Journal of Construction Education
Summer 2002, Vol. 7, No. 2, pp. 86 - 96

1522-8150/01/$3.00/Educational Practice Manuscript

Needs Assessment – A Construction Management Bachelor of Science Degree Program in Alaska

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The Alaska construction industry contributes 7.5% of a $24.4 billion gross state product. Alaska is one of seven states that do not have a postsecondary construction education program. The closest program is 2,435 miles away at the University of Washington. The purpose of this research effort was to investigate the perceived needs of Alaskan contractors in hiring entry-level construction management personnel. This includes the number of graduates needed, the salaries contractors are willing to pay these employees, and the skill sets employers want the graduates to possess. Ninety-nine respondents from the construction industry participated in a survey including general contractors, subcontractors, construction management consultants, and engineering consultants. Results indicate the need for approximately 31 construction management graduates annually. The required skills identified in the survey will be used as a basis to develop a new construction management program curriculum specific to the unique Alaskan environment. These findings correlate well with existing research that predicts the supply and demand for construction education graduates nationwide and indicate the need for a Construction Management Bachelor of Science degree program in Alaska.

Keywords: construction education, construction management, construction engineering, construction industry, project management

Introduction

Members of the Associated Schools of Construction include 91 postsecondary construction education programs at colleges and universities in 43 States. These programs produce graduates with Bachelor of Science degrees in Construction Management, Construction Engineering, Construction Engineering Management, Construction Engineering Technology, and Construction Management Technology among others. Emphasis areas in these programs include construction, engineering and business. Graduates from these programs fill entry-level positions in the construction industry with titles and duties that include estimator, field engineer, scheduling engineer, office engineer, project engineer, or project manager. The most common degree title is Construction Management among 51 of the 88 members of the Associated Schools of Construction that responded to an Engineering News-Record (ENR) survey (Rosenbaum & Rubin, 2001). The various degrees are referred to as CM. Survey results are included in the Appendix A. There are CM programs in at least 43 states in the continental United States. Five states in the continental United States do not have CM degree programs. In these states major universities are less than a four-hour drive from a CM program in a neighboring state, and the majority are 65 miles or less away from an existing CM program.

High school graduates in Alaska, and personnel currently working in the Alaskan construction industry, who are interested in a CM degree, must travel at least 2,435 miles to Washington State to find this type of postsecondary program. There is a high demand for CM graduates in the lower 48. Existing CM programs are unable to keep up with demand for graduates at a rate that is increasing by 600 graduates per year (Bilbo, Fetters, Burt, & Avant, 2000). Anecdotal evidence suggests that many Alaskans who travel outside to study CM do not return upon graduation. Lower 48 construction companies interview CM graduates and make offers of employment. This research focuses on the perceived needs of the Alaskan construction industry for CM graduates. Our results indicate an industry need of approximately 31 CM graduates annually.

The Bureau of Labor Statistics, in the 1998-1999 Handbook, stated that construction managers held 249,000 jobs in the United States in 1996, and that between 1996 and 2006 employment of construction managers will increase between 10 and 20 percent (Bilbo, Fetters, Burt, & Avant, 2000) at a relatively steady annual growth rate so that young college graduates can have a predictable employment opportunities. This can be compared to other industries such as information technology and oil and gas where employment is extremely sensitive to external pressure from the economy and the price of oil, creating cyclical hiring and firing. These factors seem to indicate that development of a Construction Management Bachelor of Science degree program in Alaska would be beneficial.

The History of Construction Management Education

The first identifiable construction education program in the United States was at the University of Florida Gainesville (Robson & Bashford, 1997). Prior to World War II, the light construction industry had a volume of around $6 billion per year (Knievel, 1965). A Johns-Manville pamphlet titled "New Career Opportunities in the Building Industry" stated, "The United States Department of Commerce has recently (1946) estimated the dammed-up demand for housing will reach 40 billions of dollars by 1947." (Knievel, 1965) Johns-Manville and representatives of the building industry approached colleges and universities to set up programs with curriculum that would train students to meet the demand for construction management projected by the federal government. For example, the Light Construction and Marketing program was initiated at Colorado Agricultural and Mechanical College, currently Colorado State University, in 1946, and was administered by the Industrial Arts Department (Hauck, 1998 and Knievel, 1965). The first graduates from this program received degrees in 1949. This was a program similar to programs installed at 20 other universities as a result of being approached by Johns-Manville and representatives of the building industry (Knievel, 1965).

The first college-level construction education program earned legitimacy 25 years ago through accreditation. There are currently as many as170 construction education programs in the United States with at least 82 of those programs being accredited by American Council for Construction Education (ACCE), Accreditation Board for engineering and Technology (ABET), and/or National Association for Industrial Technology (NAIT). ACCE accreditation covers programs focused on construction management, whereas ABET accreditation is focused on construction

engineering. NAIT accreditation does not require a construction focus. (Rosenbaum & Rubin, 2001).

Supply and Demand for Construction Education Graduates

A study (Bilbo, Fetters, Burt, & Avant, 2000) started in 1999 and published in 2000 predicts that the demand for construction education graduates is increasing at a rate of approximately 600 per year. This study concludes that the 54 universities with construction education programs accredited by the ACCE and ABET that were used in the study produce 2,350 graduates per year, and the study predicts that by the year 2005 the demand for CM graduates will be over 6,500 per year. This prediction is based on survey responses from these programs and over 773 non-Alaskan companies that consistently hire graduates from these programs. An average of over 40 organizations recruit students at each of the 88 schools that responded to the ENR survey (Rosenbaum & Rubin, 2001).

The five lower 48 states that do not have a CM program at any of the state's colleges or universities are close enough to CM programs in neighboring states to allow construction companies from those states to easily travel to existing CM programs to interview for potential entry-level CM personnel. Refer to Table 1 for the distances from a major university in a state that does not have a CM program to a CM program in a neighboring state (Road Atlas, 2002 and Fitzpatrick & Modlin, 1986).

Table 1

Seven states that do not have a CM program

State without a CM program	Major University	City, State	Miles to	Major University with a CM Program	City, State
Alaska	University of Alaska Anchorage	Anchorage, AK	2,435	University of Washington	Seattle, WA
Delaware	University of Delaware	Newark, DE	45	Temple University	Philadelphia, PA
Hawaii	University of Hawaii	Hilo, HI	2,461	California State University	Long Beach, CA
New Hampshire	University of New Hampshire	Manchester, NH	47	Wentworth Institute of Technology	Boston, MA
Vermont	University of Vermont	Burlington, VT	260	State University of New York	Syracuse, NY
West Virginia	West Virginia University	Morgantown, WV	213	Pennsylvania State University	Middletown, PA
Wyoming	University of Wyoming	Laramie, WY	65	Colorado State University	Fort Collins, CO

The proximity to an existing CM program hampers the ability of Alaskan contractors to find entry-level CM personnel. The construction industry in Alaska is unable to interview potential entry-level employees without flying down to lower 48 universities that have CM programs, or paying to fly potential employees up to Alaska for an interview. Both options have a high cost, and are not convenient or practical for contractors. Hiring an employee based solely on a resume and a telephone interview has high risk for the contractor. If an Alaskan contractor does hire an

individual from the lower 48 then there are additional costs of relocation, and Alaska state law requires the contractor to move the employee back to the lower 48 at the termination of employment.

Alaskan Construction Industry Survey

A survey was developed to evaluate the perceived needs of the Alaskan construction industry for CM graduates.

The survey asked recipients if a CM program existed:

- Do they have a problem finding entry-level management personnel?
- How many and how often students would be hired to fulfill internship requirements?
- How many and how often graduates would be hired?
- What is the starting pay for recent CM or engineering graduates?
- What is the starting salary for graduates with six months of internship work experience?

Respondents were asked to score the importance of skills possessed by CM graduates on a Likert scale. The skills listed were developed from ACCE accreditation curriculum requirements, and skills taught in various similar programs. Respondents were asked to indicate industry sectors they served.

Survey Population

The list of survey recipients was obtained from three sources. The Associated General Contractors of Alaska (AGC) distributed the survey to the AGC General Contractor Members (81), Specialty Contractor Members (204), and Associate Members (278); from a list of Associated Builders and Contractors (ABC) members in Alaska, 22 surveys were sent to eight general contractors and 14 subcontractors; and from a list of companies provided by the Alliance of Process Industries in Alaska, 66 surveys were sent to contractors that primarily provide goods and services for the oil industry. Surveys were also sent to five construction management firms and owner's project representatives and project managers known to the authors and identified as not on the lists above. Out of the total 651 surveys sent out, 99 surveys were returned. This is an overall response rate of 15.2%. Within the category of general contractor the response rate was 49.4%.

The authors asked several suppliers, associate members of the AGC of Alaska, why they did not return the survey. The responses were very consistent. For example, "We are a small shop, just me and my wife. I didn't think the survey really applied to me, and I didn't want to hurt the results," said the owner of Aurora Construction Supply in Fairbanks, Alaska. Since the AGC Associate member category includes material suppliers, bankers, insurance brokers, bonding companies, and other similar entities, it appears that the low response rate for all surveys sent out is due to the recipients believing that the survey did not apply to them. This resulted in a low response rate for that category of recipient, and lowered the response rate for all recipients.

Figure 1 illustrates industry sectors of the respondents. The "Other" category includes five specialty subcontractors, four owner's representatives, four material suppliers, two hazardous material contractors, two engineering design firms, one manufacturing company, one mining company, one oil refining company, one heavy equipment leasing company, and one freight/material transport company. The respondents were encouraged to check as many industries as are applicable to their firm.

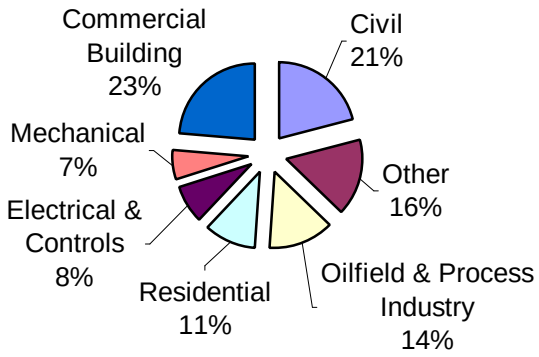

Figure 1: Construction Industries in which the Survey Respondents Work

Difficulty Finding Entry-Level Employees

The survey asked for a response to the statement, "It is very difficult to find entry level construction management or project engineering personnel in Alaska" with the response choices being: 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure (neither agree nor disagree), 4 = Agree, 5 = Strongly Agree. The mean response was 4.01, so that the average contractor that responded agreed that it is difficult to find entry-level personnel.

The average response to the statement, "Our firm would save some of the costs of training new hires to fill a position in project management or project engineering when we hire a graduate from a construction management program compared to hiring a recent design engineering graduate" was 3.86 using the same response scale. Results clearly indicate that the average Alaskan contractor has difficulty finding entry-level employees and they have the burden of additional training costs if they hire from an existing engineering program in Alaska.

How Many CM Graduates and Interns would be Hired

The survey asked, "If a construction management program existed in the University of Alaska system, would your firm hire graduates from that program: Never, Once Every Five Years, Once Every Other Year, One Graduate per Year, more than One Graduate per Year. Responses indicate that the respondents predict that their firms would hire an average of 31 graduates per year.

Based on the responses from the 88 programs that responded to the ENR survey, the mean number of CM students that graduated from one of these programs during the 2000 – 2001 academic year was 38.73, with the median number of graduates being 30. With a standard deviation of 30.82, there are large differences in the number of graduates from the 88 CM

programs. The highest number of graduates from one program was 156 from Purdue University in West Lafayette, Indiana, and the lowest number of graduates from one program was two from Tri-State University in Angola, Indiana.

In addition to hiring CM graduates, the responses to the survey indicate that the contractors would be willing to hire 58 students per year to fulfill internship requirements.

Faculty and administrators involved in existing CM programs in the lower 48 have continued to meet with their local construction industry representatives to determine what attributes possessed by CM graduates are needed by these companies (Rosenbaum & Rubin, 2001). The responses were most often centered on practical experience. For example, the CM program at Colorado State University found that since many industry supporters favored six months of contiguous internship experience, the program allows either two three-month or one six-month internship placement to fulfill program requirements (Hauck, 1998). The ENR survey determined that 46% of the CM programs that responded include an internship as a graduation requirement (Rosenbaum & Rubin, 2001). Even if an internship is not a formal graduation requirement, practical construction experience is strongly encouraged by advisors and educators in CM programs.

Entry-Level Starting Salaries

The survey asked two questions regarding the starting salaries that the Alaskan contractors would be willing to pay entry-level CM or Engineering graduates. The first question asked what salary range they would be willing to pay for a graduate with little or no experience. The calculated average annual salary was $39,006 for the first question. The second question asked what salary range they would be willing to pay for a graduate with six months of internship work experience. The calculated average annual salary was $42,233 for the second question. This compares very favorably to the results of the ENR survey in which the average response from the 88 CM programs responding said that the average salary for their graduates was $40,983. (Rosenbaum & Rubin, 2001).

CM Graduate Skill Requirements

To assess the entry-level skill sets needed by the industry, the survey asked respondents to evaluate the importance of skills using a scale from one to five, with five having the highest importance. A list of 16 skill areas was developed from ACCE curriculum accreditation requirements, discussions with construction industry managers, and skills that would be primarily taught in other education programs. Refer to Table 2 for the results of the survey responses.

Skills listed by the respondents under "Other" included: practical experience, geology, blasting, negotiation and conflict resolution, team building, labor relations, blueprint and topography reading, codes and permits, on-site education and training, equipment and labor productivity, leadership and management skills, and soft skills including listening, personnel management, and people skills.

Table 2

CM Graduate Skills Required by the Alaskan Construction Industry

Rank	Skill Description	Score
1	Oral and written communication	4.62
2	Planning and scheduling	4.53
3	Estimating including quantity take-off and bid analysis	4.45
4	Project administration and management including documentation at job site & office, submittal review/processing, quality control procedures, and computer applications	4.43
5	Decision making including analysis of alternatives, cost/benefit, return on investment, and net present value	4.25
6	Safety practices, compliance, training, and records	4.22
7	Accounting and cost control	4.13
8	Construction methods and materials including concrete, steel, wood, and soils	3.96
9	Logistics including material management, transportation, storage, and procurement	3.90
10	General education including humanities, social sciences, math and sciences	3.62
11	Business and construction law	3.55
12	Drawing/drafting or CAD skills	3.25
13	Environmental management including haz-mat reporting & training, EMS plans, and response planning	3.24
14	Civil and/or structural design	3.18
15	Construction surveying	3.15
16	Mechanical or electrical design	3.08

A study conducted in 1994, surveyed construction experts to determine the rank order of skills required by entry-level constructors (Mead & Gehrig, 1994). Although the list of skills is not exactly the same, comparing the lists show similarities. From that survey, the rank order of future skills: 1. Communication Skills; 2. Business Management 3; Leadership Skills 4;. Technical Knowledge 5; Field Experience 6; Planning and Scheduling 7; Computer Skills 8; Attitude & Eagerness 9; Estimating Skills 10; Construction Law.

The most important skills as determined by the recipients of both surveys are communication skills. But in the past six years the importance of planning and scheduling, and estimating skills has increased, or these skills are more important to contractors in Alaska, which may be due to remote construction sites and the short construction window in Alaska when compared to states with a longer time in which the projects can be completed or enclosed. Weather protection, complicated logistics involving ice roads, access by air only, barge transportation, access to ice locked ports, planning for harsh weather and snow drifting, and difficulties in getting missing supplies, power, fuel, and communications to remote locations, for example, are activities not always included in lower 48 construction projects. Construction law by comparison to other skills is low in importance to the respondents in both surveys. Computer skills, which is ranked six out of ten in the 1994 survey, are skills that are implicitly required in the top five in the Alaska survey: written communication, scheduling, estimating, project administration, and decision making.

Respondent Information

The 99 respondents indicated that of the 622 employees that worked for their companies, 11% had CM degrees. If the responses from the engineering consultants are removed from the survey, 16% of their employees had CM degrees. The 99 respondents indicated that 52 were owners or

presidents of their company, 17 were project managers, six vice presidents, six operations or general managers, and the rest filled a variety of positions in the construction industry.

The Construction Economy

The gross state product for Alaska in 1997 was $24.494 billion, and construction industry contributed 4.1% of the total (Bureau of Economic Statistics, May 2000). In 1998 the construction industry in Alaska had a 7.5% share of earnings, which can be compared to 5.9% for the entire construction industry in the United States (Bureau of Economic Statistics, March 2000). The construction industry in Alaska is an important part of the Alaskan economy. In 1990 an average of 10,503 individuals were working in the construction industry, 4.5% of the entire work force. By 1999 an average of 13,835 people were working in construction, 5.0% of the work force (Alaska Department of Labor, 1999). On the national level there are more than six million people employed in the construction industry in the United States. This yielded "more than $600 billion worth of new construction projects such as new hospitals, schools, highways, bridges, homes, office buildings, stores, etc. That is about 10 percent of America's Gross Domestic Product" (Herring, January 2002).

The Indiana Factbook (Indiana University Press, May 1998) projects that the construction industry in Alaska will experience a 27% increase in employment from 2005 to 2045, compared to a 24.5% increase in construction employment for the entire United States during that same time frame. The projected construction industry employment in 2005 will be 21,500 individuals, 5.1% of the Alaskan work force. By 2045 the projected employment in the construction industry will be 27,300 individuals, 5% of the Alaskan work force. This increase in the number of individuals working in the construction industry will require an increase in project management staff as well. Having as many construction education programs available as possible would assist the construction industry in being prepared to manage the projected employment increase.

The Aging of Alaska's Workforce

The Alaska Department of Labor and Workforce issues a publication called Alaska Economic Trends, which along with other economic trends, studies the aging of the Alaska workforce. This research points to the fact that there has been a decline of young adults in Alaska, and that the number of Alaskans age 20 to 34 has declined by 36,000 since the 1990 census. The median age of Alaskans has risen from 29.3 in 1990 to 32.9 in 1999. General Contractors in the building construction arena employ workers, 36.9% are over 45 years old and 13.8% are over 50 years old. This picture gets worse for the heavy construction aspect of the industry in which 40.1% of employees are over 45 years old, and 21.1% are over 50 years old. As stated in Alaska Economic Trends, as this trend continues, "the 'graying' of the Alaska worker will place new demands on training institutions." (Hadland & Williams, September 2000)

Conclusions

This research shows strong support for the creation of a Construction Management Bachelor of Science degree program in Alaska. Out of the 99 respondents, 58 indicated that they "would be willing to write a letter in support of creating a Construction Management Bachelor of Science degree program in the University of Alaska system". This demonstration of support from the construction industry reveals the underlying need for a construction education program in Alaska. Coupled with the current and projected demand for CM graduates in the lower 48, the need for a CM program in Alaska is amplified. Another factor that will increase future need for CM graduates is the aging Alaskan work force. As project management personnel currently working in Alaska retire, a source of well-educated and well-trained replacement personnel is needed with an increased emphasis on making those opportunities for training and job placement available to Alaskans.

There continues to be a strong need in the construction industry for civil, structural, and architectural designers, and that specific need could be the subject of additional research. But there are skills taught in construction management education programs that are required by the construction industry and are not provided by the design program curricula. A minor in CM could be made available should any individual focused on a degree in one of the design areas of study desire to gain the project management skills identified by the Alaskan construction industry, and as defined by the curriculum requirements as defined by ACCE as an accreditation requirement.

Accreditation of a CM program in Alaska would provide the credibility that the graduates deserve, and that the program needs in order to grow. CM program accreditation would help the University of Alaska recruit out of state students, another potential resource for the Alaskan construction industry. A Construction Management Bachelor of Science degree program is needed by the Alaskan construction industry to be prepared to meet the construction needs in Alaska for the 21st century.

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Appendix A

Engineering News-Record Construction Schools Survey Data, based on 88 responses from construction education programs that are members of the Associated Schools of Construction.

Colleges/Schools where Degrees Resides			
Engineering	Architecture	Business	Other
31	9	4	44

Degree/Program Titles			
Construction Management	Construction Engineering Management	Construction Engineering Technology	Other
51	9	12	16

Degrees Offered			Accreditation		
Bachelor of Science	Master of Science	Ph. D	ACCE	ABET	NAIT
50	22	16	55	23	8

Enrollment			
Total Number of Under-Graduates	Average Number of Under-Graduates	% Full-Time	% Part-Time
15,314	174	85%	15%

Average Curriculum Percentage		
Construction	Business	Engineering
35.3%	12.8%	11.2%

Bachelor of Science Graduates		
Total	Male	Female
3,408*	3,067	328

Recruiting (Average)	
Starting Salary	Number of Organizations Recruiting
$40,983	40.5

*One of the programs surveyed listed 13 total graduates with no gender break down.