

Construction Industry Institute

An Assessment of Education and Training Needs Among Construction Personnel

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Special Publication 14-2

April 1992



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TOPICS

The purpose of the publication is to make available to industry the results of research conducted by the Construction Industry Institute (CII). The publication does not necessarily represent the views of CII member companies, but is offered as a contribution to the industry.

CII was founded in 1983 to improve the cost effectiveness of the nation's largest industry. The members who represent a broad cross-section of owners and contractors, believe that many of the problems that limit cost effectiveness are common ones, and that real improvements can be best accomplished in a cooperative environment with the benefits being shared by the construction industry at large.

CII uses the acronym TOPICS to describe the research effort. TOPICS signifies the six research thrust areas: Technology, Organization, People, Information, Controls and Sigma (meaning others). The task forces for each area are listed below:

Technology

- Advanced Technological Systems
- Computer Integrated Design & Construction
- Constructability
- Electronic Data Management
- EPC Flexibility
- Environmental Remediation Technology
- Modularization
- Technology
- Technology Strategy
- Technology Survey

Organization

- Constructability Implementation
- Management of Project Changes
- Partnering
- Project Organization
- Project Team Building
- Project Team Risk/Reward Allocation

People

- Americans with Disability
- Construction Work Force
- Drug-Free Workplace
- Education and Training
- Employee Effectiveness
- Safety
- Zero Accidents

Information

- CICE Impact Evaluation
- Industry Data & Statistics
- International Construction
- International Standards
- Model Plant
- Owner Engineering Organization
- Project Management Assessment Survey

Controls

- ASCE Quality Manual
- Change Order Impacts
- Contracting, Phase II
- Contracts
- Cost/Schedule Controls
- Design
- Dispute Prevention and Resolution
- Materials Management
- Overtime
- Overtime, Phase II
- Productivity Measurements
- Quality Management
- Quality Performance Measurement
- Total Quality Management

Sigma

- Construction 2000
- Insurance
- Piping Function
- Retrofit Projects
- U.S. Navy Demonstration Project
- Workers Compensation

An Assessment of Education and Training Needs Among Construction Personnel

*Prepared by the
Education and Training Task Force*

Construction Industry Institute

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April 1992*

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The University of Texas at Austin.

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Executive Summary

The mission of the Construction Industry Institute is "to improve the total quality and cost effectiveness of the construction industry through research and implementation for the purpose of providing a competitive advantage to U.S. business in the global marketplace." Human resources are the most valuable aspect of any effort to upgrade productivity and quality control. Therefore, to attain the goal of more and better construction for the money, it is necessary to upgrade the supply and preparedness of human operatives at all levels. To undertake such an ambitious project, the CII Education and Training Task Force first brought its own experience and knowledge to the issue, then reviewed The Business Roundtable Construction Industry Cost Effectiveness (CICE) studies plus the work of several experts, governmental agencies, institutions, associations and companies. The investigative effort culminated in the task force's conducting a national assessment survey to obtain the views of many other parties active in the construction industry.

The national study was conducted using a special matrix instrument designed to compare a list of 10 skill/traits to 11 position/functions in the construction performance hierarchy, from senior executive to subjourneyman. The survey was sent to several segments of the construction industry, constructors, owners, academics and design professionals (in order of number of respondents) with the dual objectives of:

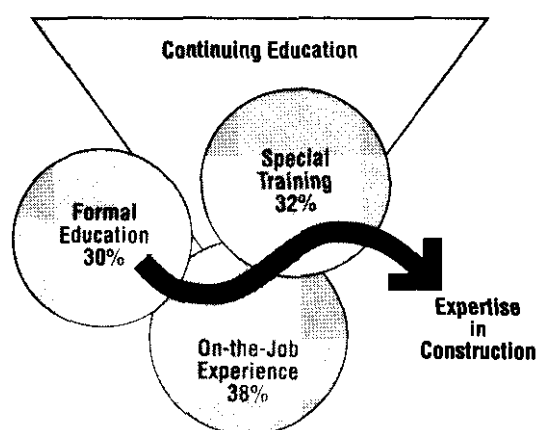
1. Determining broad perceptions of the current state of construction education and training.
2. Gaining observations on how requisite skills and traits should be acquired to perform well in the various positions in the construction industry.

The responses produced a comprehensive set of views representative of the industry. Several hypotheses were supported, others received new

light. Widely held perceptions of the respondents are that current education and training at all levels are not adequate to meet the needs of the construction industry, and that the problem is particularly acute in view of the anticipated emergence of more complex technologies. It also became clear that:

1. Education and training are viewed as a continuum over a career.
2. Formal education (see Figure 1) provides approximately 30 percent of the preparation needed to perform in a career, thus it should concentrate on fundamental knowledge and skill development in communications and problem solving.
3. Beyond formal education, a combination of special training and on-the-job experience should provide the other 70 percent of career preparation through ongoing individual improvement and adaptation to the changing needs of the industry and of the society at large. Continuing education is lifelong.

Figure 1 Components of Expertise in Construction



Values of three modes of learning, from "Acquisition of Skills and Traits Among Construction Personnel," CII Education and Training Task Force, 1990.

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The task force drew inferences from the study and other investigations which led to the following key recommendations:

1. Critical review is needed of all formal education, from primary/secondary (which prepares personnel to function in all occupations) to college programs that prepare management personnel for construction.
2. In regard to primary/secondary education, representatives of the construction industry should join other entities at the local, state and national levels to help improve this vital link in the chain.
3. Contractors and owners should make it clear to educators that construction needs well educated people, not high school dropouts; that construction is not just “grunt” work, but needs craft and technical people who can continue learning in a complex industry while enjoying rewarding careers.
4. Construction, particularly the trades, should become more rewarding in terms of prestige, steady employment, ongoing careers and remuneration, including benefits.
5. Equal attention should be paid to retention as well as recruitment to offset the “30-year-old” exiting syndrome (whereby personnel tend to leave the industry when reaching the age of 30).
6. Craft training requires serious improvement in both technical and communication skills. Cooperation is needed among public institutions, contractor associations, owner councils, unions and the workers themselves.
7. Special attention should be given to recruitment, training, orientation and incentives for foremen and trade superintendents. Regular

curricula should be developed at the two-year college level in which leadership, communication, problem solving and personnel relations are emphasized for supervisory candidates.

8. While college level education is ample in quantity to produce the needed managers, support personnel and supervisors, the quality of that education requires ongoing attention. Constructors should become involved by serving on college advisory councils and accreditation boards and by serving as resources such as guest lecturers, jobsite tour hosts, career day organizers and internship employers.
9. Continuing education in construction needs to be upgraded through the efforts of academic institutions, contractor associations and owner (user) councils.
10. Individual companies should become more organized in their employee development and career planning programs.
11. The many association-based and entrepreneurial training programs which have sprung up in the past two decades should be encouraged, but some form of quality control is recommended.
12. If construction will indeed be increasingly dependent on a less qualified labor force, then special training linked to on-the-job experience becomes even more critical.

A path forward and blueprint for action should include both a short-term strategy and a long-term strategy. The highest immediate priority is craft training, followed by attraction of youth to construction careers, improvement of jobsite supervisory personnel and expansion of management training beyond college. The long-

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term strategy involves improvement of primary/secondary education including vocational training, review of two- and four-year college curricula and emphasis on unified continuing education programs. Retention is as important as recruitment. A positive relationship exists among training, rewards and career development. The task force feels that improved training will lead to improved rewards and longer construction careers.

Continuing education centers are proposed, involving colleges and universities along with contractor associations and local user councils. Such centers will engage several levels of education and training depending on local needs.

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The task force accepted the charge to determine the education and training requirements to meet the needs of the construction industry in the 1990s and beyond. The scope of the effort includes addressing the effectiveness of existing programs, types of training, worker certification, attractiveness of construction as a career, management development, and responsibility for funding the necessary improvements. Important definitions are:

- *Education* is the broad upgrading of the individual, involving the arts and sciences, reasoning, ethics, and communications necessary to determine one's role and function in society and in the world. Education is based in formal institutions, but extends into everyday life. It is the basis of continued growth and development.
- *Training* is applied education relevant to performance in particular areas of endeavor. Training may be based in institutions, but contains components which are best rendered in special settings or on the job.
- *Development* is the ongoing process of honing one's knowledge and skills in the face of new challenges in an ever changing environment.

It is clear that education is a lifetime continuum, and also that construction education, training and development are as fragmented as the industry itself.

Since construction activity directly contributes 10 percent of the total economy of the nation and undergirds much of the other 90 percent, its success is critical to the future of the United States. Also, since construction, like many other businesses, is now truly internationalized, the competition is more fierce than ever. In any competitive field, from business to sports, people make the difference—the levels of education, training, development, motivation

and performance of those people are the keys to success. Thus the focus is how best to improve this most valuable resource.

The first several months of activity by the task force were spent examining existing conditions through review of research studies and reports on labor supply, training methods, extent of training, supervisory improvement programs and collegiate level construction education. Visits were made to training centers, construction association headquarters, union offices and university campuses. The task force conducted three seminars employing both members and outside experts. The results of these efforts established a basis for a research direction:

1. Education and training are not keeping pace with the changing environment of construction.
2. A shortage of skilled trades is already present in some regions and will get worse through the 1990s. This is partly due to demographics; there will be fewer overall job entrants in the United States each year until the latter 1990s.
3. Construction work generally is viewed as being less attractive than it was a generation ago, thus there will be fewer recruits to construction and they probably will be less qualified than in previous times.
4. Construction frequently is viewed as interim work, that is, something to do while trying to find one's life's work. Many workers depart construction before they become truly skilled and highly productive.
5. The make-up of the construction work force will change, with a greater representation of women and minorities, but with immigrants remaining an important component. Supervision and management must respond to these directions.

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6. With the decline of labor unions, the traditional apprenticeship training programs have reduced impact on craft training.
 7. Contractor associations, construction companies, equipment manufacturers and private entrepreneurs are seeking to fill the void in craft training. The quality and extent of this training is quite varied and is difficult to measure.
 8. Only the largest construction companies are doing in-house training, due to the high cost and risk of losing trained craftsmen to other contractors.
 9. The belief once held that vocational schools would supply a steady stream of tradesmen has not materialized. Most construction-oriented vocational education has a strong bent toward residential work and does not adequately address changing technology.
 10. A relatively new phenomenon is project training agreements between owners and contractors wherein owners provide funds to be used directly toward training for specific projects.
 11. Similar area-wide agreements between owners groups and contractors have established training trusts to carry on continuing education in particular geographical areas. These trusts typically employ existing curricula approved by the Bureau of Apprenticeship and Training of the U.S. Department of Labor.
 12. Another growing area of concern is the quality of supervision. Experienced jobsite foremen and superintendents are leaving the industry more rapidly than they can be replaced by qualified younger persons.
 13. Supervisory training programs are underway by associations, contractors and a few colleges, but the effort is not extensive enough to fill the needs.
 14. In certain skill areas such as heavy equipment operation, product manufacturers are providing short, intensive training, while entrepreneurs are selling training at simulated jobsites. The former are generally well implemented but limited in extent; the latter are quite varied in quality.
 15. Regarding management education, a proliferation of college construction programs exists, most less than 20 years old. The characteristics, curricula and quality are uneven. Of the more than 160 undergraduate programs, about 40 percent exist in colleges of engineering, and the others are in architecture, technology, business and even agriculture.
 16. The two accrediting bodies for collegiate construction programs are the Accreditation Board for Engineering and Technology (ABET), which accredits engineering based programs and some technology based programs, and the American Council for Construction Education (ACCE), which accredits construction and construction management programs. Little dialogue exists between the two bodies.
 17. Many construction and owner companies, particularly large ones, maintain active management training programs to prepare graduates from various colleges to perform to their companies' requirements.
 18. Engineering graduates are generally preferred by owner companies and large construction companies, while graduates from non-engineering construction programs are preferred by mid-sized and smaller companies.

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19. Engineering based programs usually are more academically rigorous than non-engineering programs, but have fewer construction courses than the technology and management programs. Large contractors are willing to take the time and expense to provide applied construction and management training. Smaller companies want graduates who are immediately job ready.
 20. Graduate education in construction management is predominantly set in colleges of engineering. However, of the new graduate programs in construction, evolving at the rate of about one per year, many are in such colleges as architecture, business and technology. Approximately 75 graduate programs in construction now exist, with about half of those offering Ph.D's as well as Master's degrees. The Ph.D's are almost exclusively engineering degrees with construction options or emphases.
 21. At least 300 two-year colleges offer some type of construction education. These are quite varied in content and quality, ranging from supervisory preparation to feeders for four-year colleges. They tend to be locally or regionally oriented.

In summary, the task force has found a plethora of education and training activity. The key question becomes: With all of the opportunities, why is construction education and training still judged to be inadequate? The following chapters will attempt to answer this question.

Baseline Data

Numerous studies have been conducted on the condition of the construction work force in the United States, with important implications for education and training. The U.S. Bureau of Labor Statistics and the Census Bureau issue periodic reports on industry volume and population. Some comparative macro numbers (rounded) for two recent years are shown in Table 1 below.

The 1990 figures were taken for May, then annualized. In fact, the construction recession began about that time. All such figures are somewhat crude, using statistical models and census data, mixed with direct reporting, but they are the most comprehensive available. Organizations such as F.W. Dodge, Turner Construction Company and CII publish volume and cost reports. CII published an article with the \$495 billion figure, citing under-reporting

by the Census Bureau in industrial construction and maintenance and repairs.

The difficulty in measurement is based on what is included, such as residential remodeling and industrial maintenance. For instance, residential improvements are included, but repairs are not, and the dividing line is unclear. As the CII article points out, the same situation occurs in tabulating industrial work. In any case, construction volume has been relatively flat over the three-year period shown, the increase in dollar volume being inflation rather than more work, despite the increase in employment. For comparison, F.W. Dodge reports a high volume mark in August 1989 and steady decline until early 1991.

Regarding the construction work force, the differences in the two sets of data are based on collection and reporting methods used by the Bureau of Labor Statistics (BLS). The household

Table 1 Macro Statistics

	1987	1990
Total U.S. employment (mid-yr. statistics annualized)	112.4 million	117 million
Average unemployment rate	6.5%	5.2%
Construction work force (BLS household survey)	7.456 million	7.69 million
Construction employment (BLS firm survey + est. "other" employment)	5.4 million	5.65 million
Construction volume (Dept. Commerce)	410 billion	450 billion
Construction volume (CII) (Compiled from various sources)	495 billion	

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survey includes all persons who are reported as being construction workers regardless of whether they are actively employed, in the private or public sectors, farm or non-farm, skilled or unskilled. The utility of the numbers is to give an estimate of the potential construction work force at any given time. BLS also does a firm survey, which indicates the number of positions reported or estimated by construction companies. It excludes the governmental and farm work force (unless someone who lives on a farm works for a construction company). The “firm” numbers listed above include an “extra” estimate for government employees in construction plus those working in facilities management, for example. The 1987 BLS figure is 4.96 million in the firm survey. The task force estimated an additional 440,000 in government and facilities management, to equal 5.4 million. The 1990 figure is 5.2 million plus 450,000, which equals 5.65 million. All of this illustrates the difficulty in finding accurate figures. Additional estimates are made later in this chapter.

The Construction Labor Research Council (CLRC) tracks construction employment in the country as a whole plus particular states. Extracts from various CLRC reports include some of the data listed below. These items are taken from various years in the 1980s and do not reflect the recessionary influences present at the time of this writing. The intent is to give a profile of construction employment conditions in the 1980s.

1. The base construction work force has traditionally been 5 percent of the total national work force, with periodic fluctuations up and down.
2. The projected needs of the 1990s indicate that 5.8 percent of the total national work force will be required to staff construction-when the recession concludes.

3. The size of the 18-24 age component of the U.S. labor pool is declining from 27.9 million in 1985 to 24.3 million in 1995.
4. A total of 240,000 new construction workers are needed annually through the 1990s, for both replacements and expanded work force.
5. Since light residential work makes up approximately 40 percent of total construction volume in a typical year, it supplies a proportionate number of jobs. Also, since residential work is the most volatile component, it experiences the largest swing in employment.
6. Union membership among all construction workers (including residential) is estimated at 25 percent in 1990, compared to 32 percent estimated in 1981 (Not all union card carriers are necessarily working in unionized construction).
7. Some key statistics for the 1980s:

a. Annual average craft hours	1650
b. Average years with one employer	4
c. Working regular daytime shift	97%
d. Receiving overtime pay	16%
e. Absence rates	4%
8. There is a measurable exodus from construction work beginning at about age 30 as workers turn to other types of work for a variety of reasons (see Figure 2).
9. Up to 10 percent of all workers who list themselves in construction trades are actual

ly working in other industries (such as manufacturing), government and institutions; in facilities management as carpenters, pipefitters, and so forth—both as employees of these industries and as employees of construction companies performing maintenance contracts. These positions provide essentially full annual employment at approximately 2000 hours per year. Direct employees of manufacturers and institutions usually have better benefits than do regular construction workers.

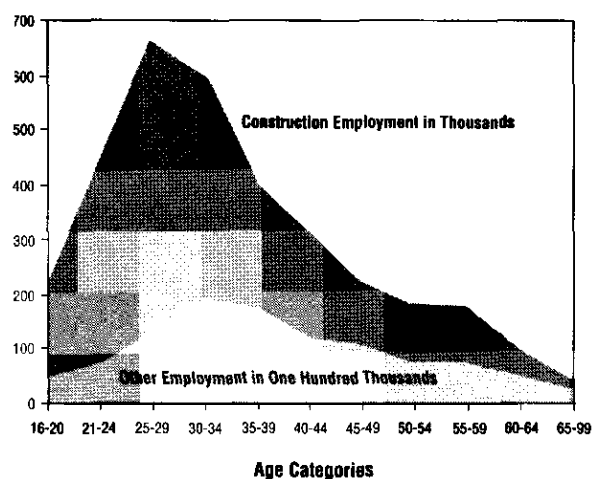
10. Unions are aggressively pursuing maintenance contracts under their National Maintenance Agreement and The Associated Maintenance Contractors General Presidents' Agreement, which together claim two billion dollars in current annual contracts at over 150 companies, typically large manufacturers, processors and power companies. Some open shop companies have similar maintenance contracts.

The following assumptions are drawn from the various foregoing statistics:

1. The two million person discrepancy in Bureau of Labor statistics between firm survey and household survey is explained in part by construction unemployment, farm and government persons who consider themselves to be construction workers, facilities management personnel and job-hoppers who tend toward short-term employment. The firm survey concerns positions, and more than one person may occupy a position in a year's time.
2. The "hard core" construction work force, that is, those who consider themselves regular construction workers and, in fact, are thusly employed, is about 5.25 million. Up

to 1.5 million more can be drawn into construction during boom times, but they are typically short-term or interim workers, many of them being in residential work. The "nominal" construction work force, that is, average overall employment including those in contract work, major remodeling, government and facilities management, and including labor, supervision, support and management, is approximately 6.0 million.

Figure 2 Construction Employment Curves (1988)



Source: Construction Labor Research Foundation

3. Pure demographics suggest that there will be an inadequate "hard core" of construction workers if the economy is strong in the 1990s, and if construction continues under present methodologies.
4. As construction employment goes up, overall productivity goes down (gross volume over gross employment) due to interim workers being poorly trained, inexperienced and less motivated.
5. Regular 2000 hour-per-year jobs are attractive to most of the work force, thus attract-

ing the best trained people to such jobs in related industries or in maintenance contracts.

6. Construction workers are generally more job mobile than are workers in other sectors. However, they are less geographically mobile than a generation ago, due to working spouses, less economic incentive, and a greater willingness to switch to other occupations.
7. Union influence in worker representation, recruitment and training experienced a significant decline between 1970 and 1990, but the decline has leveled out and unions continue to be an important factor in the training equation.
8. The economic incentives of construction work are not as persuasive as they once were. Since 1975, construction wages over all have not kept up with income in other segments of the economy, nor have they kept pace with inflation. Construction pay will be an important issue in the '90s, as simple supply vs. demand will drive up wages. (There are exceptions, such as union rates in New York City and San Francisco, which are well above market.)

Subdivision of the Work Force

Obviously there are different education and training needs for different segments of the work force. The first dichotomy is between residential and non-residential. Then the four broad hierarchical categories are management, support, supervision and labor. Labor is further subdivided by crafts and unskilled. Using a nominal total work force of 6.0 million, the approximate breakdowns are shown in Table 2. (These are all estimates from the information available.)

The breakdown in Table 2 indicates where training emphasis may be placed. There is no

Table 2 Breakdown of Construction Work Force

Residential (non-institutional, light, low rise)	2.3 million
Non-residential (including commercial, industrial, heavy, and "commercial residential")	3.7 million

Focusing just on the non-residential (including those working in facilities management):

Management (executives)	100,000
Support (technical, estimating, sales, accounting, etc.)	160,000
Supervision (foremen and superintendents)	340,000
Labor (skilled and unskilled)	3.1 million

Non-residential labor breakdowns including trainees and foremen, union and non-union:

	1990	Annual needs
Bricklayers and stone masons	110,000	3,000
Carpenters	720,000	25,000
Concrete masons and terrazzo workers	90,000	5,000
Iron workers	90,000	5,000
Millwrights	25,000	2,000
Drywall workers	65,000	4,000
Electricians	520,000	13,000
Floorlayers	60,000	3,000
Glaziers	40,000	2,000
Insulation workers	40,000	3,000
Painters and paperhangers	250,000	5,000
Plasterers and lathers	25,000	1,000
Plumbers and pipefitters	400,000	6,000
Roofers	100,000	6,000
Sheetmetal workers	80,000	5,000
Tilessetters	30,000	2,000
Operating engineers	90,000	8,000
Laborers & helpers	500,000	42,000
Miscellaneous	65,000	3,000
T o t a l	3,300,000	143,000

(Figures include non-residential craftsmen, foremen and trainees)

Based on data from the U.S. Department of Labor, AGC, Construction Labor Research Council, and State of Ohio.

Table 3 Rank Order of Occupations by Desirability

1. Actuary	241. Pro football player
2. Computer programmer	242. Cowboy
3. Computer systems analyst	243. Lumberjack
4. Mathematician	244. Roustabout
5. Statistician	245. Dairy farmer
6. Hospital administrator	246. Seaman
7. Industrial engineer	247. Roofer
8. Physicist	248. Construction worker
9. Astronomer	249. Fisherman
10. Paralegal	250. Migrant farmworker

Source: *Jobs Rated Almanac*, 1988

union/open shop division, but as indicated before, approximately 25 percent of the labor force is functioning as union workers (with a small segment on the residential side).

Attractiveness of Construction Careers

In the 1988 *Jobs Rated Almanac*, 250 occupations were evaluated based on criteria including working conditions, opportunities for growth, stress pay, etc. The top 10 and lowest 10 positions are shown in Table 3.

The listings in Table 3 are somewhat subjective, but some inferences are possible. The highly rated occupations are clean, orderly, steady, conducted in controlled environments and require good mental skills. The lower rated jobs are the historic “manly” occupations requiring strength, endurance and various levels of manual skills. Unless these positions are highly remunerative, as with pro football players, their attractiveness will be limited to the adventurous and those who wish to avoid education or true career preparation. This indicates an obvious problem for the construction industry. (Several special construction trades were listed, with HVAC mechanic being the highest rated at number 161.)

The objective of the Construction Industry

Workforce Foundation (CIWF) is to determine how to attract more candidates and how to improve construction craft skills, qualitatively and quantitatively. The CIWF commissioned a study on perceptions of youth regarding construction in 1990. It identified the dichotomy in young people’s views between the concepts of “construction” as an industry and “construction worker” as an occupation. Construction was seen as making important contributions to society by creating shelter, business, roads and jobs, but the construction worker was seen as being associated with dirt, sweat, obscenities, loafing and low prestige. For non-college bound youth, careers in the military or law enforcement are respectable while working in construction is merely a paycheck.

According to the CIWF study, young people believe that:

1. Construction work is boring and lacking opportunities for advancement.
2. Employment is unstable.
3. Workers are expendable.
4. Construction historically excludes minorities and women.

The report states: “While the precise age at which a person decides on a career is quite varied, the pre-teen and teen years are full of both external and internal influences: family, friends, experiences, self-knowledge, etc. High school career counseling seems to have little influence on individual decisions.” As the individual decision becomes more critical in late teens, construction as a career is seldom effectively “dangled” in front of a young job seeker. Other competing careers, including the military, are presented in much more attractive ways.

The net result is that relatively few young people make a conscious choice to enter construction trades as a career. Many will opt for construction work when few other choices remain. (Contact: the Construction Industry

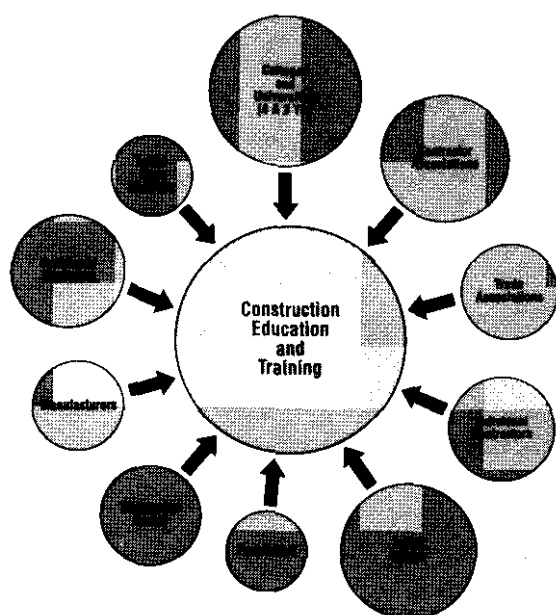
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remain. (Contact: the Construction Industry Workforce Foundation, P.O. Box 57131, Washington, D.C. 20037)

These studies are substantiated by occupational statistics which show jobs in communications, finance, retailing and the overall service sector growing much more rapidly than are jobs in either construction or manufacturing. The implications are that both construction and manufacturing are receiving the least well prepared job entrants, who thus require the most training, including the basic skills which the public education system should be providing. Whereas manufacturing companies are frequently financially able to supply such training, most construction companies cannot; profit margins simply do not allow such.

Apprenticeship and Training (BAT) of the U.S. Department of Labor. The typical complement of trade curricula was 14, matching the number of prominent trade jurisdictions. The operations were, by U.S. law, jointly operated by labor and management. Funding was by a wage check-off system agreed upon through collective bargaining. The money was actually coming from project owners through the regular payments to contractors, then into the joint fund via a mandatory percentage of payroll.

Figure 3 Sources of Construction Education and Training



A joint board with equal representatives of labor and management established policy, retained program directors and provided essential guidance. Class hours were regulated overall by BAT, with local boards having a good degree of autonomy in the actual operations. It was a fundamentally good model for craft training; in fact, it remains so and continues to function in most parts of the country, but at a lesser level.

Bureau of Apprenticeship and Training

The Bureau of Apprenticeship and Training was established by the U.S. Congress in 1937 to set standards for the already well entrenched system. It works with state apprenticeship councils (27) and through field offices in analyzing needs, enforcing U.S. law, providing veterans assistance, and issuing technical advice. It currently oversees programs with 360,000 apprentices, about half of whom are in construction, in both union affiliated programs and open shop programs (see Figure 4).

With this strong history and governmental support, what then were the problems? Why did union apprenticeship programs not continue to prosper? Some of the reasons are:

1. The programs were never all inclusive, that is, not all craftsmen were required to go through the four or five years of preparation to become a journeyman.

Historical Role of Labor Unions

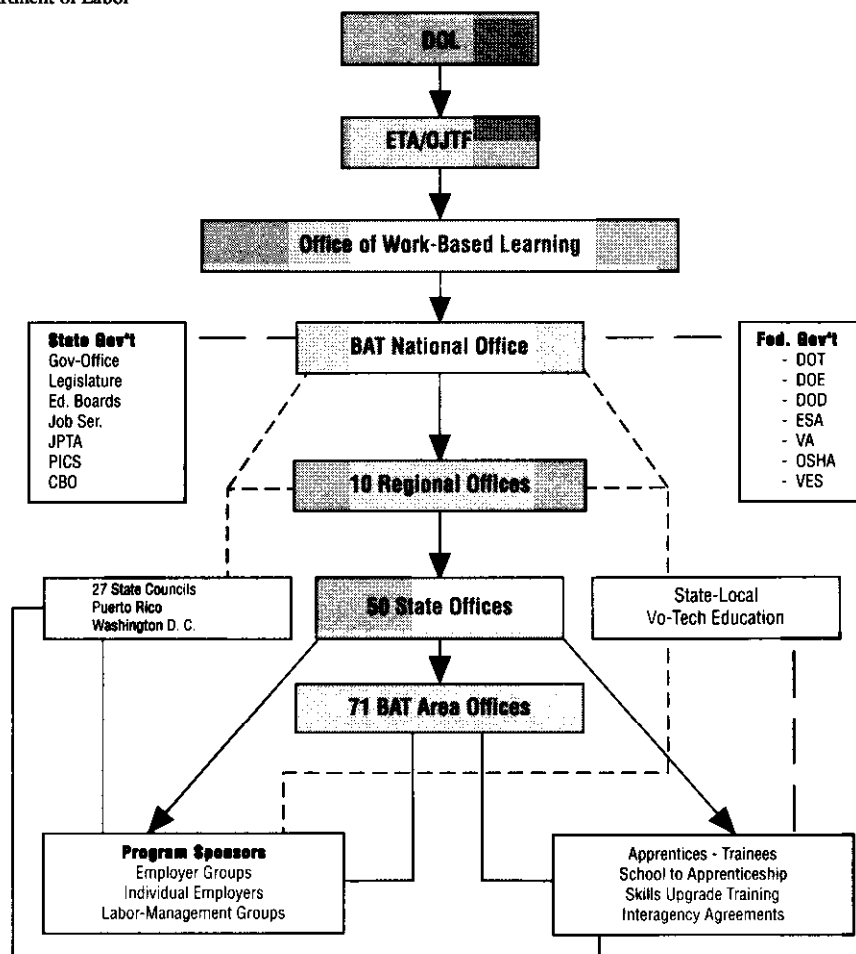
The term "apprenticeship training" historically is closely linked to construction trade unions. The perception is held that during most of the Twentieth Century, all nonresidential tradesmen came up through established training programs of four or five years' duration. Then upon successfully completing the apprenticeship training, the tradesmen became journeymen mechanics with the accompanying status and wages.

This perception is largely true. Until the mid-1970s, union apprenticeship programs were the main source of skilled construction tradesmen. Every metropolitan area in the United States had programs approved by the Bureau of

2. A mechanic with some level of skill might be hired "off the street" as a journeyman without ever becoming an apprentice. In some locals as many as half of all journeymen had not been apprentices. Local marketplace conditions tended to dictate the practices as well as unions' quest of more dues-paying members.
3. The quality of programs was uneven due to different local objectives, training directors and screening mechanisms. Thus journeyman mechanics were widely varying in skill and productivity while drawing similar wages.
4. Unions tended to dominate the joint boards as management partially abdicated responsibility. In most cases, the unions tended to invest more energies in the whole operation, from screening to instruction, than did contractors. Thus issues such as quality control, productivity and cost effectiveness received inadequate emphasis, while job protection and jurisdiction were given inordinate emphasis.
5. Discriminatory screening was practiced in some areas. Many union locals were overly selective in their processes, effectively blocking entrance to minorities, women and others who did not meet particular guidelines.

Figure 4 Organizational Chart, Apprenticeship and Training

Source: U.S. Department of Labor



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6. Sizes of apprenticeship classes were limited in some cases. This was to avoid “flooding” certain trades, but, in fact, it caused inadequate supplies of mechanics during busy construction periods, which in turn contributed to overtime and pressures for wage increases.

The union joint apprenticeship programs declined in the same environment in which the unions themselves were forced into retreat from dominance in the construction marketplace. During the 1970s and 1980s, there was a broad advance of the open-shop movement, based on cost differentials, more liberal work rules and an inadequate supply of union trained mechanics. More contractors refused to sign exclusive collective bargaining agreements, thus education funds declined. At the conclusion of the 1980s, the decline had leveled out. Unions were pursuing market share more aggressively, becoming more flexible in work rules and revamping training programs to provide highly skilled mechanics. Currently about 150,000 nonresidential trainees are in union joint apprenticeship programs, according to BAT. However, this is only about 25 percent of all nonresidential construction workers with less than four years of construction, i.e., the key training years. (For discussion of market recovery and work rules, see “Construction Industry Collective Bargaining in the 1980s” by the National Construction Employers Council and the Building & Construction Trades Department, AFL-CIO)

Training by the Residential Sector

Light residential construction is not a priority interest of CII, but it is difficult to ignore 40 percent of the construction marketplace. And, it does have impact on the commercial/industrial/heavy sector in many ways, including leading the construction cycle. New housing leads to schools, shops, roads, product manufacture and so forth. Also, many workers are attracted to

construction via homebuilding and then progress to heavier construction with or without additional training. Most construction employment statistics do not distinguish between residential and commercial construction, but based on its size and labor intensive-ness, residential is easily the single largest sector of construction employment, probably close to the 40 percent volume number. However, residential is also the most volatile, with wild swings of employment as the residential marketplace is particularly subject to economic influences such as interest rates.

Regarding training, there is limited formal job preparation related to residential construction, but there is an abundance of informal on-the-job training. Home building remains relatively “low-tech,” so there are no full apprenticeship programs as understood in the commercial construction sector. However, thousands of youths learn basic job skills at the elbow of experienced craftsmen, and the skills are passed on from generation to generation.

Organizationally, home building is implemented by a countless number of small specialty contractors who work as subcontractors to builders, who are primarily brokers between these specialty contractors and the buying public. The specialty contractors are typically small, poorly capitalized companies, frequently bound with family ties, many of which float in and out of the market, and few of which do any formal training. This environment is almost totally non-union except in the older heavily unionized cities of the Northeast and Upper Midwest. Union craftsmen will sometimes take non-union residential employment, but “with their cards in their shoes.”

The National Association of Home Builders (NAHB), a powerful organization of 100,000 members, has made valiant efforts toward training, with appreciable success. Soon after World War II, educational programming began with a handful of seminars and workshops. Gradual

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growth led to the establishment of the Home Builders Institute (HBI) in 1983, which now offers a wide variety of pre-apprentice entry-level programs, apprenticeship training, continuing education and certification programs to thousands of trainees and practitioners. To date, HBI has trained 125,000 young men and women for careers in the construction trades.

One commendable program of HBI, which deserves review by the commercial segment of the industry, is conducting programs at Job Corps Centers. The U.S. Congress established the Job Corps in 1964 as one of the "Great Society" programs. Administered by the Department of Labor, it has had a checkered career at best. However, the Homebuilders in 1974 began training programs at the centers, which have been moderately successful. Currently HBI provides training to more than 6,000 young men and women in 11 trades at Job Corps centers nationwide in cooperation with BAT. Total candidates trained to date number 50,000. The programs are one to two years in length depending on the learning curves of the youths.

The significance of the Job Corps effort is that work force forecasts indicate that all of construction will need to attract workers from previously untapped sources, including those candidates with weak work histories. These are precisely the people HBI is training in Job Corps centers.

All of the HBI training programs are of relatively short duration, one to two years, compared to traditional commercial apprenticeship programs. This is justified by the lower complexity of homebuilding and the strong tradition of on-the-job training. The NAHB also works with vocational schools in local areas in guiding programs toward producing graduates for construction careers.

Additionally, HBI has established the Graduate Builders Institute to allow established practitioners to pursue "Master Builder" status

through a series of professional level courses offered in several parts of the country. (The HBI contact is Frederick N. Humphreys, Vice President for Training of the Home Builders Institute, 15th & M, N.W., Washington, D.C. 20005, 202/822-0494)

Training by Contractor Associations

As union influence has declined in the past two decades, many contractor associations have responded with their own training programs. The Associated General Contractors (AGC) "Blueprint for Training," inaugurated in 1974, and showing gradual growth since, incorporates learning modules in competency-based training, at the pre-apprentice level, designed to allow students to progress at their own speeds. Instruction was originally designed and tested in conjunction with the Oklahoma State Department of Vocational and Technical Education. The intent is to link the program to as many vocational training centers as possible across the United States. Currently curricula are in use for 12 trades. Instructional packages consist of highly programmatic manuals and videotapes based on the learning modules, each having a competency test. The packages are aimed at use by local AGC components in conjunction with vocational schools or labor groups.

Additionally, AGC has taken on craftworker certification in carpentry and masonry, wherein workers with at least two years of verifiable experience or two years of vocational education plus one year of work experience may take written tests for a series of ratings up to a master level. Testing is done locally with national tests. Certification is voluntary. (Contact is AGC Manpower & Training Services, 1957 E St. N.W., Washington, D.C. 20006, 202/393-2040)

The Associated Builders and Contractors, Inc. (ABC) has developed "Wheels of Learning," a modular program distinctly designed to serve the open shop arena. With the growth of open shop since 1970, training has