

Jointly Sponsored Training Systems In American Industries

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Introduction

This paper examines recent developments in credentialing in jointly sponsored training and qualifications systems across the United States. This paper builds on previous work on building trades joint apprenticeship and training programs, which describes their structure and activities and documents their superior performance over programs unilaterally operated by employers (Glover and Bilginsoy 2005, Glover 2007). Jointly sponsored training programs are not common in the U.S., but strong programs are found in the building trades where they serve important roles in preparing and qualifying the skilled craft workers.

Most of the joint training programs in the building trades follow a similar pattern of organization and activities. At the national level, a sector-focused national partnership bringing together labor and management coordinates and governs the overall industrial or craft training system. This is embodied in a separate joint institution that is distinct from both management and labor organizations, the national Joint Apprenticeship and Training Committee. The committee's functions include developing and maintaining current standards of the knowledge, skills and abilities needed for the covered occupations. They develop curriculum and produce instructional materials. They provide training and certification for trainers in local JATC programs through national joint training centers and training institutes. They interface or partner with universities, other research organizations and equipment /materials manufacturers that are developing the next generations of workplace technologies. They negotiate college credit arrangements for apprentices, journeymen and instructors in their training programs. They contract for research for use in developing curriculum, etc. They administer pilot projects to test and demonstrate innovative training approaches. They organize industry training seminars and conferences, review the quality and consistency of the training and certification provided by local training partnerships and maintain current information with the US Department of Labor.

At the level of the individual work place, and sometimes on a statewide or regional basis, a local JATC carries out workforce training, typically at a joint training center funded through the collective bargaining agreements by negotiated contributions for each hour worked by covered employees. The negotiated contribution to joint training funds is based on cents per hour worked in the industry. Local JATCs assure that their trainers are kept current on new industry technologies and work techniques by sending them to the national JATC's national training center and/or training program. Trainers are typically recruited from among the best craft workers in the area, with additional training provided to build their skills as trainers and course developers. Local JATCs coordinate closely with employer and customer needs as dictated by the particular circumstances of their local labor market, geography, climate, equipment, etc. They provide training for new entrants into the industry (typically, but not exclusively, relatively young workers) as

well as continuing training opportunities to update and expand the skills of experienced workers who have already reached the journeyman level. They work with community groups and educational institutions to recruit new entrants into their craft or industry, often coordinating with broader efforts of the national JATC to promote industry recruitment and image building.

Some leading examples of joint training systems in the building trades are found in electrical work, in plumbing and pipefitting, and in the masonry trades. This paper profiles training and certification in these three crafts, giving special attention to significant developments in credentialing practices.

Recent Changes in Skill Certification Procedures

Traditionally in apprenticeships, testing has been embedded in courses taken in the related classroom portion of training and supervisors have rated performance on the job. If apprentices passed the tests in related training courses and if supervisors judged performance of apprentices on the job as acceptable, apprentices were advanced to the next level. The only certification needed to work as a journeyman was a union journeyman card.

Skill certification procedures are changing, motivated by several factors. Primarily, the new skill certification procedures are required by end-users and by insurance companies. Owners of major industrial construction projects, such as Exxon-Mobil, have begun requiring that all craft workers on their worksites be certified under common standards. Similarly, architect and designers may require skill certification on selected projects. Some government agencies, such as the U.S. Department of Transportation or the Nuclear Regulatory Commission, require documentation of skill certification. In addition, as a condition of their warranties, manufacturers have begun to require that workers with appropriate skill certifications install their products.

The Meaning of Skill Certification

Certification is a voluntary credential that is obtained by an individual that recognizes a significant mastery of knowledge, skills and abilities in a defined job-related area. Certification of a profession refers to a generally voluntary process in which the certifying organization formally grants recognition to those who meet certain predetermined standards or qualifications. Skill certification needs to be distinguished from other forms of credentials, which include the following:

Licenses – only governments can offer a license credential

Degrees – schools, universities and other educational institutions offer degrees

Certificates or certificates of completion—usually attendance at a specific program, seminar, or defined course of study enables an individual to earn a certificate that recognizes participation or completion

Skill certification usually includes written and performance examinations to assess the candidates' qualifications. The written examination assesses the candidate's knowledge whereas the performance tests the proficiency in applying knowledge to tasks in hands-on demonstrations. Skill certification offers the public protection because practitioners have to meet standards or qualifications and pass an exam, and they do so voluntarily. Developing a certification is a complex and time-consuming process and requires a strong administrative organization in order to maintain its quality. Over a thousand certification programs exist in the U.S., qualifying professionals from crane operators to energy efficiency experts, from financial planners to automobile technicians.

Voluntary certification programs can accomplish four important goals:

- (1) They offer a signal of competence to employers;
- (2) They provide a measure of protection to the public by giving them a credential for judging the competency of practitioners;
- (3) They provide practitioners with a way to distinguish themselves from their competition and improve their recognition and status; and
- (4) By potentially improving quality, they improve the public perception of the given occupation, helping increase the industry's prominence.

Also, there are several sources of workers, including former military personnel through the "Helmets to Hardhats" program, workers recruited into unions in organizing campaigns, immigrant workers. Employers and unions need to understand what Knowledge, Skills and Abilities (KSAs) these workers have when they apply. What are they missing? The best way to find out is to create craft assessment and certification procedures.

Electrical Work

A prime example of recent dramatic changes in credentialing can be found in the electrical trades, which has one of the most highly regarded apprenticeship and training systems in the nation. In 1941, the National Electrical Contractors Association (NECA) and the International Brotherhood of Electrical Workers (IBEW) created the National Joint Apprenticeship and Training Committee (NJATC or National JATC). The mission of the National Joint Apprenticeship and Training Committee is "to develop and standardize training to educate the members of the International Brotherhood of Electrical Workers and the National Electrical Contractors Association, insuring and providing the Electrical Construction Industry with the most highly trained and highly skilled workforce possible." (<http://www.njatc.org/about.aspx>)

The National JATC divides electrical work into four occupations:

Outside Linemen are the electrical workers who install the distribution and transmission lines that move electricity from the power plants to factories, businesses and homes.

Inside Wiremen are electrical workers who install the power, lighting, controls, and other electrical equipment in commercial and industrial buildings.

Residential Wiremen are electrical workers who specialize in installing the electrical systems in homes and apartments.

Telecommunications Installer-Technician installs networks of low voltage cabling used for voice, data, and video (VDV) or other low voltage signaling.

These four types of electrical work share common skills and knowledge but also have skills and knowledge that are particular to the occupation. Thus they each have a different apprenticeship program.

New Approaches to Skill Certification in Electrical Work

In January 2007, the National JATC announced implementation of a new approach to craft certification involving written and performance assessments of apprentices at the end of each year of apprenticeship, along with a comprehensive craft assessment at the completion of apprenticeship. Since Inside Wireman is typically a five-year apprenticeship, the new craft certification involves five sets of written and performance assessments given annually, plus a final comprehensive assessment. Individuals passing these assessments are eligible to receive certification documents, including a wallet card with a photo ID.

Craft certification is required of all apprentices. Whether existing journeymen need to take the assessments or are “grandfathered” in is left to the discretion of local programs. However, to work on some major industrial projects, owners may require all journeymen on the site to have taken and passed the assessments.

In addition to craft certification, as Michael Callanan, executive director of National JATC explained: “Our apprenticeship and training programs aim to offer as many useful certifications as possible. Certifications are useful to the extent that they are meaningful to our customers.”¹ Especially notable examples are specialty certifications in instrumentation and in cable splicing.

Instrumentation – The certification is jointly used by the electrical trades (IBEW) and the pipefitting trades (UA) under the oversight of the Electric Power Research Institute (EPRI), a non-profit center for public interest energy and environmental research. EPRI members represent over 90 percent of the electricity generated and distributed in the United States. Successful candidates are posted to the National JATC’s website and are listed with EPRI for use by prospective employers and utilities requiring preemployment knowledge assessment in the field of instrumentation.

¹ Personal interview with Michael I Callanan, Executive Director, National Joint Apprenticeship and Training Committee for the Electrical Industry, November 14, 2008.

Cable splicing – Certification for cable splicing is conducted by the National Cable Splicing Certification Board (NCSCB), an independent, non-profit organization formed in 2004 with representatives from utilities, contractors, manufacturer, organizations, cable splicers, and others. The NCSCB was set up to establish, maintain, and administer certification and recertification programs for practitioners who demonstrate knowledge, skills, and abilities in the field of cable splicing and terminating. NCSCB includes representatives from IBEW, NECA, National JATC and Independent Electrical Contractors, as well as from several utilities and construction companies. To be eligible to take the cable splicing exam, a candidate must have a minimum of two years of related field experience in electrical shielded power cable splicing.

Note the pattern here: in both instrumentation and in cable splicing, skill certification is conducted in conjunction with an organization that has industrywide credibility and is geared to standards that represent the consensus of stakeholders in the industry.

Another example from the electrical industry is use of the certification programs of the International Municipal Signal Association (IMSA), which offers certifications for maintenance and installation and inspection of *traffic signals* and *roadway lighting*, among other functions. The IMSA dates traces its roots back to 1896 when a group of municipal signal men from several east coast cities began meeting. The organization is “dedicated to providing quality certification programs for the safe installation, operation and maintenance of public safety systems” (<http://www.imsasafety.org/index.html>). It is the oldest organization of its kind in the world and has evolved to become the main international association in the industry. ISMA began certifying individuals in various public safety activities in 1982 through offering exams and review courses. Although its certification procedures do not include performance testing, it requires five years of work experience in the specialty to be eligible to take an examination and ISMA requires re-certification every three years. The U.S. Department of Transportation plays a role in requiring these certifications.

IMSA and the National Institute for Certification in Engineering Technologies (NICET) offer examinations and certifications related to the installation and operation of *fire alarm systems*. This certification does not involve performance testing, but does require a verified work history that includes technician-level experience and positive third-party evaluations of job performance.

Requirements for such specialty certifications challenge journeymen into taking classes to expand and upgrade their skills to be able to work and advance in the specialty.

In its Installer Technician apprenticeship program, the National JATC trains to industry standards established by Telecommunications Industry Association/Electronics Industry Alliance (TIA/EIA) and others. More than 60 organizations including manufacturers, end-users, and consultants contributed to the development of these standards. The Electronic Industries Alliance (EIA) was established in 1924 and was originally known as the Radio Manufacturers Association (RMA). Since then, the EIA has evolved into an organization that represents a wide variety of electronics manufactures in the United

States and abroad; these manufactures make products for a wide range of markets. The EIA is organized along specific product and market lines that allow each EIA sector to be responsive to its specific needs. These sectors include components, consumer electronics, electronic information, industrial electronics, government, and telecommunications.

The National JATC also partners with the major manufacturers in the video, voice and data industries to assure that electrical workers are trained in the latest technologies, including training required to validate manufacturers' performance guarantees and product warranties.

The National JATC has made a conscious effort to develop and foster training partnerships with related organizations, including equipment manufacturers. As of November 2008, National JATC had 110 training partners who, depending on the level of their contribution, are recognized as platinum, gold, silver or bronze partners at an annual banquet. The aim of these partnerships is not to raise monies; rather the objective is to enlist their support on an individual in-kind basis. Some partners provide training on a specialized topic (e.g., associated with the product they manufacture). Some lend their newest equipment or provide consumable supplies for use in training. Others provide tools for new apprentices, or scholarships. Training partners are invited to present at national Webinar training sessions broadcast monthly by the National JATC.

In addition to training and certification for apprentices and journeymen, the National JATC sponsors the National Training Institute (NTI) during every summer at the University of Michigan in Ann Arbor. Through the NTI, training and certification is available for instructors, training directors, local JATC trustees and foreman in the pipe trades. Many National JATC training partners exhibit their latest technologies at the National Training Institute.

Conducting job analysis and ascertaining skill standards, developing curriculum and instructional materials and training instructors are most efficiently accomplished at the national level and shared. The National JATC contracted with the American Institutes for Research to develop a data-based job analysis. Curriculum and instructional materials are reviewed and revised every three years. At the end of 2008, the National JATC was reorganizing the training curriculum for electrical workers into a core-specialty format, consistent with their craft and specialty approach to skill certification.

Joint Training Activities Improve Labor-Management Relations

The experience of the electrical trades demonstrates that training is an arena in which labor and management can work together effectively and build trust in one another.

The National JATC is one of several joint organizations and activities that promotes improved labor-management relations in the electrical industry. Others include the Council on Industrial Relations, a forum for dispute resolution, and the Quality Connection, an initiative of the National Labor-Management Cooperation Committee of

the Electrical Construction Industry. The Committee also co-sponsors a recruiting campaign and website entitled electrifyingcareers.com.

Similar institutions and activities are common in other trades.

Plumbing and Pipefitting

The United Association of Journeymen and Apprentice Plumbers and Pipefitters in the United States and Canada (hereafter referred to as United Association or UA) and employer associations, especially the Mechanical Contractors Association of America (MCAA) and the Plumbing-Heating-Cooling Contractors Association (PHCC), jointly sponsor the training system in the pipe trades, which covers the following four occupations:

Plumbers assemble, install and repair pipes, fittings and fixtures of heating, water and drainage systems according to specifications and plumbing codes. They building plans and working drawings to determine work aids required and sequence of installation. They cuts and threads pipe, using cutters, cutting torch and pipe threading machine.

Pipefitters lay out, fabricate, assemble, install and maintain piping and systems, fixtures and equipment for steam, hot water, heating cooling lubricating sprinkling and industrial processing systems.

Sprinkler Fitters install and maintain fire protection systems.

HVACR (Heating, Ventilation, Air Conditioning and Refrigeration) Service Technician install and maintains heating, air conditioning and refrigeration systems. Assemble and install variety of piping for air, ammonia, gas and water systems. Works on electrical installation and wiring for HVAC equipment, switches and controls. Recovers refrigerant gasses (CFC Certified). Conducts start test and balance air or water systems.

Each occupation has its own apprenticeship and national joint apprenticeship and training committee with equal representation from management and labor.

The United Association training system consists of the Great Lakes Training Center on the Campus of Washtenaw Community College in Ann Arbor, MI and 400 local union training facilities in the United States and Canada. This system designed to:

- Support and enhance existing training programs.
- Train instructors more quickly through the use of specialized onsite classes, Internet-based classes and teleconferencing technology.
- Provide training in specialized certification programs not available at all local unions.
- Provide local unions access to specialized pieces of equipment, enabling them to offer courses right at home that they could not otherwise provide.

- Conduct highly specialized (and expensive) training that may not be feasible to hold at every training site.

As the UA website proclaims “Certification is the wave of the future in piping.” (<http://www.ua.org/training.asp>) To certify journeymen skill levels, the UA has begun a new program called UA STARS, which involves both written and performance assessment. The STAR exam is used as a comprehensive examination at the completion of the five-year apprenticeship.

In addition to craft certification, the United Association offers several specialty certifications related to the piping and HVACR industries, including certifications in various types of welding, backflow prevention, valve repair, refrigerant handling, medical gas installation, industrial rigging, geo thermal, green awareness, and instrumentation. Each of these programs relies on third-party validation to help assure objective evaluation and testing of skills and abilities.

A good example is medical gas installation. Professional training consists of at least 32 hours beyond the five-year apprenticeship. The training is offered by instructors who have completed instructor training and participated in at least an additional 40 hours of specialized training in medical gas installation and brazing. Training is geared to the industrywide standards developed and promulgated by the American Society of Safety Engineers and the National Fire Protection Association. Third-party testing is conducted by the National Inspection, Testing and Certification Corporation (NITC) (<http://www.nationalitc.com/>) to provide outside verification that UA installers have mastered the skills and knowledge necessary to do quality work. NITC is certified under ISO 9000 and accredited by the American National Standards Institute (ANSI).

In 1954, the pipe trades were first to organize training for instructors of apprenticeship, an initiative that has been copied by several other crafts since then. Training and certification for instructors, training directors, local JATC trustees, and foremen are available each summer at Washtenaw Community College in Ann Arbor, Michigan. The instructor certification program, conducted one week each summer over five years, helps assure that pipe trades instructors have the technical expertise to know not only what to teach but how best to teach it. The UA Interactive Online Curriculum, administered by the National Training Fund, enables UA instructors and training coordinators to share instructional resources (http://www.uauniversity.org/teaching_tools/).

Masonry Work

In the masonry trades, the International Union of Bricklayers Allied Craftsmen (BAC) and the Mason Contractors Association (MCA) collaborated in 1970 to form the International Masonry Institute (IMI). The IMI is a labor-management trust to foster improved labor-management relations and to promote the unionized sector of the industry

by addressing three key areas: (1) apprenticeship and training, (2) advertising and promotion, and (3) research and development.

To support apprenticeship and training, the IMI operates a network of regional centers as well as its flagship BAC/IMI John J. Flynn National Training Center, located on 25 acres in Bowie, Maryland, which opened in 2007.

The BAC philosophy of strong initial training and lifelong learning is reflected in the training options available to members through IMI. These include an emphasis on cross training, upgrade training, health and safety training, instructor training and supervisor/foreman training. BAC and IMI promote cross-training in all BAC crafts: brick, tile, terrazzo, marble, stone, Portland cement concrete (PCC), plaster, cement, and refractory work. Upgrade training includes subjects such as flashing, welding, blueprint reading, grout/reinforced masonry, and specialty training in new products. Health and safety for members and instructors includes an array of OSHA courses. The BAC/IMI training system also includes Supervisor Certification Program (SCP) for current and future foremen or supervisors and Instructor Certification Program (ICP) conducted at the Flynn National Training Center. In addition, the IMI sponsors a national contest for apprentices and an annual Masonry Camp at the Center for young architects and masonry craft workers to give them hands-on exposure to each other's professions.

New Products and Systems

One of the most creative aspects of joint training in masonry is IMI's initiative to align training with the introduction and promotion of innovative products in masonry. Several specialty masonry certifications have been developed in conjunction with selected industry partners that manufacture new or promising masonry related products, coatings, and systems. Some examples include the following:

Autoclaved Aerated Concrete Installation and Coatings □ Autoclaved Aerated Concrete (AAC) is a lightweight, precast building material with good thermal insulation properties and low environmental impact in all phases of its life cycle, from processing of raw materials to disposal. The material is new to the U.S. market. IMI trains BAC members in installations and coatings and informs designers and builders. Through research and development, IMI also has designed tools to work with AAC more efficiently.

The makers of ARCOM □ MASTERSPEC™, a system for cast-in-place concrete, recommend optional language requiring American Concrete Institute (ACI) certification for flatwork finishers, technicians and foremen. IMI has several ACI certified trainers available and is well positioned to certify in-house quickly and cost-effectively.

The American Concrete Institute (ACI) is a nonprofit technical and educational society organized in 1904 and is one of the world's leading authorities on concrete technology. ACI is a forum for the discussion of all matters related to concrete and the development of solutions to problems. ACI also has a long-standing tradition for certifying construction craft workers, technicians and inspectors through written and performance

testing. ACI offers numerous programs internationally to certify concrete craftsmen, technicians, supervisors, and inspectors. Benefits of ACI Certification to the individual include receipt of an internationally recognized credential from ACI indicating the individual has demonstrated knowledge and ability. In many cases, certification provides the opportunity to be considered for employment on projects where ACI Certification is required directly or by reference in the project specifications. Benefits of ACI Certification to employers include the ability to easily identify individuals who have demonstrated their knowledge, skills, and ability to pass the ACI Certification examinations and in employing these individuals, the ability to bid on projects requiring ACI-certified personnel, as well as being recognized as a company committed to quality.

Grout & Reinforced Masonry designers are increasingly specifying training and certification in grouting and reinforced masonry, which is provided by IMI.

JAHN stone and terra cotta restoration materials have authorized IMI to offer an exclusive certification program, licensed by U.S. distributor Cathedral Stone Products, Inc. Courses at the Flynn Center also cover restoration practice and theory.

Mapei, manufacturer of a new flowable terrazzo technology, worked with IMI to develop its product and establish specialized training to install it. Mapei's specifications require that only BAC/IMI certified technicians and finishers be allowed to install their product.

Recognition through Arrangements for College Credit

There are two major recent developments regarding credentialing in joint training programs in the building trades: skill certification and arrangements for college credit. Skill certification was discussed in previous sections. This section reviews college credit arrangements.

During the past decade, the practice of accessing college credit has gained considerable momentum so that national initiatives are underway in nearly all of the building trades. The AFL-CIO's George Meany Center established the National Labor College, an accredited, degree-granting postsecondary institution which offers a Bachelor's degree programs in Labor Education and Labor Studies. Several trades, including the plumbers and pipefitters, sheet metal workers, structural steel workers, and the laborers, have negotiated college credit arrangements for their apprentices through the National Labor College in Washington, D.C. The National JATC for the electrical industry has collaborated with Middle Tennessee State University to develop a Bachelor's degree in Construction Management with a specialty in electrical construction. First offered in Fall 2003, the program is designed for students who already have completed 50 transferable semester hours of college credit from an accredited institution. An evaluation of the applicant's work experience and apprenticeship by the college may yield up to 20 additional units of upper division credit. Thirty-three semester hours of courses must be completed at Middle Tennessee State University, many of which can be completed on-

line. Finally the program requires the student to spend one week each summer on campus, participating in presentations, hands-on projects and examinations.

In the approach used in the pipe trades, programs leading to an associate's or a bachelor's college degree are available to any member of the pipe trades union. The UA partners also with three educational institutions to offer its members education degrees, in addition to skill certifications. In collaboration with UA training, Ferris State University and the National Labor College both offer a bachelors degree and Washtenaw Community College offers an associate's degree. Successfully passing the UA STAR assessment provides 32 college credits toward these degrees.

The focus on college credit for apprentices has stimulated interest among apprenticeship instructors to obtain college credentials. Most states require instructors teaching courses for college credit to have a degree at least at the level that they are teaching. Often instructor training is also combined with college credit. In the pipe trades, completion of an apprenticeship along with the 200 hours of instruction in the Instructor Training summer program over five summers earns an instructor 45 units of college credit at Washtenaw Community College which is three-quarters of the way to an Associate degree in Industrial Training. Individuals who wish to go further can enter the bachelor's degree programs at Ferris State University or the National Labor College.

Four new aspects characterize this vitalized interest in college credit by joint apprenticeship and sponsors: (1) the credit arrangements are negotiated nationally in addition to arrangements made by individual local apprenticeship programs on college-by-college basis; (2) some course offerings are available on-line through the Internet; (3) the new efforts go beyond associate's (two-year) degrees, making available to apprentices, journeymen and instructors a variety of college degrees, including bachelor's (four-year), and master's (postgraduate) degrees in technical and non-technical majors; and (4) opportunities to earn college credentials are being organized for apprentice instructors as well as for apprentices.

Apprenticeship sponsors often provide discounts on tuition, scholarships, and other forms of subsidies. These arrangements, together with the built-in "earning while learning" feature of apprenticeship, make postsecondary education more affordable and accessible to craft workers and technicians.

Augmenting apprenticeship with college learning and educational credentials benefits individual workers as well as the industry as a whole. College degrees provide apprentices and instructors with additional recognition for their learning and access to opportunities to move ahead in their careers, including being promoted into supervisory responsibilities. Individual learners benefit because they are not forced to choose between an occupational or educational track; they can accumulate academic credentials as they progress up industry career ladders. At the same time, college credit adds status to the trades, which can facilitate recruitment of new applicants to industry. For the nation, this practice is also beneficial because it fosters a more seamless education and training system.

Conclusions

The joint training programs profiled in this paper are labor-management partnerships organized nationally and locally in a network to train highly skilled technicians and craft workers to improve competitiveness and serve customer needs. Through negotiated collective bargaining agreements, these training systems have the benefit of reliable sources of funding – both locally and at the national level – to establish and improve their training and skill certification systems. The identification of skill standards, development of instructional materials and curriculum, instructor development, and assessments aligned with the jobs and the training are all functions that are efficiently undertaken at the national level to promote quality and support local programs. Local programs train new hires and incumbent workers, sharing best practices with fellow programs in other localities.

One of the features of apprenticeship and training systems that has been a recent focus of improvements is assessment and certification. The combination of practical and theoretical learning that apprentices gain in classrooms and on the job assignments is increasingly verified by certification procedures that include both written and performance assessments. The written examination is designed to assess the candidate's knowledge. It may be administered in written form, by computer or even orally. A computer-based exam can be administered on line corrected nationally with local test proctors. Performance exams demonstrate hands-on proficiency—proving that the candidates can apply what they know. Judges of performance assessments need to be trained to help assure consistency in judging performance (inter-rater reliability). For example, the National JATC in the electrical industry all judges of performance exams to first must take a 12-hour training program.

Certifications are available for crafts as well as for specialty skills. The assessments are formal and generally conducted and/or monitored and verified by an independent competent organization with credibility across the industry. A personnel directory (database) of certified individuals is maintained, available to employers for verification. Expanded opportunities for college credit have also been arranged for apprentices and their instructors.

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