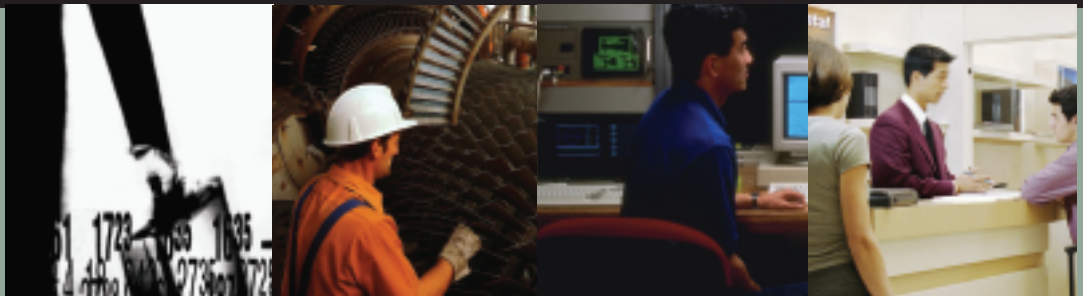


Ready for the Job:

Understanding Occupational and Skill Demand in New Jersey's Construction Industry

A Report of the New Jersey State Employment and Training Commission



Prepared by the
John J. Heldrich Center for Workforce Development at Rutgers University

With the Assistance of the Workforce Investment Boards of
Bergen, Cumberland/Salem, Hudson, Mercer and Passaic Counties,
and Cumberland County College, Mercer County Community College, and William Paterson University

James E. McGreevey, Governor

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Preface and Acknowledgements

The *Ready for the Job* project was developed by the New Jersey State Employment and Training Commission (SETC) with the New Jersey Departments of Labor and Education. The project was directed by Henry Plotkin, Executive Director of the SETC, and was funded by the New Jersey Department of Education. The research was conducted by the John J. Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey, with assistance from the local Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer, and Passaic Counties and from researchers at William Paterson University, Cumberland County College, and Mercer County Community College.

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Project Summary

Economic prosperity for New Jersey, its citizens and its businesses depends on a well-trained workforce. This joint effort of the New Jersey State Employment and Training Commission, the New Jersey Department of Education, and the New Jersey Department of Labor is designed to collect up to date information from employers on the skill needs of eight key industries in the state. The eight industries that are the focus of this effort are: health care, finance/insurance, construction, utilities/infrastructure, manufacturing, tourism/hospitality, transportation/logistics, and information technology.

The entire effort, led by the local Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer, and Passaic Counties and guided by Industry Advisory Groups, involved over thirty focus groups and eighty interviews with employers and educators. The Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey, with assistance from researchers from William Paterson University, Cumberland County College, and Mercer County Community College, conducted this research to identify the skills, knowledge, and educational requirements of approximately eighty select occupations and eleven job groups. The Heldrich Center and its research partners also identified the key trends in each industry that affect skill requirements and identified strategies for meeting the key workforce challenges of each industry.

The information collected through this effort will be disseminated through this series of reports and through an Internet website (www.njnextstop.org) that will include a searchable database of each profiled occupation. This information will assist a variety of users. Students and job seekers can use this information to make decisions about education and careers. Educational and training institutions can use this information to develop courses and programs of study that will provide individuals with necessary skills. Policy makers at the state level can use this information to ensure that government resources are invested in programs and efforts that will benefit individuals and businesses.

Understanding Occupational and Skill Demand in New Jersey's Construction Industry

Executive Summary

The construction industry in New Jersey is an integral part of the state's economy, employing over 160,000 individuals.

Nationally and in New Jersey, the construction industry is thriving, injecting billions of dollars in economic activity into the state. While recent economic uncertainty may result in some decreased private demand for construction work, this possible lag will be more than offset by current public investment, including the New Jersey School Construction Program, which has been valued at \$8.6 billion over the next ten years. Employment prospects in the construction industry have been characterized in the Bureau of Labor Statistics' Career Guide as "excellent."

Jobs in the construction industry are changing with an influx of new technology and new building materials, necessitating that workers possess more technical expertise than in the past. At the same time, workers must possess strong math, teamwork, occupational safety, and workplace readiness skills to succeed in the industry. However, employers bemoan the severe lack of many of these skills in new workers and job seekers, and cite the lack of workplace readiness and basic literacy and math skills as a major factor contributing to the significant gap between the need for and the availability of skilled, qualified workers.

This report, based on focus groups and interviews that include twenty-three separate employers, summarizes the skill, knowledge, and educational requirements of key construction occupations and identifies strategies for meeting the key workforce challenges facing the industry.¹

Skill Requirements of Selected Job Groups

Ten occupations selected for this study by our Industry Advisory Group largely fall into three "job groups" that share a common set of core competencies, basic educational requirements, and skill sets. While within each job group the level of skill mastery required varies, the occupations within the job group share a common continuum of competencies and tasks. In a dynamic and fluid economy, the definitions and requirements of occupations change often and can vary from one employer to another. The grouping of occupations into job groups minimizes the effect of these differences.

Our analysis of demand occupations in the construction industry finds three main occupational groups: analytical work, labor and skilled trades, and management/supervision.



Analytical Work

The Analytical Work job group includes occupations such as cost estimators, who must understand the nature of the construction business and a particular job or site to estimate the cost of materials and personnel required to complete the work. Estimators compile and analyze data on all the factors that can influence costs—materials, labor, location, and special

machinery requirements, including computer hardware and software. Job duties vary depending on the type and size of the project. Jobs in this job group are not “hands on” occupations, but they do require that a worker have the ability to effectively understand and quantify the resource, labor, and time demands necessary for completing a construction job.

Occupations: Cost Estimators

Core Competencies

Apply knowledge of financial, math, statistics, and technology systems concepts routinely and accurately.

Demonstrate understanding of the various components of a system, project layout, or business practices and an ability to quantify those components in terms of time, resources and labor.

Communicate goals and resource needs effectively with various types of project partners.

Develop and implement effective solutions to address problems identified.

Use technology effectively to complete tasks. Demonstrate capabilities in using specialized software.

Sample Skills

Problem Solving and Critical Thinking

Mathematics

Systems Evaluation

Reading Comprehension

Interdisciplinary Knowledge

Writing

Communication

Organization

Labor and Skilled Trades

The Labor and Skilled Trades job group includes both highly skilled and entry level workers who perform the “hands on” building, repairing, installing, and controlling of equipment and materials at a construction job or site. Mastery and precise application of a range of tools and materials is necessary to

succeed in this job group, particularly as new tools and materials are introduced to the industry. In addition, the ability to understand and apply technology to construction work is critical, as the work becomes more technologically complex.

Occupations: Electricians, Carpenters, Ironworkers, Masons, Equipment Operators, Construction Laborers, Plumbers and Pipe fitters

Core Competencies

Precise application of tools and materials.

Effective application of math concepts relevant to construction.

Understanding of and adherence to safety precautions.

Knowledge and effective application of technology relevant to construction.

Ability to think critically and solve problems encountered on the work site.

Ability to work as a team with multiple occupational sectors on a work site.

Sample Skills

Mathematics

Problem solving and critical thinking

Equipment selection and maintenance

Operation and control

Installation and repairing

Reading comprehension

Management/Supervision

The Management/Supervision job group includes construction managers and on-site or first line supervisors. As a rule, Management/Supervision workers are not wielding the shovels, drills and other equipment and materials present on a job site. However, they must have the ability to effectively manage those who do, to make judgments and decisions regarding the

most efficient, cost effective, and safe way to complete tasks and to coordinate the many people and units present on a job or site. "Construction managers can make or break a job," explains one employer. "And both managers and supervisors need to be able to communicate with every worker on the job site and keep track of what every unit is doing, every day."

Occupations: Construction Managers, On-site or First-line Supervisors

Core Competencies

Use effective judgment and decision making to allocate resources and personnel to meet project budget and deadline.

Communicate and coordinate the efforts of multiple project partners, vendors, and workers to share common organizational goals.

Understand and adhere to safety precautions with consistency.

Provide technical leadership across projects/disciplines.

Sample Skills

Problem solving and critical thinking

Entrepreneurship and business skills

Coordination

Communication and teamwork

Monitoring

Time management

Management of personnel resources

Key Workforce Challenges

The construction industry in New Jersey is facing two primary workforce challenges:

Challenge 1: Attracting and Recruiting Workers

Major construction projects in New Jersey and the surrounding area, including the state's multi-billion dollar school construction initiative and the Lower Manhattan reconstruction project, are increasing the demand for workers. Traditionally, the construction industry workforce is predominantly male, limiting the pool of labor. At the same time, many students and job seekers today are unaware of or disinterested in career opportunities in the industry.

However, many sectors of construction continue to play a significant role in the national and state economies, and these sectors face many of the above-referenced challenges. In addition, each sector faces challenges unique to its particular niche.

Challenge 2: Preparing Skilled, Qualified Entry-Level Workers

The increased use of technology in the industry is increasing the demand for high-skill workers. At the same time, the skill levels of workers entering the field are declining, and employers tell us that many workers lack the basic educational skills needed to pass apprenticeship tests mandated by the unions.

To address these challenges, the construction industry must work with the public and the private sector, as well as educational institutions, to create and coordinate a comprehensive set of workforce development and marketing strategies. Recommendations for doing so must recognize the complex needs of this changing industry.

Recommendations

The *Ready for the Job* project recommends a coordinated series of public/private strategies to address these challenges. They include the following:

1. Recommendations to Attract and Recruit Workers

Increase Awareness of Careers in the Industry Among High School Students

The construction industry must create better career education opportunities for students. Education, workforce development, and industry groups should work together to better educate students of all ages regarding the full range of career opportunities available to them, including careers in the construction industry.

The industry should also coordinate existing efforts to develop an industry marketing strategy. This industry-wide strategy should provide high school students, guidance and career counselors, and the workforce development system with information on careers in construction. This strategy must build on the efforts of trade unions, the New Jersey Department of Labor, and local business groups such as the Cumberland County Business Education Alliance to recruit individuals to jobs in the construction industry.

Recruit Workers from Untapped Labor Pools

The industry must increase its efforts to recruit women, minorities, and other underrepresented groups. In addition, job seekers transitioning off welfare, people collecting unemployment insurance, and users of the One-Stop Career Center system should be informed about opportunities in the construction industry.

2. Recommendations to Prepare Skilled, Qualified Entry-Level Workers

Strengthen Secondary Education

The New Jersey educational system must incorporate workplace readiness and foundational skills needed in the workplace into school curriculums. Employers in this and other industries report that many entry level workers lack workplace readiness and foundational skills that are necessary to succeed in nearly all jobs in the twenty-first century world of work. High schools should work to incorporate these key skills into the curriculum.

At the same time, the State of New Jersey must strengthen the vocational technical (voc-tech) system and acknowledge its value in preparing students for careers.

Strengthen Post-Secondary Education and Training

Construction employers should work to expand union-industry partnerships. These partnerships, while usually focused on apprenticeship programs, can serve as the source of funds and resources to develop and implement additional training and

educational programs for both incoming and incumbent workers, and to attract more workers to the unions.

The industry also should develop additional apprenticeship opportunities for those interested in entering the trades.

3. Overall Recommendations

The Cumberland/Salem Workforce Investment Board (WIB) should maintain the advisory group formed as part of this project. This group can be the coordinating body for implementing the above recommendations, for developing additional initiatives, and for facilitating communication among employers, and other stakeholders in the construction industry.

¹ A full discussion of the methodology used for this study is included in Appendix A.

Reader's Note

Ready for the Job Identifies Four Skill Types

The *Ready for the Job* project identifies four types of skills that are required by or important to employers. Employers require basic skills and workplace readiness skills for nearly all jobs. Cross-industry demand skills, identified through the focus groups and interviews with employers, are important in a variety of occupations in many industries. Finally, employers require advanced technical and professional skills for many jobs. These skills are job-specific and are typically obtained through postsecondary education and training either provided by educational institutions or by employers.

Type of Skill	Definition	Level of Importance
Basic Skills	Ability to read, write, and perform basic mathematical calculations.	Criteria for most entry level or low-skilled types of jobs.
Workplace Readiness Skills	Minimum expectations for functioning in the workplace, that include meeting standards for attendance and promptness, reliability and integrity, as well as dress and decorum.	Criteria for all jobs in the workforce.
Cross-Industry Demand Skills	Broader skill sets that are in the highest demand among employers in today's economy, and indicative of success in the workplace.	Strength in these skill areas can lead to expanded employment opportunities and career success across industries.
Advanced Technical/Professional Skills	Skills acquired through education and training needed to perform specific tasks and succeed in specific jobs.	Criteria for performance in specific jobs. Education and training is provided by postsecondary educational institutions and/or employers.

Understanding Occupational and Skill Demand in New Jersey's Construction Industry

I. Introduction

The construction industry in New Jersey is an integral part of the state's economy, employing over 160,000 individuals. This report, based on focus groups and interviews that include twenty-three separate employers, summarizes the skill, knowledge, and educational requirements of key construction occupations and identifies strategies for meeting the key workforce challenges facing the industry.²

The Cumberland/Salem Workforce Investment Board (WIB) convened an advisory group of industry stakeholders to guide the effort.³ This advisory group, working in collaboration with each WIB in South Jersey (Atlantic/Cape May, Burlington, Camden, Cumberland/Salem, and Gloucester) selected ten key occupations within the construction industry for in-depth skill demand analysis and provided input on focus group and interview participants, research, and recommendations. The Heldrich Center and Cumberland County College held four focus groups with industry and educational stakeholders regarding industry trends and the skill, knowledge, and educational requirements of selected occupations. The Heldrich Center also conducted ten interviews with industry human resource and management personnel regarding education, training, and recruitment issues.⁴

II. Profile of the Industry and Its Skill Needs

a. Background of the Construction Industry and its Importance to New Jersey

The construction industry includes workers employed in a wide array of occupations and settings. It has three major professional segments: general building contractors, heavy construction contractors, and special trade contractors. Activities undertaken within the construction industry include the construction of buildings and other structures, heavy construction, additions, alterations, reconstruction, installation, and maintenance and repairs. Construction establishments include those engaged in the demolition or wrecking of buildings and other structures, clearing of building sites and sale of materials from demolished structures, as well as establishments engaged in blasting, test drilling, landfill, leveling, earth-moving, excavating, land drainage, and other land preparation.⁵

Nationally and in New Jersey, the construction industry is thriving, injecting billions of dollars in economic activity into the nation and state. At the national level, the industry generated 4.7% of the Gross Domestic Product⁶ (GDP) and employed more than 8.3 million workers in 2000.⁷ At the state level, the New Jersey Council of Economic Advisors indicates that in 2001 the value of office, commercial, and industrial construction contracts was at its highest level in recent history (at \$5.5 billion). While the recent economic uncertainty may

Figure 2.1: At-a-Glance: The Construction Industry

Economic Impact: National and State

Industry as share of GDP (2001) ⁹	4.8%
Industry as share of GSP (2001) ¹⁰	4.3%

Employment and Compensation: National¹¹

Number employed (2000)	8.3 million
Average Weekly Earnings (2000) ¹²	\$702
Projected Employment Growth 2000-2010	12%

Employment and Compensation: New Jersey

	Building Construction	Heavy Construction	Special Trade Contractors
Number employed (2003) ¹³	34,420	19,040	110,830
Average Weekly Earnings (2003) ¹⁴	\$929	\$988	\$899
Projected Employment Growth 2000-2010 ¹⁵	8.8% (across total industry)		

result in some decreased private demand for construction work, this possible lag will be more than offset by current public investment, including the New Jersey School Construction Program, which has been valued at \$8.6 billion over the next ten years.⁸

Individuals employed in the construction industry, one of the nation's largest, are more likely than workers in other industries to put in long hours, work in small companies (eight in ten construction companies employ less than ten people), be self-employed and be unionized. Approximately one-fourth (25%) of construction workers in 2000 worked forty-five hours or more a week. In 2000, 1.6 million construction workers were either self-employed or unpaid family members. Earnings in the construction industry are higher than the average for all industries. In 2000, production or nonsupervisory workers in construction averaged \$17.86 an hour, or approximately \$702 a week (see Figure 2.1).

Construction workers also are more likely to be unionized, with 20.4% of this workforce belonging to unions, compared to 15% in general private industry.¹⁶ According to the New Jersey

Policy Research Organization, one in three New Jersey construction workers are union members.¹⁷ More significantly, the positive impact of unionization on earnings is greater within the construction industry than it is in other industries. For example, while the difference between union and nonunion weekly earnings for workers in the national transportation industry was 28% in 2001, union members in the construction industry enjoyed a 52% advantage in weekly earnings over nonunion construction workers. Of course, this earnings differential is explained, in part, by variations in skill level and qualifications between union and nonunion workers.¹⁸ It also is attributable to the difference in wages between residential and commercial construction. While the above figures on wages are for the industry as a whole, many industry representatives indicate that wages in residential construction often are lower than nonresidential construction. In addition, the construction unions often provide the best training (and in some cases the only training) for entrance and advancement into the construction trades. Employment prospects in the construction industry have been characterized in the Bureau of Labor Statistics' Career Guide as "excellent."

Figure 2.2: New Jersey Employment¹⁹ and Earnings²⁰ in Selected Occupations* Throughout All Industries

Occupation	Mean Annual Wages 2003	Estimated Number Employed 2000	Projected Number Employed 2010	Percent Change 2000–2010	Annual Openings (due to both growth & replacement)
ANALYTICAL WORK					
Cost Estimators	\$56,060	8,200	9,300	13.8%	290
LABOR AND SKILLED TRADE WORK					
Construction Laborers	\$39,340	13,500	15,200	12.3%	290
Carpenters	\$47,235	25,500	27,100	6.1%	590
Electricians	\$52,420	17,800	19,900	12.1%	550
Plumbers, Pipefitters, & Steamfitters	\$49,330	11,400	11,900	4.0%	230
Brickmasons and Blockmasons	\$50,535	4,900	5,400	9.1%	140
Operating Engineers & Other Construction Equipment Operators	\$48,605	7,600	7,900	3.8%	200
Structural Iron & Steel Workers	\$59,515	1,600	1,800	11.5%	40
MANAGEMENT/SUPERVISION					
First-Line Supervisors/Managers of Construction Trades & Extraction Workers	\$62,380	17,700	18,900	7.3%	530
Construction Managers	\$84,560	5,100	5,700	10.3%	140

* Totals may not add due to rounding. Employment data are rounded to 100. Percent changes are based on unrounded data.

b. Skill Requirements of Selected Occupation Groups

The advisory group for this effort selected ten occupations for in-depth skill demand analysis. These ten occupations were selected by the advisory group to include the occupations with the largest number of annual openings or that were expected to experience significant growth in openings in the next ten years. The advisory group members used estimates and projections produced by the New Jersey Department of Labor, as well as their own knowledge of the industry. In addition, the advisory group also considered occupations with a shortage of qualified workers. Finally, the advisory group ensured that the selected occupations represented a diversity of educational requirements and earnings potential.

In 2000, 113,300 individuals were employed in these ten selected occupations in the state (see Figure 2.2). The number of individuals employed in these occupations is expected to grow by 9% from 2000 to 2010 and produce 3,000 openings each year. The mean annual wages of these occupations ranged from \$39,340 to \$84,560 in 2003.

The ten selected occupations in the construction industry largely fall into three “job groups” that share a common set of core competencies, basic educational requirements and skill sets (see Figure 2.3). These include Analytical Work, including cost estimators; Labor and Skilled Trade Work, including carpenters, iron workers, plumbers and pipe fitters, electricians, construction laborers, equipment operators, and masons; and Management/Supervision, including construction managers and on-site or first-line supervisors. A description of

Figure 2.3: Profile of Construction Industry Job Groups

Job Groups	Description of Job Group	Occupations Included in Job Group	Education/Training Required or Preferred by Employers	Core Competencies ²¹	Sample Occupational Skills
Analytical Work	Work that involves mathematical, statistical, and systems analysis and planning.	Cost Estimators	B.A./B.S. preferred Specialized certificates and/or licenses specific to job may be necessary.	<p>Apply knowledge of financial, math, statistics, and technology systems concepts routinely and accurately.</p> <p>Demonstrate understanding of the various components of a system, project layout, or business practices and an ability to quantify those components in terms of time, resources, and labor.</p> <p>Communicate goals and resource needs effectively with various types of project partners.</p> <p>Identify problems, inconsistencies or inefficiencies within systems, sets of information, or business practices.</p> <p>Initiate innovation in technical problem solving.</p> <p>Develop and implement effective solutions to address problems identified.</p> <p>Use technology effectively to complete tasks. Demonstrate thorough capabilities in using specialized software.</p>	<p>Problem solving and critical thinking</p> <p>Mathematics</p> <p>Systems evaluation</p> <p>Reading comprehension</p> <p>Interdisciplinary Knowledge</p> <p>Writing</p> <p>Communication and teamwork</p> <p>Organization</p>

continued on next page

Figure 2.3: continued

Job Groups	Description of Job Group	Occupations Included in Job Group	Education/Training Required or Preferred by Employers	Core Competencies	Sample Occupational Skills
Labor and Skilled Trade Work	Work that involves building, repairing, installing, controlling, or operating equipment and materials. Also includes work such as cleaning buildings, landscaping grounds, and preparing foods.	Electricians Carpenters Ironworkers Masons Equipment Operators Construction Laborers Plumbers and Pipe fitters	Union workers: HS diploma/GED and Apprenticeship, which includes classroom and on-the-job (OJT) training. Non-union workers: OJT	Select and use tools and materials with precision to meet task specifications. Apply knowledge of math concepts relevant to industry. Understand and adhere to safety precautions with consistency. Apply knowledge of technology concepts relevant to industry. Demonstrate initiative and an ability to think critically and solve problems in a time and cost efficient manner. Demonstrate ability to work cooperatively as a team member towards organizational goals, relying on strong knowledge of roles of colleagues and oneself. Some positions in this job group require workers to conduct quality control analysis, relying on thorough knowledge of product and service delivery specifications.	Mathematics Problem solving and critical thinking Mathematics Equipment selection and maintenance Operation and control Installation and repairing
Management/Supervision	Work that involves supervising, coordinating, and planning work of site and staff.	Construction Managers On-site or First-line Supervisors (can lead to construction manager job)	HS Diploma/GED Work Experience Bachelor's degree preferred for managers, especially among those applicants who do not have past experiences with the hiring company Associate's degree typically preferred for supervisors	Use effective judgment and decision making to allocate resources and personnel to meet project budget and deadline. Communicate and coordinate the efforts of multiple project partners, vendors and workers to share common organizational goals. Understand and adhere to safety precautions with consistency. Provide technical leadership across projects/disciplines.	Problem solving and critical thinking Entrepreneurship and business skills Coordination Communication and teamwork Monitoring Time management Management of personnel resources

these selected occupations, their skill requirements, and key workforce issues can be found in Appendix D. A searchable database of all selected occupations in the eight industries is available at www.njnextstop.org.

While within each job group the level of skill mastery required varies, the occupations within the job group share a common continuum of competencies and tasks. In a dynamic and fluid economy, the definitions and requirements of occupations change often and can vary from one employer to another. The grouping of occupations into job groups minimizes the effect of these differences.

Analytical Work

Description and Skill Requirements

The Analytical job group includes occupations such as cost estimators, who must understand the nature of the construction business and a particular job or site to estimate the cost of materials and personnel required to complete the work. Estimators compile and analyze data on all the factors that can influence costs—materials, labor, location, and special machinery requirements, including computer hardware and software. Job duties vary depending on the type and size of the project. Jobs in this job group are not “hands on” occupations, but they do require that a worker have the ability to effectively understand and quantify the resource, labor, and time demands necessary for completing a construction job. Growth of the construction industry is the driving force behind the demand for cost estimators.

Employers prefer cost estimators that have a certificate or bachelor’s degree in construction management or finance. They also cite a strong desire for construction experience, gained through work or internships in the industry.

Emerging Skills

Increasingly complex safety, security, and insurance regulations means that Analytical workers must keep abreast of new developments and be able to effectively understand and apply all required procedures.

Workforce Trends and Issues

The growth of the construction industry is resulting in a shortage of individuals to fill analytical jobs.

Labor and Skilled Trade Work

Description and Skill Requirements

The Labor and Skilled Trades job group includes both highly skilled and entry level workers who perform the “hands on” building, repairing, installing, and controlling of equipment and materials on a construction site or job. Occupations such as carpenters, laborers, ironworkers, electricians, masons, plumbers and pipe fitters, and equipment operators fall under this job group. Mastery and precise application of a range of tools and materials is necessary to succeed in this job group, particularly as new tools and materials are introduced to the industry. In addition, the ability to understand and apply math concepts and technology to construction work is critical, as work sites and jobs become more technologically complex, and math skills are needed to calculate dimensions, use of materials, and other construction functions. Finally, employers emphasize the importance of critical thinking and problem-solving on a site, as workers are likely to encounter a range of issues and problems that require them to apply their knowledge of their specific trade while considering the implication to the entire job or site.

Workers within this job group can be divided into two groups: union or non-union (or “open shop”). Unionized workers start apprentices, and must complete a course of training and study that includes both classroom instruction and on-the-job training. Upon completion of this process, apprentices enter the union, where they receive certain guarantees of pay, pension, and job security. In contrast, nonunionized workers do not have to complete an apprenticeship, and rely more on on-the-job training to gain the experience that employers require or prefer.

Emerging Skills

New technology, materials, and equipment increasingly are used in the construction industry. Workers therefore must have good technology skills that were not necessary in the past, as well as facility in working with new materials such as lightweight plastics. The increased use of prefabricated structures also necessitates familiarity with working with this new medium. Employers note that workers today need to be computer literate and comfortable with learning the new technology skills demanded by more technologically complex instruments, tools, and machinery.

Workforce Trends and Issues

Several trends are influencing the demand for workers with these skills sets, including the boom in construction in New Jersey fueled by school and casino construction, as well as the need for construction workers in Lower Manhattan. In addition, as technology enters the construction industry, trades worker must continually adapt and upgrade their skills.

However, many of the workers entering these occupations, employers tell us, do not have the skills needed to perform their jobs. Even less skilled positions are becoming hard to fill, due to the high demand and the low supply of students and job seekers interested in or aware of opportunities in the construction field. Employers bemoan the fact that high schools are “pushing students away from their sincere interests. They basically learn as they are growing up that the trades are not good enough.” Adds another employer, “Guidance counselors “scare” young people away from the trades.”

In conducting focus groups and interviews with employers in the construction industry, a set of skills necessary to succeed in the selected occupations emerged. Using their own skill language, employers emphasize first and foremost that the skills most lacking in today’s workers and job seekers are basic academic skills and work readiness, and that many of today’s job seekers interested in construction do not have them. As described by employers, these include basic literacy skills and knowledge of practical math (what some employers describe as “shop math”), including addition, subtraction, multiplication, and division, as well as algebra and geometry. Many of these basic academic skills are necessary for students to qualify for union apprenticeships. In addition, employers overwhelmingly voice the need for workers who are punctual, have a strong work ethic, are responsible and respectful, and are willing to

learn. Employers complain, “Young people have a poor attitude, lack of work ethic, and no pride in their work.” Said one employer, “Can you imagine having to sit here and say ‘I am happy when a worker shows up?’” Repeatedly, employers say that if they could find people with the above referenced skills, they could teach them all the specific skills they will need to succeed on the job. In fact, employers express overwhelming willingness to teach the trades to those who are dedicated.

Management/Supervision

Description and Skill Requirements

The Management/Supervision job group includes supervisors and managers of construction jobs and sites. Employers tell us that workers in these positions often are drawn from the ranks of the Labor and Skilled Trades job group, and include workers who have been in the industry for many years, have worked their way up to manager or supervisor, and have extensive experience in the industry. For these jobs, work experience is currently more important to employers than formal education such as a bachelor’s degree.

Employers tell us that for construction managers—“the most important person on the project”—they look for a worker with bachelor’s or associate’s degree in engineering or construction management or supervision. Employers require or prefer an associate’s degree, such as those offered by several county colleges, for their first-line supervisors (see Appendix E).

As a rule, Management/Supervision workers are not wielding the shovels, drills, and other equipment and materials present on a job site. However, they must have the ability to effectively manage those who do, to make judgments and decisions regarding the most efficient, cost effective, and safe way to complete tasks and to coordinate the many people and units present on a job or site. “Construction managers can make or break a job,” explains one employer. “And both managers and supervisors need to be able to communicate with every worker on the job site and keep track of what every unit is doing, every day.”

Workforce Trends and Issues

The growth of the construction industry, and the approaching retirement of many workers in the Management/Supervision job group (union members can retire at age 55), is resulting in a shortage of supervisors and managers. Employers do not always have the pipeline of experienced workers from which to tap managers and supervisors, and instead turn to younger workers with more formal education.

III. Key Workforce Challenges

As a result of industry growth, increased skill requirements, and difficulties in attracting new workers, the construction industry is confronting a serious and continuing shortage of skilled workers in New Jersey and across the country. In 2001, the Construction Industry Institute reported that 75% of contractors faced labor shortages.²² Similarly, 80% of employers surveyed for a 2001 study by Deloitte and Touche identified labor shortages as the greatest challenge anticipated for the next five years.²³ A 2001 survey of construction consumers (conducted by the Construction User’s Round Table) found that 82% of respondents struggled with shortages of skilled labor. One-third of respondents reported schedule delays and increased project costs associated with the shortage.²⁴ Two key workforce challenges, employers tell us, are causing these shortages.

Challenge 1: Attracting and Recruiting Workers.

Major construction projects in New Jersey and the surrounding area, including the state’s multi-billion dollar school construction initiative and the Lower Manhattan reconstruction project, are increasing the demand for workers. In addition, workers such as women are significantly underrepresented in the industry.

The New Jersey Department of Labor estimates that the number of jobs in the construction industry in the state will increase by 8.8% from 2000 to 2010. This growth will result in approximately 13,600 new jobs in the industry. The demand for labor is expected to also increase as current employees retire. The average age of construction workers is 47, and continues to increase.²⁵ As Baby Boomers continue to move towards their retirement years, this demographic shift will further exacerbate the labor shortage.

Research shows that high school students have a generally negative impression of the construction industry, ranking it low among careers they are interested in pursuing. Women job seekers, in particular, have not made great inroads in the industry, with most women in construction working in administrative or secretarial occupations.

Challenge 2: Preparing Skilled, Qualified Entry-Level Workers.

The increased utilization of technology in the industry is increasing the demand for high-skill workers. At the same time, the skill levels of workers entering the field are declining, and employers tell us that many workers lack the basic educational skills needed to pass apprenticeship tests mandated by the unions.

In interviews and focus groups, employers cite the need for workers to be familiar with computers and willing to learn new technologies. Similarly, the development of new building materials (such as lightweight plastic) and increased use of prefabricated structures mean that workers must master working with these mediums.

While the increased utilization of technology in the industry is increasing the demand for high skill workers, the industry and educational institutions have been slow to respond. Indeed, the Business Round Table reported in 1998 that construction training programs did not adapt appropriately to account for current advances in the use of technology in the industry.²⁶ “Continual upgrading of skills is very important,” employers tell us. “There are a lot of changes in the industry around technology, such as the rapid technology advances in welding and pipefitting.” But as one employer states, “we need to keep up, but it’s not always so easy to do.”

In more recent years, the industry has responded with a heightened demand for more training programs. The number of certification requirements has jumped from one to twenty in twelve years, and the number of advanced technology courses has quadrupled in five years.²⁷ As more people begin to understand the technological transformation that is taking place in the construction industry, the reputation of jobs in the industry may improve. The dated perception that construction occupations require just physical power and aptitude may change to an understanding of industry positions as ones requiring highlevel knowledge and the ability to apply advanced skills.

While employers cite the need for more specific job skills, focus group and interview discussions continually returned to this theme: that many applicants for entry level jobs in the industry today do not possess either the basic math and literacy skills, nor the work readiness needed to succeed in the construction industry and to pass apprenticeship tests mandated by the unions. Employers view this foundational skill gap as the major skill gap plaguing the industry.

IV. Current Efforts to Meet the Challenges

As demand for workers in the construction industry grows and the skill requirements of many jobs increases, the industry must attract more workers to the field and the quantity of training programs must be increased.

Strategies to Attract and Recruit Workers

The increased demand for construction workers can be addressed by increased efforts to recruit to the field more women and minorities, groups that are underrepresented in the industry. In addition, this demand can be met by more effectively informing high school students about opportunities in construction. Currently, employers assert, many high school students are unaware of opportunities in the field due to a bias toward college attendance on the part of the public education system. The lack of information regarding what the construction industry has to offer (wages, benefits, pension), the statewide decline in vocational education programs at the high school level and the reluctance of high schools to encourage students to pursue careers in the trades has led to a severe “pipeline” issue for the construction industry. As noted by the SETC, “it has been the reluctance to firmly link

vocational education and academic education that is most responsible for the gap between the skills of our students and the needs of labor.”²⁸

Strategies to Attract More High School Students to the Field

Many young people perceive the industry negatively. The declining provision of training programs, as well as a poor understanding of opportunities for career advancement, has limited the appeal of careers in construction. A decline in the state’s vocational educational offerings limits many students’ exposure to construction and other trade occupations, as does the decline in “shop class” offerings to middle and high school students. In focus groups and interviews, employers cite the decline in vocational education and other trade programs and classes as a major problem for their industry. “Voc-techs are not all full-time programs, they are pull-out programs,” explains one employer. “Students need to learn more hands on material,” says another. “Students learn the theory, but they are unable to practice.” Employers also cite the school funding mechanism as a major barrier to robust vocational education, as high schools are loath to lose the funding that accompanies a student when he or she enrolls in a voc-tech school; according to employers, some schools actively discourage students from pursuing vocational education.

High school guidance counselors and teachers have the responsibility to provide students with proper career information in a nonbiased way. However, employers cite issues with the typical high school guidance system as a significant contributor to this problem, as the majority of students are encouraged to attend college and are not informed of other viable options. “Kids with an interest in trades are being pushed into the college track,” says a construction representative. “And pushed away from their sincere interests. They basically learn as they are growing up that the trades are not good enough.” What’s more, say employers, “Guidance counselors “scare” young people away from the trades.” Focus group and interview participants overwhelmingly concluded that guidance counselors do not tell students about opportunities in the trades.

A National Business Employment Weekly survey of high school students (designed to gauge the appeal of various career options) ranked work in the construction industry at 247 out of a possible 250 career options.²⁹ Another survey of 800 high school seniors and juniors found that 41% of students say they would be embarrassed to engage in postsecondary education or training program related to vocational education such as construction.³⁰

What many students and job seekers may not know, however, is that 80% of newly created jobs in the United States do not require a baccalaureate, but do require some form of post-secondary education.³¹ These jobs are characteristic of many of those in the construction industry. Among the occupations selected for study, apprenticeships, work experience, and on-the-job-training are typically required by employers instead of a four-year degree.

This negative image of the construction industry continues to hinder new recruitment, as young workers entering the labor market strive to move into fields they see as more attractive and lucrative. Contrary to the popular perception that construction workers require few skills, the introduction of advanced technologies into the field has resulted in a tremendous need for workers with highlevel skills. These technological advances have significantly impacted the construction industry. The *New York Times* detailed this transformation in 2002, describing a construction industry that will likely surprise most lay people. Construction workers may utilize computer programs, robotic compactors, and special cameras, among other technologically advanced equipment.³² Clearly, the application of technology in the construction industry is widespread.

Focus groups of high school students conducted by the Building Contractors Association of New Jersey revealed that students are remarkably unaware of career possibilities in the industry. However, after learning more about the industry, students became interested by the following industry selling points: availability of free training, the fringe benefits, and the potential for advancement into management or ownership roles.³³

To build on this interest, the construction industry has embarked on a number of initiatives to combat the current shortage of skilled workers. For example, the Building Contractors Association of New Jersey (BCANJ), in collaboration with its five signatory trade unions (carpenters, laborers, ironworkers, bricklayers, and operating engineers), has launched various initiatives to combat the industry labor shortage in the past five years. For example, each year the five unions train more than 3,000 apprentices and coordinate the continuing education of about 55,000 journey workers to keep their skills current with the latest technologies and construction methods.³⁴ In addition, the Construction Industry Advancement Program, a nonprofit trusteeship amongst the New Jersey Asphalt Pavement Association, Utility and Transportation Contractors Association of New Jersey, and the Associated General Contractors of New Jersey, provides construction education and research, as well as scholarships and tuition assistance.

The New Jersey Department of Labor recognizes the need for high school students to have more information about careers in the construction industry. The Department has provided funding to BCANJ to create an extremely innovative and creative marketing effort. The Association has developed and distributed to high schools throughout the state a Construction Careers Kit. Each comprehensive kit (contained in a sturdy plastic briefcase) includes a "Resource Manual for Guidance Counselors," which provides an overview of each of the general construction trades, current wages and benefits, narratives on the training and apprenticeship programs and how to apply, admission requirements, exam preparation, the qualities and characteristics individuals should possess to pursue a career in the industry, brochures, posters, and other materials. This colorful and creative marketing effort can serve as a model for other segments of the construction industry.

The New Jersey trade unions' campaign for a more stable workforce also has initiated an annual Construction Industry Career Day, which attracted more than 3,100 high school students in 2002. Other initiatives include various scholarship and internship programs, the development of placement guides and brochures for students, and a train-the-trainer program intended to better educate guidance and employment counselors as well as students and parents about career possibilities in the industry. BCANJ also collaborates with institutions of higher learning such as Rutgers University, Rowan University, and the New Jersey Institute of Technology to promote the construction industry to better educate students about construction careers.

To increase the provision of training programs in high schools, the Home Builders Institute, of the National Association of Home Builders, developed a major industry led school-to-career initiative in pilot schools across the nation, including Kansas City, Orlando, and Indianapolis. HBI uses the construction of new homes as valuable classroom templates, exposing potential recruits to careers in homebuilding and throughout the industry.³⁵

In Kansas, industry leaders have stepped in to fill the void left by the local schools, which have phased out industrial arts programs. The Associated General Contractors (AGC) of Kansas, along with other industry representatives, have established a wide array of creative programs designed to introduce young people to career opportunities in construction. A collaborative effort between local high schools and technical colleges, AGC and local businesses provides high school students with an introduction to thirteen different crafts. They also promote the national programs Build Up! and On-Site, which are construction-related activities designed for 5th and 7th graders.³⁶

In New Jersey, the Cumberland County Business Education Alliance is proposing a program of awareness building and education for the county's guidance counselors and teachers from all sixteen K-12 school districts. This program will provide counselors and teachers with the opportunity to participate in a school year long program to inform them of the many careers available in the county and to assist them with preparing students to enter those careers. As currently planned, the program would begin with a two-day orientation and then meet one day a month for six months. Through this effort, the County seeks to more fully inform the high school guidance system of both college and noncollege opportunities for students interested in a career in fields such as the trades.

Strategies to Attract More Women and Minorities to the Field

While more women and minorities are employed in construction than in the past, they have not yet entered the industry in significant numbers. For example, women are largely absent from the construction industry, comprising just 9.75% of the workforce in 2001.³⁷ Moreover, among those women who are employed in the industry, relatively few are employed in on-site construction positions; rather, they are employed largely

in the administrative positions, as well as managerial and professional specialty occupations.³⁸ Employers tell us that today women are less restricted by physical job requirements because many tools and materials are not as heavy and large as they once were due to a number of advances, particularly the use of lightweight plastics. This may open the way for the recruitment of more women into the profession. But other barriers to women's entry into the industry must be overcome. Recent research suggests that women employed in the industry experience a high level of sexual harassment, as well as an unwillingness of some men to work with them.³⁹ Such problems pose a serious obstacle to the recruitment and retention of women in the industry, who are a valuable resource in shoring up the needed supply of labor.

While women's entrance into the industry has been disappointing, the entrance of Hispanics into construction is promising, as they represent one of the fastest growing sources of new labor. In 1995, Latinos were 11.4% of construction trades workers. By 1999, Latinos comprised 15.0% of construction trades workers.⁴⁰ More efforts could be made to enhance this trend, strengthening the supply of labor.

To help women and minorities enter the construction industry, the New Jersey Department of Labor's Direct Entry Initiative aims to enhance the skills of women and minorities involved in school construction through the provision of the necessary advanced training and apprenticeship opportunities.⁴¹ In addition, the New Jersey Department of Labor has also taken a proactive stance—providing grants under the "Promoting Construction Trades Training Program Among Women and Minorities." These initiatives provide a promising foundation for expanded efforts.

In October 2003, the New Jersey Department of Education awarded the Center for Women and Work at Rutgers nearly \$1 million to create a Nontraditional Career Resource Center. The new center will assist New Jersey students grades seven through twelve in identifying and training for professions that now attract less than 25% of their gender, including the building trades for women. A comprehensive, interactive career website, pilot training programs, and a summer "Nontraditional Career Week at Rutgers University" is planned for the first year.⁴²

Strategies to Prepare Skilled, Qualified Entry-Level Workers

Improving the Basic Academic Skills and Work Readiness of Students Interested in the Industry

Employers in focus groups and interviews routinely stress that many applicants for entry-level jobs in the construction industry lack the necessary basic math and literacy skills and work readiness. The statewide *School Counts!* initiative sponsored by the Business Coalition for Educational Excellence of the New Jersey Chamber of Commerce is attempting to address this skills gap. The Cumberland County *School Counts!* program provides a credentialing system that ensures workforce

readiness while simultaneously encouraging academic success. The purpose of the program is to emphasize to high school students the vital link between academic performance and future employment and educational opportunities. It is sponsored by the Cumberland County Business and Education Alliance and the Cumberland County College Foundation. Cumberland County College is the first institution in New Jersey to use *School Counts!* as a means of credentialing the workforce, as well as advancing educational opportunity through college scholarships.

One of the most difficult tasks facing employers in the county is determining the level of workplace readiness in job applicants. *School Counts!* addresses this challenge by enabling students to provide the 450 county employers who are participating in the program an actual credential verifying desirable workplace skills. When interviewing for positions, employers are encouraged to request this school-based certificate documenting student performance and the achievement of goal-oriented work habits. Each high school student that annually meets the four program criteria will earn a *School Counts!* certificate. The program criteria include:

1. Obtaining a grade of C or better in every course (Quality)
2. Achieving a 95% attendance and punctuality record (Attendance)
3. Completion of high school in eight consecutive semesters (Persistence)
4. Taking more than the minimum number of credits required for graduation (Rigor)

Certificates are awarded by each high school at the end of the academic year to all students who have met the program criteria. These certificates are a convenient way of alerting an employer that the job candidate has developed strong workforce readiness skills in the areas of quality, attendance, persistence and rigor. Similarly, students learn that their academic performance, and work ethic are important determinants in their selection for available positions and in their success once they are on the job.

To date, approximately 450 local employers have registered to participate in the program. In 2001, 736 high school students earned first year certificates. In addition to these components of the statewide model, Cumberland County College provides a two-year scholarship to any student that earns four *School Counts!* certificates.

Preparing High School Students for Apprenticeships

Unions in New Jersey are helping vocational and high schools to more effectively prepare students for apprenticeships in the industry. For example, the International Brotherhood of Carpenters and Joiners provides curriculum materials to area vocational schools and high schools that offer carpentry programs. These materials include information on required competencies and on health and safety, as well as hand tools

and equipment, which can be used alone or in conjunction with the established curriculum. Materials are in both floppy disk and CD-ROM formats. In addition, the International provided training to classroom teachers of carpentry in the use of the materials. Districts that employ these curriculum materials will ensure that students who successfully complete the program will be competitive in meeting the entrance requirements of the New Jersey unions that are affiliated with the International Brotherhood of Carpenters and Joiners.

Similarly, the International Brotherhood of Electrical Workers (IBEW), Local Union 351, New Jersey, has provided technical assistance to partnering vocational technical schools to align their electrical curriculum to meet IBEW's entrance requirements for apprenticeship. In some instances, districts have implemented IBEW's National Apprenticeship and Training Committee's math book; in others, IBEW has reviewed the curriculum to ensure that it includes their math requirements. IBEW has conducted mock employment interviews for participating students. Students participate in lab activities at the IBEW's apprenticeship and training center, including use of programmable controllers, motor control, and basic circuitry. Other partnership activities include outreach to two alternative high schools to let students know about careers in the electrical trades. Students who successfully complete IBEW's Youth Transitions To Work (YTTW) Program are eligible to apply for the local union's electrical apprenticeship program.

Apprenticeship Programs

Union apprenticeships have long been a source of training for young people entering the trades. Applicants to apprenticeship programs must be at least 18 years of age and have a high school diploma or GED. The content and length of training varies according to the needs of the industry. Some apprenticeships can last up to five years from entry-level student to certified journeyman, while some are completed in a matter of months. They include classroom time and on-the-job training. Each of the trades associated with the construction industry run their own apprenticeship programs.

The apprenticeship and training programs of the building trades unions are administered by local joint apprenticeship and training committees (JATCs), made up of representatives from the local union and from industry employers. Financing for labor-management apprenticeship programs is negotiated on a local level, and is guaranteed in the collective bargaining agreement. These funds are administered by an Apprenticeship Trust Fund Committee, and are then allocated to the JATC. In New Jersey, BCANJ members serve as management trustees on apprenticeship training funds, and use these funds to develop curriculums that meet the needs of the construction industry. The development of new and expanded partnerships between the building unions and industry can increase the resources available to train new and incumbent workers.

An innovation in the apprenticeship programs of the building trades combines apprenticeship with college study. In some programs, apprentices are "dually enrolled" in the apprenticeship program and in a college degree program. These programs

recognize the achievement of those who successfully complete their apprenticeship and offer participating apprentices expanded career options. One such program is through the National Labor College in Maryland, which offers apprentices an opportunity to receive college credit for their related instruction and on-the-job training, and simultaneously work toward a Bachelor of Technical Studies.⁴³

Post-Secondary Education Programs

A number of educational programs in southern New Jersey provide training for management and analytical occupations. The International Masonry Institute, located in Bordentown, runs a Contractor's College that provides a coordinated curriculum of specialized courses to help trowel trade contractors develop the skills they need to improve their business practices. Modules in this certificate program include project management, technical electives (trade specific), business and financial management, human resources, and professional practice.

Cumberland County College offers a Construction Supervision Program in both degree and certificate options. The programs are designed to develop supervisors, not technicians. Research by Cumberland County College indicates that sixty new jobs per year will be created for graduates of this program. CCC and its partners also will help to provide various types of financial assistance to students, and several local construction firms have already committed to tuition reimbursement for employees who enroll in the program. Explained one employer, "This is not a vocational program in the traditional sense but a program designed to prepare professionals in business management and give an understanding of the various trades."

Gloucester County College offers a Civil Engineering Technology degree with a Construction Management option, which prepares students as construction supervisors. Under this option, students can opt for the Construction Technology Sales and Services track, which provides the skills and knowledge for an individual to be employed as a purchasing agent for a construction company or a sales representative for a material supplier to construction firms. There is also a Field Supervision track, which prepares students to be field supervisors; an Inspection Code and Enforcement track, which prepares students for the administration and enforcement of new construction codes related to federal, state, and local legislation; and a Project Management track, which prepares students to plan and direct construction projects.

Atlantic Cape May, Cumberland, Burlington, and Gloucester County Colleges each offer Design and Pre-Construction curricula, including certificate and Associate of Applied Science (A.A.S.) programs.⁴⁴

V. Recommendations

The construction industry is faced with a number of challenges in meeting their current and future labor and skill needs. First, many of the students and job seekers interested in careers in construction do not have the necessary qualifications. Second, not enough students and job seekers are aware of or interested in careers in construction. Third, subsets of the labor pool, such as women, remain largely untapped. In recognition of these problems, the industry and many of the state's two-year institutions of higher education already have developed a number of programs and initiatives to increase both the supply and the skill level of construction labor. However, the industry should consider additional steps that would support and build upon current efforts, further strengthening the current construction labor force and increasing the pipeline of future workers. These include:

1. Recommendations to Attract and Recruit Workers

Increase Awareness of Careers in the Industry Among High School Students

Create Better Career Education Opportunities for Students:

Employers note that many young people do not have an accurate understanding of the nature of work in the construction industry, nor do they understand what career opportunities exist. Education, workforce development, and industry groups should work together to better educate students of all ages regarding the full range of career opportunities available to them, including careers in the construction industry. Informational websites, career awareness fairs, internship opportunities, and career awareness activities integrated into school curriculums could be initiated on state and local levels to further these efforts.

Develop Marketing Campaigns

Coordinate Existing Efforts to Develop an Industry Marketing Strategy:

The construction industry—perhaps using the Construction Career Kit as a model and starting point—must develop a comprehensive, industry wide marketing strategy that provides high school students, guidance and career counselors, and the workforce development system with information on careers in construction. Trade unions, industry groups such as the Building Contractors Association of New Jersey, the New Jersey Department of Labor, and local business groups such as the Cumberland County Business Education Alliance have all been involved in efforts to recruit individuals to jobs in the construction industry. These efforts should be coordinated.

Such a strategy should heavily promote the benefits of a career in construction (high pay, benefits, pensions, availability of jobs) and raise the profile of the industry from the commonly perceived “blue collar” image to one that emphasizes some of the high skilled, technology dominated aspects of the industry. The industry should coordinate this marketing effort with the state's community colleges, particularly those with programs and curricula already in place. This marketing strategy should

target elementary and high school students, as well as college graduates and other job seekers, with particular attention paid to minorities and women. For example, the Building Contractors Association of New Jersey has developed Build Up! Tool Kits that are used as a means of acquainting fifth grade students with the world of construction. BCANJ members sponsor these kits at a cost of \$199 each, and the organization has placed hundreds of units with elementary schools throughout the state. The construction industry should build upon this effort as part of its overall strategy.

The industry should utilize TV, print, and other forms of media for the widest possible saturation. In addition, the industry must develop and promote a clear career path that portrays construction as a viable career choice all the way through adulthood. It should include paths that involve further education, promotion and financial benefits, and convey the natural progression from trades to management or estimator positions, or to small business ownership. Employers suggest that the state allot 10% of Perkins Funds for grants (to be matched by local unions, schools, and contractors) to develop this marketing campaign.

Recruit Workers from Untapped Labor Pools

Attract Women and Other Untapped Groups to the Industry:

The State of New Jersey should continue its efforts to attract women, minorities, and other sources of untapped labor to nontraditional fields such as construction. This can be accomplished by expanding the Department of Labor's Direct Entry Initiative and the construction trades training program for women and minorities. Job seekers transitioning off welfare, people collecting Unemployment Insurance, and users of the One-Stop Career Center system should be informed about opportunities in the construction industry.

2. Recommendations to Prepare Skilled, Qualified Entry-Level Workers

Strengthen Secondary Education

Incorporate Workplace Readiness and Foundational Skills Needed in the Workplace into School Curriculums:

Employers in this and other industries complain that many entry-level workers lack workplace readiness skills and foundational skills that are necessary to succeed in nearly all jobs in the twenty-first century world of work. High schools should work to incorporate these key skills into the curriculum. Since foundational skills, such as interpersonal, communication, critical thinking, and problem-solving skills, can be applied in any discipline, these skills can be incorporated into existing curricula.

Workplace readiness skills should also be integrated into the high school experience as well. While still in its infancy, the *SchoolCounts!* Program, in place in several counties in New Jersey and developed by the Business Coalition for Education Excellence at the New Jersey Chamber of Commerce, may be a promising approach. This program rewards students by issuing an employer-recognized certificate to students for promising behavior such as consistently high attendance rates, above

average academic performance, finishing high school on time and taking initiative by enrolling in extra courses. Local employers enrolled in the program agree to accept the *SchoolCounts!* Certificate as evidence of workforce preparedness.

Strengthen and Reward Occupational Education: The public education system and the State of New Jersey must strengthen the vocational technical system and acknowledge its value in preparing students for careers. One way to do this is for the State of New Jersey to reward achievement in the voc-tech system. For example, the state report cards on schools provide statistics on the number of college-bound students, student SAT scores and other academic information. It should also include statistics on the number of students accepted into unions, apprenticeships and training programs. Currently, these statistics just fall into the “Other” category. Student vocational education achievements should be praised and promoted equal to academic and college achievement.

In addition, the state should eliminate the financial disincentives to public high schools to have students enter voc-tech programs, as state funding attached to that student is

transferred from the public school to the voc-tech. At the same time, the state must find ways to equally fund occupational education as it does college preparatory education.

Finally, the work of the International Brotherhood of Carpenters and Joiners and the International Brotherhood of Electrical Workers, LU 351, to strengthen vocational school education programs through curricula, materials, and technical assistance should be expanded and replicated.

Strengthen and Expand Post Secondary Education and Training

Expand Union-Industry Partnerships: These partnerships, while usually focused on apprenticeship programs, can serve as the source of funds and resources to develop and implement additional training and educational programs for both incoming and incumbent workers, and to attract more workers to the unions. Financing for these partnerships are negotiated on a local level, and is guaranteed in collective bargaining agreements.

Figure 5.1: Recommendations by Stakeholder

Investment	State Government Education	Workforce Boards	Secondary Associations	Employers/	Unions
Recommendations to Prepare Skilled, Qualified Entry-Level Workers					
Strengthen Secondary Education					
Incorporate Workplace Readiness and Foundational Skills Needed in the Workplace into School Curriculums	x		x		
Strengthen and Reward Occupational Education	x		x		
Strengthen and Expand Post Secondary Education and Training					
Expand Union-Industry Partnerships				x	x
Develop Additional Apprenticeship Opportunities			x	x	x
Increasing the Awareness of Careers in the Industry Among High School Students					
Create Better Career Education Opportunities for Students	x		x	x	x
Develop Marketing Campaigns					
Coordinate Existing Efforts to Develop an Industry Marketing Strategy	x			x	x
Recruit Workers from Untapped Labor Pools					
Attract Women and Other Untapped Groups to the Industry	x	x		x	x

Develop Additional Apprenticeship Opportunities: The industry should work to develop more apprenticeship opportunities for those interested in entering the trades. For example, the general construction trades' Apprenticeship Training Programs provide all-inclusive training and education to individuals entering the construction trades. In addition, each trade offers a series of journey worker upgrading classes (see Figure 5.1).

VI. Conclusion

Major school and other construction throughout the state currently are fueling the continued growth and economic development of the construction industry. However, a lack of skilled workers threatens to derail this growth. The construction industry is facing several workforce development challenges, including a shortage of workers who have the increasingly complex skill requirements demanded by employers. In addition, the decrease in vocational education and the increased emphasis on college attendance for high school students have seriously impacted the traditional pipeline of the construction workforce.

At the same time, employers interviewed for this report are highly critical of the workforce preparedness of today's younger workers and cite a lack of basic math and literacy skills and unfamiliarity with expected workplace behavior (punctuality, responsibility, a strong work ethic) as serious impediments to finding enough qualified employees.

Employers in the construction industry are engaging in a number of initiatives to raise the profile of the industry and increase the supply of skilled workers. The industry should continue and expand upon these efforts, targeting guidance and career counselors and students with marketing materials and working with county colleges to develop much needed curriculum and degree and certificate programs. An aggressive and far reaching marketing strategy is essential, as are efforts to expand apprenticeship opportunities and union-industry partnerships. State policymakers and the public education system must take steps to address fundamental inequities in the funding of occupational education, and to reduce the bias against noncollege bound students. While employers agree that the onus is on them to target, recruit, and train workers, they see an important role for educators and policymakers to play in creating a climate more favorable to the growth of the construction labor force. Finally, the Cumberland/Salem WIB should maintain and support the advisory group formed as part of this project. This group can act as the catalyst for new initiatives and provide a valuable communication venue for construction employers to address current and future workers and skills needs crucial to their success in New Jersey.

² A full discussion of the methodology used for this study is included in Appendix A.

³ A full list of Advisory Group members is included in Appendix B.

⁴ A full list of focus group and interview participants is included in Appendix C.

⁵ U.S. Census Bureau. "North American Industry Classification System." <<http://www.census.gov/epcd/naics/NDEF23.HTM#N23>>

⁶ Bureau of Economic Analysis, U.S. Department of Commerce. "Industry Accounts Data: Gross Domestic Product by Industry." 28 October 2002. <<http://www.bea.doc.gov/bea/dn2/gposhr.htm>> (21 August 2003).

⁷ Bureau of Labor Statistics, U.S. Department of Labor. "Construction." *Career Guide to Industries, 2002-2003 Edition*. <<http://www.bls.gov/oco/cg/cgs003.htm>>

⁸ Sileo, Olia. "Pent-up Demand Fuels NJ Construction Industry." *Commerce and Industry Association of New Jersey*. 2003. <<http://www.cianj.org/magazine/construction.cfm>>

⁹ Bureau of Economic Analysis, U.S. Department of Commerce. "Industry Accounts Data: Gross Domestic Product by Industry." 28 October 2002. <<http://www.bea.doc.gov/bea/dn2/gposhr.htm>>

¹⁰ New Jersey Department of Labor. "Gross State Product for New Jersey by Industry, 1977-2001 (Millions of Current Dollars)." 7 July 2003. <http://www.wnjp.net/OneStopCareerCenter/LaborMarketInformation/lmi09/gsp_NJ01C.xls>

¹¹ Bureau of Labor Statistics, U.S. Department of Labor. "Construction." *Career Guide to Industries, 2002-03 Edition*. <<http://www.bls.gov/oco/cg/cgs003.htm>>

¹² This figure reflects employment of production or non-supervisory workers.

¹³ New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey: 2003 Edition*. January 2003. <<http://www.wnjp.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>>

¹⁴ Ibid.

¹⁵ New Jersey Department of Labor. "Estimated and Projected Employment by Industry, 2000-2010." November 2002. <<http://www.wnjp.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi04/state/detailind.htm>>

¹⁶ Bureau of Labor Statistics, U.S. Department of Labor. "Construction." *Career Guide to Industries, 2002-03 Edition*. <<http://www.bls.gov/oco/cg/cgs003.htm>>

¹⁷ Maurice, Arthur. "The Vanishing Clout of New Jersey Organized Labor." The New Jersey Policy Research Organization. November 2002.

¹⁸ Potter, Ed. "Financial Outcomes in Union and Non-Union Workplaces." Employment Policy Foundation. 14 March 2003.

¹⁹ New Jersey Department of Labor. "Occupational Employment Projections, 2000-2010." <<http://www.wnjp.net/OneStopCareerCenter/LaborMarketInformation/lmi04/state/index.html#occ>>

²⁰ New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey: 2003 Edition*. January 2003. <<http://www.wnjp.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>>

²¹ Core competencies are a set of skills, knowledge, and abilities a worker needs to master to perform this job.

²² Construction Industry Institute. "Attracting and Maintaining a Skilled Construction Work Force." 2001. <construction-institute.org/services/catalog/products/more/137_1_more.htm>

²³ Association of General Contractors. "Year 2000 Insights in Construction Survey." 2001. <<http://www.agc.org>>

²⁴ As cited in Corey Delta Contractors. 2003. <<http://coreydelta.com/news.html>>

²⁵ Garrity, Kathleen. "No Easy Solution to Construction Labor Shortage." *Seattle Daily Journal of Commerce*. March 1999.

²⁶ Chini, et al. "Causes of the Construction Skilled Labor Shortage and Proposed Solutions." 1999. <<http://asceditor.unl.edu/archives/1999/chinj99.htm>>

²⁷ Mohn, Tanya. "Construction Sites Seek Technologically Adept." *The New York Times*. 28 April 2002.

²⁸ New Jersey State Employment and Training Commission. "New Jersey in Transition: The Crisis of the Workforce." October 2001. <<http://www.njsetc.net/publications/NJ-Transition.htm>>

²⁹ Kantz, Fred. 2001. "Jobs Rated Almanac." *National Business Employment Weekly*.

³⁰ Ferris State University Career Institute for Education and Workforce Development. "Decisions Without Directions—National Study on Career Guidance and Decision-Making." 2001. <<http://www.ferris.edu/htmls/administration/president/CI/research.htm>>

³¹ U.S. Department of Labor. "The Workforce Gap." 2001.

³² Mohn, Tanya. "Construction Sites Seek Technologically Adept." *The New York Times*. 28 April 2002. <<http://www.canadausemployment.com/news051502.htm>>

³³ Mihelic, Fred J. "Recruiting and Training Tomorrow's Workforce." *New Jersey Building Contractor*. 2002. Volume III.

³⁴ Ibid. However, the industry response to these changing skill needs has lagged. Indeed, the Business Round Table reported in 1998 that construction training programs did not adapt appropriately to account for current advances in the use of technology in the industry.

³⁵ Cumberland County and the County Colleges of several southern counties also offer a range of programs that target the construction industry, as well as initiatives that are designed to increase the workforce preparedness of high school graduates.

³⁶ United States Chamber of Commerce. *Industry-Based Initiative: What's happening in school-to-career?* www.uschamber.com.

³⁷ Mazzullo, Lainie. "Construction Industry Targets Education to Stem Labor Shortage." *Memphis Business Journal*. 17 May 2002.

³⁸ Sarkar, Mousumi. "Women in Construction." *Housing Economics*. September 2002.

³⁹ Ibid.

⁴⁰ Advisory Committee on Occupational Safety and Health. *Women in the Construction Workplace: Providing Equitable Safety and Health Protection*. June 1999.

⁴¹ Gutierrez, Rose. "Hispanics and the Construction Industry." *Housing Economics*. August 2000.

⁴² The Regional Alliance for Small Contractors. "Active Projects." <<http://www.regional-alliance.org>>

⁴³ Cusido, Carmen. "Center Receives \$1 Million to Create Career Institute." *The Daily Targum*. October 10, 2003.

⁴⁴ Construction Apprenticeships. <<http://www.constructionapprenticeships.org/>> See also: The George Meany Center for Labor Studies-The National Labor College at <http://www.georgemeany.org/index.html> 2003.

Appendix A: Methodology

Methodology for Industry Reports

The Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer and Passaic counties, in partnership with the New Jersey State Employment and Training Commission, selected the industries for study based on their prevalence in the state and regional economies, their current employment rate, and their potential for job creation.

The Heldrich Center, with input from each WIB, conducted a thorough literature search, or “knowledge inventory,” for each industry. The Heldrich Center compiled background research using the Internet and published research reports on the current and emerging national and state trends, and focused on emerging trends and growth projections in the selected industries. The knowledge inventory formed the basis of the industry reports.

The Heldrich Center utilized New Jersey Department of Labor Labor Market Information (LMI) data to create a list of occupations for each industry. The primary criterion was gross openings and expected growth. The secondary criterion was occupations with a shortage of qualified workers and those that displayed a diversity of income and educational levels. The Heldrich Center created a ranking of occupations for review by the WIBs. The WIBs, based on input from each Sectoral Advisory Committee, selected a subset of occupations for study that represented the above criteria and/or their own experience within the industry.

The WIBs convened an Advisory Group for each industry to guide the project. The Advisory Group consisted of employers and other key industry stakeholders. The Advisory Group aided in the selection of occupations for study and provided input regarding report recommendations. The groups met twice throughout the project.

The Workforce Investment Boards, with assistance from the Heldrich Center, Cumberland County College, Mercer County College and William Paterson University, convened four or more focus groups for each industry. These focus groups were facilitated by the Heldrich center, and included industry and educational representatives. In addition, the Heldrich Center and its research partners conducted ten or more phone interviews per industry with human resource or key operations managers regarding current and future skill issues and requirements.

Appendix B: Advisory Group Members

Don Ayres	City of Millville
John Biondi	IBEW Local 351
Julie Drzymalski	Cumberland County College
Margaret Durham	Dutra Sheet Metal
John J Krwawecz III	Fabbri Builders, Inc
Sandy Forosisky	Cumberland Empowerment Zone, Corp
Russell Kadlac	Stanker & Galetto, Inc
Dan Kuhar	DRK & Associates
Leigh Marcello	Tri-Mark Building Contractors, Inc
Jerry Scarano	International Union of Bricklayers and Allied Craftworkers
Don Schreiber	Cumberland County Technical Education Center

Appendix C: Focus Group and Interview Participants

Michael Becker	IBEW Local 351
Tom D'Arrigo	TJD Architects
Julie Drzymalski	Cumberland County College
Walt Emerle	Plumbers & Pipefitters Local
Gary Forosisky	GE Mechanical
Sandy Forosisky	Cumberland Empowerment Zone, Corp
Russell Kadlac	Stanker & Galetto, Inc
Dan Kuhar	DRK & Associates
Ken Leipert	Joule Industrial Contractors
James Lombardo	United Concrete, Inc
Hugh McCaffrey	Southern New Jersey Steel Company, Inc
Charles Parrish	Parrish Construction
Jim Sauro	AR Sauro Plumbing & Heating
Don Schreiber	Cumberland County Technical Education Center
Teri Stallone	Technical Institute Of Camden County
Robert Sweeney	Electrician, IBEW
David Sweeney	Electrician, IBEW

Appendix D: Profile of Selected Occupations

1. CARPENTERS

Carpenters use wood and other building materials to erect and repair structures. Carpenters may work on residential or commercial buildings, as well as road construction. There are two major types of carpenters: rough carpenters and finishing carpenters. Rough carpenters are more heavily involved in formwork than finishing carpenters while finishing carpenters tend to specialize in tasks such as cabinetry, casework, and installation. Finishing carpentry requires a greater skill level than rough carpentry due to its demand of advanced precision and the use of a wider array of tools than rough carpentry.

Carpenters must have a strong knowledge of the basic theories of architectural structures. They must also possess the ability to communicate with various project partners and clients. Key skills include the ability to select and operate equipment. Carpenters must also be skilled in reading blueprints while drawing skills are preferred, though not required, by employers. South Jersey employers have identified the greatest skill gap among carpenters to be in their ability to accurately conduct “shop math,” a critical skill for this occupation. While employers generally prefer that carpenters have earned a high school diploma, they are most interested in whether an applicant has received any technical training or completed an apprenticeship.

The increasing trend in construction towards prefabricated structures affects the skill demands of carpenters, who now must possess an understanding of the new products coming out of the prefabrication industry. At one time, all carpenters were considered to be on-site workers. However, the increased use of prefabrication has led to some carpenters now finding employment in the prefabrication shops.

2. OPERATING ENGINEERS

Operating engineers operate large equipment such as cranes and bulldozers in order to excavate and transport heavy materials. In addition, operating engineers must be able to both maintain equipment and assess and repair equipment failures.

Operating engineers must have a strong knowledge of building and construction and mechanics. They must be skilled in the operation and maintenance of equipment and possess excellent troubleshooting and repair skills for when equipment failures arise. The production schedule and budget of a project are dependent upon successful operation of equipment. Employers require that either a school, union or equipment manufacturer formally train operating engineers.

Recent technological advances have resulted in increased skill demands on operating engineers. As a result of these changes, operating engineers must now demonstrate technical know-how and an ability to learn new and more advanced equipment, some of which comes loaded with intricate control panels.

3. COST ESTIMATORS

Cost estimators estimate the cost of materials and personnel required to complete a construction project. Estimators compile and analyze data on all the factors that can influence costs—such as materials, labor, location, and special machinery requirements, including computer hardware and software. Job duties vary widely depending on the type and size of the project.

This position is not a “hands on” occupation, but it does require that a worker have the ability to effectively understand and quantify the resource, labor and time demands necessary for completing a construction job. Therefore, the cost estimator must possess thorough knowledge of building and construction, administration, and the various costing methods. Analytical skills are crucial for successful performance in this occupation, as are communication, systems evaluation, and blueprint reading skills.

The education and skill requirements of cost estimators have advanced in recent years. Government and private industry clients are now generally seeking cost estimators who are certified. A bachelor’s degree in construction management or finance, though not required, is considered desirable among employers. Employers also cite a strong desire for construction experience, gained through work in the industry or internships.

4. CONSTRUCTION MANAGERS

Construction managers oversee the utilization of all resources employed on a project. They are responsible for developing the construction project from the vision conceived of by the engineers, architects, and drafters to the completed product as it is crafted by the laborers.

Construction managers must be skilled at creating productive work relationships with team members at all levels of production, from owners and engineers to laborers. Managers are particularly concerned with completing the project within the established budget and schedule. The Occupational Outlook Handbook details key skills for those employed in this group: “They should be decisive and work well under pressure, particularly when faced with unexpected occurrences or delays. The ability to coordinate several major activities at once, while analyzing and resolving specific problems, is essential, as is an understanding of engineering, architectural, and other construction drawings.”⁴⁵

Construction managers are increasingly college-educated, though some managers may still come up through the ranks without going to college. As is the case for cost estimators, employers indicated that the best construction managers are often those who have had extensive experience in the industry as a trades worker and who are therefore better able to visualize the various tasks that are required of a project.

5. CONSTRUCTION LABORERS

Construction laborers prepare and clean-up job sites, maintain and provide equipment, and move materials to aid the efforts of the more advanced trades workers. The skill level of construction laborers may vary by the type of project. Employers noted that highway construction laborers are generally more skilled than building construction laborers.

Physical strength and endurance are key skills required of workers at this occupational level of the industry, as are hand-eye coordination, strong sense of balance, and manual dexterity. Other important skills include the ability to work on a team and to undertake basic problem solving and utilize math skills.⁴⁶ Employers stated that a good construction laborer is one who possesses a strong perception of the work site and an awareness of where the project is headed. The greatest asset employers seek in laborers is reliability. Because laborers are the first workers on a job site and are responsible for the preparation of the day’s work, they are a critical component of

meeting a project schedule and budget. There is no education requirement for employment as a construction laborer. Experience as a helper may lead to a more advanced position.

An increasing share of construction laborers speaks Spanish as their primary language. While the construction laborer position may serve as the initial rung of the construction career ladder, advancement is generally contingent upon mastery of the English language.

6. PLUMBERS

Plumbers are responsible for the installation, maintenance and repair of pipe systems. Their work also includes the installation of fixtures and appliances. All work must meet specification and code standards. Master plumbers are responsible for the supervision of less experienced plumbers.

Blueprint reading and “shop math”, particularly measuring abilities, are among the key skills needed by plumbers. These individuals must also possess excellent troubleshooting skills. Plumbers must utilize a broad knowledge base including familiarity with certain job-related aspects of building and construction, geometry, chemistry and water treatment. Plumbers are employed as apprentices, journeymen, or master plumbers.

Master plumbers must hold a bachelor’s degree in a related field and have worked as an apprentice or journeyman for one year OR have completed a four-year apprenticeship program, and completed one-year as a journeyman. Master plumbers must pass a state examination.

Plumbing employers, like other employers in the construction industry, cite a strong lack of “shop math” skills among new entrants into the profession. The ability to perform basic calculations and understand the geometry of plumbing is often lacking among young applicants. In addition, employers noted that while some of their new entrants have witnessed demonstrations of plumbing procedures in the local technical schools, they have not been given the opportunity to actually participate in hands-on activities prior to employment.

7. ELECTRICIANS

Electricians install, maintain and repair electrical systems. They also install fixtures and appliances. Electricians must meet safety standards and established codes.

New entrants into the profession are aided by training in a vocational program, though this background is not required. More advanced electrical contractors must possess a high school diploma or GED certificate and have five years of hands-on experience in the field. The hands-on experience may be substituted by completion of an approved four year apprenticeship program OR the combination of a bachelor’s degree and two years of hands-on experience OR determination as a qualified journeyman (according to state guidelines) with at least one year of hands-on experience. Electrical contractors must pass a state examination prior to being licensed.

on experience may be substituted by completion of an approved four year apprenticeship program OR the combination of a bachelor’s degree and two years of hands-on experience OR determination as a qualified journeyman (according to state guidelines) with at least one year of hands-on experience. Electrical contractors must pass a state examination prior to being licensed.

8. IRON AND STEEL WORKERS

Iron and steel workers erect the structural frames that form the foundation of new construction projects. Once the formation has been completed, iron and steel workers work to enclose the structure. They may also install other components of a construction project, such as staircases and parts of elevators.

Iron and steel workers must be skilled in burning, cutting, and welding. Manual dexterity is also important for successful performance in this profession. As is the case across all construction professions, math skills are highly valuable.

While strength was once considered a key ability for this occupation, it has become de-emphasized (though still valuable) in recent years. This is due to the introduction of many new lightweight materials.

9. FIRST LINE SUPERVISORS

First line supervisors oversee the work activities of trade workers and production laborers. Supervisors are responsible for coordinating and delegating work tasks of a project and ensuring that they are being fulfilled adequately. In addition to their management responsibilities, many first line supervisors also perform the same work as other trades workers.

First line supervisors must possess knowledge in the fields of administration, building and construction, and human resources. Key skills for this occupation include organization, management of resources, and blueprint reading. Communication is a particularly crucial key as first-line supervisors (more so than other partners on a construction project) must be adept at conveying information to individuals at all levels of a project, from the entry-level laborer to high-level managers.

Employers tell us that workers in these positions are often drawn from the ranks of the trades workers, and include workers who have been in the industry for many years, have worked their way up to manager or supervisor, and have extensive experience in the industry. For these jobs, work experience is currently more important to employers than formal education such as a bachelor’s degree. However, the growth in the construction industry, and the approaching retirement of many workers in the managerial occupations, is resulting in a shortage of supervisors and managers. As a result, employers do not always have the pipeline of experienced workers from which to tap managers and supervisors, and instead turn to younger workers with more formal education.

⁴⁵ New Jersey Department of Education. “Inventory of Programs Offered at New Jersey 2-Year Institutions of Higher Education.” Draft Report. September 2003. <<http://www.state.nj.us/njded/voc/clusters/2year.pdf>>

⁴⁶ Bureau of Labor Statistics, U.S. Department of Labor. “Construction Managers.” *Occupational Outlook Handbook*. p. 37-39.

10. MASONS

Masons work with a variety of materials including brick, stone, tile, cement and other materials to build and repair structures as well as lay foundations.

Math skills are critical for successful performance as a mason, who must be able to assess the dimensions of a project before beginning the actual physical work. Other key skills include consistency, leveling skills, and the ability to read blueprints. Last, masons must possess a strong knowledge of the products being used. Most masons learn the craft through vocational programs or on-the-job training. In New Jersey, individuals interested in becoming a mason can apply to the Bricklayers and Allied Craftworkers Apprenticeship Program in Bordentown and Morristown.

As is the case with other construction trades, technology increases have advanced the skill requirements for masons. For instance, some construction firms are now using laser screens to achieve greater accuracy in foundation laying. The equipment used for some jobs performed by masons is increasingly advanced and employers noted that it has been difficult finding qualified teachers to instruct masons on use of this new equipment.

