenix (2009) and San Francisco (2012). In 2011 Shepley Bulfinch was one of three firms honored by the American Institute of Architect's Diversity Recognition Program.

Does the rise of green projects call upon a different set of skills for architects?

WEDGE: Absolutely. I think the role of collaboration across disciplines is huge. Early in my career, the architect developed a concept, [and] once we had a conceptual idea, we passed it to the engineers. Now we are meeting at the very beginning with the entire AEC team to say: What are the implications of this site from all our different perspectives? What are the ambitions for energy use or water use from all these different perspectives? You have to be a collaborator, a good listener and a synthesizer in ways that a lot of architects were not trained to be.

The second thing that is changing is the need for research and exploration as part of the design process. A lot of architects were trained to develop a process that was about their firm or the lead designer's point of view. And now, I see research [taking hold]—asking questions, exploring new systems and approaches, and taking apart the assumptions about systems you use.

What impact do you see on large architectural firms like yours from the increase of trends like green, BIM and collaboration?

WEDGE: There is skill development and process redesign that goes with integrated design. It changes the way you think about planning out a project, who is supposed to be at the table, how often the team comes

together and what communication looks like. The processes we used to develop a project 10 years ago look pretty different today.

[Another] component is assessment. The hardest part has been ... getting good metrics from our buildings, getting their yearly energy use and getting it converted [to a form] that we really understand. [Architects typically] do not take classes in understanding BTUs and their throughput and how to extrapolate that to dollars. That connects to the post-occupancy research and review that we do ... There is a much more extended relationship between the AEC team, the building itself and the client.

Does this create any new positions?

WEDGE: That depends on a firm's strategy. I have seen firms that are hiring researchers, energy modelers and building scientists. I think we [at Shepley] shy away from the pigeonholing part. We think the better, more nimble professional is going to be able to work across those skill sets. To really contribute across a project and have a rich and complete career, you need to be exposed to the whole spectrum ... But it really depends on your business model. I don't think either is right or wrong.

What other trends do you think are impacting architecture?

WEDGE: Globalization is a huge impact ... There's an explosion of

ideas, experiments, new products and new strategies. You have to be pretty voracious to stay on top of all that is going on in the industry.

The interesting thing about globalization is that there are so many parts of the world that do not have the infrastructure and systems we have. One of the exciting opportunities is whether you can solve the problem without making it complex? ... The exposure to solutions globally and the way problems are being solved in different cultures and communities inspires new thinking on all projects.

What trends are you watching with concern?

WEDGE: Part of the recession is the recession echo ... I worry about really bright, creative, talented people continuing to focus on architecture as a profession they want to pursue.

Will the retiring baby boomers create shortages in the recovery?

WEDGE: The retirement of the baby boomers is actually an interesting opportunity for firms to have people act in different roles, as consulting principals or mentors ... We are going to have to be more flexible in how people contribute to the work. I can imagine baby boomers working part-time on projects ... Firms that can be flexible and creative in how to fill the voids [created by a talent shortage in a busy economy] will do much better than ones that are very strict and structured. ■

Data: Workforce Shortages

Workforce Shortages

Over two thirds of the industry are concerned about workforce shortages. This reflects that the industry is seeing beyond the recession and into future gaps. Key findings in this section include:

- **Professions with Shortages:** A/E firms and general contractors are most concerned about experienced workers, while specialty trade contractors worry about the pipeline of new skilled workers.

- **Trade Shortages:** Carpentry/millwork and electrical contractors top the list of trades where shortages are most expected by A/E firms and general contractors. For green projects, trades of most concern are HVAC/boilermakers and carpenters.
- **Green Project Skills In Demand:** Increased shortages of green skilled workers are expected by 70% of respondents in the future, with the highest levels of shortages expected in the trades.

Difficulty Hiring Workers by Level of Experience

A/E Firms

A/E firms are far more concerned about hiring workers with 10 years of experience or more than hiring workers with less experience. Currently, 36% are concerned about finding experienced workers, and roughly the same percentage (37%) are concerned about hiring experienced workers in 2014. These numbers are consistent between those directly involved with hiring decisions and those who are not.

In contrast, only 12% are currently concerned about hiring less experienced workers, although more (16%) are concerned about this in 2014. However, fewer hiring managers share this concern both currently and in 2014. The increase in concern about the student pipeline in the future may reflect the expected impact of the well-publicized job losses in design, which could discourage students from choosing this profession.

VARIATION BY PROJECT SECTOR

A/E firms that work in the industrial sector are concerned about finding experienced staff, with 43% concerned now and 45% by 2013. This is in sharp contrast to the commercial and institutional sectors, where those concerned currently and in 2014 range from 34% to 39%.

VARIATION BY FIRM SIZE

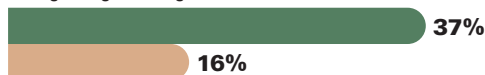
Firms with billings of less than \$250,000 are more concerned than larger firms about hiring those with less than 10 years of experience, with 21% currently and 31% for 2014 indicating their concern. Smaller firms may face greater recruiting challenges than larger firms, especially in this down economy.

Difficulty Expected Hiring Staff in 2014 (By Level of Experience)

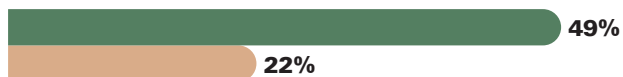
Source: McGraw-Hill Construction, 2012

- 10 or More Years
- Less than 10 Years

Design/Engineering Staff at A/E Firms



Craft Worker Staff at GC Firms



General Contractors

More general contractors are concerned about finding experienced craft workers than they are about finding management staff. Currently, 39% are concerned about hiring craft workers, compared to 27% concerned about hiring management staff. **By 2014, nearly half (49%), are concerned about finding experienced craft workers**, far more than the 39% concerned about management staff.

VARIATION BY REGION

A higher percentage of general contractors in the Northeast believe that it will be more difficult for their firm to hire skilled craft workers in the next three years compared to the other regions. While 20% to 23% of respondents in the other regions consider it difficult, 30% in the Northeast do.

Expected Shortages by Profession by 2014

69% of A/E and general contractor respondents expect some sort of skilled worker shortage by 2014. This finding is supported by other industry research findings. For example, in a national survey conducted in 2011 by the Construction Users Roundtable (CURT) of 531 construction industry leaders, 74% reported some sort of shortage of skilled labor in the short term (1–3 years), with 20% reporting a moderate to severe shortage.

A/E Firms versus General Contractors

A/E respondents expect the greatest shortages in engineering, while nearly half of the general contractors (45%) expect a shortage in specialty trade contractors. Since A/E firms typically work with engineering firms and general contractors hire specialty trade contractors, it is not surprising that each would be very concerned about worker shortages in these categories.

Hiring Decision Maker Opinions

More respondents who influence hiring decisions are expecting shortages in architecture and engineering than those who do not make those decisions—25% expect shortages in architecture and 31% expect shortages in engineering.

This may be the case because architects and engineers who do not participate in the hiring processes at their own firms may be more acutely aware of potential shortages among contractors than they are in their own field, due to their interaction with contractors during the construction of a project.

Shortages in Architecture

Among the firms who expect a shortage in architecture, 41% expect a major/somewhat major shortage of architects, compared to 19% for interior designers, 15% for landscape architects and 21% for urban design.

VARIATION BY REGION

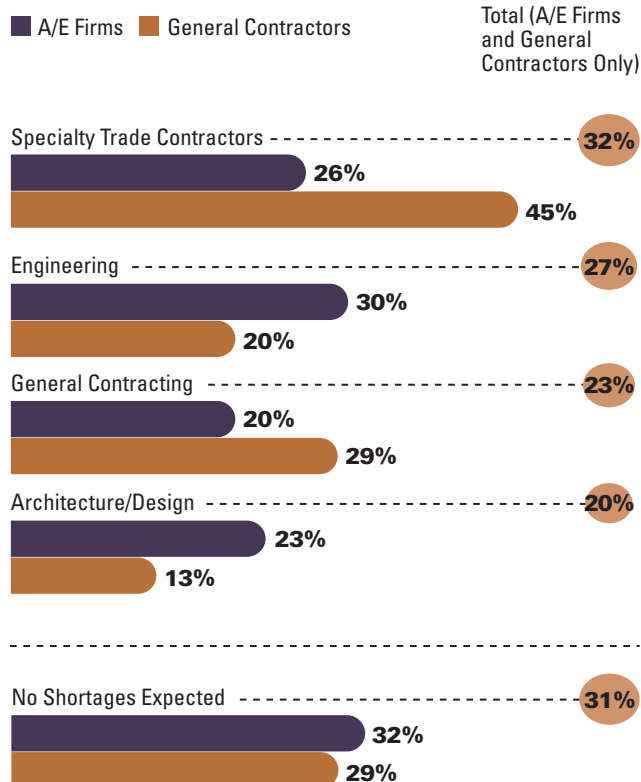
54% of respondents expecting a shortage in architecture in the South believe that there will be a major/somewhat major shortage of skilled architects, significantly higher than those in the Northeast (29%), and slightly higher than those in the Midwest (36%) or the West (44%).

VARIATION BY LEVEL OF GREEN INVOLVEMENT

Half of the firms that do more than 50% green projects expect a major/somewhat major shortage in skilled

Professions with Expected Skilled Worker Shortages by 2014 (by Player)

Source: McGraw-Hill Construction, 2012



architects, compared to close to a third for those doing less than 50% green.

Shortages in General Contracting

Out of the respondents expecting a general contracting shortage, 44% expect a major/somewhat major shortage in general contractors, 35% in construction managers, 33% in design/builders and 28% in remodelers. The fact that there is less concern about skilled remodelers may be due to the fact that the remodeling market has remained relatively steady through the economic downturn, allowing for more stability in its workforce.

GENERAL CONTRACTORS

For the most part, among those expecting a shortage in general contracting, the percentage who anticipate a major/somewhat major shortage in general contractors is

Workforce Shortages

Expected Shortages by Profession by 2014

CONTINUED

consistent across different project sectors, firm sizes, regions and levels of experience.

Shortages in Engineering

Among those who expect a shortage in engineering in general, the largest percentage expect a major/somewhat major shortage for mechanical and electrical engineers, with 44% for mechanical and 43% for electrical.

MECHANICAL ENGINEERING

A significantly larger percentage (67%) of respondents from firms doing more than 75% green projects expect major/somewhat major shortages in mechanical engineering compared to those whose firms have less green involvement, which range from 34% to 47%.

ELECTRICAL ENGINEERING

Nearly half of firms that work in the industrial sector (49%) and that expect an engineering shortage also expect a major/somewhat major shortage of electrical engineers, slightly more than those in the commercial and institutional sectors (41%–42%). In addition, only 17% in the industrial sector expect

a minor/somewhat minor shortage of electrical engineers, compared to 27% in commercial and 24% in institutional.

Shortages in Specialty Trade Contractors

Out of 15 skilled trades covered in the survey, the top five with major/somewhat major shortages expected are carpentry, electrical, HVAC/boilermaker, concrete finisher/cement mason, and ironworker/steel erection, fabrication and welding (see below).

VARIATION BY FIRM TYPE

While contractors are more concerned about shortages in the all trades (except HVAC) compared to A/E firms, **the percentage concerned about major shortages of carpenters, concrete workers and ironworkers/steelworkers is much greater**, suggesting more concern about the structural trades than the interior trades.

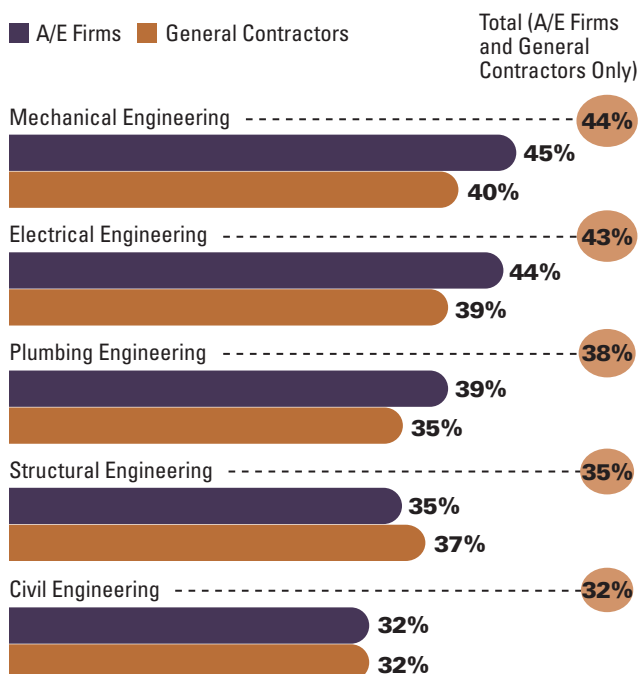
VARIATION BY REGION

36% of firms in the Northeast expect major/somewhat major shortages in ironworkers and steelworkers, at least double the percentage in other regions.

Types of Engineers with a Significant Shortage of Skilled Workers Anticipated

(Among Those Expecting a Shortage)

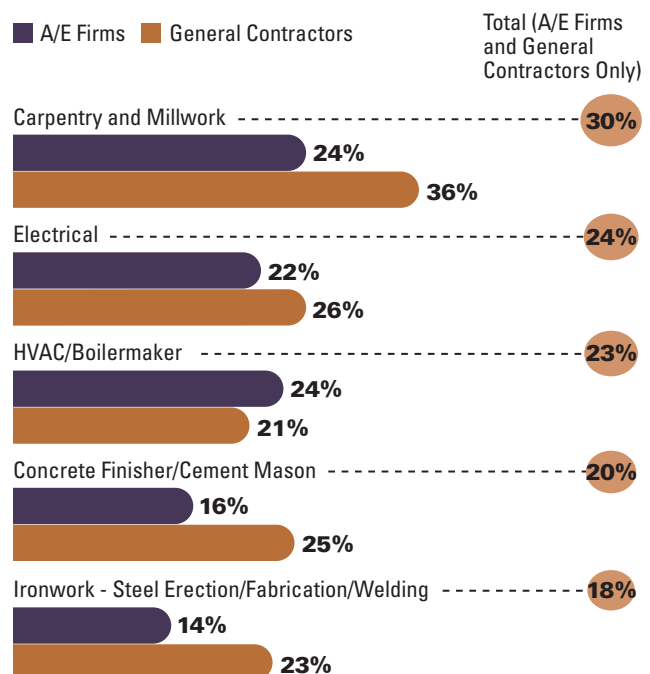
Source: McGraw-Hill Construction, 2012



Top Five Trades with Skilled Labor Shortages Expected by 2014

(According to A/E Firms and General Contractors)

Source: McGraw-Hill Construction, 2012



Factors Impacting Skilled Workforce Shortages

The design and construction industry is most concerned about the impact of the loss of knowledge and experience due to retirement and layoffs on the availability of skilled workers in the future. While the concern about the loss of knowledge due to retiring leaders is shared by all the firm types, concern about loss of experience due to layoffs is particularly pronounced in the A/E firms, although more than half of the general contractors and specialty trade contractors share this concern.

This finding corresponds with the expectation that workers with ten years of experience or more will be more difficult to hire than those with less experience. It is also aligned with general concerns in the U.S. workforce regarding employee losses when the baby boom generation retires. However, in this case, the concern is compounded by the impact the economic downturn has had on the retention of experience and talent in the industry.

Respondents who help make hiring decisions are more concerned about all of the five factors except concern over wages compared to those with no hiring authority.

Variation by Firm Type

A/E FIRMS

A/E firms are more concerned about the impact of low wages than the other professions. Among A/E firms, those with higher billings (\$1 million or more) are less concerned about this issue than the smaller firms.

The architecture and engineering professions require higher education, and as such, frequently leave younger professionals with a significant amount of debt that employees of general construction and specialty trade contractors are less likely to be burdened with.

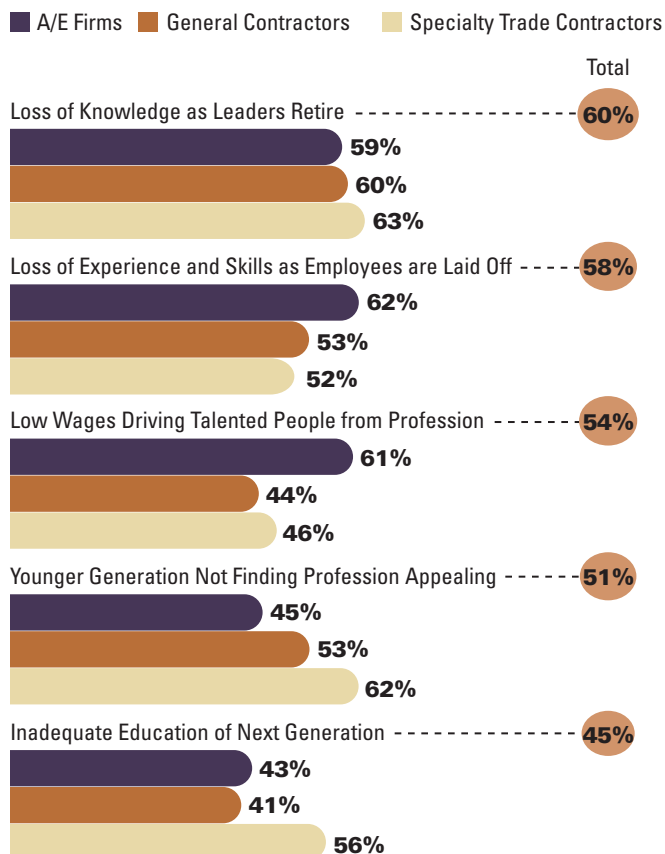
GENERAL CONTRACTORS AND SPECIALTY TRADE CONTRACTORS

■ Attracting the Next Generation

A significantly higher percentage of general contractors (53%) are concerned about the younger generation not finding their profession appealing compared to A/E firm respondents (45%), but the specialty trade contractors are even more concerned about this issue than the general contractors, at 62%. For both general contractors and the trades, it is second only to concerns about loss of knowledge due to retiring leaders. Construction work is sometimes perceived to be dangerous and difficult, but it is possible that, as green construction becomes more widespread, the younger generation's widely publicized

Percentage Concerned Over Factors Impacting Future Workforce (by Player)

Source: McGraw-Hill Construction, 2012



commitment to environmental issues may make construction more appealing.

■ Pipeline of Future Employees

Specialty trade contractors are also far more concerned than A/E firms or general contractors about whether the pipeline of new employees is adequately educated to enter the workforce. This suggests that more training programs focused on the trades are essential (see page 46 for more information on training for the trades.)

Variation by Region

A higher percentage of firms in the Northeast (60%) are concerned about whether the younger generation finds their profession appealing compared to those in the other regions, which range from 45% to 46%.

Shortage of Architects and the Student Pipeline: Results from the Architect Firm Gap and Student Studies

One third of the architects surveyed in the Architect Firm Gap study believe that there will be a shortage of architects in the future. While this seems much higher than the 23% who expect the same shortage in the industrywide survey, there are some important differences in the questions asked. The industrywide survey examined the likelihood of shortages by 2014, while the architects in the firm gap survey were asked if there will be an eventual shortage due to professionals leaving the profession. It is possible that the differential may reflect an expectation that a full recovery of construction activity may not occur by 2014, thus pushing the expected shortages down the road.

Of those expecting a shortage, 79% of the architects are also unsure whether there will be sufficient students to replace the architects leaving the profession due to economic conditions, and 37% of them are confident the pipeline of students will NOT be sufficient.

The survey of architecture students also suggests that concerns about the pipeline may be valid, with 36% of architecture students and recent graduates stating that they are not sure if they plan to stay in the architecture field. The fact that 76% of students and recent graduates express interest in working abroad could also have serious implications for future potential shortages. While

the biggest factor motivating students and recent graduates is the desire to live abroad, well over half also believe that they may find more job opportunities abroad than in the U.S.

These concerns over the student pipeline are echoed in the MHC industrywide survey, in which 45% of architects believe that the younger generation does not find their profession appealing. Even though a lower percentage of architects expressed concern about this factor than the other construction professions, 45% is still quite significant, especially for a field like architecture that typically captures the imagination of its workers.

Impact of Current Economic Downturn on Anticipated Workforce Shortages

A/E and General Contractor Respondents

Among the A/E and general contractor respondents who expect a skilled worker shortage in one of the professions, most of them attribute that shortage to the economic downturn. The following is the percentage of A/E and general contractor respondents who believe the economic downturn is the sole cause or a contributing factor in the workforce shortages they anticipate in the next three years:

- Architecture Shortages: 66%
- Engineering Shortages: 38%
- General Construction Shortages: 51%
- Shortages in the Trades: 51%

These findings correspond to the high level of concern noted, especially by A/E firms, about the loss of experience and skills due to layoffs (see page 24 for more information).

Specialty Trade Contractor Respondents

Fewer respondents (37%) who think there will be a skilled worker shortage in their trade believe the economic downturn contributes significantly to those shortages compared to the A/E and general contractor respondents.

Workforce Concerns from a Global Perspective

Global construction output is predicted to increase 70% from 2010 levels by 2020, according to Global Construction Perspectives and Oxford Economics.¹ Much of that growth is expected to occur in emerging countries, and construction industry professionals and companies need to prepare for this new world order.

The increasing global activity and shifting focus to the developing world have led large design and construction firms to practice internationally. In fact, in 2011, *Engineering News Record* (ENR) reported that the top 225 international contractors had revenues of \$383.66 billion generated by projects outside their home countries in 2010, and the top 200 international design firms generated \$57.66 billion internationally as well, with greater growth in markets like Africa, South America and Australia as the more developed countries struggled through the recession.²

Doing work internationally, however, has its own challenges and requires different skill sets. And the growth of construction work abroad may have unexpected consequences for the workforce here in the U.S.

Working Internationally

The Architect Firm Gap and Student Studies reveal that 81% of architecture students and 61% of recent graduates are interested in working abroad. For over 70% of them, the desire to live abroad is a strong motivation, but over 50% also cite more job opportunities in their field as a reason.

However, their selection of where they are thinking of looking for work does not correspond with where the biggest opportunities lay according to the Firm Gap Study. The practitioners identify China, the

Middle East and India as the regions with the best opportunities, but a larger percentage of students and recent graduates express interest in going to Europe and Australia.

The relatively strong level of interest in Australia and Central America, however, does correspond to markets that ENR identified as growing in its analysis of the international market,³ so there is some potential alignment of market and interest.

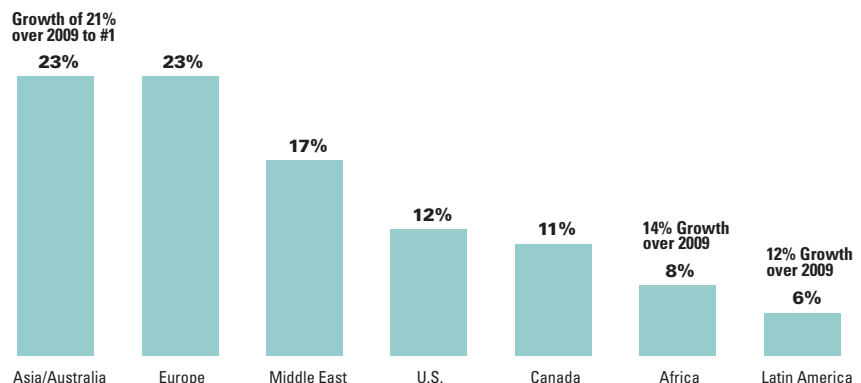
The gap between where the work is and where people want to work is not confined to architecture alone. Michael Stokes, managing director of the MENA (Middle East and North Africa) region for Navigant Consulting Inc., explains that the contractors he works with have jobs in places like Saudi Arabia and Afghanistan,

regions that are not typically popular for recruiting employees. He says, "When you are looking at regions like that, you need people that have the right mentality, but you also need to make sure that you look after them appropriately, not just in terms of security and remuneration, but [considering things like] rotation packages ... that effectively increase the contractor's cost a lot because [they] essentially need one and a half people for every post."

However, Stokes has observed that the challenge of finding work in the U.S. has temporarily improved firms' ability to find workers for these locations. "With the global downturn, you now find people working the more hostile locations because they are contractors and they have to go where the work is."

Regional Market Activity of ENR Top 200 International Design Firms (% of Total Market)

Source: ENR Top 200 International Design Firms, ENR, July 25, 2011

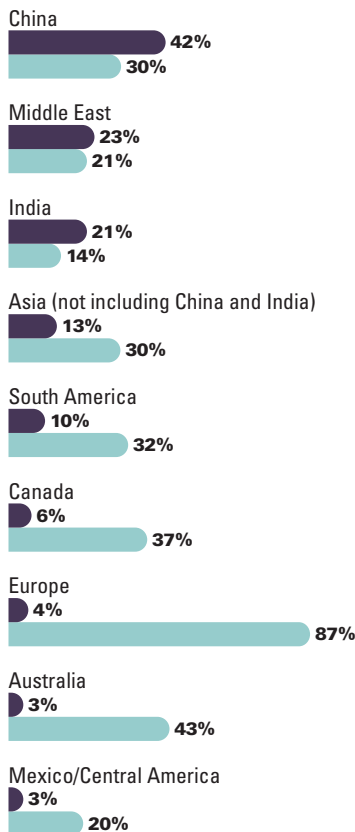


¹ *Global Construction 2020*, Global Construction Perspectives and Oxford Economics, 12 November 2009. Page 6. ² Reina, Peter and Tulacz, Gary. "The Top 225 International Contractors: With Traditionally Strong Markets in Decline, Firms Look to Break into New Regions," *Engineering News Record*, 29 August 2011. Page 46. ³ *ibid*.

Global Market Perspectives for Recent Architectural Graduates

Source: AIA/MHC Studies 2012

- Firms Reporting Demand for Recent Graduates
- Students Seeking Work (Percentage of Those Interested in Working Outside of the U.S.)



David Seaton, chairman and CEO of Fluor Corporation, affirmed the necessity for creating strategies to work in these regions in his keynote speech at *ENR*'s 2012 Global Construction Summit. While he acknowledges that many firms have shied away from working in the BRIC and emerging nations, he states, "I assure you that those decisions are short-sighted and increasingly untenable in today's hyper-competitive world. Going forward,

emerging markets are where the vast amount of work is going to be, and we have to be there to take advantage of those markets."

Skills Required

Putting together the right team for an international project is, according to Mike Kirchner, deputy director of risk management at CH2M Hill, "one of our primary risk mitigation measures, and their experience and know-how is really how we are going to protect ourselves."

One key skill required in an employee who is expected to work abroad is a strong facility to build relationships. In the architect firm survey, qualities such as communication skills, speaking the local language and cultural understanding are selected by a much higher percentage of firms than project experience.

For Jody Debs, enterprise risk manager at CH2M Hill, working in the Middle East makes the relationships that a firm builds as fundamental as its contracts. "Frequently, it is the relationships [with clients] that will determine how [contracts] get enforced and how the project will be implemented. You need to focus on the long-standing and deep relationships that are quite common in the Middle East, which are very different from [those] most people would have with U.S. clients. You need people who understand that relationship building is a very important part of their job and the success of the project, but who also have a talent for it."

Preparing the Workforce

In addition to finding the right people, companies can also help prepare their people for working abroad. Stokes asserts that the most successful international design programs have

a couple of people on the local team "to make sure that the information is received and correctly understood."

CH2M Hill places great emphasis on preparing its workforce to function effectively abroad. Debs describes how they will create corruption mitigation plans and project-specific security plans when sending workers into regions with a high level of risk in these areas.

Seaton also discussed how the construction industry can tackle the corruption issue: "Many government organizations including the United Nations are working with non-government agencies like Transparency International on the corruption problem. Our industry needs to be part of that dialogue."

Global Workers in the U.S.

Carole Wedge, president of Shepley Bulfinch, also sees the potential for emerging markets abroad to provide a greater supply of architects from those regions looking for work in the U.S. after demand in their home countries dwindles, especially China. "They have built a lot of architecture schools in China," she says. She also questions what will happen if their construction bubble bursts. "My sense of designers is that they are endlessly interested. There are a lot of people that work [in the U.S.] from all over the world because they are interested in a new experience." ■

Role of a Temporary Workforce in the Construction Industry

Temporary workers have always been a part of the construction industry, but a rigorous recovery will create additional demand for their services. As contractors continue to seek ways to increase their productivity and profitability, these temporary workers may offer a better solution than the traditional cycle of hiring and laying off workers.

Construction firms must be able to have the right people in the right positions when they are needed. Contractors cannot spend long hours searching for qualified employees, especially when their need for specific workers may be limited to specific project stages. Thus, temporary staffing firms have always been important to the industry, supplying skilled workers when needed, especially for urgent, last-minute tasks.

The importance of this role is heightened as the industry faces a skilled workforce shortage problem. Many workers are reaching retirement, and there is an insufficient number of people entering the skilled trades in construction. Additionally, some parts of the country are experiencing growth and attracting an influx of workers driven by higher wages, and as a result, contributing to shortages in other regions.

Skilled Workers Move to High-Demand States

North Dakota's shale oil boom and Intel's \$5.2 billion fabrication plant in Ocotillo, Arizona,¹ are two examples of projects that have caused a spike in the demand for skilled construction workers. Temporary staffing firms, especially ones that have a national footprint, can identify where surpluses in skilled labor exist and facilitate

bringing workers to fill these jobs. "We are able to use our extensive network to find pockets of available workers and then either help move them or supply them with per diem and travel for customers," says Shannon Kahn, director of the West Region for CLP, a nationwide skilled trades staffing firm.

According to Kahn they are seeing an increased demand for workers in the skilled trades in the Northeast and Southeast, and they expect the surging demand in North Dakota to spill over into Wyoming and Colorado. Kahn says, "The skill sets we are seeing most in demand include the mechanical trades, pipe fitters, plumbers, welders, electricians and HVAC related."

Impact of Renewables

Firms like CLP also note growing industries, such as the renewable energy sector, is driving the need for temporary staff. Growth in the solar and wind energy fields has resulted in an influx of workers, some of which are in highly skilled trades, such as electricians and environmental technicians, and some of which are in more entry-level positions, such as installers and laborers. (See page 63 for more information.)

Impact of the Recession

When the recession hit the construction industry, temporary staffing firms saw a decline in the need for their services at first. Many

of the temporary staffers that were brought on were the first to be let go. In essence, this illustrates the role of temporary staffing—it allows construction firms to expand and contract their workforce without affecting their full-time employees.

However, as the economy has started to recover, the staffing firms have seen rapid growth. Construction firms are hesitant to bring people back onto their payroll, having experienced severe layoffs recently, and consider using temporary staffing firms a safer and more cost-effective method.

According to Kahn, many construction firms have determined using temporary staff is better in the long term as well, rather than continually increasing their employees and then laying them off. Kahn says, "It makes more sense to bring on a temporary workforce to handle the short-term fluctuation in need that they have on a project." She continues, "Temporary staffing firms are then able to work with laid-off workers, find them jobs and keep moving them from project to project so that they can continue working."

The demand for temporary staffing in the construction industry seems likely to increase. The recession hit construction firms hard, and they may be cautious to hire even with an increased workload. The temporary workforce may become one that is part of regular staffing strategies versus being for emergency needs only. ■

¹ PC Magazine. « Obama to Visit Intel's Fab 42 Construction Site » Jan 24, 2012. <http://www.pcmag.com/article2/0,2817,2399283,00.asp> [Accessed April 12, 2012]

Difficulty in Hiring Skilled Green Workers for A/E Firms and General Contractors

56% of A/E firms and 63% of general contractors experience at least moderate difficulty in finding green skilled workers to hire.

Variation by Firm Type

A/E FIRMS

In general, A/E firm respondents find mid-level employees with green skills most difficult to hire, at 41%. However, nearly one third also report difficulty finding senior green skilled staff. There is far less concern about entry-level employees, with only 13% reporting any difficulty with finding them.

These hiring challenges likely stem from firms' recognition of the growing green marketplace. In order to win jobs and complete green projects successfully, these firms need firm and team leaders to be knowledgeable about green building at a deep level. In comparison, the skills required of younger staff may be easier to offer as they come on board. Additionally, some architecture and engineering schools are starting to recognize green building practices and offer coursework in these areas.

■ Hiring Decision Makers

14% of respondents who participate in hiring decisions at A/E firms report great difficulty in hiring green staff, compared to 5% of those who are not involved in hiring.

Respondents involved in hiring only report higher levels of difficulty in hiring mid-level staff compared to those not involved in hiring, with 51% reporting this challenge versus 33% not involved in hiring decisions.

■ Firm Size

Consistent with other findings, small A/E firms (those with billings less than \$250,000) report greater difficulty in finding employees with green skills—72% report at least moderate difficulty compared to an average of 53% among those with higher billings.

GENERAL CONTRACTORS

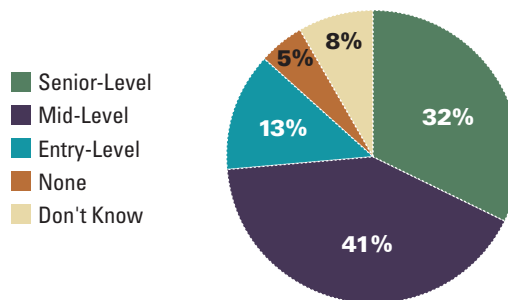
Among those who report that finding green skilled workers is challenging, general contractors are almost evenly split between the challenge of finding management and craft worker staff with green skills.

■ Region

Significantly more firms in the Northeast (23%) report that it is very difficult to hire green skilled employees, compared to a range of only 6% to 8% in other regions.

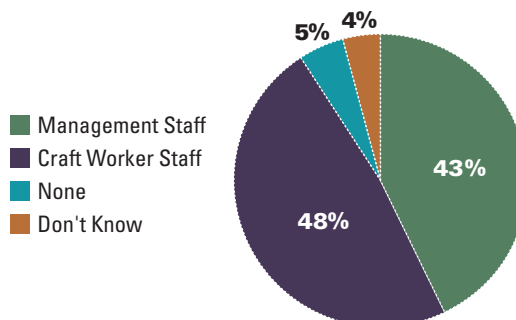
Percentage of A/E Firms Who Find Green Skilled Employees Difficult to Hire (by Level of Seniority)

Source: McGraw-Hill Construction, 2012



Percentage of General Contractors Who Find Green Skilled Employees Difficult to Hire (by Employee Role)

Source: McGraw-Hill Construction, 2012



■ Level of Green Involvement

While the percentage that find hiring green skilled workers difficult is the same between those with a lower level of green involvement (50% or less green projects) compared to those with a higher level (more than 50% green projects), the percentage who do not find it difficult is quite different. 48% of firms with high green involvement have little difficulty finding green skilled workers, compared to 32% of those with lower green involvement. This may suggest that firms doing more green work are more appealing to potential hires with green skills and/or they are part of networks where experienced green staff can be found.

Professions with Expected Green Skilled Worker Shortages by 2014

70% of A/E and general contractor respondents expect shortages of green skilled workers by 2014 or don't know. The largest percentage from both professions believe that there will be shortages among specialty trade contractors.

Hiring Decision Makers

Interestingly, more respondents that do not make hiring decisions (73%) expect green worker shortages by 2014 or don't know, compared to 66% of hiring decision makers. However, when they do see a shortage, **significantly more respondents who make hiring decisions expect a shortage of green skilled architects and engineers, while those with no hiring authority tend to see more shortages with green skilled workers in the specialty trades.**

- **Green Architect Shortages:** 22% of decision makers expect shortages in green architects compared to 15% of non-decision makers.
- **Green Engineer Shortages:** 25% of decision makers expect green engineer shortages compared to 19% of non-decision makers.
- **Green Specialty Trade Worker Shortages:** More non-decision makers (37%) expect a green skilled worker shortage compared to those who do hire (28%).

Shortages in Architecture

A higher percentage of firms expecting green skilled worker shortages in this profession expect them to be major/somewhat major compared to the general skilled worker shortages expected, especially for landscape architects and urban design.

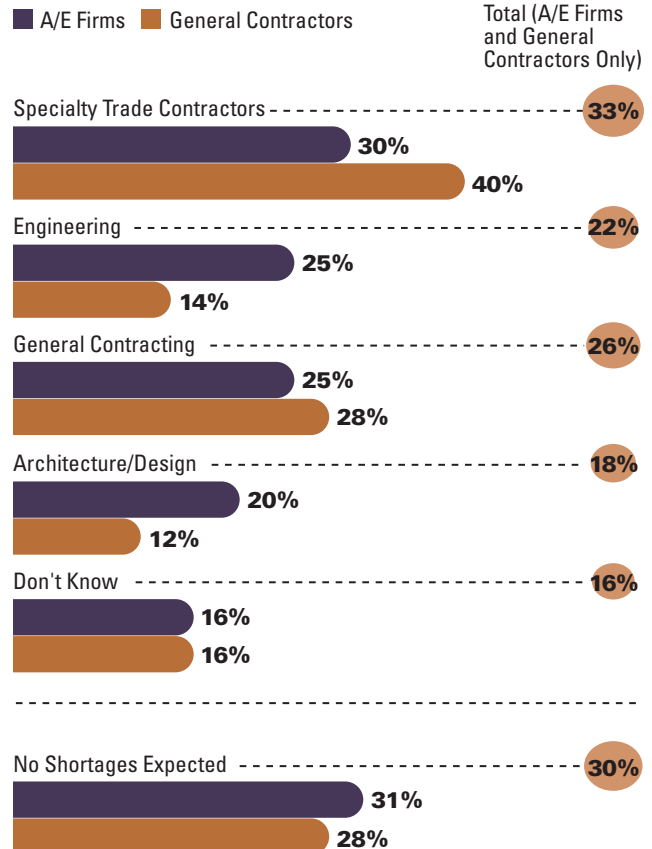
- **Architecture:** 51% for green skilled workers versus 41% for general skilled workers
- **Interior Design:** 29% for green skilled workers versus 19% for general skilled workers
- **Landscape Architecture:** 29% for green skilled workers versus 15% for general skilled workers
- **Urban Design:** 37% for green skilled workers versus 21% for general skilled workers

Shortages in Engineering

The percentage of firms expecting shortages of green skilled workers in engineering for the most part mirrors the general shortage expected (see page 23 for more information). The one exception is mechanical engineering, with 53% expecting a major/somewhat

Professions with Expected Green Skilled Worker Shortages by 2014 (by Player)

Source: McGraw-Hill Construction, 2012



major shortage of green skilled workers compared to 44% for general workers.

Shortages in General Contracting

As in the architectural trades, major/somewhat major green worker shortages in general contracting are expected by a higher percentage than general shortages.

- **General Contractors:** 58% for green skilled workers versus 44% for general skilled workers
- **Construction Managers:** 45% for green skilled workers versus 35% for general skilled workers
- **Remodelers:** 41% for green skilled workers versus 33% for general skilled workers
- **Design-Builders:** 42% for green skilled workers versus 28% for general skilled workers

Green Skilled Worker Shortages in the Trades

According to A/E Firms and General Contractors

HVAC/boilermaker and carpentry/millwork are the trades expected to have severe green skilled worker shortages by 2014 by the largest percentage of A/E firms and general contractors. HVAC systems are critical to any green building, impacting energy consumption and indoor air quality significantly, elements especially important for a building to meet its green goals. Carpentry can also affect more than one green category, balancing concerns about sustainable forestry, use of recycled materials and improving indoor air quality by avoiding off-gassing materials.

Green Skilled Worker Shortages Compared to General Skilled Worker Shortages (pages 22-23)

Nearly the same percentage of A/E firms and general contractors anticipate some level of workforce shortages overall (32%) and green skilled workforce shortages (33%) in the trades (see pages 22 and 30 respectively). However, unlike the green skilled shortages expected in specific architecture/design and general construction professions, **the percentage of firms that anticipate a severe green skilled worker shortage in the trades is about the same or even smaller for nearly all the trades compared to those expecting a major/somewhat major shortage in the general workforce.**

The only exceptions to this trend are the following:

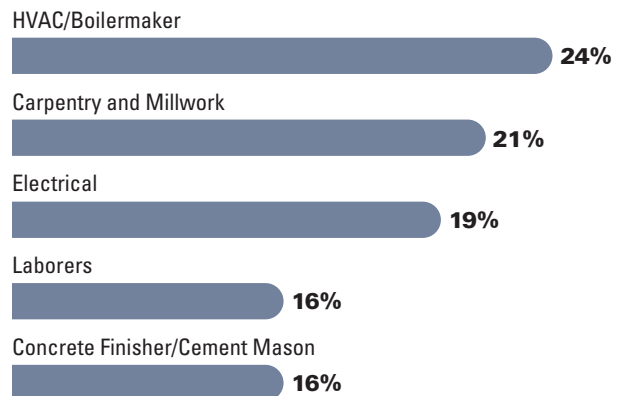
- **Laborers**
 - **Severe Skilled Green Workforce Shortage Expected: 16%**
 - Major/Somewhat Major General Workforce Shortage Expected: 13%
- **Demolition/Wrecking**
 - **Severe Skilled Green Workforce Shortage Expected: 11%**
 - Major/Somewhat Major General Workforce Shortage Expected: 5%
- **Painters**
 - **Severe Skilled Green Workforce Shortage Expected: 6%**
 - Major/Somewhat Major General Workforce Shortage Expected: 3%

Surprisingly, there are no significant variations between the A/E firms and general contractors in terms of their expectation of a severe green skilled worker shortage in any of the trades, suggesting that the experience of

Top Five Trades with Green Skilled Labor Shortages Expected by 2014

(According to A/E Firms and General Contractors)

Source: McGraw-Hill Construction, 2012



working with specialty trade contractors with green skilled workers has been relatively consistent for A/E firms and general contractors.

Variation by Region

A higher percentage of firms in the West (18%) anticipate a shortage of green skilled ironworkers/steelworkers than in the Northeast (3%), the Midwest (9%) or the South (11%).

Variation by Level of Green Involvement

For two trades, respondents with less green experience express greater concern about finding green skilled workers by 2014:

- **HVAC/Boilermaker**
 - 50% Green Projects or Less: 27%
 - More Than 50% Green Projects: 18%
- **Site Work/Excavation/Foundation**
 - 50% Green Projects or Less: 11%
 - More Than 50% Green Projects: 6%

Variation by Size of Firm

16% of smaller general contractors expect a severe shortage in green skilled workers for demolition/wrecking, compared to 3% in larger firms.

Data: Workforce Shortages

Demand for Green Activities:

Results from the Architect Firm Gap and Student Studies

In the firm gap survey, architects indicated the green systems and products they think are important for making projects greener, which offers an indicator of the near-term green market. Seeing what green products and systems the students value also suggests that some of these products and services may increase in importance in the future.

One gauge of the current demand for green skilled workers in the trades is the materials, trades and practices considered most important by practicing architects for sustainable building. The survey of architects asked the respondents to rank the importance of several design features used in sustainable buildings. Since the top features at the right are considered important or very important by most of the architect respondents, it is likely that architects are incorporating them more frequently in their designs and possibly even advocating for them with their clients.

Important Features with Implications for Trades

HIGH-EFFICIENCY HVAC

Nearly all of the architects (92%) consider high-efficiency HVAC important or very important for a sustainable and energy-efficient building. This is not surprising since HVAC typically accounts for a significant percentage of a building's energy use and is therefore critical to improving building performance. HVAC was also selected by the largest percentage of A/E and general contractor respondents (24%) in the MHC industry-wide survey as a trade in which they expect a shortage of green skilled workers.

CONTINUOUS METERING EQUIPMENT FOR LIGHTING AND HVAC SYSTEMS

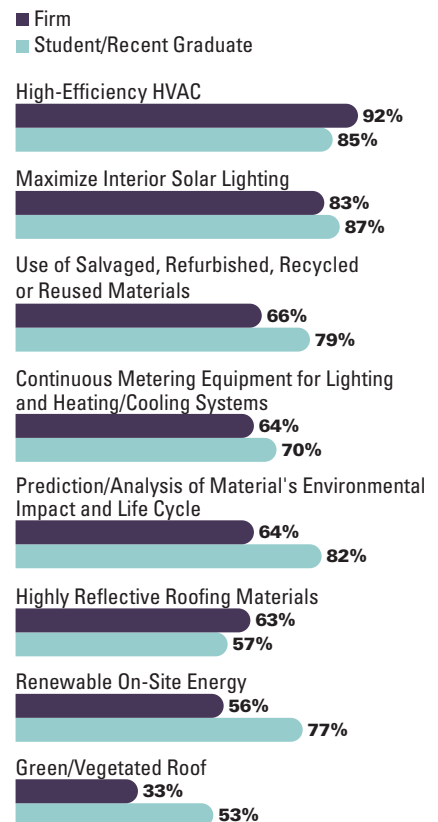
Post-occupancy evaluation of building performance is gaining prominence in the industry as a necessary step to insure that buildings are truly high performing. This has implications for electrical trade workers and others involved in metering. The recognition by architects of the importance of these practices suggests that this area will grow. In addition, 19% of A/E and general contractor respondents from the industrywide survey expect a shortage of green skilled electrical workers, the third highest category.

Looking to the Future: Features Important to Students

A higher percentage of students/recent graduates consider these features important compared to the practicing architects in every category except HVAC, which suggests that the use of these green features may expand in the future. The feature with implications for the trades that has the largest differential between practitioner and student response is renewable on-site energy. ■

Importance of Design Features for Sustainable Building

Source: AIA/MHC Studies 2012



Most Effective Strategies for Attracting New Employees

Higher salaries, better benefits and greater job security are the top three strategies considered very effective by the largest percentage of respondents for attracting new employees to the design and construction fields. Each of these has a direct financial advantages and therefore carries great weight when selecting a field to pursue.

Strikingly, for the most part, A/E firms, general contractors and trade firms value most of the potential strategies to the same degree. Thus, the top-ranking factors indicated in the chart to the right are the top-ranking strategies for all three firm types.

However, there are three strategies with notable differences in the percentages of A/E firms, general contractors and trade firms who consider them effective for attracting new employees, all of them consistent with the role they play in the industry.

■ Emphasizing Green Building

- A/E Firms: 44%
- General Contractors: 30%
- Specialty Trade Contractors: 17%

■ More Use of Advanced Technology

- A/E Firms: 59%
- General Contractors: 54%
- Specialty Trade Contractors: 42%

■ Better Reputation for Safety

- A/E Firms: 21%
- General Contractors: 40%
- Specialty Trade Contractors: 41%

Variation among A/E and General Contractor Respondents

There are a few types of A/E and general contractor respondents who are typically more optimistic or pessimistic about the majority of the strategies presented to them.

■ Hiring Decision Makers

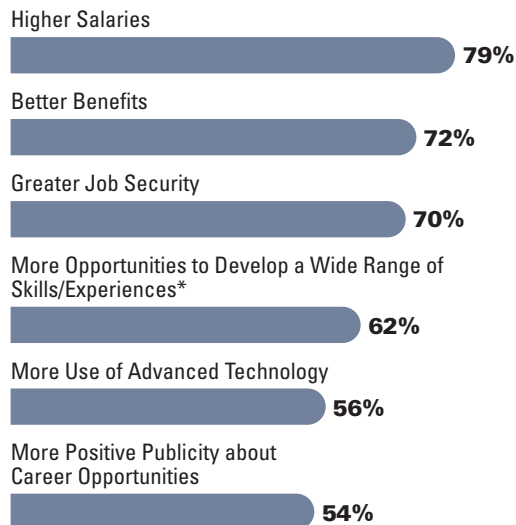
Those who make hiring decisions are more pessimistic about every strategy than those who do not, except greater use of advanced technology and more recruitment of underrepresented populations.

■ Gender

Women are more optimistic than men about the effectiveness of several strategies, especially about opportunities to develop a wide range of skills/ experience, emphasis on green building and more use of advanced technology.

Strategies Considered Most Effective for Attracting New Employees

Source: McGraw-Hill Construction, 2012



* A/E Firms and General Contractors Only

■ Years in the Profession

Respondents who have only been in the profession for one to four years are more optimistic about the effectiveness of all of the strategies than those who have been in their profession for 20 years or more, with a particularly dramatic differential for emphasis on green building and creating more programs in that field at the college level.

■ Large and Small General Contractors

When there is a statistically significant difference, large general contractors (total project value of \$500M or more) are more optimistic about the strategies than small general contractors (less than \$25M), particularly when evaluating the use of advanced technology and the impact of a better reputation for safety.

■ Level of Green Involvement

Those who work on 75% or more green projects are significantly more optimistic than those who work on less than 25% green projects about three strategies: emphasis on green building, use of advanced technologies and more recruitment of underrepresented populations.

Attracting the Next Generation of Skilled Workers

The construction industry is facing a growing industrywide shortage of skilled professionals. Fewer young people are entering into careers in construction. In addition, a significant portion of the current workforce from the baby boom generation is expected to retire over the next five to ten years.

Some current industry efforts to attract the next generation of workers include combining general academic instruction at high schools and community colleges with occupational training and campaigns designed to educate young people on the value of learning a trade. The industry hopes to begin to dispel misconceptions about the construction industry.

Imaging and Branding of the Industry

According to Carol Wedge, president of the architectural firm Shepley Bullfinch, architects need to talk more about how interesting their jobs are. She believes that there are many professions that are not as dynamic as architecture, saying, "I think sometimes we forget to tell everyone what a powerful impact you can make, how exciting it is as a profession, and that it's exciting at the beginning, middle, and end... [Every new project] is a whole new set of parameters, a whole new set of clients, and a whole new set of problems to solve."

Similarly, for Beth Heider, senior vice president of green markets at Skanska, attracting the next generation comes down to communication. She reports that in 2011, 41% of the people Skanska hired were new graduates and interns, due to the company's efforts to attract students that are graduating from school. According to Heider, "One of the things that they really like about Skanska is that they're interested in the

brand and good reputation. Our values are very important to new graduates."

Another area that concerns the next generation, according to Heider, is whether companies are looking at innovative solutions. She finds that there are compelling opportunities for innovation both in the field and in the office. She contrasts the appeal of field craft, which she describes as where "magic happens," with office work. "There's also a [huge] amount of office craft such as managing the IT, strategizing projects and scheduling and a tremendous support infrastructure, which is becoming progressively more innovative."

Heider believes that the message that today's construction firms offer a much more progressive environment than "our great-grandfather's construction firm" is critical. She also describes how Skanska is committed to the advancement of professionals within the company. "It's not just a job, but it's a career path. There are lots of opportunities for people to find the spot where they best fit within the organization."

Outreach and Education are Critical

Jim Sullivan, assistant professor at the M.E. Rinker School of Building Construction at the University of Florida, agrees that it is really about getting the word out and communicating in a way the next generation can relate to. "I tell everybody that our military's been good at that for the last 30 years.

The Army Strong commercials are a constant invitation to that experience, and we need to make sure that we're constantly presenting our message as an opportunity in a real way."

An innovative approach to training, the ACE Mentor Program of America, encourages high school students to pursue career opportunities in architecture, construction and engineering by matching them with mentors from design and construction firms. "The students get to build something tangible and something to be proud of," says John Strock, acting executive director and vice president of operations. ACE's surveys of its alumni show that 86% were convinced of a career in architecture, construction or engineering after participating in the program and 90% agreed they gained valuable skills to use in their careers and gained an edge in college.

Don Whyte, president of the National Center for Construction Education and Research, cautions that consideration also needs to be given to the influence of parents. "We can get a classroom of young people excited about our industry, but the problem is they then go home and talk to their parents, and their parents say, 'No, you're going to a four-year school.'" For him, this demonstrates the need to revitalize career technical education. He notes, "60% of the future jobs are going to be for students who have two-year certificate and degree programs and career technical education background." ■

Data: Workforce Shortages

Voice of the Next Generation of Architects

The market research in this report reveals that the next generation of architects is deeply engaged by architecture and sustainability. Tech-savvy like the rest of their generation, they view their technology tools very differently than those currently practicing.

The retirement of the baby boomers will create gaps in all industries, including architecture. With the generation X workforce considerably smaller than that retiring population, the next generation, known as the Millennials or Generation Y, will become increasingly dominant in the workforce.

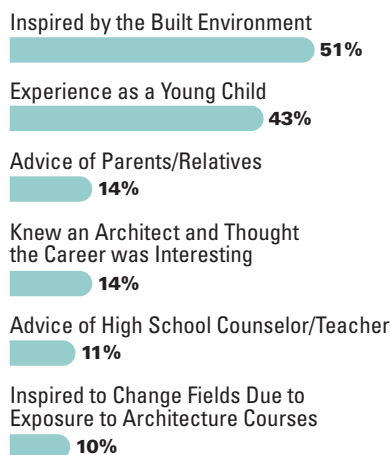
In order to understand this new group, their inspiration to become architects and their priorities, the American Institute of Architects (AIA) partnered with McGraw-Hill Construction to conduct two studies—one of architecture students/recent graduates and one of architecture firms. These two studies allow for an assessment of the gaps between thinking in the industry and that of the next generation on critical issues, such as the use of technology. Their responses reveal an inspired, technically savvy generation of new workers.

Inspiration to Become an Architect

For this generation, the decision to become an architect is one of inspiration rather than calculation, and a decision made quite early rather than one influenced by adult advisors when they begin seeking a career. While 14% or less report being influenced in their choice of profession by parents, relatives, counselors or teachers, over 50% say that they were inspired by the built environment. In addition, 43%

Top Sources of Inspiration for Students/Recent Graduates to Pursue Architecture

Source: AIA/MHC Studies 2012



report experience as a young child as a major influence, compared to only 14% being inspired by knowing an architect and seeing how the profession worked.

While Generation Y has a reputation for idealism in general, these findings support the idea that these students and recent graduates are drawn to the ideals of architecture. In addition, it suggests that their commitment is deep and long-held, a positive sign when considering the potential for the lack of immediate job opportunities to drive people out of the profession. However, it also reveals that the decision to pursue architecture as a career is not founded on an understanding of the day-to-day work architects

undertake and could suggest that they are also vulnerable to disillusionment once they enter the workforce.

Sustainability

While the results of the study regarding sustainability are analyzed in depth throughout this report (see pages 14 and 32 for more information), the overall implication is that these students value sustainability highly. A higher percentage are influenced in their decision to pursue green design by a personal sense of environmental responsibility compared to current practitioners. This finding suggests that architecture as a profession will continue to influence greater adoption of green building practices industrywide.

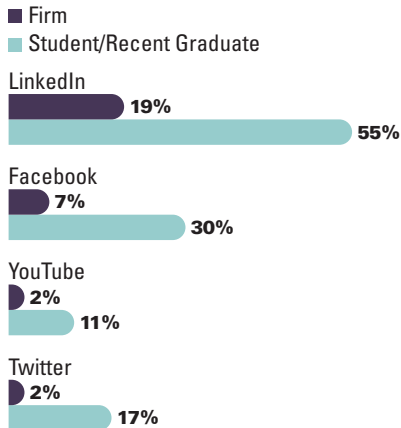
Social Media

Students rely on technology and social media tools for networking and job searches far more than practitioners currently recommend they do. However, given the way email and social media are second nature to the current generation, it is more likely that the architecture industry will need to adopt these tools as an important means of networking than that students will abandon their use.

While the reported use of social media tools is high for both students/recent graduates and architecture practitioners, the tools they use vary significantly.

Use of Social Media for Employment-Related Discussions

Source: AIA/MHC Studies 2012

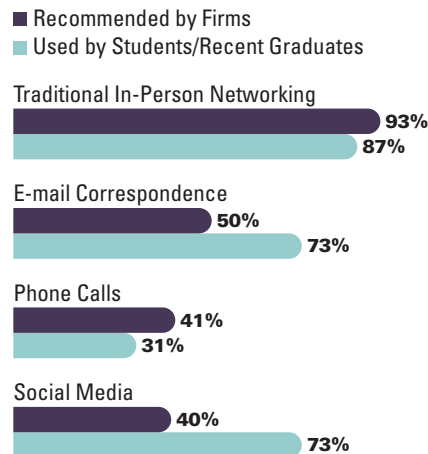


While three quarters of the practitioners are on LinkedIn, only 52% of students and recent graduates are. However, when students are disregarded and only recent graduates are evaluated, the percentage using it jumps dramatically to 81%, even higher than its use by practitioners. This suggests that the younger generation recognizes the importance of LinkedIn as a professional network for finding jobs.

Another interesting dimension of these results is how young people are using social media as more than a networking tool. They are actively using it to engage in dialogues and discussion. More than twice the percentage of students/recent graduates are using LinkedIn for job-related discussions compared to architecture practitioners. In fact, nearly the same amount of students that have a LinkedIn account use it

Networking Channels Recommended by Firms and Used by Students

Source: AIA/MHC Studies 2012



for discussions, which suggests that when students are using a social media platform, they are doing so in an intensive manner.

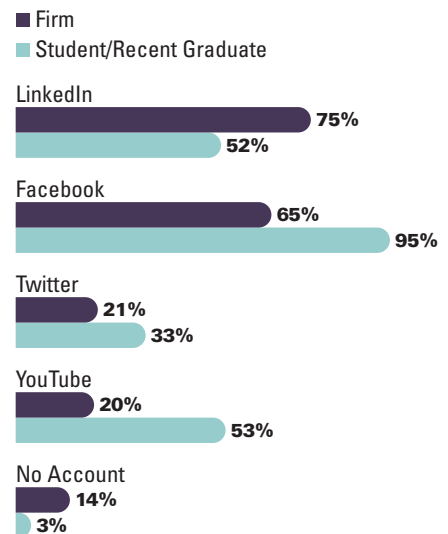
Facebook and YouTube are also used by a much larger percentage of students and recent graduates for job-related discussions. As Generation Y becomes a larger percentage of the workforce, architecture firms may need to tap the experience of the younger generation in order to better appeal to clients who may be increasingly led or influenced by members of that generation.

Global Workforce

A much larger percentage of current students (81%) than recent graduates (61%) express interest in working as an architect outside the U.S. However, this still means that well over half of the recent graduates are interested in pursuing work abroad.

Respondents with Social Media Accounts

Source: AIA/MHC Studies 2012



The largest percentage (74%) of recent graduates say that they are interested because they want to live abroad. This aligns with the fact that the regions in which they are most interested in working are not always those in which there is the most work, with far more respondents interested in working in Europe than in China. (See page 26 for more information.) Over half (51%), however, also believe there may be architecture job opportunities abroad.

This interest in working abroad may contribute to an eventual loss of talent in the U.S. If job availability does drive many architecture students abroad, it may be challenging to lure them back when the recovery creates more opportunities in the U.S., especially since many people create ties to places they live in their 20s through marriage and other relationships. ■

Data: Workforce Shortages

Viewpoints of the Unemployed

Survey data from unemployed architects, engineers, general contractors and trade contractors reveals that the recession has not lessened their interest in the industry. They also are interested in green jobs and believe in the value of certification.

The industrywide survey on workforce issues and green jobs in this report also included a representative sample of respondents who are not currently employed. A/E respondents comprised the great majority of this sample (73%), but that can be attributed to the specific professional associations involved in distributing the survey, rather than to a true representation of unemployment patterns in the industry at large. For more information on the demographics of the unemployed respondents, please see the Methodology section on page 64.

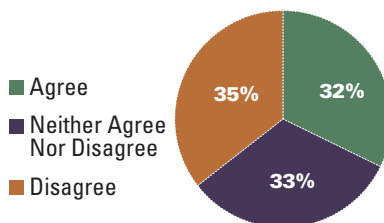
Seeking Work in Construction

90% of those surveyed intend to stay in the construction industry as they seek new job opportunities. 75% of them (over two thirds of the total unemployed respondents) are currently seeking work in the same field in which they worked previously. These numbers suggest that the long-term impact of the recession on the availability of workers may not be as severe as many in the industry expect. However, these results may be impacted by the survey sample, which reflects many practitioners who are maintaining their membership in an industry association, which probably favors those who plan to stay in the construction industry.

13% of those who are planning to stay in construction (12% of the total

Seeking a Green Job in a Different Field

Source: McGraw-Hill Construction, 2012



unemployed) are currently involved in training and plan to seek work in construction when that training is complete. These are nearly split between those seeking training in their previous field and those seeking training in a new field.

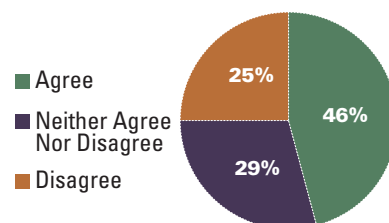
Interestingly, out of the 9% who said that they are seeking work outside construction, nearly all said that they would work in the construction industry if they felt that there were more job opportunities. So, even the small percentage leaving may not be lost to the industry as the availability of jobs improves.

Green Jobs

58% of unemployed workers are seeking a green job. The portrait of their commitment to green, though, is a little complicated. Out of those seeking green jobs, 16% are exclusively interested in a green job. On the other hand, less than half of the green job seekers are equally interested in a non-green job, suggesting that green jobs

Has Retrained to be Qualified for a Green Job

Source: McGraw-Hill Construction, 2012



are preferred, but that they remain open to other opportunities. Considering current economic conditions, this desire to be employed at all is to be expected.

46% of the green job seekers have retrained to be qualified for their green jobs. Among the unemployed architects who report seeking green jobs in the architect firm survey, the number is closer to one quarter. Although there were too few responses in the architect firm survey for that percentage to be considered representative, this differential between architect-only responses and industrywide responses corresponds to the percentage by player of employed respondents with green jobs who report having received training for their green work. A/E respondents report less retraining required compared to general or specialty trade contractors (see page 61 for more information).

However, among the unemployed, there is a much stronger tendency to be willing to switch fields to pursue

a green construction job. Nearly one third report seeking a green job in a different field, while fewer than one quarter of those currently employed got a green job in a different field than the one they were in previously.

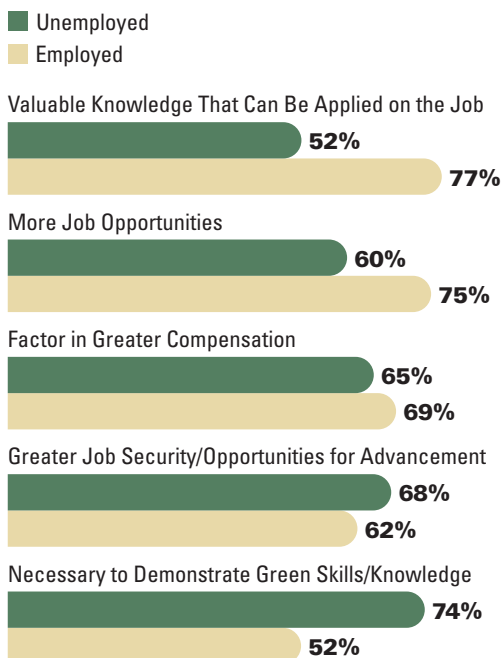
Not surprisingly, those currently unemployed are more cautious about the benefits of green jobs when it comes to job availability and job security. On the other hand, they essentially agree with the employed construction professionals that greater career advancement opportunities are available to those with green job skills.

The Benefits of Professional Certification

79% of the unemployed respondents have been certified or accredited. While the unemployed are more skeptical about the ability of certification to offer valuable, job-applicable knowledge or to create job opportunities, well over 50% do believe that certification offers these benefits. On the other hand, a much larger percentage of unemployed respondents believe that green certification is necessary to demonstrate green knowledge and skills, suggesting that they believe green certification is an important strategy in their pursuit of a new job. ■

Benefits of Certification (Unemployed Versus Employed)

Source: McGraw-Hill Construction, 2012



Data: Skills Gaps

Skills and Knowledge Sought

When Hiring Senior A/E and General Contractor Staff

Skills Gaps Introduction

Since the most serious shortages are anticipated in senior staff for A/E firms and general contractors, it is important to understand which specific skills they seek in these staff members when addressing the shortage. Also important is understanding general skill requirements in the trades and the new skills and degree of training expected for green projects.

Skills/Knowledge Sought in Senior A/E and General Contractor Staff

The largest percentage of A/E firms and general contractors seek project management skills and knowledge of construction processes in their senior staff, with a significantly higher percentage of general contractors seeking these types of skills and knowledge. However, it is notable that well over half of the A/E firms consider knowledge of construction processes to be important when seeking experienced staff, suggesting an emphasis on a more holistic view of design and construction.

Variation by Firm Type

A/E FIRMS

Significantly more A/E respondents seek specialty knowledge within their profession and proficiency with technology compared to other players. Specialization by specific project types is relatively common among A/E professionals. The rise of building information modeling (BIM) and other software for calculating building performance may account for their emphasis on technology.

GENERAL CONTRACTORS

48% of general contractors consider people management skills significant when hiring senior staff, far more than A/E firms. This also exceeds the percentage of general contractors who find specialty knowledge to be important.

Not only does general construction activity involve direct management of a firm's own staff as well as working with trade contractors, but the role of general contractors in the industry has been evolving to provide greater input during the project design stages, from providing information during the creation of construction documents to a fully integrated approach to design and construction. People management skills for contracting firms are much more important in these collaborative business arrangements.

Skills and Knowledge Sought when Hiring Senior Staff (by Player)

Source: McGraw-Hill Construction, 2012



Variation by Project Sector

A smaller percentage of respondents involved with industrial projects (33%) seek senior staff with proficiency in technology, compared to the commercial and institutional sectors (both at 39%).

Variation by Years in Profession

A higher percentage of respondents with ten years or more in their profession consider proficiency with technology and knowledge of construction processes to be one of the top three skills/knowledge areas sought when hiring senior staff versus those with less experience.

Variation by Firm Size

More large A/E firms (billings of \$5M or more) consider people management and business development among the top three skills, but fewer seek construction process knowledge.

Data: Top Skills and Experience

in Architect Job Candidates

Top Skills and Experience Sought in Job Candidates

by Architecture Firms: Results from the Architect Firm Gap and Student Studies

The results of the survey of architect firms suggest that similar skills and experience are sought in experienced job candidates and in architecture students. General computer skills, specific design technology skills and traditional design skills are all selected by a large percentage for both types of job candidates.

However, when ranking the percentage reporting these skills and experience in their job candidates, some skills rank differently for students compared to experienced architects.

Skills/Knowledge Sought in Students and Recent Graduates

The skills firms ranked as most important for students and recent graduates they would hire largely correspond to emerging trends in the profession.

REVIT AND BIM SKILLS/ PROGRESS ON IPD PLAN

The current generation either in or just graduated from college is generally acknowledged to have strong technology skills. (See the Voice of the Next Generation article on page 35 for the specific ways in which architecture students are using technologies like social media.)

The expectation that they have Revit and BIM skills corresponds to the rising focus on collaboration in the building design and construction process. One of the primary advantages of Revit/BIM is that they support these collaborative approaches. This finding is echoed in the higher rating of integrated project delivery (IPD) skills as the industry continues to see an evolution into this approach.

GREEN BUILDING SKILLS/ ACCREDITATION

In all questions on sustainability, from what motivates sustainable design to the value they place on specific practices, the students and recent graduates consistently respond strongly to green, even more so than the practicing architects. (See pages 14 and 32 for more information.) Therefore, it is not surprising that potential employers have higher expectations of green skills and accreditation for students and recent graduates than for experienced architects. In addition, it is possible that these firms see the green skills in their entry-level staff as a commitment to green growth in the future, an increasing necessity given the continued growth expected in green construction. (See page 10 for more information.)

Skills/Knowledge Sought in Experienced Architects

Not surprisingly, the requirements of job candidates that rank higher for experienced architects include several years of previous job experience and licensure, qualifications far more likely in an experienced architect than in a recent graduate.

Architectural Software

For the most part, students are learning the technologies that firms value most: AutoCAD, Revit and Google SketchUp. AutoCAD has been widely adopted for years, and Revit, a BIM software, has seen strong adoption in the U.S., demonstrated by the greater number of firms that find it essential for students to know compared

Top Types of Skills/Experience Sought by Firms in Job Candidates

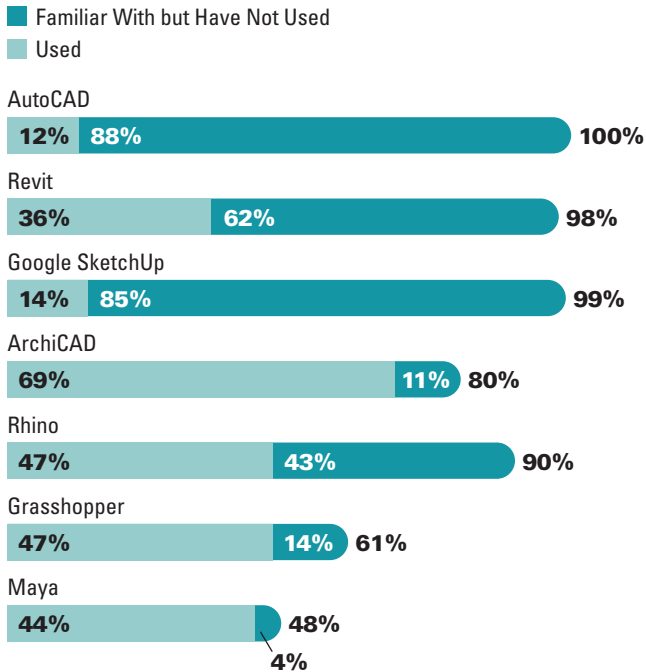
Source: AIA/MHC Studies 2012

Experienced Unemployed Architects	Architecture Students/Recent Graduates
1. Computer Skills	1. Computer Skills
2. Several Years Professional Experience	2. Revit Skills
3. Traditional Job Skills	3. Traditional Job Skills
4. Revit Skills	4. BIM Skills
5. BIM Skills	5. Green Building Skills/Accreditation
6. Licensure	6. Several Years Professional Experience
7. Green Building Skills/Accreditation	7. Progress on IPD Plan
8. Progress on IPD Plan	8. New Job Skills
9. New Job Skills	9. Licensure

Indicates skills perceived as more important
Indicates skills perceived as less important

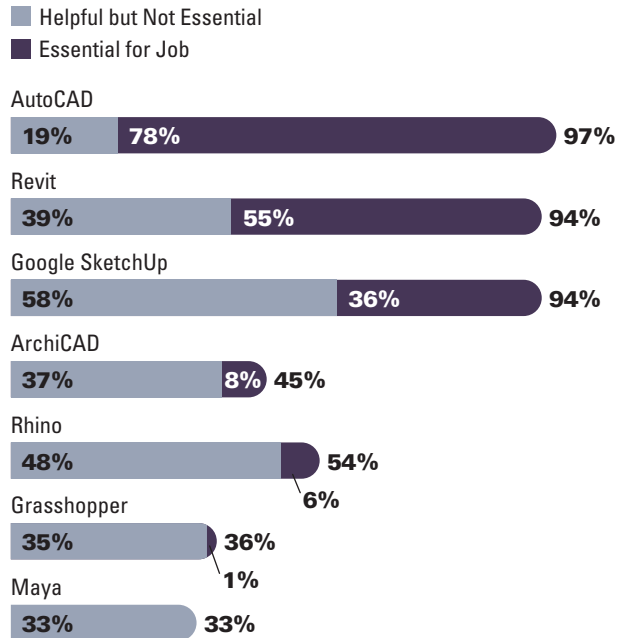
Architectural Software (by Student Familiarity and Use)

Source: AIA/MHC Studies 2012



Architectural Software Firms Consider to Be Helpful or Essential for Students to Know

Source: AIA/MHC Studies 2012



to ArchiCAD, a competing BIM software. Google SketchUp is 3D presentation software that can be used for massing studies, to build models and to create renderings, and it has the advantage of being flexible in terms of the level of detail required.

More students report using and being familiar with 3D modeling software, such as Rhino and Grasshopper, compared to the percentage of firms that consider such software to have immediate value. However, the higher level of engagement of students with these software packages suggests that these may be the future of architecture as the students become integrated into the workplace. ■

Skills and Knowledge Sought When Hiring in the Trades

Specialty knowledge is by far the most important factor when hiring in the trades according to trade contractors, with 76% selecting this as one of the top three most important skills/knowledge areas for their trade. Work in the trades is more specialized than in architecture or general construction, and it is not surprising that trade contractors highly value expertise specifically in their area of practice.

The next five factors, on the other hand, were all selected by between 30% and 41% of the specialty trade contractors as important skills sought when hiring. All these factors are important on the job site, including strong safety awareness, good project management skills and the ability to communicate, work with a team and manage time effectively. A combination of these skills would contribute considerably to reducing the risk of delays and cost overruns onsite.

On the other hand, skills that are applicable off the job site, such as technology and business development, are selected by far fewer contractors.

Variation by Hiring Decision Makers

52% of the respondents involved in hiring decisions regard safety awareness as critical, compared to 32% of the respondents who do not make hiring decisions. Safety issues can have important implications for specialty trade contractors, from legal exposure to reputation.

Variation by Trade

While there were too few respondents in any individual trades (other than electrical) to draw definitive, statistically sound conclusions, there are definite trends suggested when considering the skills valued by trade.

- **Time Management:** Trades that require extensive coordination with other workers onsite, such as electricians, drywall and carpentry, value time management far more than trades like roofing that involve less coordination.
- **Technology Skills:** Nearly half of the HVAC/sheet metal contractors value technology skills. HVAC contractors have been impacted by the introduction of building information modeling (BIM) technology, including for clash detection and, in some cases, for prefabrication of complicated HVAC systems in restricted spaces.
- **Safety:** Well over three quarters of the roofing contractors consider safety awareness one of the top three skills they seek in employees. With the heights at which they work, it is not surprising that roofers would give more careful attention to safety.

Skills and Knowledge Sought by Trade Contractors

Source: McGraw-Hill Construction, 2012



Variation by Union Membership

Teamwork is one of the top three skills sought by 48% of union members compared to 29% of non-union respondents. A union member may be more likely to work with different companies on an as-needed basis compared to other trade contractors. The ability to create new teams may therefore be more important for union members.

Variation by Gender

41% of the men surveyed regard communication as one of the top three skills they seek, compared to 22% of women. On the other hand, 88% of women regard specialty knowledge to be critical as opposed to 74% of men. In an industry still largely dominated by men, women may feel less inclined to value softer skills over areas in which they can clearly demonstrate equal ability.

Needed Green Skills (Top of Mind)

When asked an open question about what green skills they think are needed, the top ones mentioned by A/E, general contractor and specialty trade contractor respondents are all related to knowledge and education about green. In fact, 41% of the general contractors mentioned this as a missing skill, clearly suggesting that the industry sees a strong need for more educational opportunities about green.

While A/E firms note a lack of green experience in general, a larger percentage of general contractors discuss LEED project experience and particularly LEED certification experience as lacking.

■ Experience

- A/E Firms: 19%
- General Contractors: 10%

■ LEED Certification and Project Experience

- A/E Firms: 19%
- General Contractors: 25%

Some emerging strategies that make projects greener are also evident in the missing skills identified, such as specific technical expertise in energy and building information modeling and skills necessary to approach projects collaboratively.

■ Energy Modeling: Noted by 9% of A/E firms and 5% of general contractors

■ BIM Skills: Noted by 2% of A/E firms

■ Collaboration Skills

- 3% of A/E firms and 2% of general contractors note communication as an important missing green skill.
- 2% of A/E firms note integration skills as missing.

Only a small number of the trade contractors listed any missing green skills, but over half of those that did mentioned knowledge/education. In addition, a few noted a lack of interest in green (a factor noted by 3% of the A/E and general contractor respondents as well), energy modeling, and design/green design skills (also noted by 14% of A/E firms and 3% of general contractors).

Best Approach to Obtain Required Skills for Green Projects

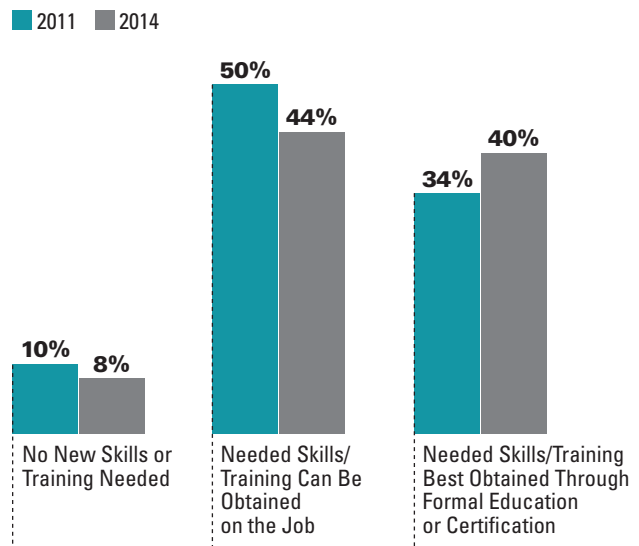
84% of respondents believe that different skills or training are required to work on green projects, and that percentage stays consistent between now and 2014.

A small but notable shift occurs in terms of how that training can be obtained between now and 2014. The percentage who find on-the-job training sufficient declines 6 percentage points, while the percentage who think formal education or certification will be required increases by the same amount. Even though a larger percentage still believe on-the-job training is important by 2014, the difference is far less pronounced. This, combined with training/education being the top-of-mind green skill gap for the largest percentage of respondents, demonstrates that the demand for green training and certification in the industry will increase.

One notable difference among A/E firms is that larger firms find more value in on-the-job training. Among the trades, union respondents are much bigger proponents of on-the-job training than non-union respondents, with the percentage who regard that as the best strategy actually increasing by 2014.

Need for and Means of Obtaining Skills Required for Green Projects

Source: McGraw-Hill Construction, 2012



State Initiatives for Job Training and New Job Growth

Construction is ultimately a local business, and state policies directly impact the size of the market and the availability of a skilled workforce. In response to industry needs, states across the country are engaged in workforce development, making strategic investments in infrastructure and encouraging job creation in the energy and environment sectors.

Training Today's Workforce for Tomorrow's Jobs

One way to address skilled labor shortages is to develop continuing education programs for workers in the skilled trades that update existing skills and teach new ones. Collaboration between community colleges, technical colleges and apprenticeship programs is providing opportunities for workers to receive academic instruction and on-the-job training. One example is the degree and certificate programs offered in electrician apprenticeship technologies and industrial mechanics and maintenance technology apprenticeships through Oregon's Portland Community College.¹ Programs like this are made possible through a partnership between business, industry, education and government, which all have a stake in increasing the training of today's workforce.

Developing a Skilled Future Workforce

States are looking at ways to create a pipeline of skilled workers by getting the younger generation to pursue careers in construction. For example, in 2009 the Alabama Legislature established the Alabama Construction Recruitment Institute (ACRI), which runs the Go Build program,² a campaign designed to educate young people on the value of learning a

trade, dispel their misconceptions about the construction industry and inspire them to consider a career as a skilled construction tradesman. Through advertising, public relations and a social media campaign, ACRI provides highly skilled employees for construction businesses and enhanced economic development for Alabama.

A key focus for states is increasing demand and access to construction related programs to encourage more K-12 students to prepare for careers in construction. One example is a School-to-Work program in Washington, which was designed to give high school students a taste of the trades.³ Students attend classes at community colleges and apprenticeship training centers and receive graded high school credit in areas such as construction building trades, applied math and applied communication. The hands-on approach allows students to work with apprentices and journeymen in the trades. Many of the students have started apprenticeships or found jobs in construction-related fields.

Wisconsin recently passed a new law that allows school districts to offer technical education high school diplomas.⁴ Under the new law, a school district can offer a course of study providing training in skilled trades such as welding and electrical work. A student must still earn the same number of credits in the same general subject areas required for a traditional

high school diploma, but courses may be tailored toward the skilled trades.

New Job Growth

States are also working to fuel the growth of the construction industry and create new jobs. For example, Michigan passed a Green Jobs Initiative with the primary goal of building a strong supply of well-trained and highly skilled workers and a more diverse, sustainable economy.⁵ Companies in the renewable energy and green construction and retrofit sectors stand to benefit.

In New York, the Solar Industry Development and Jobs Act is under consideration; it would develop over 5,000 megawatts of solar power capacity in New York by 2025.⁶ At least 50% of the total solar capacity would be installed by electric utility customers and provide on-site power to customers. The 41,705 job opportunities that are expected to be created through 2025 include green, clean tech jobs as well as operations and maintenance (O&M) jobs.

In New York, \$785 million was awarded through the Regional Economic Development Council initiative to drive economic growth and create jobs. The plan represents a community-based, performance-driven approach to economic development and invests in areas such as smart growth infrastructure and developing a 21st-century workforce.⁷ ■

1 Portland Community College Apprenticeship and Trades, Accessed April 4, 2012, <http://www.pcc.edu/programs/apprenticeship/>. 2 Go Build Alabama, <http://www.gobuildalabama.com/>. 3 Washington State Department of Labor & Industries, <http://www.lni.wa.gov/TradesLicensing/Apprenticeship/About/IntroProg/default.asp>. 4 "Technical Education High School Diploma Received Wide Bipartisan Support," Wispolitics.com, <http://www.wispolitics.com/index.jsp?Article=2653473/26/2012>. 5 Michigan NWLB Green Jobs Initiative, Accessed April 4, 2012, <http://www.insightcced.org/uploads/nnsf/michigan-green-jobs.pdf>. 6 "The Solar Industry Development & Jobs Act 2011," The Vote Solar Initiative, <http://votesolar.org/new-york-solar-jobs-act-of-2011/>. 7 New York Governor Andrew M. Cuomo Press Office, December 8, 2011, <http://www.governor.ny.gov/press/12082011RegionalCouncils>.

Data: Training and Certification

Training and Certification

Both technical and soft skills are important to all players. Training and certification help the industry gain these skills.

■ **Value of Training:** While the sources of initial training conform to industry expectations and requirements, the importance assigned to those sources reveals a high value placed on on-the-job experience.

■ **Value of Certification:** Certification has value to both individuals and firms. For individuals, the knowledge it offers is the most widely recognized benefit, but nearly as many also cite it brings them more job opportunity, better pay, greater job security and opportunities for advancement. For firms, the two top benefits of certification include increased competitiveness and ability to win contracts and expansion of their green business.

Sources of Initial Training and Their Importance

The providers of initial training selected by the largest percentage of respondents as most used and most important are not surprising when considered by profession—colleges and universities for A/E firms and on-the-job training for general contractors and specialty trade contractors.

The prominence and importance of on-the-job training, apprenticeships, internships and licensure demonstrates

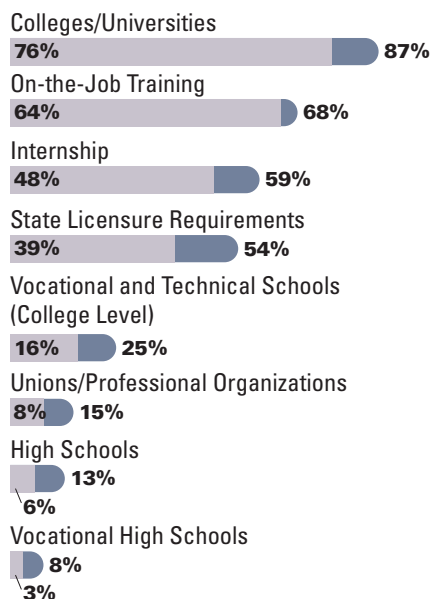
that the industry as a whole recognizes the value of practical, real-world experience. Even A/E professionals regard on-the-job training as a critical source of initial training, in addition to the college education expected of a practicing architect or engineer. While only 68% selected it as a source of initial training, nearly all of those that select it (95%) consider it important.

Use and Importance of Initial Training Sources

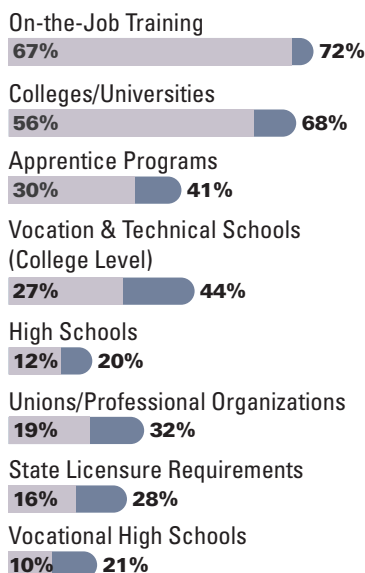
Source: McGraw-Hill Construction, 2012

■ Consider Important ■ Use

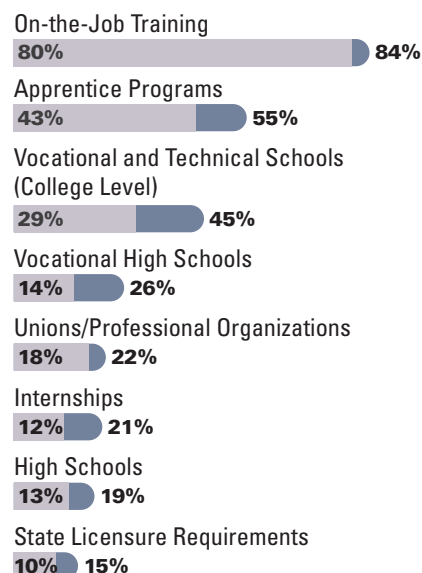
A/E Firms



General Contractors



Specialty Trade Contractors



Continuing Training Supported by A/E Firms and General Contractors to Keep Staff Knowledge Current

A/E firms and general contractors engage in multiple strategies to keep their staff knowledge current. The four options listed in the survey were adopted by over 50% of the A/E respondents, with only a 15% differential among them. The general contractor responses were slightly lower, but even more closely clustered together. These findings show that associations, unions, certification programs, educational institutions and mentor programs all play an important role in keeping professionals up-to-date on the most important developments in their industry.

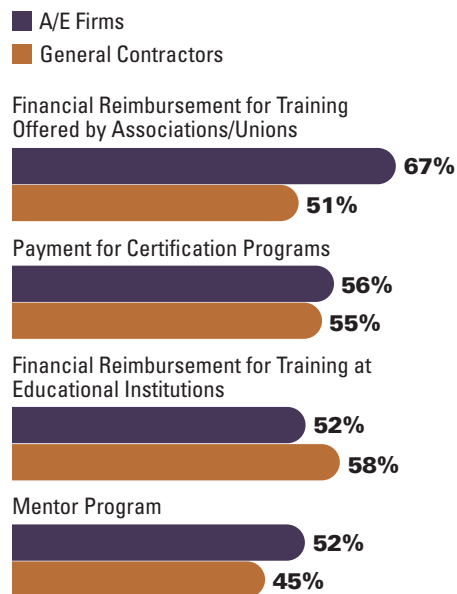
The one category selected by a nearly equal percentage of A/E and general contractor respondents is payment for certification programs. As the strong benefits associated with certification make clear (see pages 49 and 50), these programs are recognized by the industry as a whole as playing an important role in professional development.

More A/E firms are investing in mentor programs than general contractors. This may be influenced by their high level of concern about the loss of experience and skills as employees are laid off, as well as about the loss of knowledge as leaders retire (see page 24 for more information).

Over 80% of A/E firms and general contractors believe that they or their staff face challenges in keeping their knowledge current, especially lack of time and the cost of training.

Means Used by A/E Firms and General Contractors to Keep Staff Knowledge Current (by Player)

Source: McGraw-Hill Construction, 2012



Best Means for Continuing Training for Specialty Trade Contractors

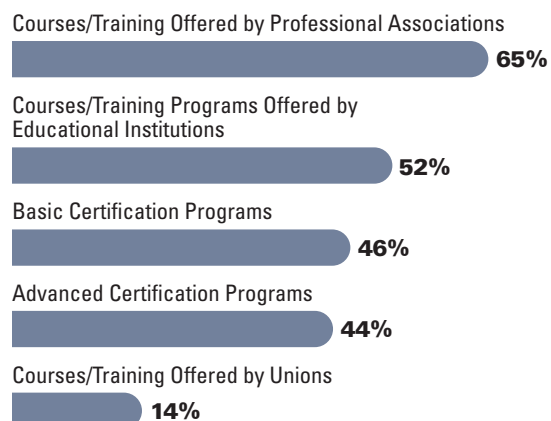
Nearly two thirds (65%) of the respondents from the trades think that the courses offered by associations are among the best ways to stay current, but they also place high value on courses from educational institutions and certification programs (both basic and advanced).

Although there are not enough respondents by trade to draw any conclusions, it is interesting to note that nearly all of the HVAC/sheet metal respondents find training offered by educational institutions to be one of the best ways to stay current, significantly more than in the other trades.

Similar to A/E firms and general contractors, over 80% of specialty trade contractors face challenges in keeping their knowledge current. They also regard lack of time and the cost of training as the most significant challenges.

Best Means for Trades to Keep Knowledge Current

Source: McGraw-Hill Construction, 2012



Training Programs in the Trades:

Driving the Future by Aligning Training and Marketplace Needs

One of the overarching workforce challenges in the construction industry involves the lack of skilled professionals in the trades. There are many programs available to help create the skilled workforce needed in the construction industry. However, one critical challenge that must be overcome is convincing the next generation of workers of the attractiveness of a career in the trades.

Across the nation, fewer people have been seeking training in the construction-related trades due to public misconceptions about the career potential of these jobs. Concern about the reduced pipeline of workers is heightened because many experienced trade workers are baby boomers who are expected to retire in the upcoming years. Moreover, young, entry-level workers continue to enter the trades without adequate job training and skills. Industry leaders report that the capacity and capability of education and training providers that serve both entry-level and existing workers could be improved and their curricula more aligned with employers' needs.

The industry is focused on meeting these challenges. Partnerships connecting employers, associations, labor unions, community colleges, workforce boards and related stakeholders are underway to develop workforce skills that meet employers' needs, as well as career pathways and recognized industry credentials. State and local officials are encouraging these partnerships and all efforts to align, integrate and connection construction education and training at all levels of the PreK-20 education system.

Union Apprenticeship

The unions value the real-world experience and rigor offered by the apprenticeship training model, their traditional approach. Michael

Callanan, the executive director of the National Joint Apprenticeship and Training Committee (NJATC)—the training arm of the International Brotherhood of Electrical Workers and the National Electrical Contractors Association—states, “[Apprenticeship] is a pretty comprehensive model that ... has proved to be an extremely effective way to teach young people skills that require technical mastery with theoretical understanding.”

Callanan sees an evolution in the profile of those who participate in their apprentice programs—the average of apprentices has shifted to the mid-20s, and apprentices in his program are more likely to have college experience. He credits these changes to the nature of the work.

Thomas Haun, an administrator with the Insulation Industry International Apprentice Fund, points out that people no longer consider working in the trades a family legacy. “15 years ago, if you asked the membership of most local unions ‘How did you get in the trade?’ most would say through family. If you asked that question today, it would be, ‘[I answered] an ad in the newspaper.’” He sees this shift as creating new possibilities for involvement by minorities and women in the trades.

Callanan also thinks that the unions are doing better at recruiting underrepresented populations. “The University of Massachusetts Labor Resource Center has done a

study comparing union crafts with nonunion crafts in terms of the graduation rates of nontraditional, underrepresented populations, and that data proves that we have been a leader in that area.” He believes pre-apprentice programs are key to that success. “We are not trying to circumvent the apprenticeship model. We’re trying to use the pre-apprenticeship tool to increase the likelihood that candidates will be successful in a difficult, four-year apprentice program.”

An example is the Edward J. Malloy Initiative for Construction Skills, which provides pre-apprenticeship training that prepares graduating New York City public high school seniors for entry into unionized trade apprenticeship programs. Upon successful completion of the program, graduates are referred to union apprenticeship programs through a direct entry track.¹

Reaching a Younger Generation

Jim Sullivan, assistant professor at the M.E. Rinker School of Building Construction at the University of Florida, believes that most of the construction associations, both union and non-union, have training programs in place, but the messaging is also critical. “They have the curriculum and they have the instructors, but they just need to do a better job expressing the importance of these jobs and how there’s an

opportunity to make a career in them," says Sullivan.

One aspect of his program that Callanan thinks needs to be emphasized more to attract generation Y is the opportunity to go to college while earning a full wage. He believes that the NJATC program offers a potentially appealing career path: "You'll be able to work yourself into that engineering technology degree as you work through your apprenticeship model, and when you end up designing electrical products, you will do so with an even better base because you will have done an installation from the ground up." Apprenticeship offers experience that can provide an edge in the job market.

Some programs are actively pursuing apprentices with college experience to increase the skill level and education of youths entering an apprentice program. One strategy to do so is to link the program with community college programs. Employers are increasingly turning to local community colleges and vocational schools to create tailored educational programs to help fill their job openings. Collaboration between community colleges and apprenticeship programs makes sense because professional success in the trades requires skills beyond hands-on training about the trade, such as problem solving.

Determining Training Needs in the Industry

Training needs are not confined to just new workers and apprentices, but they can continue throughout a worker's career. The National Center for Construction Education and Research (NCCER) is a 501(c)(3) educational

institution that provides a standardized curriculum in over 60 craft areas. In addition, it offers assessments of the knowledge and skill level of individuals in specific craft areas and a program for updated training through its National Craft Assessment and Certification Program (NCACP). According to Don Whyte, President of NCCER, "When we developed [NCACP] back in the early 2000s, we had a lot of skill deficiencies across the workforce, and there really wasn't any measure to determine what the true competency level of our workforce was. So we developed journeyman assessments where we could go out and assess a worker's knowledge and skills and provide credentialing to them if they had the appropriate journey-level knowledge and skills."

Innovative Approaches to Training

Another example of an innovative solution in the construction industry is the congressionally funded Helmets to Hardhats program, which connects National Guard, Reserve, and transitioning active duty servicemen and women to jobs in the construction industry. The program is sponsored by the fifteen unions of the building and construction trades, along with construction industry employer associations.²

Through Statewide Direct Entry programs, the program allows joint apprenticeship training councils and local unions to accept current and former military personnel into their training programs on a prioritized basis, and it provides credit for military training and experience. Michael Callanan, executive director

of the NJATC, affirms that "our data show that these returning service men and women make great candidates and apprentices."

Critical Trends Impacting Training Needs

Callanan states that the trend toward prefabrication is changing the nature of electrical work dramatically. He describes how the skilled worker shortages predicted during the height of the construction boom in the mid-2000s inspired manufacturers of electrical components and products to simplify the installation of their systems through prefabrication because they "recognized that it will be easier to get bodies than it will be to get skilled bodies."

For Haun, the rise of green building has had a major impact on his trade. It has not changed the nature of the work, which has always been green. However, he finds that the emphasis on green work has reduced the recession's impact on his trade. While Callanan reports that electricians have seen a 20%–25% reduction in the number of apprentices due to the recession, Haun says that insulators have not seen the declines experienced in many other trades because "there has been more attention to the retrofitting of buildings, the greening of buildings and mechanical insulation." He finds that one strategy to increase awareness of his trade is to educate its members on how to tell the public about their green role. This approach is critical to attracting more people to the trade, a challenge given its specialized nature. ■

¹ "Pre-Apprenticeship Training," The Edward J. Malloy Initiative for Construction Skills, Accessed April 19, 2012, <http://www.constructionskills.org/pages/pat.html>. ² "Helmets to Hardhats," Building and Construction Trades Department, AFL, CIO, Accessed April 22, 2012, <http://www.bctd.org/About-Us/Partners/Helmets-to-Hardhats.aspx>.

Benefits of Certification for Individuals

75% or more of all the respondents agreed that valuable knowledge applicable on the job and more job opportunities are benefits that individuals gain by being certified/accredited.

The percentage of respondents who find that they get valuable knowledge from certification/accreditation is nearly equal across the firm types, and it is the benefit selected by the highest percentage of general and specialty trade contractors. This suggests that certification/accreditation programs are doing a good job of addressing the educational needs of the industry.

More job opportunities is one of three categories selected by a significantly higher percentage of A/E respondents compared to the other two firm types. Combined with the other two categories—factor in greater compensation and greater job security/opportunities for advancement—it is clear that **A/E respondents see the most direct financial and career benefits from professional certification.** However, with well over 50% of all respondents from the general and specialty trade contractors also selecting these categories, certification has a strong, positive overall impact on individuals' careers and compensation.

Variation between Certified and Uncertified Respondents

Interestingly, several key benefits are recognized by as many respondents who are not certified/accredited as by those who are.

■ A/E and General Contractor Respondents: The benefits are again those with the most direct financial and career impacts.

- More job opportunities
- Greater compensation
- Greater job security/opportunities for advancement

■ Specialty Trade Contractor Respondents: Slightly different benefits are equally recognized by certified and uncertified.

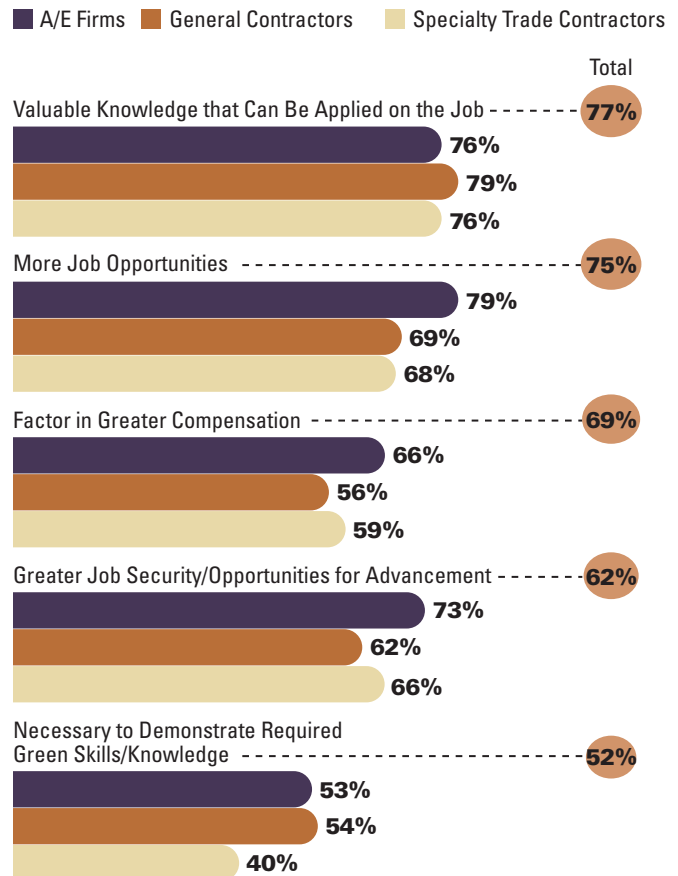
- More job opportunities
- Greater compensation
- Valuable knowledge that is job-applicable
- Necessary to demonstrate required green skills/knowledge

Variation by Hiring Decision Makers

A slightly higher percentage of respondents who are involved in hiring decisions at A/E firms and general contractors (66%) believe that certification is a factor in

Benefits of Certification to Individuals (by Player)

Source: McGraw-Hill Construction, 2012



greater compensation compared to those not involved in hiring decisions (62%). This reinforces this as an important benefit for certified employees in these fields.

However, fewer decision makers at these firms think that certification/accreditation is necessary to demonstrate required green skills/knowledge compared to those not involved in hiring decisions.

At the specialty trade contractors, a much lower percentage of decision makers (57%) agree that certified employees have greater job security/opportunities for advancement than non-decision makers (68%). They are even more reticent about whether certification/accreditation is necessary to demonstrate required green knowledge and skills compared to the decision makers at A/E and general contractor firms, with only 33% of them expressing agreement with this benefit.

Certification Benefits Experienced by Firms

The benefits of certification for firms vary more by firm type than the benefits experienced by individuals. Still, with over 50% of the respondents affirming that firms with certified employees experience nearly all of these benefits, the value of finding employees with certification across the industry is clear.

Variation by Firm Type

A/E FIRMS

■ Increasing Competitiveness and Ability to Win

Contracts: 81% report this as a benefit of certification.

Such a high percentage reveals the value A/E firms place on certified employees. Compared to general contractors and specialty trade contractors, more A/E firms cite this as an important benefit of certification. Selection of A/E firms for contracts is often driven by reputation and experience, either directly or through a proposal process, while the selection of contractors is often more influenced by their cost.

■ Expanding Their Green Business: 73% believe that green certified employees bring them this benefit.

This suggests that firms may be using the credentials of their staff as a way of demonstrating their ability to do green projects successfully.

■ Improving the Hiring Process: 62% report find certification improves the hiring process by allowing for pre-screening and by helping new hires contribute more quickly.

This demonstrates that these respondents find that the training offered through certification is often directly applicable on the job, reinforcing the value of certification to individual professionals since certified individuals have increased job opportunities.

GENERAL CONTRACTORS

■ Expanding Their Green Business: 71% find that green certified employees bring this benefit.

This reinforces the finding that clients are seeking firms with demonstrable green capabilities.

■ Increasing Competitiveness and Ability to Win

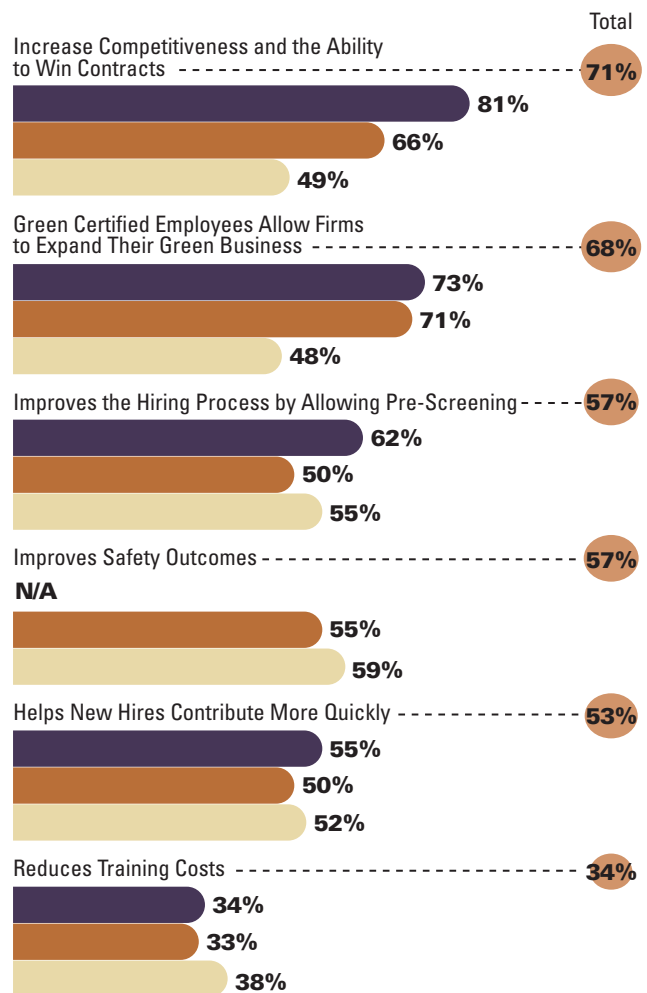
Contracts: Two thirds select this as a benefit.

Despite the fact that the selection of general contractors can be largely driven by price, their reputation is also critically important to their job prospects. They clearly recognize the role that having certified employees can play in demonstrating their expertise to potential clients.

Benefits of Certification to a Firm (by Player)

Source: McGraw-Hill Construction, 2012

■ A/E Firms ■ General Contractors ■ Specialty Trade Contractors



SPECIALTY TRADE CONTRACTORS

■ Improved Safety Outcomes: It is the number one benefit of certification for specialty trade contractors and third most important for general contractors.

These players recognize the productivity benefits increased safety can provide their firm. They clearly believe that the training offered in certification makes their projects safer.

■ Improving the Hiring Process: This benefit to the hiring process ranks higher than the potential to expand their business.

The Value of Professional Certification in the Marketplace

Increasingly today's construction industry professionals are seeking certifications and industry-based credentials to distinguish themselves and to demonstrate to employers that they have attained an in-depth and specialized knowledge in specific areas.

The construction industry has changed and grown dramatically over the last century, and these changes have created a need for a workforce that can demonstrate that they possess many unique specialties and technical and managerial skills. Given this, it is not surprising that half of the industrywide survey respondents find that certification allows them to pre-screen employees and reduces training costs, giving them the insight they need into potential employees.

Creating Value for Firms

For certification to have value for individuals, it must be considered valuable in the marketplace as a whole. The survey respondents note many benefits their firms gain from having certified employees, and the certification industry recognizes that this is central to their industry. Joseph Sapp is chief operating officer of the American Institute of Constructors and the Constructor Certification Commission (AIC), which provides certification of construction knowledge for both new professionals and experienced professionals in the industry. He states, "The employers [of certified workers] benefit [because] the certification provides a recognized credential within their company that improves marketability to clients. And in turn, clients get an increased level of assurance that their projects are being managed more effectively."

Project management and specialized project knowledge are not the only ways in which firms benefit from having certified employees on their staff. According to Dan Taddei, director of education and certification at National Association of the Remodeling Industry (NARI), many workers also need to demonstrate that they have effective business skills. To become a NARI Certified Remodeler, candidates must possess skills and knowledge in a range of business management and technical skill areas, and the certification program includes how to run a business. "A good 40% of the questions [on the certification exam] are about business operations because most of our guys get into this from the trades. They're good tradespeople, but business is a challenge for them. We want to make sure that they're able to handle the business side," says Taddei.

According to Ron Worth, president of The Society for Marketing Professional Services (SMPS), the advantages that certification provides for firms will continue to increase the demand for them and eventually make them mandatory. "Once you enter into a profession and specialize in a field, a certification in that field shows that you're a stronger resource for a firm to use because firms are very focused on return on investment." SMPS helps individuals in nontechnical backgrounds, such

as business, journalism and product marketing, who work in architectural or engineering firms or contractors demonstrate their knowledge of the industry and good business practices.

Creating Value for Individuals

Clearly, individuals benefit when firms recognize the value of the certifications they earn, both during the hiring process and in their opportunities for advancement. For the National Center for Construction Education and Research (NCCER), which provides curricula for training and education in more than 60 different construction trades to individuals that go through its accreditation program, the fact that their program is nationally recognized and their credentials portable adds value for the individual earning the certification.

However, Don Whyte, president of NCCER, notes that certification can help individuals get future employers to recognize their hard work and dedication: "Our craft professionals are proud of their accomplishments, and certification is a means for us to do two things. Number one, it helps build their esteem and professionalism; number two, it shows the industry [the time] that this person has actually invested in preparing their skills."

Many of the individuals seeking NARI certifications are self-employed, and for them, certification

is critical to build their reputations with their clients. Taddei explains that these certifications demonstrate to clients that the contractors are exceptional professionals. He states, "They are able to show their clients all of the rigorous work and requirements they have successfully completed and the exams they have passed and tell their clients it makes them not only better at being able to do their job, but it also makes their company a better run business."

Impact of the Recession on Certification Programs

Sapp also finds that individuals recognize that the efforts they make in achieving certification helps distinguish them in a very competitive job market. "A few years ago when people were not finding work, they were going back to school, and the individuals that were looking for work were trying to find a way to set themselves apart. Certification is one way to do that." Sapp describes how AIC has seen steady growth in their certifications, with a modest increase even through the recession. He explains, "For the individual, it not only provides a marketable credential that sets them apart from other individuals, but it also enhances the individual's personal image as a professional to the employer, the clients and the industry."

However, not all certification programs have fared as well during the challenges caused by the recession. For example, the recession had a big impact on NARI's certification programs. As many companies contracted and unemployment increased, there were fewer applications and renewals. Applications are up again, but there

are still challenges to growth. Taddei states, "One part is the cost, but the big part is the time. These guys are just working, trying to survive, and when you throw in that they're going to have to do two hours of class, plus the study time in between, for a 12 week period, that's a lot of work. It's certainly a big commitment."

Helping Market Transformation

All of the credentialing organizations are dedicated to providing the professionals who seek their certifications with the tools to excel in their industry and to make the industry more productive and profitable. However, the Green Building Certification Institute (GBCI) has even greater goals for their Leadership in Energy and Environmental Design (LEED) professional accreditation. They are seeking nothing short of transforming how the practice of design and construction is done.

With the growing green building market creating an increased need for a skilled green workforce, it is not surprising that the LEED accredited professional is one of the fastest growing certifications in the industry. As part of its mission, the GBCI is focused on market transformation, moving the entire industry from conventional practices to sustainable and healthier ones. A key part of that strategy involves getting professionals to approach design and construction conscious of green impacts, which LEED accreditation can help foster.

According to Peter Templeton, president of the GBCI, about 60% of the professionals seeking LEED credentials come primarily from

the architecture, engineering and construction sectors. The rest come from more specialized areas such as facility management, landscape architecture, real estate, manufacturing, owners, planners, marketing and other areas such as sales, finance and legal. Templeton states, "Most of these are individuals that are involved with projects, specifically looking at how they are able to make a difference, and this is a means for them to be able to demonstrate the expertise that they bring to the table."

The GBCI's surveys of LEED professionals find similar increased job opportunities and market advantages reported in the MHC industrywide survey (see pages 49 and 50):

- **85% of its credentialed professionals believe that their credential gives them a competitive edge in the job market.**
- **71% of hiring decision makers maintain that being credentialed increases competitiveness.**
- **81% of LEED professionals believe that earning their credential has given their organization an edge.**
- **90% of LEED professionals believe that earning their credential facilitated recognition from peers and employers in their field.**

Templeton notes, "Many LEED professionals believe that by earning a LEED credential they are contributing to the movement towards green building and that [its value is] not only a personal accomplishment and professional development but also what it says about them and their values." ■

Data: Green Jobs

Green Jobs

CONSTRUCTION INDUSTRY WORKFORCE SHORTAGES: ROLE OF CERTIFICATION, TRAINING AND GREEN JOBS IN FILLING THE GAPS DATA

Recognizing that non-industry specific green jobs definitions did not fully capture the nature of green jobs in the construction industry, McGraw-Hill Construction devised a green jobs definition that reflects work done to produce green buildings, work on uniquely green systems and green work that requires different skills or knowledge (see page 11 for the full definition). This more precise definition allows this research to reflect the number of green jobs in the construction industry reported by the industry itself, rather than estimated as a product of green projects alone.

Aside from the number of green jobs, the key findings in this section include:

- **Type of Green Job Held:** McGraw-Hill Construction's green job definition allowed for measurement of the type of green job held by the respondents.
 - A/E firms place great emphasis on green projects completed, as would be expected.
 - Specialty trade contractors are most likely to work on uniquely green systems.
 - General contractors put more emphasis on the different skills that differentiate their green work from their traditional work.

- **Practices Self-Defined as Green:** Before providing a green job definition, respondents were asked to indicate the most important green practices and what they considered to be requirements of a green job. **Strikingly, the green job requirements selected by the industry align closely with the McGraw-Hill Construction green job definition.**
- **Retraining Needed for Green Jobs:** Despite the fact that many green jobs are emerging from traditional work in the construction industry, the majority report at least minor retraining was needed for their green job.
- **Benefits of Green Jobs:** Workers with green jobs report several benefits, including more job opportunities and better career advancement. Over one quarter also report more job security, a rarity in an industry with such a high employment activity level based on the volume of work available.

Sustainability and the Practice of Architecture: Results from the Architect Firm Gap and Student Studies

The architecture profession already believes strongly in green design, but the next generation graduating from architectural programs places even greater emphasis on green.

93% of both practicing architects and students/recent graduates believe that architects should practice sustainable design whenever possible. Interestingly, this percentage exceeds those who believe global warming is caused by human activity. This supports the conclusion that for students and practitioners alike, the decision to pursue sustainable design may be influenced by factors unrelated to global

warming concerns, such as potential cost savings from green efforts and improved design features. Students in particular believe that sustainable design yields a long-term return on investment, a motivator that a higher percentage of them select compared to the practitioners (see page 14 for more information).

65% of architecture students and recent graduates report that they will do green design out of a sense of personal responsibility, a factor that only motivates 39% of current practitioners. This demonstrates the commitment to green—and the idealism—of the students.

More students also consider a wide range of green design features to be important to creating a sustainable building compared to the architecture firm respondents. Those features include the use of onsite renewable technologies and green roofs, practices still in limited use in the industry (see page 32 for more information).

While the specific demands and restrictions of clients may impact the use of specific, expensive approaches today, the commitment and enthusiasm by today's emerging professional to sustainability is likely to translate into greater penetration in the future.

Green Jobs in Construction

Green Building Market Is Fundamentally Shifting Construction Practices

McGraw-Hill Construction has been tracking the share of construction starts that is green (for definition, see page 11) since 2005. As seen on page 10, the green building market share was 31% in 2010, climbing to 41% in 2011. By 2014, the share is expected to comprise 48% of all starts.

This market has been driving change throughout the industry—more green building products are available, accessible and affordable; collaborative approaches are becoming more prevalent in design and construction; and the use of BIM and prefabrication are accelerating in these projects due to the benefits they offer in achieving green outcomes.

Correspondingly, as design and construction practices have shifted, so have the design and construction professions. New skills are now needed, new professional specialties are emerging, and new practices are becoming standard.

Green Construction Jobs Take Hold in the Industry

In order to measure the percentage of green jobs in the construction professions—architects, engineers, contractors and specialty trade contractors—McGraw-Hill Construction created a construction-specific definition of green jobs (see page 11). This definition is the first to consider the work done and the skills required to produce green projects, instead of solely basing numbers on green construction activity.

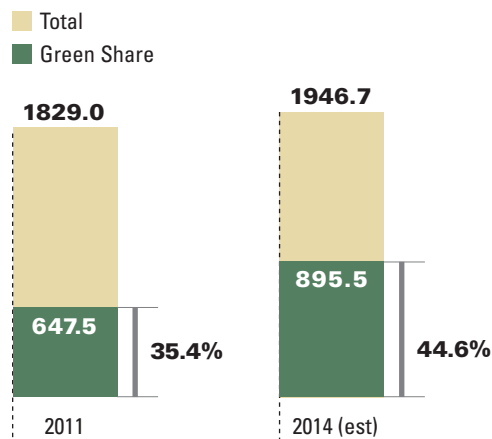
ARCHITECTS, ENGINEERS AND CONTRACTORS

In response to McGraw-Hill Construction's definition, over a third (36%) of architects, engineers and contractors (AEC) report having a green job in 2011, and nearly 45% expect to have one in 2014.

It is notable that these percentages so closely match McGraw-Hill Construction's green building market size, which is built from actual project data. This consistency confirms the impact the green market is having on jobs—at nearly a 1:1 ratio in projects to jobs. It also reinforces the validity of these green construction job numbers.

Number of Nonresidential Construction Jobs and Green Share (in thousands)

Source: Total Jobs: U.S. Bureau of Labor Statistics (Through the End of 2011); Green Share: McGraw-Hill Construction, 2012



SPECIALTY TRADE CONTRACTORS

The specialty trade contractors lag their AEC counterparts in percentage of green jobs. In 2011, 15% reported having green jobs, and 25% expect to have one by 2014. Given the requirement that a green job is one that involves work on a uniquely green system or requires significant retraining, many trade jobs would not qualify specifically as green. Therefore, the true impact of the green market on the trade specialties could be much greater than these percentages might suggest.

Interview: Thought Leader



Majora Carter, President Majora Carter Group
Creating Jobs through Sustainable Communities

Majora is producer and host of the Peabody Award winning public radio series, *The Promised Land*, and serves on the boards of the U.S. Green Building Council and The Wilderness Society. From 2001 to 2008, she was Executive Director of the non-profit she founded, Sustainable South Bronx, where she pioneered green-collar job training and placement systems in one of the most environmentally and economically challenged parts of the U.S.

When you think of a green job, how do you define it?

CARTER: I define green jobs as any job that has a net benefit to the environment, whether it is through the products that are produced or the processes that are used.

Taking that more narrowly, how do you think of green jobs in the construction professions and trades?

CARTER: [Design and construction jobs] are incredibly important. The built environment is ... obviously about the building, but it's also [about] the way the building is situated within the actual landscape of the community itself. I think it is broader than just the buildings themselves.

I particularly see green infrastructure as a way to support the built environment. So, you're talking about planted medians and green roofs and southern forestry, because that actually provides an infrastructure goal. Storm water management, air quality improvement, actually conservation in terms of mitigating urban heat islands. Those type of things. For me it is part of the built environment.

How specifically do you see green infrastructure creating job?

CARTER: The frustration that I have is that in many of the circles

that I run in, people might see the benefits of green infrastructure, but they haven't linked them to job creation. New York City is a great example. When I was running Sustainable South Bronx, my team put together some white papers about why green infrastructure was going to be so important for the city of New York. Several years later [the city] actually released a green infrastructure plan, and we were very excited, but what they missed was directly linking it to job creation in our cities and specifically focusing on the people who needed those jobs the most and who could benefit from an economic standpoint as well as a social one.

How do you think the building stock plays a role in the larger issues of social justice?

CARTER: The quality of the building stock in poor communities often leaves a lot to be desired. And definitely in the past, [buildings burdened poor communities] with lead paint and the way the buildings were built and how sick building syndrome was such a normal occurrence in our communities. That in itself was a problem.

Do you see a role for the building industry as part of the solution to these problems?

CARTER: As far as solutions go, it would be also be [to build] these

buildings in ways that are actually healthy ... Also training people in these places that were considered regional sacrifice zones to be a part of that rebuilding is a symbolically beautiful way to incorporate new people into the transformation of their communities.

How do you think the industry can better attract members of the minority community into the construction professions?

CARTER: First of all, there has to be better outreach into those groups. The non-white groups in particular are underrepresented in the design world, which is one of the reasons why the USGBC not only acknowledged [that under-representation] but worked to create a way to deal with it through the diversity mentoring initiative, which I'm a part of.

I think of my own situation. It didn't occur to me that there was such a thing as a design industry. It was just never brought up to me, so for me it is about exposure. Once [people] realize that we can play a role in how our communities are designed and built, why wouldn't we want to be part of that field?

When you helped start Sustainable South Bronx, what impact did the Bronx Environmental Stewardship Training (BEST) Academy program have on jobs?

CARTER: I have to say that I have no connection to it at all now, but when I did run it, the reason we created it was to link job creation with environmental remediation, and we wanted to provide jobs for folks in our communities as opposed to bringing other people from outside our neighborhood to do this kind of work. We wanted to create a personal and a financial stake in improving the environment right where people work. Then they could see the environment as not just something where [people] go hiking—because that’s what people thought the environment was. That was incredibly important, and we had an 85% success rate.

What was the focus of the work?

CARTER: We focused mostly on green infrastructure and climate adaptation, things such as storing water and reducing the urban heat island [effect]. We wanted to engage in [activities] where people could be active now to make sure our community was benefiting on the giving and the receiving end.

Do you think these are new jobs or do you think they’re transitions of existing jobs?

CARTER: The jobs that I’m trying to pitch are new ones, [not transitional ones]. For example, we’re talking about horticultural engineers focused on green infrastructure, and there aren’t a lot of people [in that profession] right now.

What do you think of green job training programs?

CARTER: I definitely have some issues with how some of those training programs have happened over the past couple years. It seemed

“We need to create infrastructure so that people who are trained can actually get work.”

to me like they were so focused on training people that there wasn’t as much focus on placing them. That is incredibly troubling to me. We need to create infrastructure so that people who are trained can actually get work. So, I’m trying to put policies in place that will actually support the creation, not only of training opportunities, but of placement opportunities to support robust local economies.

Are there any organizations that you think are taking an innovative approach to green job training?

CARTER: There is a great group called Detroiters Working For Environmental Justice. A number of years ago ... they did a great green jobs training and placement system. They trained people, definitely worked on job skills and job readiness, but then also worked to create their own companies so that they could hire people. And I just thought now that is smart.

What are you focusing on right now?

CARTER: We’re starting a new organization called Hometown Security Laboratories. And we’re focused on the revitalizing communities, including things like job training, life skills, community

education and even capital development. In this time of fear and widespread economic insecurity, we’re really interested in cultivating assets that are essential to revitalizing America’s hometowns, wherever they are, and in particular the low-income communities around them. We are going to be using real estate development in particular as one of our primary tools. We see it as a platform for social, environmental and economic change.

We are going to try to harness the power of gentrification so that we can use it to create social, environmental and economic change in our communities by developing mixed income housing and mixed use commercial development, which, if done in a way that provides an opportunity for local economic development, can lead to sustainable job creation. ■

Most Important Activities for a Job to be Defined as Green

Before the survey respondents were presented with a definition of green jobs (see page 11), they were asked to indicate which two of six green activities they considered most important for a job to be considered green.

Reduction in Energy Use Beyond Mandates

67% identified reducing energy use beyond mandates as the most important activity that could define a job as green. A/E firms are the biggest proponents of energy use reduction at 72%, but only 50% of the trades respondents selected this category, making it only the second highest category for the trades.

It is not surprising that for A/E and general contractor respondents, energy use reduction ranks high. It can offer clear cost savings for their clients, and reduction in energy use is also associated with reducing the carbon footprint of a building. An emerging trend toward reporting energy use for commercial real estate may also drive the importance of this category in the future.

Reduction in the Use of Natural Resources

The top ranking category for the trades and the second highest overall is reductions in the use of natural resources. For contractors, this may be the area in which they are most able to contribute to greening a project, either through the selection of building products with a high degree of renewable or recyclable content or through sustainable waste management.

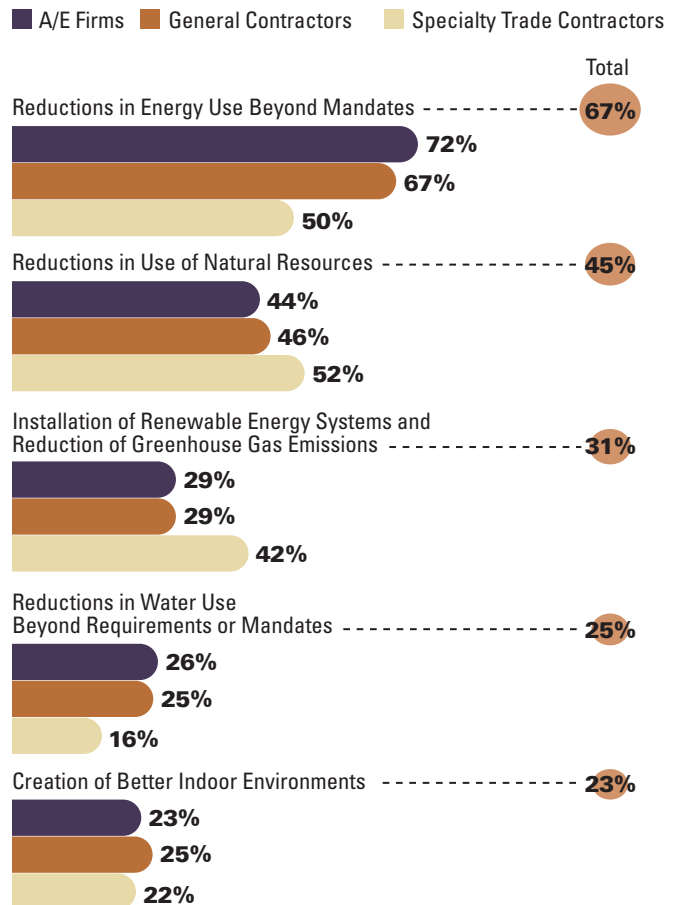
Renewable Energy Systems and Reduction of Greenhouse Gas Emissions

Specialty trade contractors also place considerable weight on the installation of renewable energy systems and the reduction of greenhouse gas emissions. Lower responses among A/E and general contractor respondents may reflect the still limited use of renewables in buildings, demonstrated in other McGraw-Hill Construction market research in various *SmartMarket Reports*.

General public perception often associates green, and especially green jobs, with the renewable energy industry. (See page 63 for more information on renewable energy and jobs.) This relationship is particularly compelling because, unlike the subtle distinction between an electrician wiring a traditional building and an electrician wiring a green building, the green jobs

Most Important Activities for a Job to be Defined as Green (by Player)

Source: McGraw-Hill Construction, 2012



created in this industry are often entirely new positions and thus easier to track. Many trade contractors may perceive this same link between renewables and green.

Other Factors

Reductions in water use and creation of better indoor environments are reported at essentially the same level, with roughly one quarter considering them to be among the two most important activities for a job to be defined as green. For many green experts, water shortages are expected to become paramount in the future, currently, there is far less attention paid to water than energy. Creating better indoor environments quality (IEQ) may be critical, but some energy efficiency practices, such as better ventilation, could also address IEQ concerns.

Green Job Requirements

Before being presented with the green job definition developed by McGraw-Hill Construction (MHC), (see page 11) respondents were also asked whether certain requirements—the percentage of work that goes toward making a building greener, involvement with LEED projects and the firm's percentage of green work—are necessary for a job in their profession to be considered green.

Their responses indicate that slightly over half believe that their direct work needs to make buildings greener for their job to be considered green, but slightly under half also regard those who work on LEED projects as having green jobs as well. This nearly equal split corresponds to the elements of the green job definition developed by MHC, demonstrating that the definition reflects the larger industry's approach to green.

Variation by Player

- **A/E Firms:** More favor the notion that work must be green
- **General Contractors:** More believe that working on LEED projects meets the requirements of a green job.
- **Specialty Trade Contractors:** Their responses correspond to those of A/E firms, with greater emphasis placed on greening a project than on LEED.

The architects' emphasis on making the project greener may be influenced by their higher levels of green involvement in general, which may make the affirmation of third-party certifications less important. General contractors, who have less overall green involvement than the A/E firms, prefer to gauge the greenness of projects through a third party.

Specialty trade contractors are likely more focused on the outcomes of their specific efforts than overall project certification. This conclusion is supported by the finding that far more respondents with green jobs among the trades work on uniquely green systems compared to A/E firms or general contractors (see page 59).

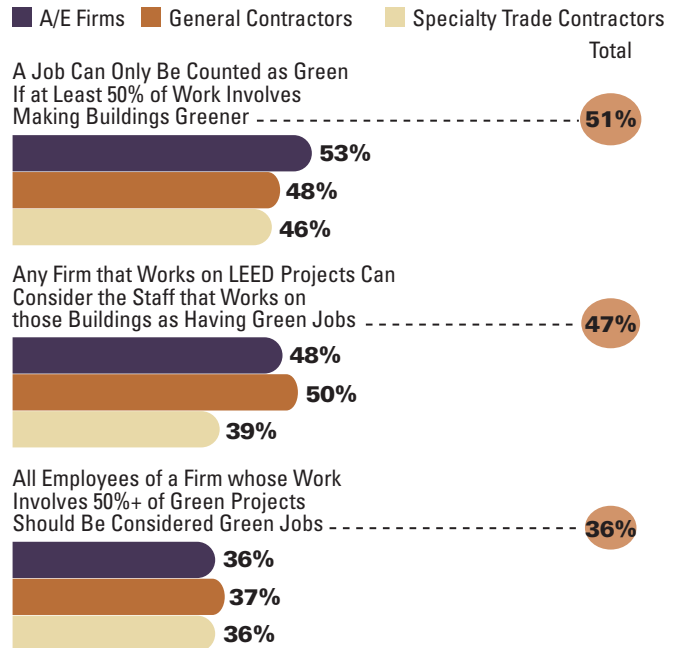
Variation by Level of Green Involvement

60% of the A/E and general contractor respondents whose firms do more than 75% green projects agree that a job can only be counted as green if at least 50% of the work involved makes the project greener, compared to 45% of firms with less than 25% green projects. Interestingly, though, there is no notable difference by level of green involvement among those who consider working on a LEED project to be a prerequisite for a green job.

Green Job Requirements

(Percentage Who Agree or Strongly Agree)

Source: McGraw-Hill Construction, 2012



Variation by Years in Profession

52% of the A/E and general contractor respondents who have worked less than five years in their profession believe that working on a LEED project makes a job green, more than the 49% of those with 20 years of experience or more. This suggests that LEED certification carries great weight with those still new to the profession.

47% of those with less than five years experience also believe that all who work for a firm doing more than 50% green projects have green jobs, including support staff. Only 36% of those with 20 years or more experience believe the same, suggesting greater caution in how they define design and construction jobs as being green.

Variation by Accreditation

57% of A/E and general contractor accredited respondents believe that those who work on LEED projects have green jobs, and 40% believe that all staff of a firm working on more than 50% green projects should be considered green, compared to 32% of non-accredited respondents.

Type of Green Job Held by Respondents

A/E Firms

74% of A/E respondents consider their jobs green because more than 50% of their work is on green projects. Only a small fraction (13%) design uniquely green systems. Given the large percentage of architect respondents compared to engineers, this makes sense, since very few architecture projects can be aptly described as a uniquely green system.

VARIATION BY REGION

80% of A/E respondents in the West believe their job is green because they do more than 50% green projects, significantly more than those in the Midwest or the Northeast.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

31% of the A/E respondents who work for firms that do less than 25% green projects identify their job as green because they design uniquely green systems for buildings. As the level of green involvement rises, this percentage drops, with only 1% who work for firms that do more than 75% green projects selecting this as the way to identify their job as green.

VARIATION BY GENDER

85% of women describe their job as green because more than 50% of the projects they work on are green, compared to 69% of the men. Conversely, 15% of the men design uniquely green systems, compared to 9% of the women.

General Contractors

Twice as many general contractors believe their job is green because it requires different skills to meet green goals compared to other criteria for defining green jobs. Even though the percentage of general contractors working on uniquely green systems is double that of the A/E respondents, more general contractors still identify their green jobs based on the skills they have rather than the specific systems they work on.

This finding has strong implications on the need for more education on green skills in the construction industry.

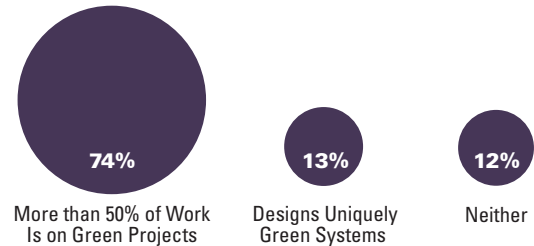
VARIATION BY FIRM SIZE

Although the total number of respondents is too low to draw a definite conclusion, the data shows a trend toward more respondents employed by very large general contractors (total value of projects \$500M or more) having green jobs that involve installing uniquely green systems compared to those in smaller firms.

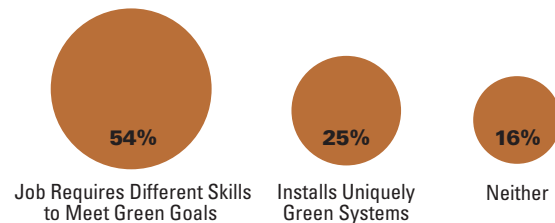
Type of Green Job

Source: McGraw-Hill Construction, 2012

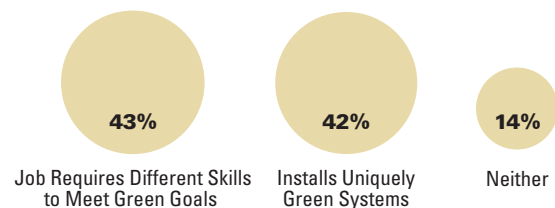
A/E Firms



General Contractors



Specialty Trade Contractors



Specialty Trade Contractors

At 42%, a much higher percentage of respondents from the trades state that they have a green job because they work on a uniquely green system compared to the A/E or general contractor respondents. This is to be expected since specialty trade contractors are more likely to focus on systems within a building rather than the building as a whole.

Proportion of Workforce with Green Jobs at Their Firm

Just as the share of green projects has grown over the last few years and is expected to continue to grow, the share of green jobs in firms follows the same pattern.

■ More than 50% Green Jobs

- In 2008, only 8% of the respondents report that more than half of the jobs in their firm are green.
- In 2011, the percentage has more than doubled to 18%.
- By 2014, 30% of the respondents believe that more than half of the jobs in their firms will be green, nearly four times the percentage in 2008.

■ 10% or Less Green Jobs

- In 2008, 58% of the respondents report that 10% or less of their employees had green jobs.
- In 2011, 37% fall in this category.
- By 2014, 23% fall in this category, less than half the amount in 2008.

Variation by Player

A/E FIRMS

McGraw-Hill Construction's research on green building has consistently demonstrated that A/E firms are at the forefront of green adoption, and this survey confirms that. Even in 2008, 11% of the A/E respondents believed that the jobs at their firm were more than 50% green, and one third of them expect that to be true in 2014. This is considerably higher than the general contractors or specialty trade contractors, and the disparity does not appear to lessen in the near future.

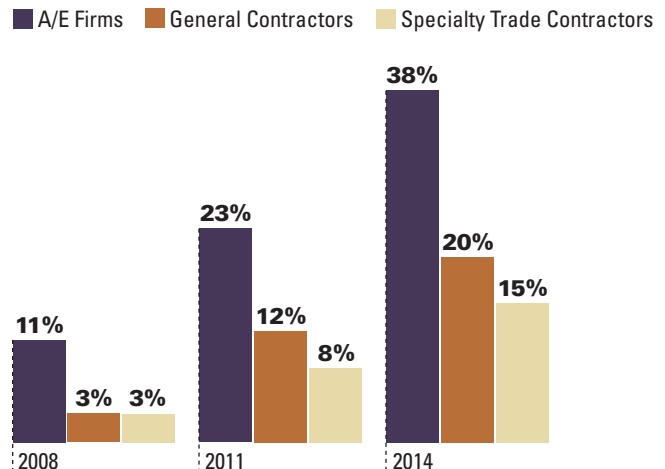
■ Size of Firm

The largest firms and the smallest firms have the largest percentage of green jobs by 2014.

- In 2008, very few large firms (11%) report having no green jobs, compared to the others, which average between 26% and 47%. A much higher percentage of large firms (9%) also report having between 50% and 75% green jobs in that year, compared to 3%–6% of the rest of the firms. However, 15% of the small firms report that more than 75% of their jobs are green, compared to just 4% of the larger firms.
- In 2011, this pattern holds, with 18% of the large firms reporting that 50%–75% of their jobs are green compared to 3% of the small firms, but with 26% of the small firms reporting more than 75% green jobs compared to 11% of the large firms.
- By 2014, a shift occurs, because the top firms with more than 75% green jobs are now the smallest and the largest

Proportion of Firms with Workforce More than 50% Green (by Player)

Source: McGraw-Hill Construction, 2012



firms, at 29% and 26%, respectively. This demonstrates that many small firms will be largely dedicated to green, a major shift. It also reveals a different pattern for large firms, which have always had some green positions and are slowly becoming greener over time.

GENERAL CONTRACTORS

General contractors are converting to green jobs at a higher rate than the specialty trade contractors. Each starts at a minimal 3% rate in 2008, but by 2014, one fifth of the general contractor workforce has a green job, compared to just 15% of the specialty trade contractors.

Size of firm also plays a major role in the percentage of green jobs for general contractors, but in this case, the larger firms consistently have more green jobs than the smaller ones, with 19% of the largest firms in 2011 and 29% in 2014 having over 50% green jobs.

Retraining Required for a Green Job

Most of the survey respondents with green jobs were able to get green jobs in their own fields.

- **A/E Firms: 83%**
- **General Contractors: 74%**
- **Specialty Trade Contractors: 75%**

This finding demonstrates that many green jobs in construction are an evolution of existing jobs, rather than completely new positions in fields like solar array installations or wind turbine technicians. This finding is further supported by the types of new jobs survey respondents see emerging as a result of construction trends, most of which are green and are also extensions of existing design and construction jobs. (See page 18 for more information.)

However, even for those whose green job is in their existing field, the majority (67%) required some sort of retraining for their new green job, and 9% found that retraining to be rather significant. With green projects expected to continue to grow for the next several years, this again confirms that more green training is essential for firms and individuals to capitalize fully on the emergence of green as a norm in design and construction.

On the other hand, the largest percentage of overall respondents (36%) only required minor/somewhat minor retraining for their green jobs.

The breakdown by player of those who find no retraining required also correlates inversely to the degree to which respondents in these categories are involved with the design or construction of uniquely green systems. The A/E respondents, who are largely not involved in uniquely green system designs, also more frequently do not require retraining, while specialty trade contractors, who do more unique green systems, have the lowest percentage stating that no retraining for green is needed.

Variation by Firm Size

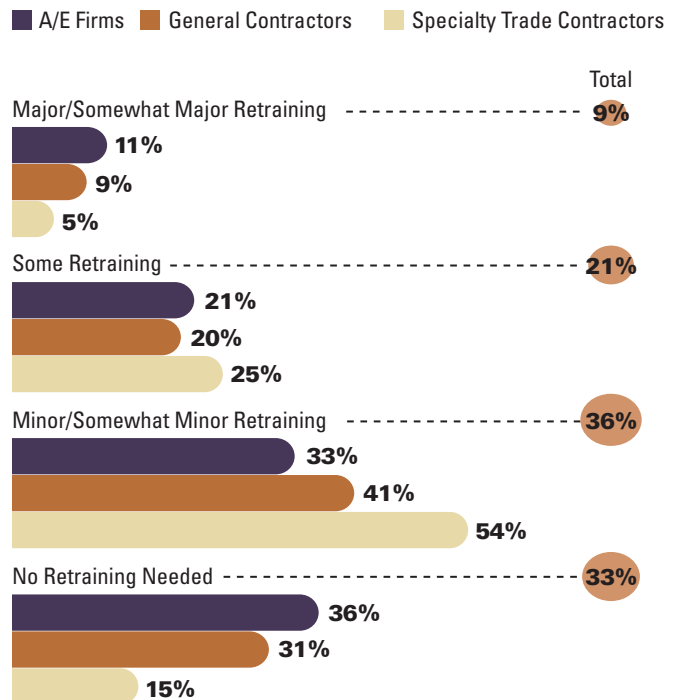
87% of the A/E respondents with green jobs who work for a firm with annual billings of more than \$1 million report that their green job is in the same field as their previous job, compared to 71% of those whose firms earn less than \$1 million.

In addition, 20% of the respondents from smaller firms who stayed in the same field also report needing major/somewhat major retraining, and only 9% in larger firms report the same.

Large firms, which have a larger pool of candidates to choose from, may be more inclined to build on the

Retraining Required for Green Job (by Player)

Source: McGraw-Hill Construction, 2012



pre-existing experience of their employees, while smaller firms may need their employees to adapt more dramatically to seize opportunities when they arise. This general tendency for small firms was likely to be even more widespread during the recession, due to the tighter competition for a smaller overall pool of projects, which may have impacted their response.

Variation by Level of Green Involvement

For respondents whose firms do a higher percentage of green work, only between one quarter and one third report the same level of minor retraining required.

This result aligns with findings of other studies that suggest that firms that do more green work overall usually do more intensively green work as well, which would likely require somewhat greater retraining.

Benefits of Green Jobs

GREATER JOB AVAILABILITY AND BETTER CAREER ADVANCEMENT

The two top benefits for green skilled workers are **greater job availability and better career advancement**. Each of these was selected by over 40% of the total respondents. In both cases, a larger percentage of A/E respondents found these benefits to be compelling, but they were selected by the largest percentages of general contractors and specialty trade contractors as well.

The market numbers bear out these findings. As green projects account for a larger percentage of the industry as a whole, it is not surprising that green job skills would offer more job opportunities and better advancement opportunities.

GREATER JOB SECURITY

A significant percentage, from over one fifth of the trade respondents to nearly one third of the A/E respondents, also find that green job skills offer greater job security. In an industry that has experienced severe cutbacks in staff and the amount of work available, job security is not a common experience. Therefore, despite the slightly lower percentages, this is still a compelling reason for design and construction professionals to be able to demonstrate green knowledge and skills.

HIGHER SALARIES

Only a small percentage of respondents report that green job skills can help secure higher salaries. Notably, this is the only category where the percentage of trade firm respondents exceeds the other two groups. The additional salary reported by trade respondents is also significant, with 36% reporting an increase of 7% or more. This may be due in part to the fact that trade respondents with green jobs more frequently report working on uniquely green systems compared to the other professions (see page 59). This greater degree of green specialization may allow them to receive a higher wage for their green skills.

Variation by Accreditation

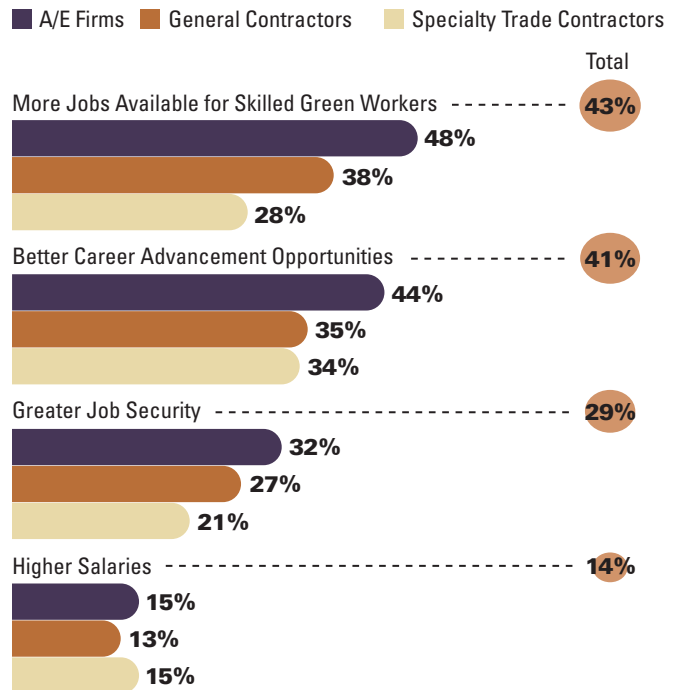
A significantly higher percentage of A/E and general contractor respondents who have professional certification find that green jobs bring all four of these benefits compared to those who are not certified.

Variation by Firm Size

49% of general contractor respondents from firms that do \$100 million to \$500 million in projects annually and 48%

Benefits of Green Jobs (by Player)

Source: McGraw-Hill Construction, 2012



of those from firms doing \$500 million or more annually believe that there are more jobs available for green workers, compared to 23% of those from firms doing less than \$25 million.

Variation by Level of Green Involvement

More A/E and general contractor respondents with high involvement in green find that there are more jobs available for skilled green workers, that green jobs offer greater job security and that green jobs offer better career advancement compared to those in firms with low green involvement.

For the respondents from specialty trade contractors with greater green involvement, the only benefit with a significantly higher response is that green jobs offer better career advancement opportunities.

Variation by Union Membership

Only 11% of the union members believe that green jobs offer greater job security compared to 23% of the non-union members.

Renewables and New Job Growth

In recent years the renewable energy market has seen significant growth driven by increasing consumer demand, venture capital infusions, and policy reforms by federal and state lawmakers seeking to spur fiscal recovery. During this period, studies report that jobs in the renewable energy economy have grown at a faster rate than U.S. jobs overall.¹

Rise of Solar Power Driving New Job Growth

After a decade of rapid growth, the solar energy industry grew ten times faster than the overall economy in 2011. According to the Solar Energy Industries Association, total U.S. solar electric capacity surpassed 3,650 megawatts in 2011, enough to power 730,000 homes.²

According to the Solar Foundation, currently more than 100,000 U.S. workers are employed in the solar industry. In 2011 6,735 new solar jobs were created, for industrywide job growth of 6.8%, and employers expect to increase their workforce by 24% in 2012. This growth is expected to boost employment in occupations such as construction managers, equipment operators, civil engineers, welders, ironworkers, steelworkers, photovoltaic installers, electricians and roofers.

Wind Energy and Wind Farms Creating Jobs

The wind energy industry has experienced rapid growth in the past decade as well. According to the American Wind Energy Association (AWEA), wind energy capacity in the U.S. today is over 46,900 megawatts, enough electricity to power approximately 10 million homes.⁴

According to AWEA, an estimated 85,000 Americans are currently employed in the wind power industry

and related fields. Wind energy has been one of the fastest-growing sources of new U.S. manufacturing jobs. Today, over 400 American manufacturing plants build wind energy components, a 12-fold increase from just a few years ago.⁵

Jobs in the construction industry expected to grow as a result of erecting wind turbines include project managers, construction laborers, construction equipment operators, crane operators and electricians.

Other Renewable Energy Trends and Job Growth

The U.S. geothermal industry grew in 2011 and the first quarter of 2012,⁶ contributing to economic growth and jobs, often in rural areas with high unemployment.

One example is the new power complex planned by CalEnergy in Imperial Valley, CA, an area with one of the highest unemployment rates in the state. The project will employ 323 construction workers and infuse nearly \$1 billion into the local economy.⁷

In the field of bioenergy, the U.S. is expected to lead the world in global development according to a report from the World Economic Forum. The report shows that as of June 2010, the biorefinery industry accounted for more than 40,000 jobs in the U.S., and further commercialization of

Specification of Solar Specifications digitized by McGraw-Hill Construction (comprising approximately 60,000 projects annually) show that the specification rate of solar/photovoltaic panels almost doubled in the office sector from 2010 to 2011—from 1.3% to 2%. While these numbers are small, the significant growth in the specification rate in just one year suggests that the design community is increasing its attention on renewables.

biofuels is expected to create 190,000 direct new jobs in the U.S. by 2022.⁸

Drivers and Challenges

Government policy has helped drive the renewables market. Two of the most prominent include: (1) Renewable energy standards—Currently in 29 states, they require that a certain amount of the electricity sold within a state comes from renewable energy sources, and (2) Production Tax Credit—It provides a 2.2 cent per kWh benefit for the first ten years of a renewable energy facility's operation.⁹ Though the future of both policies is uncertain due to some political and industry opposition, interest in renewables remains high, and their growth is expected, albeit at lower rates in the absence of policies. ■

1 The Clean Energy Economy Report, The Pew Charitable Trusts, 2009 www.pewcenteronthestates.org/uploadedFiles/Clean_Energy_Economy_Report_Web.pdf. 2 "Facts on America's Solar Industry," Solar Energy Industries Association, March 5, 2012, http://www.seia.org/galleries/pdf/factsheet_solar_industry_facts.pdf. 3 National Solar Job Census 2011, The Solar Foundation, August 2011, <http://thesolarfoundation.org/research/national-solar-jobs-census-2011>. 4 American Wind Energy Association, Accessed April 22, 2012, <http://www.awea.org/learnabout/publications/upload/AmericanWindpowerBrochure.pdf>. 5 Ibid. 6 Geo Thermal Energy Association, Accessed April 22, 2012, http://www.geo-energy.org/reports/2012AnnualUSGeothermalPowerProductionandDevelopmentReport_Final.pdf. 7 "Why Support Geothermal Energy?" Geo Thermal Energy Association, Accessed April 22, 2012, http://www.geo-energy.org/pdf/FINALforWEB_WhySupportGeothermal.pdf. 8 King, David and Hagan, Andrew, "The Future of Industrial Biorefineries," World Economic Forum, June, 2010, http://www3.weforum.org/docs/WEF_FutureIndustrialBiorefineries_Report_2010.pdf. 9 Union of Concerned Scientists, Accessed April 22, 2012, http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/production-tax-credit-for.html.

Methodology

Workforce and Green Jobs Study Research

McGraw-Hill Construction Industrywide Workforce and Green Jobs Survey

McGraw-Hill Construction conducted the 2011 Workforce and Green Jobs Study to explore trends in the construction workforce and in green jobs in construction. This study investigated the differing experiences and perspectives of the architect, engineer, general contractor and specialty trade contractor communities regarding construction workforce needs. Areas explored include: workforce shortages, level of engagement with green projects, extent of green job adoption, training and professional certification, and ways to attract skilled workers.

The research was conducted online from September to October 2011. Samples were drawn from McGraw-Hill Construction's database representative of the industry and member lists from the following industry association: AIA, NARI, SMPS, WSCSMW, USGBC and BCTD. Screening criteria required that respondents:

- Be currently or formerly employed at an A/E firm, general contractor or specialty trade contractor located in the U.S.
- If not unemployed, work at least 10 or more hours per week.
- Work at firms with no more than 50% of their projects either non-building or single-family (employed respondents only).

Interviews were conducted with 2,223 construction professionals, including the following:

■ 1,257 A/E respondents:

- **1,007 architecture firms** (includes architecture firms, A/E firms, interior design and landscape design)

- **250 engineers** (includes mechanical, electrical, civil and structural engineers)

■ 531 general contractor

respondents: Includes general contractors, construction managers, design-builders, contractors (non-building) and remodeling firms.

■ 271 specialty trade contractors:

Largest percentages include electrical contractors, HVAC/sheet metal contractors, drywall contractors, floor and ceiling covering contractors, roofing contractors, carpentry and millwork contractors, bricklayer/block mason contractors and glazier contractors, as well as a small percentage of contractors from various other trades.

■ 164 unemployed construction

professionals: Includes A/E professionals, general contractors and specialty trade contractors

1,210 (54%) of the respondents were from surveys conducted with association members (AIA, NARI, SMPS, WSCSMW, USGBC and BCTD).

The total sample size benchmarks at a 95% confidence interval with a margin of error (MOE) of 1.96%. The principal subgroups also have a 95% confidence interval, and their corresponding MOE is as follows:

- A/E: 2.7%
- General Contractors: 4.2%
- Specialty Trade Contractors: 5.9%
- Unemployed: 7.6%.

In a few places, there are less than 30 respondents in the sub-group analyses. These small sample sizes are referenced in the text, and the differences among such groups should be interpreted as directional only.

2012 AIA/MHC Architect Firm Gap and Student Studies

McGraw-Hill Construction partnered with the AIA to conduct the Architect Firm Gap and Student Studies to explore what architecture school students and recent graduates are anticipating as they enter the workforce and what architecture firms are expecting from prospective architect hires just entering the workforce. The study also identifies key gaps in perception between these two groups.

This study incorporates two surveys: one of 614 current undergraduate and graduate students at U.S. architecture schools and recent graduates of such schools (453 students and 161 graduates) and a second of 448 licensed and associate AIA members.

Both surveys were conducted online from December 2011 to January 2012. Sample sources were the AIAS for the Student Study and the AIA for the Firm Study. For the Firm Study, those who were retired were screened out.

The total sample size of 614 students and recent graduates has a margin of error of 4.6%, and the sample size of 448 firm representatives has a margin of error of 4.6%, each at a 95% confidence interval.

In a few instances, results from subgroupings with less than 30 respondents are discussed. These small sample sizes are referenced in text, and differences among such groups should be interpreted as directional only. ■

Resources

Organizations, websites and publications that can help you get smarter about construction industry workforce issues and green jobs.

McGraw Hill CONSTRUCTION

McGraw Hill Construction

Main Website: construction.com

Dodge: construction.com/dodge

Analytics: construction.com/dodge/dodge-market-research.asp

Architectural Record: archrecord.com

Engineering News-Record: enr.com

GreenSource: greensourcemag.com

Sweets: sweets.com

SmartMarket Reports:

construction.com/market_research

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U.S. Green Building Council
www.usgbc.com

Green Building Certification Institute
www.gbci.org



American Institute of Architects
www.aia.org

American Institute of Architecture Students
www.aias.org

Contributing Research Partners

- ACE Mentor Program: acementor.org
- American Institute of Constructors & Constructor Certification Commission: aic.org
- Building & Construction Trades Department, AFL-CIO: bctd.org
- National Association of the Remodeling Industry: nari.org
- National Center for Construction Education and Research: nccer.org
- Society of Marketing Professional Services: smps.org

Government Resources:

- American Recovery and Reinvestment Act: recovery.gov
- Better Buildings Initiative: eere.energy.gov/buildings/betterbuildings
- National Institute of Standards and Technology: nist.gov
- Pacific Northwest National Laboratories: pnnl.gov
- U.S. Department of Labor Bureau of Labor Statistics: bls.gov
- U.S. Department of Labor Employment and Training Administration: doleta.gov
- U.S. Department of Energy Weatherization and Intergovernmental Program: eere.energy.gov/wip

Other Industry Resources:

- American Society of Civil Engineers: asce.org
- American Society of Landscape Architects: asla.org
- American Subcontractors Association: asaonline.com
- American Wind Energy Association: awea.org
- Associated Builders and Contractors: abc.org
- Associated General Contractors of America: agc.org
- Building Green, LLC: buildinggreen.com
- Construction Users Roundtable: curt.org
- Database for State Incentives for Renewable Energy (DSIRE): dsireusa.org
- Design-Build Institute of America: dbia.org
- International Code Council: iccsafe.org
- Laborers International Union of North America (LIUNA) Training and Education Fund: liunatraining.org
- Solar Energy Industries Association: seia.org
- The Solar Foundation: thesolarfoundation.org
- Western States Council Sheet Metal Workers' International Union: wscsmw.org

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