

Training, Educating, and Maintaining Workforces for the Architecture/Engineering/Construction Industry

*A Building Futures Council Education-Training
and Societal Issues Committees Report*

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ABSTRACT

Based on focused A/E/C industry forum conclusions and a survey of the Building Futures Council membership to further refine these conclusions and recommendations, the following are considered the priorities of the Building Futures Council with respect to the inadequacies of the workforce of the design and construction industry: initiate efforts to improve the industry's image, lower the barriers for industry/university partnerships and encourage the offering of co-op and internship opportunities to prospective industry employees.

INTRODUCTION

The Education-Training and Societal Issues Committees of the Building Futures Council planned and organized committee planning sessions and a forum on "Training of the Building Futures Council, Educating, and Maintaining Workforces for the Architecture/Engineering/Construction (A/E/C) Industry to Meet the Business Challenges of 2000." After this initial Forum in May 2000, a survey of the Building Futures Council (BFC) asking members to prioritize the results of the 2000 forum was conducted the following year. This paper represents the final report of that effort which outlines the May 2000 Forum; discusses and explains the subsequent 2001 survey and its conclusions; and serves as the point of departure for the Building Futures Council's new initiatives for training and education in the A/E/C industry.

FORUM 2000

The forum held on January 31, 2000, in Marco Island, Florida, included speakers from various perspectives invited to explore related issues and concerns; future trends and directions; and potential solutions in education and training. The mission was to assist the industry in promoting the appropriate education and training of the existing workforce, and to attract youth and entry level people in an increasingly interconnected and rapidly changing world. The forum provided an opportunity for the participants to explore the challenges and exchange information and ideas. The goal was to address the following issues:

- What are fundamental issues of concern and constraints (institutional, economic, social, technological) in educating, training, and maintaining the existing workforces?
- How can existing methods in education and training be improved, and what are potential solutions?
- What are the impacts of regional, economic and demographic trends?
- What are future national and global trends and needs?
- What are recommendations, actions, and suggestions for future study?

Given the complexity and diversity of the industry, the forum focused on educating and training methods to keep the existing workforce current and to attract young people to the industry. This forum focused on two general groups: professionals (e.g., design, construction, facility management) and trades people (e.g., building trades, operation and maintenance personnel). The following matrix illustrates the four major focus areas of the forum.

| Group | Existing Workforces | Young and Entry Level People |
|--|--|---|
| Professionals: - Design - Construction - Facility Management - Others | 1. How to educate and maintain professionals for the industry. | 2. How to attract young and entry level people to the industry to become professionals. |
| Trades people: - Building Trades - Operation/Maintenance - Others | 3. How to educate, train, maintain, and retain trades people. | 4. How to attract young people to the trades. |

The issues of training, educating, and maintaining workforces for the Architecture/Engineering/Construction industry are closely related to each other. The main purpose of training and educating professionals or trades people and introducing young people to the A/E/C industries is: to attract workforces to the industry and to maintain them. A fundamental problem with attracting and maintaining workforces is the industry's image. The 1999 edition of *Jobs Rated Almanac*, which ranks the 250 best and worst jobs (based on factors such as salary, stress, security and physical demand), rates 14 construction trades near the bottom. A recent trend was "dot com" fever where people were becoming millionaires overnight. However, the construction industry does not have that same image. What can our industry do to create that kind of glamour and excitement about building and construction projects?

BACKGROUND

Until the recent economic downturn, a booming U.S. economy brought unprecedented prosperity and created the tightest labor market in 40 years. Employers were struggling to attract and retain qualified workers. There is a need for partnership between education and the building and construction industry to train, educate, and maintain the workforce. Bureau of Labor Statistics' figures show that the growth in the labor force through 2008 will come from workers age 45 and over. Current efforts to meet growing demands for highly skilled workers have focused primarily on raising the quota limits for H-1B visas to permit increased hiring of skilled foreign workers.

The National Center for Construction Education and Research has reported "sixty-five percent of the contractors responding to its third annual survey in 1997 detailed shortages in one or more crafts."

According to *Engineering News Record* (May 24, 1999), nothing seems to frustrate construction industry executives more than the challenge of finding and keeping their workers. With work booming in many sectors, shortages and turnover are already evident and competition for the best and brightest at all levels is fierce. "Generation X" is bypassing the industry for others with better benefits and more "sex appeal" and evidently more must be done earlier to find and groom potential professionals and executives. Changing the construction industry's traditional image as a dirty, low-tech, grunt-oriented career path is critical. The industry is not known for flexibility or transition between different crafts. The industry loses people dissatisfied with the business because of the absence of mentoring or lack of training. As a profession, we do not take time to mentor our people. The industry must be more aggressive in recruiting future talent, reaching out to nontraditional groups and gearing outreach efforts to younger audiences. There have been few efforts focused on minorities and women in inner cities to give them industry exposure. Taking the construction message to younger audiences is critical. The industry's perennial image is projected as low-tech and dirty, and its inability to project the excitement and challenge that would attract the next generation of employees is clearly evident. Many of our managers are not in tune with young people today. This workforce is a very different generation growing up. Their expectations are different. We have to be able to give the young people a feeling of ownership in the business.

Industry Efforts in Education and Training

The American Institute of Architects (AIA) addresses education and training through mentoring and internships among young professionals. There is an online forum called "italk" available at the internet site http://www.e-architect.com/career/idp/idp_forum.htm to discuss issues of interest to interns and those involved with internship programs. AIA's Internship Development Program (IDP) provides a framework for the productive application of a mentor/apprentice relationship that the AIA considers an integral part of the process by which new architects are trained.

The Association of General Contractors (AGC) of America supports recruiting, training and retraining workers at all levels. Attracting the brightest and best in the workforce is regarded as critical. AGC develops the resources required to meet these workforce challenges. An endeavor called "Online Institute" enables a student or professional to take construction management courses anywhere, at any time, and is available at <http://agc.advanceonline.com/index.htm>. At the AGC web site, there is information about the "BuildUp" elementary school program, AGC's Supervisory Training Program (STP), the Online Institute, student chapters, university programs, scholarships, and occupational briefs. By providing research grants to university departments, recognizing college educators, and sponsoring a student essay contest, the AGC Foundation supports a wide array of industry education programs.

The National Society of Professional Engineers (NSPE) reports that women are severely underrepresented in the engineering profession. Their research indicates that girls and young women lose interest in subjects and the fields of study leading to engineering careers long before they enter college. Their goal is to have some 100 organizations mobilize as many women in engineering as possible - a target of 10,000 - who, along with their male colleagues, will reach one million girls. "Introduce a Girl to Engineering Day" culminates on February 22, during National Engineers Week, and will become part of the annual Engineers Week campaign for NSPE.

The American Society of Civil Engineers (ASCE) realizes the need to attract underrepresented people into the field of engineering. The ASCE Committee on Career Guidance (CCG) solicits proposals from those institutions of higher learning interested in hosting a summer engineering institute targeted toward high school students from underrepresented segments of society.

The Association of Builders and Contractors (ABC) supports education and training using their Education & Workforce Development division to enhance workforce recruitment, education and training efforts in the construction industry

through program development, information dissemination, fund-raising, professional development of training staff and building a strong chapter delivery system. The School to Work (STW) program is based on the concept that education for all students can be made more relevant if it is useful to future careers and to lifelong learning. Rather than receiving mere textbook learning, students learn by applying their lessons to real life and real work situations. Successful School to Work programs are developed with the input of business, education, parents, and community-based organizations such as ABC.

The Construction Specifications Institute (CSI) is helping students to bridge the gap from school to professionalism by using a concept called the Academic Affairs Task Team. This team has developed resources to help students, instructors and administrators understand CSI's role in the construction community and the resources available from the Institute. CSI also has a growing enrollment of student members who actively participate in their parent chapters' programs. With the growth of student members, many CSI's Student Affiliates are being formed into undergraduate student societies on campus.

The Civil Engineers Institute in the United Kingdom addresses education in the form of training. Thomas Telford Training provides training services for construction professionals. These include public courses held throughout the UK, in-house courses tailored to customers' needs and distance learning packages that enable trainees to study at home. There are many resources in place for recruitment and training through continuing education, professional development programs and on-line training courses.

The Institute for Research and Construction in Canada's primary goal is to focus on research and does not deal with training to any great extent. There is however a link to information about new industry technology that is on the web site. The Institute transfers new information to users through contracts, a national newsletter (the "Construction Innovation" available at <http://www.nrc.ca/irc/newsletter/toc.html>), technical publications, seminars, and the Internet, with the assistance of industry associations, technology centers, the Canada Institute for Scientific and Technical Information (CISTI), and NRC's Industrial Research Assistance Program (IRAP).

The National Association of Home Builders focuses on training with its Home Builders Institute. This Institute is the NAHB's educational arm, and develops and administers a wide range of educational and job training programs. The NAHB seeks to serve the A/E/C industry with many vital services including construction trades training, job placement services, continuing education for builders,

superintendents, and foremen, apprenticeship programs, instructional design, and student chapters.

The Project Management Institute (PMI) focuses on training and education of project managers through the PMI Educational Foundation. PMI establishes project management standards, provides seminars, educational programs and professional certification that more and more organizations desire for their project leaders. PMI hopes to expand the annual college/university student scholarship and award programs; identify other programs to aid college/university professors and students; and advance project management awareness and skills among secondary students and educators using its foundation.

The Women Contractors Association focuses on education and training through role models and leadership. Their goals include: educating outsiders about the successful role of women in this industry; and creating strong role models, mentors, and leaders.

What remains unknown is the magnitude of these efforts relative to the need. There may be holes that need to be filled when you examine the Architecture/Engineering/Construction as a whole. While seasoned professionals can speculate on the need, it is the population of entry level people in A/E/C fields that need to be surveyed. A survey could be sent to these entry level people some time period after the completion of some of the mentioned education programs to determine the efficacy of the training.

Special Meeting of the National Center for Construction Education and Research

On September 7, 2000, in Atlanta, Georgia, a special meeting of the National Center for Construction Education and Research (NCCER) convened on training, educating, and maintaining workforces. This meeting was a by-invitation-only workshop organized to analyze, discuss and challenge the leaders of the construction industry on matters of recruiting and retaining a work force. Presenters included several of the nation's leading contractors who participated in a panel discussion describing best practices in recruiting and retaining their workforce. A second panel of young craft workers also discussed and shared work experiences and gave their opinions of the strengths and weaknesses of the industry.

In addition to the meeting, NCCER conducted a survey concerning the image of the construction industry. The analysis of the survey reflected that 76 percent of those asked felt that the industry had an image problem and 71 percent suggested that there was a need for a coordinated industry-wide image campaign. Survey participants

also ranked three areas of importance to them concerning the industry. The areas in need of improvement for a successful image were: compensation and benefits, career paths, and training.

The survey respondents also suggested that national associations and contractors should take a lead role in coordinating and/or implementing a national industry image campaign.

FORUM 2000 RECOMMENDATIONS

1. One of the major problems in the education and training of professionals and trades people in the A/E/C industry is that the industry is so fragmented and localized. In some instances the industry has a short-term view of education and training for professionals and trades people. The forum supported the above-mentioned initiatives and saw a need for greater collaboration among these efforts.

2. Forum participants concurred that the industry's image was also identified as one of the major concerns in attracting youth and workforces. To improve the industry's overall poor image, it was recommended that more national forums be held to gather industry leaders and representatives to further discuss training and education issues. To improve the industry's image, there is a need to give new graduates a clear concept of career path in the industry, provide better than average wages and benefits, and offer information about entrepreneurial opportunities.

3. It was recommended that the A/E/C industry seek to attract workforces and youth to the industry by emphasizing: competitive wages, accessibility of entrepreneurial opportunities, job satisfaction, work outside of an office, opportunities to travel, practicality of things learned, immediate earning potential – no college debt, and that workers can make as much or more as those with Master's degrees with only high-tech training/degree.

4. The construction trades are rated near the bottom in career choices, so there is a need to better define the construction industry as a career option for youth. This can begin by better informing and guiding high school counselors and investigating the current trend towards information technology and other high tech areas to make the industry more attractive. Counselors should stress the importance of technical knowledge, computer literacy, as well as strong English and writing skills. The forum participants recommended that education and training include such critical subjects as: 1) team work, 2) open-ended problem solving ability, 3) better

communication skills and ethics, and 4) encouraging and requiring co-ops and internships in the education curriculum.

5. The Forum 2000 participants recommended that the industry and universities be aware of the following trends and their impact on the industry: 1) Dot com and IPO fever will attract more students toward high-tech industries; e-commerce will be prevalent in all business areas; 2) The industry will be more involved with international businesses so education and training should prepare students for international practice; 3) More under-represented groups will become part of the workforce; education and training of workforces should prepare them for a career; 4) Reduction in university budget allocations to the A/E/C area will have a negative impact on the industry; 5) Increasing number of international students in the U.S.A. higher education system will have a significant impact on the industry; and 6) Research issues important to the future – making virtual teams work, construction supply chain performance, modularization, pre-fabrication.

6. It was stressed that the following recommendations be carefully studied, and a strategic plan for their implementation be developed: 1) revise the curriculum for the education of A/E/C professionals, 2) re-assess education and establish a strong partnership between industry and education institutes, 3) improve the industry's image, 4) encourage interdisciplinary education to parallel the industry, 5) create an environment to attract qualified faculty to universities, 6) establish mentoring programs, 7) establish new accreditation approaches, 8) increase retention among A/E/C students and reduce graduation time, 9) review salary structure – which is currently inconsistent with the level of effort, and 10) lower the barriers for industry/university partnerships.

The Forum encourages initiatives such as the New York statewide pre-apprenticeship program which was created through a New York Department of Transportation (DOT) grant. The purpose of the program is to identify and train at-risk students who are not planning to go to college, but interested in the construction industry. All women and minority students can apply to this program. There are only 25-35 students in each of 8 programs across the state, in addition to a coordinator who monitors the students' progress. The program requires parental involvement, and students must attend weekly workshops and participate in several summer construction projects. Approximately one-third of students go on to college, one-third go into apprentice programs, and one-third go to work. The forum encouraged that education institutes develop a strong partnership with sources such as DOT that could provide financial support.

Forum 2000 Specific Recommendations

- Integrate professional A/E/C societies to generate synergism for developing effective education and training programs.
- Encourage universities to investigate innovative techniques such as internet, videos, and CDs for distance learning and continuing education of professionals and trades.
- Increase the number of professional educational opportunities.
- Increase university support of K-12 and high-tech educational construction programs.
- Study the impact of professional certification upon graduation.
- To be successful in the future, the key will be to lead and clearly understand all aspects of a project fully. A/E/C industry must come to the table as partners.
- Give special attention to the next generation of constructors, which most likely will come from inner-city workforces.
- Monitor the level of trades people that are trained versus those who leave the industry (in vs. out). The critical question is: As the supply pool diminishes, does the demand for these jobs rise?
- Monitor the profile of students who are entering the industry.
- Study the impact of the economy on the industry's education needs and trends. While it appears that there is less need for education and training during better economic times, the industry must support education regardless of the vagaries of the economy.
- Be aware of the fact that while unemployment is low and labor hard to find, there are groups of African Americans who are very under-employed.
- The 21st century will be different from the 20th century. Technology will play a key role, and partnerships between labor and management will become the norm.

- The difference between the 21st century workforce and 20th century workforce is that there will be more women and minorities in the industry. We should study the training and education needs of these groups and provide remedial help and scholarships.
- Creative ads and marketing nationally is very expensive. It was recommended that we should establish a strong partnership with firms such as Home Depot to attract funding for large advertising campaigns. We need to have nontraditional approaches to improve the industry's image. One way might be to attract Hollywood's attention to develop a television program or movie about the industry.
- The industry should consider training and education a long-term strategy versus short-term benefits.
- The industry professionals should work closely with universities and training centers to ensure that education and training are suitable, up-to-date, and an integral part of the curriculum.

Engineering Concerns

- Associate degree and technical degree – will they lead to careers? Academic advising is critical and plays a major role if a student elects to transfer to a four-year college or university.
- Many junior colleges and community colleges aspire to have four-year programs.
- Enrollment in engineering is down.
- Participation of underrepresented groups – more women in engineering, except in the case of civil engineering.

Architectural Concerns

- The focus of good programs is design, rather than...?
- When students move into the field, salaries are very low.
- Where do students learn skills like HVAC sketching and working drawings?

Educational Process

- Provide a better freshman experience.
- Adding team-work, open-ended problems, ethics and communications at an early level.
- Institute and/or intensify peer mentors.
- Offer more co-op and internship opportunities.

Industry/Academic Interface

- Requires institutional organization of A/E/C professionals within the American research university that do not compete with other high-tech areas. Professional curriculum should be a mix of substantive skills, management, research and hands-on experience.
- Funding from industry is critical.

Georgia Tech Building Construction Student Survey (not a Forum 2000 survey)

- More "performance oriented" hands-on experience.
- More full-time professors.
- Increased interaction between design and construction students.
- Increased number of site visits.
- A field "certification" upon graduation.

THE BUILDING FUTURES COUNCIL PRIORITY SURVEY

The Buildings Futures Council Committee decided that the recommendations generated during the 2000 Forum should be carefully studied and analyzed in order to produce a prioritized list.

To assist the committee in developing the priorities of the general membership, a survey for the BFC members was designed and disseminated. The survey utilized a list of the recommendations reported in the "Forum 2000 Summary Report" and devised a ratings scale of one to five. This survey was then sent to the Building Futures Council membership. A preliminary analysis of this survey was reported at the Fall 2001 meeting of the BFC in San Francisco. A more detailed analysis follows.

The survey consisted of twenty-five statements that the survey recipients were to rate according to whether they felt the statement should be implemented by the BFC. They were to rate the statements on a scale of 1 to 5. The results were then

tabulated to determine which statements were of the highest importance to the BFC members

The tabulated results were in two forms, the average score the statement received and the percentage of four or five ratings the statement received. The average rating of all the statements on the survey was 3.59. There were four questions that had an average rating above 4.0, while only three statements received an average rating below 3.0. Therefore, nineteen of the statements averaged a rating between 3.0 and 4.0. None of the statements on the survey received an average rating below 2.5. The lowest average rating was 2.77; while the highest rated statement had an average of 4.32. Four of the twenty-five statements were rated above 4.0. This is interpreted as the BFC body believes that these statements are to be of the highest priority.

Based upon an analysis of this survey, the following are considered the priorities of the BFC membership with regard to Training and Education initiatives: improve the industry's image, lower the barriers for industry/university partnerships and offer co-op and internship opportunities. To a lesser extent the issue of establishing a strong partnership between industry and educational institutions is also important to the membership. It would seem that those steps deemed to be achievable and within the control of the organization rated as high priorities with scores that represented a high level of agreement.

COMMITTEE RECOMMENDATIONS FOR FURTHER ACTION

Based on the recommendations from Forum 2000 and the opinion of the members as exhibited in the BFC Survey, there are several avenues for the Education and Training Committee to take. It is interesting to note that the BFC survey of its members agrees with the NCCER survey in one important respect. The A/E/C industry has a major challenge with its image. However, what has not been addressed is that the image problem may be two-fold: a dearth of public relations as well as dissatisfaction with entry-level job descriptions and duties. Efforts to ameliorate the industry's image must be coupled with efforts to improve the quality of the work environment for recent graduates and other entry-level personnel.