The Current Status of Four-Year Undergraduate Construction Education Programs in the United States.

Lawrence Leslie Rosso

Louisiana State University and Agricultural & Mechanical College

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THE CURRENT STATUS OF FOUR-YEAR
UNDERGRADUATE CONSTRUCTION EDUCATION
PROGRAMS IN THE UNITED STATES

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Vocational Education

by

Lawrence Leslie Rosso
B.S., Louisiana State University, 1978
M.S., Louisiana State University, 1980
May 1998
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ABSTRACT

The objectives of this study were to describe selected program, curriculum, student, and faculty characteristics, and to explore bivariate relationships between selected pairs of variables within these categories.

The review of literature encompassed: general curriculum development and philosophy; American Council for Construction Education, Accreditation Board for Engineering and Technology, and National Association of Industrial Technology accreditation agencies program philosophies and criteria; and past studies related to programs, faculty, and graduates.

The methodology included: a survey of 156 programs; a 26 item survey mailed questionnaire; two follow-up postcards and a follow-up telephone call to all non-respondents; and a facsimile to 25 non-respondents.

The survey had a 72.48% response rate from 109 programs that were classified as four-year undergraduate construction education programs. The Associated Schools of Construction was represented by 73.42% of the respondents.

The data were analyzed by the Number Cruncher Statistical Systems 6.0. Measures of central tendency, variability, and association were presented on selected variables. The results were compared to similar results of past studies.
The major findings were that construction education programs were administered by design, technology, and business disciplines. Construction management was the most common name of a program. ACCE was the most common accreditation agency. Programs experienced large industry advisory board involvement, graduate job placement rates, and external funding. Student enrollment and faculty had increased since 1990. The majority of the faculty had doctorate and masters degrees. Almost half of the faculty had tenure and were engaged in research activities. Correlations with substantial association were found among full-time faculty, research activities, external funding, and tenured faculty.

The summated conclusion and recommendation was construction education was a young discipline that was strongly supported by industry. The discipline continues to grow in the academic environment of higher education in the United States. Further research was recommended on program, curriculum, student and faculty characteristics, and program growth and expansion.
CHAPTER I
INTRODUCTION

Brief History

Since the turn of the century, there has been an apparent process of evolution in construction education in the United States. Construction education has essentially emerged into three divergent programs of study: construction technology, construction engineering, and construction management (Rebholz, 1989).

The first program of study in construction education predominantly evolved from industrial arts and technology programs. Moreover, these construction education programs evolved into minors/options in construction, two-year associate programs, four-year undergraduate programs, and ultimately into graduate programs. Today, even after a century has elapsed, some of these very same initially sound programs continue to operate and function under the parent program's philosophy of technology. The undisputed longevity of construction technology has been due, in part, to a very basic philosophy: learn by doing. Therefore, the historical perspective upon which construction technology was founded should not be overlooked.
A brief review of the curriculum structure reveals the remnants of these supporting industrial arts and technology programs. These construction education programs were administratively assigned to technology colleges and were thereby physically assigned to share compatible classrooms and laboratories, as well as office space. It was not uncommon to see a melange of faculty and students collectively assembling in the very same buildings on campus. The physical features and philosophies of these programs which evolved from the technology disciplines have historically withstood the everpresent test of time. While these programs do indeed still have a very traditional approach to the learning process itself, they lend themselves well to the integration of modern technology and expertise that was required for fulfillment of the overall learning experience. These programs were typically accredited by the National Association of Industrial Technology (NAIT), an agency that accredits technology programs. Graduates of these programs offer the construction industry a blend of traditional and modern approaches to technology.

The second program of study evolved from the engineering and architecture programs. These programs also made major contributions to construction education as well.
Many of these programs still remain in effect today, operating under the leadership and administration of various engineering and architecture colleges and schools. Furthermore, they also exhibit minors/options in construction, two-year programs, four-year undergraduate programs, and graduate programs. While some of these programs have remained under the parent administration, some have sought a new home with a different identity. The programs that remain in the shadows of engineering and architecture reflect a strong emphasis on design rather than technology and/or management. Even those programs which have migrated from the design disciplines still emulate a prominent design tract in the curriculum. These programs were well recognized as design programs by the construction industry, and even the name, "Construction Engineering", implied a design emphasis. Typically, these programs have received their accreditation through the Accreditation Board for Engineering and Technology (ABET). The graduates of these programs have strong backgrounds in the design area with an underlying mixture of technology and management. ABET also accredits technology programs as well. Some of the programs which evolved from the industrial arts and technology area have blended with
programs from design, thus precipitating a highly favorable setting for ABET accreditation.

The third program of study involved a more modern day evolution that strongly emphasized management. These programs have either evolved from the first two sources cited herein, or they have emerged on their own via external influences. For example, the Associated General Contractors of America (AGC) has conducted several studies surveying their contractor membership regarding what programs were industry approved and acceptable. This survey, by its very nature, has had some influence on program design, especially regarding the curriculum (AGC, 1992). Programs which have used this model are referred to as "model" programs. An analysis of this type of program indicated a blending of engineering and technology with an emphasis in management. Often referred to as a blend between the business areas and technical areas, these programs are typically accredited by the American Council for Construction Education (ACCE).

Statement of the Problem

It is understood by construction educators, administrators, and industry personnel that there are several different types of construction education programs. Moreover, each type of program has its own philosophy,
criteria, and method for accreditation (Rebholz, 1989). These programs, by their very nature, not only differ in structure and character but also vary widely by name. They have emerged from different starting points, and have branched in many diverse directions. Such an observation perplexed the profession and, therefore, prompted an updated and comprehensive study of the current status of four-year undergraduate construction education programs in the United States. Such a study would answer questions regarding program and curriculum diversity, and student and faculty characteristics. For these reasons, the researcher addressed the question: What is the current status of four-year undergraduate construction education programs in the United States?

Purpose of the Study

While construction education is still in an evolutionary state, it does, indeed, exhibit a need for mandated requirements for future growth and expansion. According to Rogers (1990), college level construction management programs are relatively young when compared with more traditional majors such as engineering, law, business, education, and humanities. Although the construction education accrediting agencies do have program philosophies and criteria, a lack of continuity remains throughout the
programs. Construction educators who are asked their opinion about new, relevant studies regarding the overall current status of construction education consistently make the statement that there are no current status studies which describe construction education (E.W. Jones, personal communication, March, 1996). Furthermore, Rogers and Weidman (1990) stated that little definitive information concerning programs and faculty was available for their study.

The purpose of this study was to describe and explore the current status of four-year undergraduate construction education programs in the United States. This research study has provided a basis for on-going research on current status as well as other related research. Furthermore, it can help with the adoption of new programs, restructuring of existing programs, or maintenance of any program currently being implemented.

This research study can also serve as a reference for the construction industry. The Rogers and Weidman study in 1990 referenced the United States Department of Labor report in 1989 which stated, “Employment of construction managers is expected to increase faster than the average for all occupations through the year 2000, as construction projects increase in size and complexity”. Therefore, the
construction industry needs a comprehensive study of the current status of four-year undergraduate construction education programs.

Objectives of the Study

The objectives of this study were to describe and explore bivariate relationships of selected variables relating to the current status of four-year undergraduate construction education programs in the United States. More specifically, this study included the following objectives and selected variables:

1. To describe the following selected program characteristics:
   a. College or administrative unit name.
   b. School or department name.
   c. Program name.
   d. Accreditation(s).
   e. Program age.
   f. Program evolution.
   g. Program independence.
   h. Industry advisory board involvement.
   i. External funding from industry.
   j. Graduate job placement rate.
   k. Graduate starting salaries.
2. To describe the following selected curriculum characteristics:
   a. Academic structure (semester/quarter hour system).
   b. Total required credit hours.
   c. Required credit hours of lecture format construction courses.
   d. Required credit hours of laboratory format construction courses.
   e. Brand names of construction related computer software programs in use.
   f. Number of construction content areas offered.

3. To describe the following selected student characteristics:
   a. Current undergraduate student enrollment (full-time and part-time).
   b. Current male undergraduate student enrollment (full-time and part-time).
   c. Current female undergraduate student enrollment (full-time and part-time).
   d. Chartered student chapters of national organizations.
4. To describe the following selected faculty characteristics:
   a. Number of faculty members by highest degree held.
   b. Number of full-time faculty members.
   c. Number of part-time (adjunct) faculty members.
   d. Number of shared faculty members.
   e. Number of male faculty members.
   f. Number of female faculty members.
   g. Total number of faculty members.
   h. Number of tenured faculty members.
   i. Number of non-tenured faculty members.
   j. Number of faculty members engaged in externally funded research.
   k. Number of faculty members engaged in internally funded research.
   l. Number of faculty members engaged in non-funded research.
   m. Number of faculty members engaged in research activities.

5. To determine if a bivariate relationship exists between each of the following selected pairs of variables:
a. Total required credit hours and current undergraduate student enrollment.

b. Program age and graduate job placement rate.

c. Number of construction content areas offered and graduate job placement rate.

d. Number of construction content areas offered and graduate starting salaries.

e. Number of brand names of construction related computer software programs in use and graduate job placement rate.

f. Number of brand names of construction related computer software programs in use and graduate starting salaries.

g. Program age and number of construction content areas offered.

h. Number of total required credit hours and number of construction content areas offered.

i. Number of female faculty members and current female undergraduate student enrollment (full-time and part-time).

j. Number of tenured faculty members and number of faculty members engaged in externally funded research.
k. Number of tenured faculty members and number of faculty members engaged in internally funded research.

l. Number of tenured faculty members and number of faculty members engaged in non-funded research.

m. Number of full-time faculty members and number of faculty members engaged in research activities.

n. Number of industry advisory board members and graduate job placement rate.

o. Number of credit hours of lecture format construction courses and graduate job placement rate.

p. Number of credit hours of laboratory format construction courses and graduate job placement rate.

q. Number of industry advisory board members and approximate dollar amount of external funding over a three-year period.

r. Program age and number of chartered student chapters of national organizations in the program.
s. Number of undergraduate students enrolled in the program and number of chartered student chapters of national organizations in the program.

t. Number of industry advisory board members and number of chartered student chapters of national organizations in the program.

u. Program age and number of undergraduate students enrolled in the program.

Limitation of the Study

At the present time, there are several different levels of construction education programs found throughout the United States. First of all, there is the two-year associate degree program. These two-year degree programs are well represented throughout America and are generally respected by industry since they can be granted accreditation through ACCE, ABET, and NAIT. These programs exist in colleges and universities, junior colleges, technical schools, and vocational trade schools.

A second level of construction education programs is the option or minor in construction. These partial programs exist in numerous locations, and they exist in many different departments within many different academic
units. They primarily exist in larger departments within the various academic units.

Thirdly, there is the graduate program. There are few construction education programs at the graduate level. Most are housed in engineering and architecture programs, and some are in business and management programs (AGC, 1992).

Finally, there are the four-year undergraduate construction education programs which are both the most popular programs and the most volatile in terms of diversity, change, and influence. These programs, according to the AGC, have the strongest impact on the total construction education picture. Therefore, this study was limited to the current status of four-year undergraduate construction education programs in the United States.
CHAPTER II
REVIEW OF THE LITERATURE

Introduction

There are three distinctly different types of construction education programs in the United States today: construction technology, construction engineering, and construction management. Each program has a somewhat different philosophy of construction education, but there are, indeed, some common elements and interests within the program structure. Why is there overlap? Is there a specific reason for the seemingly apparent compulsion of unity that makes the programs blend harmoniously? Does the current four-year undergraduate construction education program in the United States succeed because of the aforementioned amalgam? A bivariate exploratory correlational and descriptive study of the four-year undergraduate program would help answer some of the questions after reviewing the literature that was focused on the following topics: general curriculum development and philosophy; background of general curriculum philosophy and objectives of construction education; American Council for Construction Education--program philosophy and criteria; Accreditation Board for Engineering and Technology--program philosophy and criteria; National Association of Industrial Technology--program philosophy
and criteria; Associated General Contractors of America--
construction curriculum survey; graduate salaries; current
status of two-year construction management programs;
construction management programs; and faculty survey.

General Curriculum Development and Philosophy

The primary purpose of curriculum development is to
strengthen educational programs so that students will have
improved learning opportunities. Program improvement
activities are most effective when all elements affecting
the program are committed to achieving agreed upon goals.
These goals are statements of purpose which lend direction
to the curriculum (Bellon, 1992).

There are four areas of focus when evaluating a
program. They are as follows: goals, organization,
operation, and outcome. The current status of each area
would have to be analyzed before any alteration or
restructuring can occur. The goals are directed outcomes
which support the philosophy of the program. Organization
involves specific program offerings, resources, and
administrative structure. Operation is the functioning of
a program to a particular setting, and outcome is what the
program is intended to do. It is generally agreed that
curriculum improvement activities are most effective where
attention is paid to the various factors influencing the
program, and programs should display some form of unity (Bellon, 1992).

Background of General Curriculum Philosophy and Objectives of Construction Education

According to the AGC Collegiate Construction Education Directory of 1992, there are 172 four-year undergraduate construction education programs in the United States. AGC recognizes 67 programs that have the highest level of construction emphasis and industry involvement as represented by the following characteristics: the name of the program includes the word "construction"; the program is accredited by ACCE or ABET; the curriculum, scope, and content reflects the AGC Construction Education Committee’s recommendation guidelines for a four-year undergraduate program; the program is a member of the Associated Schools of Construction (ASC); the program has an AGC student chapter; the program has an industry advisory board. Among these 67 programs exist 11 different names. They are: Building Science (1), Construction (9), Construction Engineering Technology (11), Construction Management (22), Building Construction (5), Construction Technology (7), Construction Engineering (4), Construction Science (5), Construction Engineering Management (1), and Construction Management Technology (2). The remaining 105 programs are in the fields of architecture, engineering, and industrial
technology. These programs offer either construction options, specializations, or minors in construction. Many of these programs are accredited by ABET or NAIT. Although this directory was relatively comprehensive in scope, it did not list the current status of each program.

E. W. Jones, Director of Construction Education for the AGC, acknowledged via a telephone conversation in March, 1996, that there were no comprehensive current status studies. The only study conducted by the AGC was a survey of contractor members as to what exactly a program should encompass. He further stated that several programs have gone to construction as the main emphasis and some programs are extinct. Therefore, the researcher concluded that this directory was not a complete frame.

The ASC is the professional association for the development and advancement of construction education, where the sharing of ideas and knowledge inspires, guides, and promotes excellence in curricula, teaching, research, and service (ASC, 1996). Although quite large (83 four-year programs in the 1996 directory), it is not mandatory for a program to be a member; therefore, it does not provide a complete frame of all four-year undergraduate construction education programs in the United States. A telephone conversation with Dale Koehler, ASC Publisher, in
March, 1996 revealed that there have been few research studies on curriculum and faculty, but no comprehensive studies on the current status of four-year undergraduate construction education programs.

A survey of the current status of four-year undergraduate construction education programs should encompass the analysis of: 1) Resources—faculty, funding, and facilities; 2) Structure—job descriptions, policy manuals, and promotion and tenure guidelines; 3) Programs—goals, philosophy, size, curricula and extra curricula activities, and outside support; 4) Instruction—faculty evaluation, effectiveness, and course content; 5) Outcomes—graduates, job placement rates, and interim and future goals (Bellon, 1992).

The term curriculum means many different things to different people, and curricula take many different forms (Posner, 1992). Curriculum is simply the content or objectives for which a program holds students accountable. The curriculum should be flexible enough to adapt to a perpetual changing society and industry (Nichols, 1978). Curriculum needs to facilitate current social needs, address current problems, and reflect current human knowledge. Curriculum guidelines and criteria should
address individual differences, have continuity and balance, and be flexible (Haas, 1993).

Through recent years, ASC has provided an outlet for presentation of papers at its annual conference. Although there has been little research on the current status of four-year undergraduate construction education programs in the United States, there has been some research on faculty, programs, and curriculum criteria. As described by Newitt (1987), construction education curricula should follow the systems approach to curriculum development. It is an orderly process for developing a solution. Furthermore, it is a process which is structured to minimize prejudicial preconceived notions and maximize the objectivity required to arrive at a scientifically correct answer (Lechmann, 1968). It is action-oriented. An overview of the systems approach contains several steps according to Newitt (1987). First a need is expressed. The need would be expressed by one or more of the following: parents, employers, prior students, current students, prospective students, professional organizations, faculty, and industry advisory committees. Through their experiences they would sense a need for a change in curriculum, a need for a new course, or a change in an existing course. Construction education is tied to a dynamic industry, an industry that demands
frequent change. This implies that construction education programs should be riding the crest of the wave of advancement, not floundering in the froth and foam after the wave is spent (Martin, 1987).

Three basic types of construction education programs exist nationwide: construction engineering, construction management, and construction technology (Rebholz, 1989). The two major accreditation agencies reviewing these programs are ACCE and ABET. A third agency is NAIT. A synopsis by Rebholz places ACCE accrediting the predominantly management oriented programs and ABET accrediting the predominantly engineering and technology programs with NAIT accrediting a few technology programs. According to Rebholz, not all construction education programs are accredited and some programs have dual accreditation.

According to Rogers and Weidman (1990), the only study which specifically addressed the faculty in construction programs was conducted at the University of Florida in 1989. Unfortunately, the results of that study were unpublished.

There are approximately 210 faculty members in approximately 100 construction education programs throughout the United States. These programs are located
within various colleges and departments such as engineering, education, agriculture, business, and architecture (Rogers, 1990).

A brief look at the three accrediting agencies, their goals and philosophies, and their criteria reveals three different directions of construction education; yet all three exhibit some consistency and similarity in their approach.

**American Council for Construction Education—Program Philosophy and Criteria**

ACCE believes that a program should have three areas of student development: 1) attainment of specialized knowledge in the field of construction, 2) attainment of a well balanced education to assure students are provided opportunity for life-long learning, and 3) attainment of a sense of professionalism and leadership to serve both the construction industry and society. Accreditation will greatly assist construction education in the United States by establishing minimum criteria for construction education, recognize construction programs that meet minimum criteria, provide the profession with competent graduates, foster a national unity in construction education, and encourage the preservation and advancement of construction education. Curriculum minimum criteria for
four-year undergraduate programs, consists of the following:

1. General education (18 semester hours, 27 quarter hours)
   English composition, speech, technical writing, psychology, sociology, social sciences, ethics, literature, history, philosophy, art, language, and political science

2. Mathematics and science (18 semester hours, 27 quarter hours)
   analytic geometry, calculus, linear algebra, statistics, physics, chemistry, geology, computer science, and other sciences

3. Construction science (24 semester hours, 36 quarter hours)
   construction materials, material testing, statics, strength of materials, dynamics, thermodynamics, soil mechanics, hydraulics, structural technology, mechanical systems, electrical systems, formwork, scaffolding, foundations, surveying, graphics, project development, feasibility studies, value analysis, site planning, building codes, quality control, specifications, inspection, and architectural and engineering electives

4. Business and management (24 semester hours, 36 quarter hours)
   economics, accounting, finance, management, industrial relations, marketing, real estate, business law, and general business electives

5. Construction (24 semester hours, 36 quarter hours)
   construction fundamentals, estimating, bidding, contract documents, specifications, project management, scheduling, purchasing, expediting,
6. Other requirements (12 semester hours, 18 quarter hours)
general studies, military science, physical education and free electives.

Total Requirements: 120 semester hours, 180 quarter hours

Currently, there are 42 four-year undergraduate construction education programs in the United States accredited by ACCE. Twenty-three programs have “construction management” as their name. The remaining 19 programs have either “construction science,” “engineering,” or “technology” as their names (ACCE, 1996).

Accreditation Board for Engineering and Technology--Program Philosophy and Criteria

ABET believes that a program should promote the intellectual development of those interested in engineering and engineering-related professions, and provide technical assistance to agencies having engineering-related regulatory authority applicable to accreditation. Furthermore, ABET exists to serve the public, industry, and the profession generally by stimulating the development and improvement of engineering and technology, provide minimum standards on program criteria, and identify those programs that meet or exceed the minimum standards. Curriculum
minimum standards for four-year undergraduate programs consist of the following:

1. Technical sciences, specialties, and electives (48 semester hours, 72 quarter hours)
   skills and techniques, problem solving, processes, construction techniques, production methods, field operation, safety, maintenance, design and construction engineering, and other technical courses

2. Basic sciences and mathematics (24 semester hours, 36 quarter hours)
   physics, chemistry, life and earth sciences, algebra, trigonometry and calculus

3. Social sciences and/or humanities and written and oral communication (24 semester hours, 36 quarter hours)
   English composition, oral presentation, literature, technical writing, social science and humanities electives

4. General technology/engineering related courses (28 semester hours, 42 quarter hours)
   to provide for a well rounded engineering and technology program.

Total Requirements: 124 semester hours, 186 quarter hours

Currently, there are six four-year undergraduate construction education programs in the United States accredited by ABET. All six programs have the word "engineering" in their name (ABET, 1996).
National Association of Industrial Technology--Program Philosophy and Criteria

NAIT strives to provide recognition of the attainment of certain professional standards for industrial technology. It also encourages others to strive toward these goals and standards. Each curricula pattern will be reviewed in terms of its stated objectives, content, methods, and evaluation. The philosophy and objectives of NAIT state that the following shall be compatible with the approved definition of industrial technology: 1) program mission, 2) program definition and purpose; 3) program acceptance, and 4) program goals. The program name shall have appropriate titles (titles such as business, engineering, or education that imply the focus of the program is in a related field of study are not acceptable).

The curriculum minimum standards for a four-year undergraduate program consists of the following:

1. General education (18 semester hours) humanities, English, history, economics, sociology, psychology and speech

2. Mathematics (6 semester hours) algebra, trigonometry, analytical geometry, calculus, statistics, computer science

3. Physical science (6 semester hours) physics and chemistry
4. Management (12 semester hours)
   production control, quality control, manufacturing cost analysis, supervision, production management, plant layout, time and motion study, human resource management, accounting, business law, and marketing

5. Technical (24 semester hours)
   computer integrated manufacturing, computer aided design, electives, material testing, computer technology, packaging, construction manufacturing processes

6. Electives (6 semester hours)

   These are minimum semester hours. NAIT does state that the maximum semester hours of a curriculum is 150. Programs on the quarter system will equate accordingly to each category. (NAIT, 1990).

   According to the Baccalaureate Program Directory, 13 programs are accredited by NAIT. The names of the programs have the word “technology” in conjunction with either the word “industrial” or the word “construction” (NAIT, 1997).

   Associated General Contractors of America--Construction Curriculum Survey

   The AGC, as a part of its mission and goals, provides construction education programs and construction related agencies with information on contractor approved curriculum guidelines. They survey approximately 5,000 contractor members on a non-periodic basis and publish the findings to the various programs and agencies interested in the data.
Part "A" of the survey includes questions to contractors asking them to rate the different subject areas of a curriculum using a Likert-type scale. A scale of one to five is used with one being the least important and five being the most important. The subject areas subdivided into topic/subject are: 1) general education, 2) mathematics and science, 3) construction design, 4) business and management, 5) construction technology, 6) management of construction, and 7) other requirements and electives.

Part "B" of the survey is subject area significance. In this part, contractors are asked to rate the aforementioned subject areas in a percent format, from one to one hundred. The total of all subject areas should equal 100 percent.

Part "C" of the survey consists of respondent profile. Items in this part included demographics such as type of firm, volume of work, type of construction, geographical region, and mailing address (AGC, 1996).

A telephone conversation between the researcher and E. W. Jones, Director of Construction Education for the AGC, in March, 1996, related the following: in the past, survey response at best was five percent; contractors typically endorse highly the subject areas in general and
suggest that the different curricula should have a common interest regardless of format or accreditation. He also stated that there was some activity in curriculum restructure due to the survey. However, none of the accreditation agencies endorse and/or incorporate into their criteria these findings. His final statement was the survey is a suggestion and not a mandatory requirement. Furthermore, it is primarily used for informational purposes only.

**Graduate Salaries Survey**

The American Institute of Constructors (AIC) conducts an exit survey of graduates of four-year undergraduate construction education programs on a yearly basis. The survey results are published in their quarterly newsletter on an annual basis. The following is a summary of the 1995 results.

The average annual starting salary was $32,000. This figure was up from the previous year's annual starting salary of $29,950, an increase of 6.8%. The percentage of graduates employed immediately following graduation is 73%. This was a 10% increase from the previous year. The survey also revealed the type of construction markets in which the graduates were gaining employment. Building construction was the leading type with 60% of the graduates obtaining
employment in this market. Highway construction was second with 20% of the graduates, followed by residential construction at 16%, and 4% of the graduate population became employed in other construction markets. Also mentioned was the percentage of female graduates participating in the survey (9%). The graduates indicated that salary alone was not the deciding factor. Other factors that lead graduates to the choice of employment were company volume and company benefits (Graduate Salaries, 1996).

Since only 17 universities out of the 86 universities (20%) responded to this survey, the researcher concluded that the data presented in this study were not reflective of the total population. The statistics in this study were purely descriptive. No inferences to the population were noted in this study.

Current Status of Two-Year Construction Management Programs

A research study of current status of two-year construction management programs in the United States by Weidman in 1992 describes the following: program emphasis, curriculum structure, and program characteristics. More specifically, the study describes credit hours required for two-year degrees, type of degree offered, number of credit hours required in the major course of study, and the
relationship of these program requirements to the newly adopted ACCE guidelines for two-year program accreditation. A 39 item questionnaire was sent to 188 department heads/chairs of two-year construction education programs. The questionnaire addressed institution, faculty, program, and accreditation intentions. The study had a 70% response rate. Descriptive statistics and exploratory bivariate correlations were analyzed on the aforementioned items. No significant relationships were discovered; however, several trends and program characteristics were noted in the study.

Construction Management Program and Faculty Survey--1990

Rogers and Weidman conducted a study of the construction programs and faculty in 1990. After a review of the literature, they sensed a need for a study due to the lack of data on construction education programs and faculty in the United States. Their study was two-fold: construction management programs and construction management faculty. They used two different questionnaires to retrieve the data.

The first questionnaire was mailed to department heads of construction programs. Their frame consisted of 82 construction management programs and the questionnaire solicited information concerning program requirements, expectations, and operations. They had a 38% response rate.
Their findings were as follows: seventy-four percent of the programs were on a semester hour system. The word "engineering" was part of the program name for 39% of the programs. The word "management" was part of the program name for 29% of the programs. Nineteen percent of the programs had the word "construction" as part of their name. The words "building science" and "architecture" both were observed in 6.5% of the program names. The average age of the programs was 18.6 years. Thirty percent of the programs were less than 10 years old. Fifty-two percent (16 out of 31) were accredited as follows: ABET (55%), ACCE (35%), and NAIT (10%). Two programs were candidates for accreditation. The average number of undergraduates was 115. The range was 25 to 330. The number of full-time faculty ranged from 2 to 13 with the average being 5. The average number of students per faculty member was 26.8.

The second questionnaire was mailed to 180 construction faculty through their department chairs. The response rate was 61% (110 out of 180). Their findings to this part of the study were as follows: six (5%) had a bachelor’s degree; fifty-three (48%) had a master’s degree; thirty-seven (34%) had a Doctor of Philosophy degree; ten (9%) had a Doctor of Education degree; two had a Juris
Doctorate degree. Sixty-nine percent of the faculty were engaged in research activities. Thirty-one percent were not engaged in research activities.

With a response rate of 38% for construction management programs and a 61% response rate for construction management faculty, the researcher concluded that the data were not representative of the total population. Furthermore, the study was done in 1990, seven years ago, thus an update of the data at a minimum was required to reflect the current status of four-year undergraduate construction education programs in the United States.

Summary

One hundred seventy two four-year undergraduate construction education programs existed in the United States in 1992 (AGC, 1992). Of these, 156 were, or either had the potential to become, four-year undergraduate construction education programs as defined by the AGC. Recent (1996) ASC, ACCE, ABET, and NAIT directories combine to indicate that there are approximately 100 four-year undergraduate construction education programs in the United States. This number was also mentioned in the Rogers and Weidman study (1990). When this listing was compared to the AGC Collegiate Construction Education Directory of
1992, 56 programs were not accounted for in 1996. These programs may exist today as four-year undergraduate construction education programs without accreditation and membership in ASC.

Furthermore, three different types of construction education programs existed among the total number of diverse programs with three different types of accrediting agencies serving each different type of program. Some research has been conducted on the curricula activity of the programs and faculty, but none has been done on the current status.

Therefore, an inaccurate listing of four-year undergraduate construction education programs, general curriculum development and philosophy, and construction education philosophy implied a need for research on current status. This study served as a basis for future research and an opportunity for new cohesiveness among the four-year undergraduate construction education programs in the United States. Furthermore, it presented an updated and comprehensive description of these programs.
CHAPTER III
METHODOLOGY

Population

The target population of this study was four-year undergraduate construction education programs in the United States. The frame of this population was established by the 1992 AGC Collegiate Construction Education Directory of four-year undergraduate construction education programs. There were 156 programs listed in this directory (see Appendix A - Mailing List). There was no type of sampling of the target population due to the relatively small frame. The accessible population was the target population.

Instrumentation

The type of instrument that was used in this study to collect the data was a survey questionnaire. A copy of this questionnaire is included in Appendix B. Some of the questions required only a "yes" or "no" response while others asked for brief responses. The questionnaire was designed for easy responses with few time consuming tasks. The questions were structured in such a way as to not be offensive or degrading to any program, and care was taken in the design of each question to assure an accurate response.
Question four, list all degree(s) offered in your program, was used for screening purposes only. If a program's response to this question revealed a current status of less than a four-year undergraduate construction education program or a graduate program associated with a program other than a construction education program (e.g., associate degree only or masters degree only), then that program was eliminated from this study. The remaining questions were designed and constructed to describe and explore bivariate relationships of variables as noted in the objectives of the study. The format of the questionnaire was designed so that department chairs or heads who chose to participate in the study had an opportunity to comment on any questions or items they deemed significant. Consideration was given to all written comments. They were included in Chapter IV, Findings, and were listed unabridged in Appendix C.

The questionnaire was field tested in a research design class (Vocational Education 7905) on November 7, 1996. The number of participants in the field test was twelve. All 12 participants were asked to complete the questionnaire as if they were department chairs or heads. Comments regarding the questions were noted on the questionnaire. Discussions were conducted on instrument
validity, and the researcher made the appropriate revisions on the original copy. After these revisions were made, the questionnaire was then submitted to Professors Frank M. O'Quinn and Duncan W. Kinchen of the LSU Department of Construction Management for their perusal and input. The questionnaire appearing herein was a result of those revisions.

Mailing and Follow-Up Procedures

The initial mailing of the questionnaire included 156 construction education programs in the United States. Appendix D shows a cover letter that was enclosed with the questionnaire reflecting the survey and describing the nature and importance of the study. A reasonable time frame was allotted for completion of the questionnaire (approximately one week), and a reasonable time frame was allotted for mail routing (approximately one week). A follow-up post card was sent to all non-respondents after two weeks (see Appendix E), and one week was allotted for mail routing. At the beginning of the fourth week, all non-respondents were sent a second follow-up postcard (see Appendix E). At the beginning of the fifth week, all non-respondents received a follow-up telephone call. They were asked to respond to the mailed survey questionnaire during the follow-up telephone call. In addition to this
procedure, 25 non-respondents were sent another copy via facsimile as per their request during the follow-up telephone call. The survey was terminated after the seventh week (Dillman, 1978).

Data Organization

After the mailing and follow-up procedures were completed and the data was collected, it was placed into database and spreadsheet files. These files were analyzed by the Number Cruncher Statistical Systems 6.0, 1996. Descriptive statistics and exploratory bivariate correlational statistics were computed by this program. All summarized data reflected the current status of four-year undergraduate construction education programs in the United States.

More specifically, descriptive statistics were computed on the following:

a. College or administrative unit name.
b. School or department name.
c. Program name.
d. Accreditation(s).
e. Program age.
f. Program evolution.
g. Program independence.
h. Industry advisory board involvement.
i. External funding from industry.

j. Graduate job placement rate.

k. Graduate starting salaries.

l. Academic structure (semester/quarter hour system).

m. Total required credit hours.

n. Required credit hours of lecture format construction courses.

o. Required credit hours of laboratory format construction courses.

p. Brand names of construction related computer software programs in use.

q. Number of construction content areas offered.

r. Current undergraduate student enrollment (full-time and part-time).

s. Current male undergraduate student enrollment (full-time and part-time).

t. Current female undergraduate student enrollment (full-time and part-time).

u. Chartered student chapters of national organizations.

v. Number of faculty members by highest degree held.
w. Number of full-time faculty members.
x. Number of part-time (adjunct) faculty members.
y. Number of shared faculty members.
z. Number of male faculty members.
aa. Number of female faculty members.
ab. Total number of faculty members.
ac. Number of tenured faculty members.
ad. Number of non-tenured faculty members.
ae. Number of faculty members engaged in externally funded research.
af. Number of faculty members engaged in internally funded research.
ag. Number of faculty members engaged in non-funded research.
ah. Number of faculty members engaged in research activities.

The following exploratory bivariate correlations were computed using the Pearson product-moment correlation coefficient:

a. Total required credit hours and current undergraduate student enrollment.
b. Program age and graduate job placement rate.
c. Number of construction content areas offered and graduate job placement rate.
d. Number of construction content areas offered and graduate starting salaries.
e. Number of brand names of construction related computer software programs in use and graduate job placement rate.
f. Number of brand names of construction related computer software programs in use and graduate starting salaries.
g. Program age and number of construction content areas offered.
h. Number of total required credit hours and number of construction content areas offered.
i. Number of female faculty members and current female undergraduate student enrollment (full-time and part-time).
j. Number of tenured faculty members and number of faculty members engaged in externally funded research.
k. Number of tenured faculty members and number of faculty members engaged in internally funded research.
1. Number of tenured faculty members and number of faculty members engaged in non-funded research.

m. Number of full-time faculty members and number of faculty members engaged in research activities.

n. Number of industry advisory board members and graduate job placement rate.

o. Number of credit hours of lecture format construction courses and graduate job placement rate.

p. Number of credit hours of laboratory format construction courses and graduate job placement rate.

q. Number of industry advisory board members and approximate dollar amount of external funding over a three-year period.

r. Program age and number of chartered student chapters of national organizations in the program.

s. Number of undergraduate students enrolled in the program and number of chartered student chapters of national organizations in the program.
t. Number of industry advisory board members
   and number of chartered student chapters of
   national organizations in the program.

u. Program age and number of undergraduate
   students enrolled in the program.

Any exploratory bivariate correlations not mentioned
previously and outlined in the objectives of the study, are
included in Chapter 4, Findings. Furthermore, any comments
written on the questionnaire by the respondents are
included in Chapter IV, Findings, and are listed unabridged
in Appendix C.
CHAPTER IV

FINDINGS

The purpose of this study was to describe four-year undergraduate construction education programs in the United States. A general description of the response to the survey and comments about the survey is presented first, followed by the findings for each objective as outlined in the objectives of the study.

Response to the Survey

One hundred fifty six programs throughout the United States were invited to participate in this study. Of these, 109 programs were classified as four-year undergraduate construction education programs as defined by: the program awards a bachelors degree and the curriculum has a construction emphasis (see Appendix F). Forty-seven programs were eliminated from this study. Of these 47 programs, seven programs were eliminated via their response to question 4 of the survey questionnaire (e.g. associate degree only or masters degree only). The remaining 40 programs were eliminated via a telephone conversation between the researcher and the department chair/head or a faculty/staff member of that program (e.g. no bachelors degree, no four-year program, and construction is not an emphasis in the curriculum).
Responses were received from 79 of the 109 programs that were classified as four-year undergraduate construction education programs (see Appendix F). This was a 72.48% survey response rate. Seventy responses (64.22%) from the 109 programs were received by mail. All non-respondents, 39 out of 109 or 35.78%, were sent two follow-up postcards by mail and received a follow-up telephone call. In addition to this procedure, 25 of the non-respondents were sent a facsimile of the survey questionnaire as per their request during the follow-up telephone conversation. Nine of these were returned either by mail or facsimile. This was a 36% facsimile response rate, and it accounted for 8.26% of the 109 programs and 11.39% (9 out of 79) of the survey response rate.

Since the literature established the Associated Schools of Construction as the professional association dedicated to the development and advancement of construction education, it was important to report the response rate of the respondents who were members of this association. Eighty-three of the one hundred nine (76.15%) programs were members of the Associated Schools of Construction (ASC). These 83 programs were listed in the 1996-1997 ASC Membership Directory and were classified as four-year undergraduate construction education programs by
this association and the researcher. Responses were received from 58 out of 83 (69.88%) respondents. These 58 respondents accounted for 73.42% of the total survey response rate (58 out of 79).

Comments About the Survey

Of the 79 respondents, 21 or 26.58% wrote comments in the space provided at the end of the questionnaire. Those comments are listed unabridged in Appendix C. The following is a summary of those comments. Seven respondents indicated a strong interest in the survey results even though it was stated in the cover letter that all participants would receive a copy of the findings. Six respondents indicated that question 26, credit hours for each content area, of the survey questionnaire was difficult. Two respondents indicated that their program was being dismantled over the next few years.

Objective One

Objective one of this study was to describe the following selected program characteristics:

a. College or administrative unit name. Respondents were asked to indicate the name of their college or administrative unit to which their program was assigned. Of the 79 responses, 74 or 93.67% were categorized into the three name categories as presented in Chapter II, Review of
the Literature, while five or 6.33% were labeled as "other" by the researcher. The college or administrative unit names associated with this "other" category were: Education (1), Agriculture (1), Professional Studies (1), and University College (1). One respondent reported that their institution was a college and therefore had no college name. Of these three name categories, Engineering/Architecture and Technology/Applied Science had the highest frequencies of 34 (43.04%) and 33 (41.77%) respectively (see Table 1).

Table 1

<table>
<thead>
<tr>
<th>Name Categories</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering/Architecture</td>
<td>34</td>
<td>43.04</td>
</tr>
<tr>
<td>Technology/Applied Science</td>
<td>33</td>
<td>41.77</td>
</tr>
<tr>
<td>Business/Management</td>
<td>7</td>
<td>8.86</td>
</tr>
<tr>
<td>Othera</td>
<td>5</td>
<td>6.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>79</td>
<td>100.00</td>
</tr>
</tbody>
</table>

*a Other includes: Education (1), Agriculture (1), Professional Studies (1), University College (1), and no college (1).

b. School or department name. Respondents were asked to indicate the name of the school or department to which their program was assigned. There were a total of eight different school or department names reported by the
79 respondents. The most frequently observed name was "Construction Management" (17 or 21.52%). This was followed closely by "Engineering Technology" (16 or 20.25%). The least observed names were "Architecture" and "Agricultural Engineering" with 3 or 3.80% and 1 or 1.27% respectively. It was important to note that the word "Technology" appeared in 38 or 48.10% of the school or department names, and the word "Engineering" appeared in 15 or 18.99% of the school or department names (see Table 2).

Table 2

Frequencies and Percentages of Names of Schools or Departments Assigned to Construction Education Programs

<table>
<thead>
<tr>
<th>School or Department Name</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Management</td>
<td>17</td>
<td>21.52</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>16</td>
<td>20.25</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>14</td>
<td>17.72</td>
</tr>
<tr>
<td>Construction Technology</td>
<td>13</td>
<td>16.46</td>
</tr>
<tr>
<td>Industrial Technology</td>
<td>9</td>
<td>11.39</td>
</tr>
<tr>
<td>Construction</td>
<td>6</td>
<td>7.59</td>
</tr>
<tr>
<td>Architecture</td>
<td>3</td>
<td>3.80</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>1</td>
<td>1.27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>79</td>
<td>100.00</td>
</tr>
</tbody>
</table>

c. Program name. Respondents were asked to indicate their program name. There were a total of seven different program names reported by the 79 respondents. The most
frequently observed name was "Construction Management" (42 or 53.16%). The least observed name was "Construction Engineering" (1 or 1.27%). It was important to note that the word "Construction" appeared in all 79 of the respondents program name. The word "Management" appeared in 50 or 63.29% of the respondents program name. The word "Technology" appeared in 26 or 32.91% of the respondents program name. The word "Engineering" appeared in 17 or 21.52% of the respondents program name (see Table 3).

Table 3

<table>
<thead>
<tr>
<th>Program Name</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Management</td>
<td>42</td>
<td>53.16</td>
</tr>
<tr>
<td>Construction Engineering Technology</td>
<td>13</td>
<td>16.46</td>
</tr>
<tr>
<td>Construction Technology</td>
<td>8</td>
<td>10.13</td>
</tr>
<tr>
<td>Construction</td>
<td>7</td>
<td>8.86</td>
</tr>
<tr>
<td>Construction Management Technology</td>
<td>5</td>
<td>6.33</td>
</tr>
<tr>
<td>Construction Engineering Management</td>
<td>3</td>
<td>3.80</td>
</tr>
<tr>
<td>Construction Engineering</td>
<td>1</td>
<td>1.27</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>100.00</td>
</tr>
</tbody>
</table>

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responded "no". Of these 60 respondents, 31 reported that they were accredited by ACCE, 25 reported that they were accredited by ABET, and eight reported that they were accredited by NAIT.

Four respondents reported that their program had dual accreditation. Of these four respondents, two respondents reported dual accreditation with ACCE and ABET, one respondent reported dual accreditation with ACCE and NAIT, and one respondent reported dual accreditation with ABET and NAIT.

The second part of question nine addressed respondents that reported that their program was not accredited by ACCE, ABET, or NAIT but had applied for candidate status with one of the aforementioned accreditation agencies. Ten respondents reported candidate status. Nine respondents reported candidate status for ACCE accreditation, one respondent reported candidate status for ABET accreditation. There were no respondents that reported candidate status for NAIT accreditation. Nine respondents reported no accreditation or candidate status (see Table 4).

e. Program age. Respondents were asked to indicate the year that their program became a four-year undergraduate construction education program. The
responses ranged from 1930 to 1996. The following summarized data was determined by subtracting the responses from 1997. The mean age of a program was 24.97 years (SD=13.17). The median age was 24 years and the mode was 25 years.

Table 4

Frequencies and Percentages of Accreditation Status of Construction Education Programs

<table>
<thead>
<tr>
<th>Accreditation Status</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCEa Accredited Programs</td>
<td>31</td>
<td>39.24</td>
</tr>
<tr>
<td>ABETb Accredited Programs</td>
<td>25</td>
<td>31.65</td>
</tr>
<tr>
<td>ACCE Candidate Programs</td>
<td>9</td>
<td>11.39</td>
</tr>
<tr>
<td>No Accreditation or Candidacy</td>
<td>9</td>
<td>11.39</td>
</tr>
<tr>
<td>NAITc Accredited Programs</td>
<td>8</td>
<td>10.13</td>
</tr>
<tr>
<td>ABET Candidate Programs</td>
<td>1</td>
<td>1.27</td>
</tr>
<tr>
<td>NAIT Candidate Programs</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note. Table does not sum to 79 or 100% since four respondents reported dual accreditation (2-ACCE and ABET, 1-ACCE and NAIT, 1-ABET and NAIT).

a. American Council for Construction Education
b. Accreditation Board for Engineering and Technology
c. National Association of Industrial Technology

f. Program evolution. Respondents were asked to indicate whether or not their program evolved from another program and, if yes, list that program. Forty-three (54.43%) of the seventy-nine respondents reported that their program evolved from another program. Thirty-six
respondents (45.57%) reported that their program did not evolve from another program.

Of the 43 respondents that reported that their program evolved from another program, 17 (39.53%) reported that their program evolved from industrial arts/technology programs. Six (13.95%) respondents reported that their program evolved from civil engineering. All others were less than 10% each (see Table 5).

Table 5

<table>
<thead>
<tr>
<th>Program Name</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Arts/Technology</td>
<td>17</td>
<td>39.53</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>6</td>
<td>13.95</td>
</tr>
<tr>
<td>Architectural Engineering</td>
<td>4</td>
<td>9.30</td>
</tr>
<tr>
<td>Construction (Two-Year Program)</td>
<td>4</td>
<td>9.30</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>4</td>
<td>9.30</td>
</tr>
<tr>
<td>Civil Engineering Technology</td>
<td>3</td>
<td>6.97</td>
</tr>
<tr>
<td>Architecture</td>
<td>2</td>
<td>4.65</td>
</tr>
<tr>
<td>Forestry</td>
<td>2</td>
<td>4.65</td>
</tr>
<tr>
<td>Real Estate</td>
<td>1</td>
<td>2.35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>43</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Program independence. Respondents were asked to report if their program was independent or part of another program. Sixty-four of the seventy-nine respondents
(81.01%) reported that their program was independent. Fifteen of the seventy-nine respondents (18.99%) reported that their program was a part of another program. These 15 respondents were then asked to report the program name that their program was part of. All 15 responses were labeled by the researcher as "non-independent construction education program names". They were all administered by either engineering or technology programs (see Table 6).

Table 6
**Frequencies and Percentages of Non-independent Construction Education Program Names**

<table>
<thead>
<tr>
<th>Program Name</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Technology</td>
<td>5</td>
<td>33.33</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>4</td>
<td>26.67</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>3</td>
<td>20.00</td>
</tr>
<tr>
<td>Civil Engineering Technology</td>
<td>2</td>
<td>13.33</td>
</tr>
<tr>
<td>Architectural Engineering</td>
<td>1</td>
<td>6.67</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>100.00</td>
</tr>
</tbody>
</table>

h. Industry advisory board involvement. This was measured by the responses to the question: Does your program have an industry advisory board? If the response to this question was "yes", then they were asked to report how many members serve on this board and how often do they meet. Responses were received from 79 respondents. Seventy-three (92.41%) of the seventy-nine respondents
reported that their program had an industry advisory board. Six (7.59%) respondents reported that their program did not have an industry advisory board. The 73 industry advisory boards ranged in board members from as little as two to as much as seventy. The mean was 14.03 board members (SD=10.01). The median and the mode were both 12 board members. These industry advisory boards meet from as little as once per year to as much as four times per year. The mean was 1.95 board meetings per year (SD=0.81). The median and the mode were both two meetings per year.

i. External funding from industry. Responses were received from 79 respondents. Fifty-six of the seventy-nine (70.89%) respondents reported that their program received external funding from industry. Twenty-three (29.11%) of the seventy-nine respondents reported that their program did not receive any external funding from industry. Fifty-four of the fifty-six (96.43%) respondents reported dollar amounts of external funding from industry over a three-year period. One respondent reported "unknown" and one respondent reported "none of your business". The mean dollar amount of the 54 responses was $91,018.52 (SD=$26,273.00). The 54 responses ranged from as little as $2,000.00 to as much as $1,700,000.00. The
median dollar amount was $25,000.00 and the mode was $30,000.00.

j. Graduate job placement rate. Respondents were asked to indicate the approximate job placement rate (in percent) of the May/June 1997 graduating class. Responses were received from 79 respondents. The 79 respondents reported the approximate graduate job placement rate of the May/June 1997 class ranged from as little as 75% to as much as 100 percent. The mean approximate graduate job placement rate was 98.27% (SD=4.66%). Half, the median, of the respondents reported that the approximate graduate job placement rate of their May/June 1997 graduating class was 100 percent. The mode was also 100 percent.

k. Graduate starting salaries. Respondents were asked to indicate the approximate average annual starting salaries of the placed May/June 1997 graduating class. Responses were received from 76 of the 79 (96.20%) respondents of this study. Three respondents (3.80%) reported that the approximate average annual starting salary of the placed May/June 1997 graduating class was unknown. The 76 respondents reported salaries ranging from as little as $25,000.00 per year to as much as $40,000.00 per year. The mean was $32,263.16 (SD=$2,875.73). The median and the mode were both $32,000.00 per year.
Objective Two

Objective two of this study was to describe the following selected curriculum characteristics:

a. Academic structure. Responses were received from 79 respondents. Of the 79 respondents, 68 or 86.08% reported that their program was on a semester hour system. Eleven or 13.92% of the seventy-nine respondents reported that their program was on a quarter hour system.

b. Total required credit hours. Responses were received from 79 respondents. For the purpose of unifying the summarized data, the total required credit hours for the 11 quarter hour system programs were transformed to the semester hour system; therefore, \( n=79 \). The semester hour/quarter hour transformation formula used was: quarter hours times 0.67 equals semester hours. The mean required credit hours in the curriculum of the 79 respondents was 129.46 (SD=4.90). The lowest observed required credit hours of the responses was 120 and the highest was 144. The median required credit hours was 129 and the mode was 128. For the 11 quarter hour system programs to equate to the summarized data, use the following transformation formula: semester hour summarized data times 1.49 equals quarter hour summarized data.
c. Required credit hours of lecture format construction courses. Respondents were asked to indicate the number of credit hours of lecture format construction courses required in the curriculum. Responses were received from 76 of the 79 (96.20%) respondents. There were three (3.80%) missing cases. The semester hour/quarter hour transformation formula was also used for the purpose of unifying the following summarized data. The mean required credit hours of lecture format construction courses reported by the respondents was 38.76 (SD=16.44). This accounted for 30.05% of the average 129 semester credit hour curriculum. The lowest observed required credit hours of lecture format construction courses reported by the respondents was 12 and the highest was seventy-eight. The median was 39 and the mode was 30 semester credit hours. In addition to this data, the 76 respondents were asked to indicate the required credit hours of lecture format construction courses administered by their departments. The mean semester credit hours was 36.53 (SD=16.35). The responses ranged from as little as 9 to as much as 78 semester credit hours. The median was 36 and the mode was 30 semester hours. The following summarized data was determined by each of the responses to the required credit hours of lecture format construction
courses administered by the department divided by each of the responses to the required credit hours of lecture format construction courses in the curriculum times one hundred. The mean percentage of required credit hours of lecture format construction courses administered by the 76 programs was 95.26 ($SD=13.30$). The lowest was 15% and the highest was 100 percent. The median percentage was one hundred.

d. Required credit hours of laboratory format construction courses. Respondents were asked to indicate the number of credit hours of laboratory format construction courses required in the curriculum. Responses were received from 74 of the 79 (93.67%) respondents. There were five (6.33%) missing cases. The semester hour/quarter hour transformation formula was also used for the purpose of unifying the following summarized data. The mean required credit hours of laboratory format construction courses was 19.12 semester credit hours ($SD=12.08$). This accounted for 14.82% of the average 129 semester credit hour curriculum. The lowest observed required credit hours of laboratory format construction courses reported by the respondents was three and the highest was fifty-four semester credit hours. The median was 17.5 semester credit hours and the mode was 30 semester
credit hours. It was important to note that five respondents reported, in the margins of the questionnaire, that their program did not give credit for laboratory hours when it was part of a lecture hour course. In addition to this data, the 74 respondents were also asked to report the required credit hours of laboratory format construction courses administered by their departments. The mean was 17.42 semester credit hours (SD=11.48). The responses ranged from zero to as much as 46 semester credit hours. The median was 15 semester credit hours and the mode was 30 semester credit hours. The following summarized data was determined by each of the responses to the required credit hours of laboratory format construction courses administered by the department divided by each of the responses to the required credit hours of laboratory format construction courses in the curriculum times one hundred. The mean percentage of required credit hours of laboratory format construction courses administered by the 74 programs was 90.85 (SD=19.48). The lowest was zero percent and the highest was 100 percent. The median percentage was one hundred.

e. Brand names of construction related computer software in use. All 79 respondents reported that their program used at least two different brand names of
construction related computer software. The largest number of brand names of construction related computer software used in a program that was reported by a respondent was seven. The smallest number that was reported by a respondent was two. The mean was 3.94 (SD=1.14). The median was four brand names of construction related computer software in use. Of the 79 respondents, more than 80% reported that their program used Primavera, Timberline, and AutoCAD. Ten (11.54%) respondents reported that their program used some type of earthwork software (e.g. Agteck, Rockteck, Paydirt). Five (6.33%) respondents reported that their program used Project Manager.

Forty-three or 54.43% of the seventy-nine respondents reported that their program used other brand names of construction related computer software (two or less) in addition to one or more of the three most frequently observed brand names. Respondents reported other brand names used in their program were: Mac Builder, Quick Start, Lotus 123, Accuest, Fast Track, Quest, Expedition, RISA, Q-Pro, Archcad, Engercalc, E-Builder, Build Soft, Woodworks, Super Project, Timeline, Winest, Softdesk, Estimator, Autosurvey, CadKey, Pro-E, Arch-T, HCSS, and Solid Builder (see Table 7).
Table 7

Frequencies and Percentages of Brand Names of Construction Related Computer Software Programs in Use

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primavera</td>
<td>75</td>
<td>94.94</td>
<td>4</td>
<td>5.06</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>Timberline</td>
<td>70</td>
<td>88.61</td>
<td>9</td>
<td>11.39</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>AutoCAD</td>
<td>65</td>
<td>82.28</td>
<td>14</td>
<td>17.72</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>Other(^a)</td>
<td>43</td>
<td>54.43</td>
<td>36</td>
<td>45.57</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>Microsoft Excel</td>
<td>19</td>
<td>24.05</td>
<td>60</td>
<td>75.95</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>MC Squared</td>
<td>14</td>
<td>17.95</td>
<td>65</td>
<td>82.05</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>Agtech/Rockteck/ Paydirt</td>
<td>10</td>
<td>11.54</td>
<td>69</td>
<td>88.46</td>
<td>79</td>
<td>100.00</td>
</tr>
<tr>
<td>Project Manager</td>
<td>5</td>
<td>6.33</td>
<td>74</td>
<td>93.67</td>
<td>79</td>
<td>100.00</td>
</tr>
</tbody>
</table>

\(^a\)Other includes: MacBuilder (2), Quick Start (2), Lotus 123 (2), Accuest (2), Fast Track (2), Quest (2), Expedition (2), RISA (2), Q-Pro (2), Archead (2), Engercalc (2), E-Builder (2), Build Soft (2), Woodworks (2), Super Project (2), Timeline (2), Winest (2), Softdesk (2), Estimator (1), Auto Survey (1), Cad Key (1), Pro-E (1), Arch-T (1), HCSS (1), and Solid Builder (1).

f. Number of construction content areas offered.

Respondents were asked to indicate the total number of credit hours for each content area of construction offered in their curriculum, even if it is only a part of a course. There were ten content areas listed on the questionnaire and one blank was provided for other courses not listed on the questionnaire. Responses were received from 63 (79.75\%) of the 79 respondents. There were 16 or 20.25\% missing cases. Of the 63 respondents, 48 reported the
number of credit hours in the appropriate blanks, 12 reported check marks in the appropriate blanks, and one reported by writing "all of these" in the margin.

Since 15 (23.81%) of the 63 responses cannot be treated as missing cases, the researcher measured all 63 responses as nominal data. If a respondent reported one or more credit hours in a blank beside a content area, then that content area was considered to be offered in the curriculum and was coded as "1=yes". If a respondent reported a check mark in a blank, then that content area was considered to be offered in the curriculum and was also coded as "1=yes". All content areas that were encompassed by brackets were each coded as "1=yes". All 11 content areas were each coded as "1=yes" for the response of "all of these". Responses of zero and all other blanks left empty by the 63 respondents were coded as "0=no".

Therefore, the number of construction content areas offered in the curriculum is the unit of measure for the following summarized data and not the number of credit hours for each construction content area.

The number of construction content areas offered in a curriculum ranged from as little as three to as much as eleven. The mean was 6.43 (SD=1.94). The median was six
and the mode was five construction content areas offered in the 63 construction education curriculums.

Table 8 presents frequencies and percentages of construction content areas offered in the 63 construction education curriculums. Electrical construction had the highest frequency of 61 or 96.83 percent. Mechanical and commercial/building each had frequencies of 59 or 93.65 percent. Marine/offshore construction had the lowest frequency of one or 1.59 percent. One category was labeled as “other”. Respondents were asked to indicate construction content areas offered that were associated with this category. They included: construction management (3), construction administration (3), and construction law (3).

Objective Three

Objective three of this study was to describe the following selected student characteristics:

a. Current undergraduate student enrollment (full-time and part-time). Respondents were asked to indicate the total number of undergraduate students currently enrolled in their program, both full-time and part-time. Responses were received from 79 respondents. The smallest number of full-time undergraduate students reported was zero. This was reported by a respondent representing an
### Table 8

**Frequencies and Percentages of Construction Content Areas Offered in Construction Education Curriculums**

<table>
<thead>
<tr>
<th>Construction Content Areas</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td>61</td>
<td>96.83</td>
<td>2</td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td>59</td>
<td>93.65</td>
<td>4</td>
</tr>
<tr>
<td><strong>Commercial/Building</strong></td>
<td>59</td>
<td>93.65</td>
<td>4</td>
</tr>
<tr>
<td><strong>Residential</strong></td>
<td>53</td>
<td>84.13</td>
<td>10</td>
</tr>
<tr>
<td><strong>Heavy</strong></td>
<td>42</td>
<td>66.67</td>
<td>21</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td>35</td>
<td>55.56</td>
<td>28</td>
</tr>
<tr>
<td><strong>Highway</strong></td>
<td>32</td>
<td>50.79</td>
<td>31</td>
</tr>
<tr>
<td><strong>Municipal/Civil</strong></td>
<td>28</td>
<td>44.44</td>
<td>35</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>26</td>
<td>41.27</td>
<td>37</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>9</td>
<td>14.29</td>
<td>54</td>
</tr>
<tr>
<td><strong>Marine/Offshore</strong></td>
<td>1</td>
<td>1.59</td>
<td>62</td>
</tr>
</tbody>
</table>

*Other includes: construction management (3), construction administration (3), and construction law (3).*

Evening college where there were no full-time students.

The largest number reported was 620 full-time undergraduate students. The mean was 129.59 full-time students (SD = 111.72). The median was 94.5 full-time undergraduate students. The mode was 150 full-time undergraduate students. The smallest number of part-time undergraduate students reported by the respondents was zero and the largest was 114 part-time undergraduate students. The mean...
was 15.66 part-time students ($SD=23.15$). The median was 8.5 part-time undergraduate students and the mode was ten.

The total number of undergraduate students was determined by the addition of each of the respondent's full-time and part-time responses. The total number of undergraduate students enrolled in a program (full-time and part-time) ranged from 10 to 620 students. The mean was 145.83 undergraduate students ($SD=113.54$). The median was 115 undergraduate students and the mode was 100 undergraduate students.

b. Current male undergraduate student enrollment (full-time and part-time). Respondents were asked to indicate the total number of male undergraduate students currently enrolled in their program, both full-time and part-time. Responses were received from 75 (94.94%) of the 79 respondents. There were four (5.06%) missing cases. Responses ranged from zero to as much as 572 male full-time undergraduate students. The mean was 118.64 male full-time undergraduate students ($SD=104.09$). The median was 85 male full-time undergraduate students. The mode was 80 male full-time undergraduate students.

The smallest number of male part-time undergraduate students reported was zero and the largest was ninety-two.
The mean was 12.84 (SD=19.04). The median was six male part-time undergraduate students and the mode was zero.

The total number of male undergraduate students was determined by the addition of each of the respondent’s full-time and part-time responses. The total number of male undergraduate students (full-time and part-time) ranged from nine to five hundred eighty two. The mean was 131.48 male undergraduate students (SD=105.56). The median was 99 male undergraduate students. The mode was 70 male undergraduate students.

c. Current female undergraduate student enrollment (full-time and part-time). This was determined by subtracting the responses of the current undergraduate enrollment from the responses of the current male undergraduate enrollment (full-time, part-time, and total). Pairwise deletion was used for the missing cases. The smallest number of female full-time undergraduate students observed was zero and the largest was seventy. The mean was 11.27 (SD=12.09). The median was eight female full-time undergraduate students. The mode was five female full-time undergraduate students.

The smallest number of female part-time undergraduate students observed was zero and the largest was 25 students.
The mean was 3.12 (SD=5.94). The median and the mode were both zero female part-time undergraduate students.

The total number of female undergraduate students (full-time and part-time) ranged from zero to seventy. The mean was 14.39 female undergraduate students (SD=13.38). The median was 10 female undergraduate students. The mode was five and ten female undergraduate students.

The percentage of female undergraduate enrollment was determined by dividing the total female undergraduate enrollment by the total undergraduate enrollment times one hundred. Pairwise deletion was used for the missing cases. The mean percentage of female undergraduate enrollment was 10.41 (SD=6.10). The smallest percentage was zero and the largest was 27.78. The median percentage was 9.26.

d. Chartered student chapters of national organizations. Respondents were asked to indicate all chartered student chapters of national organizations in their programs. Responses were received from 79 respondents. Three (3.80%) of the seventy-nine respondents reported in the margins that their program had no chartered student chapters of national organizations. Four respondents reported that their program had six chartered student chapters of national organizations. The mean was 2.22 chartered student chapters of national organizations.
(SD=1.53). The median was two chartered student chapters of national organizations. The mode was one chartered student chapter of national organizations.

Table 9 presents the frequencies and percentages of chartered student chapters of national organizations of the 76 respondents. The Associated General Contractors of America (AGC) had the highest frequency, 65 out of 76 or 85.53%, and the American Institute of Constructors (AIC) had the lowest frequency, 12 out of 76 or 15.79 percent. Twenty-two respondents reported that their program had other student chapters of national organizations. This "other" category included: Construction Management Association of America (5), National Association of Women in Construction (5), American Society of Civil Engineers (5), National Electrical Contractors of America (3), American Society of Safety Engineers (1), National Association of Industrial Technology (1), American Society of Professional Estimators (1), and Chartered Institute of Builders (1).

Objective Four

Objective four of this study was to describe the following selected faculty characteristics:

a. Number of faculty members by highest degree held. Respondents were asked to indicate the total number of
Table 9

Frequencies and Percentages of Chartered Student Chapters of National Organizations in Construction Education Programs

<table>
<thead>
<tr>
<th>Chartered Student Chapters</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated General Contractors of America</td>
<td>65</td>
<td>85.53</td>
</tr>
<tr>
<td>Sigma Lambda Chi</td>
<td>29</td>
<td>38.16</td>
</tr>
<tr>
<td>National Association of Home Builders</td>
<td>26</td>
<td>34.21</td>
</tr>
<tr>
<td>Other*</td>
<td>22</td>
<td>28.95</td>
</tr>
<tr>
<td>Associated Builders and Contractors</td>
<td>21</td>
<td>27.63</td>
</tr>
<tr>
<td>American Institute of Constructors</td>
<td>12</td>
<td>15.79</td>
</tr>
</tbody>
</table>

Note. Table does not sum to 79 or 100% since respondents were asked to check all that apply.

*Other includes: Construction Management Association of America (5), National Association of Women in Construction (5), American Society of Civil Engineers (5), National Electrical Contractors of America (3), American Society of Safety Engineers (1), National Association of Industrial Technology (1), American Society of Professional Estimators (1), and Chartered Institute of Builders (1).
faculty assigned to their program by highest degree held. The number of faculty members with doctorate degrees reported by the 79 respondents ranged from as little as zero to as much as thirteen. The mean was 2.81 faculty members (SD=2.48). The median and the mode were two faculty members. The sum was 222 faculty members with doctorate degrees. The number of faculty members with masters degrees reported by the 79 respondents ranged from as little as zero to as much as twelve. The mean was 3.42 faculty members (SD=2.64). The median and the mode were three faculty members with masters degrees. The sum was 270 faculty members with masters degrees. The number of faculty members with bachelors degrees reported by the 79 respondents ranged from as little as zero to as much as six. The mean was 0.70 faculty members (SD=1.42). The median was zero. The sum was 55 faculty members with bachelors degrees. Of the 79 respondents, five reported that their program had a faculty member with a juris doctorate degree and one reported that their program had a faculty member with an associate degree. This was a sum of six degrees labeled as "other" by the researcher. The total number of degrees held by construction education faculty was 553 (see Table 10).
Table 10

Frequencies and Percentages of Degrees Held by Construction Education Faculty

<table>
<thead>
<tr>
<th>Degrees</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>270</td>
<td>48.82</td>
</tr>
<tr>
<td>Doctorate</td>
<td>222</td>
<td>40.14</td>
</tr>
<tr>
<td>Bachelors</td>
<td>55</td>
<td>9.95</td>
</tr>
<tr>
<td>Other*</td>
<td>6</td>
<td>1.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>553</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note. Frequencies listed are the sums of the responses from 79 respondents that participated in this study.
*Other includes: juris doctorate degree (5) and associate degree (1).

b. Number of full-time faculty members. Respondents were asked to indicate the number of full-time faculty members assigned to their program. Responses were received from 79 respondents. The number of full-time faculty members reported by the 79 respondents ranged from zero to as much as eighteen. A respondent representing an evening college and three respondents representing programs that were administered by other departments reported, by writing in the margins, that their programs had no full-time faculty members. The mean was 4.27 full-time faculty members (SD=3.48). The median was three full-time faculty members. The sum was 337 full-time faculty members collectively reported by the 79 respondents.
c. Number of part-time (adjunct) faculty members. Respondents were asked to indicate the total number of part-time (adjunct) faculty members assigned to their program. Responses were received from 79 respondents. The number of part-time faculty members reported by the 79 respondents ranged from zero to as much as thirteen. The mean was 2.01 part-time faculty members (SD=2.58). The median was one adjunct faculty member. The 79 respondents collectively had a sum of 159 part-time faculty members.

d. Number of shared faculty members. Respondents were asked to indicate the number of shared faculty members assigned to their program. Responses were received from 79 respondents. The mean number of shared faculty members reported by the 79 respondents was 0.72 (SD=1.53). The smallest number of shared faculty members reported was zero and the largest reported was eight. The median was zero. The sum was 57 shared faculty members reported collectively by the 79 respondents.

The sums of three previous variables determined percentages of the faculty employment status. Almost sixty-one percent of the faculty were full-time and more than 10% of the faculty were shared with another program (see Table 11).
Table 11

Frequencies and Percentages of Construction Education Faculty Employment Status

<table>
<thead>
<tr>
<th>Faculty Employment Status</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Time</td>
<td>337</td>
<td>60.94</td>
</tr>
<tr>
<td>Part-Time (Adjunct)</td>
<td>159</td>
<td>28.75</td>
</tr>
<tr>
<td>Shared With Another Program</td>
<td>57</td>
<td>10.31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>553</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note. Frequencies listed are the sums of the responses from 79 respondents that participated in this study.

e. Number of male faculty members. Respondents were asked to indicate the total number of male faculty members assigned to their program. Responses were received from 79 respondents. The number of male faculty members reported by the 79 respondents ranged from as little as one to as much as seventeen. The mean number of male faculty members was 5.62 ($SD=3.30$). The median was five and the mode was three. The sum was 444 male faculty members collectively reported by the 79 respondents.

f. Number of female faculty members. This was determined by subtracting the total number of faculty members of each of the respondents' responses from the total number of male faculty members of each of the respondents' responses. This yielded collectively a sum of 109 female faculty members. The mean female faculty members per program was 1.38 ($SD=1.63$). The smallest...
number of female faculty members was zero and the largest was eight. The median was one female faculty member and the mode was zero.

g. Total number of faculty members. This was determined by adding the total number of full-time, part-time, and shared faculty members. The total number of faculty members was 553 among the 79 programs. The smallest faculty of a program was one and the largest was twenty. The mean number of faculty members per program was seven (SD=4.07). The median was 6 faculty members. Fifteen programs, the most common, had a magnitude of five faculty members.

h. Number of tenured faculty members. Respondents were asked to indicate the total number of tenured faculty members assigned to their program. Responses were received from 79 respondents. The mean was 2.82 tenured faculty members (SD=2.30). The median was two tenured faculty members. Nineteen respondents, the most common, reported two of their faculty members had tenure. The largest number of tenured faculty members reported by a respondent was twelve.

i. Number of non-tenured faculty members. This was determined by subtracting the total number of faculty members in each of the 79 respondents’ responses from their
responses to the tenure question. Three (3.80%) respondents reported by writing in the margin that their institution had no tenure system. Those three responses accounted for a sum of 18 faculty members. These 18 faculty members were considered as non-tenured faculty members by the researcher. Five respondents reported that none of their faculty members had tenure. Of these five respondents, one respondent reported that 16 of their faculty members were non-tenured. The total number of non-tenured faculty members was 312. The mean non-tenured faculty members was 4.17 (SD=3.33). One and three non-tenured faculty members were the most common while the median was three.

j. Number of faculty members engaged in externally funded research. Respondents were asked to indicate the total number of faculty members assigned to their program that were currently engaged in externally funded research. Responses were received from 44 or 55.70% of the 79 respondents. The most common numbers of faculty members engaged in externally funded research were one and two. The mean number of faculty members engaged in externally funded research was 1.43 (SD=2.04). The median was three faculty members. The largest number of faculty members engaged in externally funded research reported by a
respondent was twelve. The sum was 113 faculty members engaged in externally funded research.

k. Number of faculty members engaged in internally funded research. Respondents were asked to indicate the total number of faculty members assigned to their program that were currently engaged in internally funded research. Responses were received from 22 or 27.85% of the 79 respondents. The mean was 0.56 faculty members (SD=1.33). One respondent reported that eight of their faculty members were engaged in internally funded research. The sum was 44 faculty members engaged in internally funded research.

l. Number of faculty members engaged in non-funded research. Respondents were asked to indicate the total number of faculty members assigned to their program that were currently engaged in non-funded research. Responses were received from 30 (37.97%) of the 79 respondents. The mean number of faculty members engaged in non-funded research was 1.13 (SD=2.75). One respondent reported 16 faculty members were engaged in non-funded research. The median and the mode were both zero faculty members engaged in non-funded research.

m. Total number of faculty members engaged in research activities. This was determined by adding the responses of externally funded research, internally funded
research, and non-funded research. Fifty-six (70.89%) of the seventy-nine respondents reported at least one or more faculty members were engaged in at least one type of research activity. One respondent reported that their faculty, collectively, were engaged in 31 research activities. The mean number of faculty members engaged in research activities for the 56 respondents was 4.39 (SD=5.32). The median was three faculty members. The most common number of faculty members engaged in research activities was one. The number of programs that had no faculty members engaged in research activities was 23 out of 79 or 29.11 percent.

Of the 553 faculty members throughout the 79 programs, 246 or 44.48% were engaged in research activities while 307 or 55.52% were not engaged in research activities. Table 12 presents frequencies and percentages of the number construction of faculty members engaged in research activities in the 79 programs from which responses were received.

Table 13 presents the frequencies and percentages of the number of construction faculty members engaged in research activities in the 56 research active programs that participated in this study. This was measured by a response of one faculty member or more engaged in one or
more research activities (externally funded, internally funded, and non-funded). Externally funded research had the highest percentage (45.93) and internally funded research had the lowest percentage (17.89).

Table 12

Frequencies and Percentages of Faculty Members Engaged in Research Activities

<table>
<thead>
<tr>
<th>Research Activity</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>307</td>
<td>55.52</td>
</tr>
<tr>
<td>Externally Funded</td>
<td>113</td>
<td>20.43</td>
</tr>
<tr>
<td>Non-Funded</td>
<td>89</td>
<td>16.09</td>
</tr>
<tr>
<td>Internally Funded</td>
<td>44</td>
<td>7.96</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>553</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note. Frequencies listed are the sums of the responses from 79 respondents that participated in this study.

Table 13

Frequencies and Percentages of Faculty Members Engaged in Research Activities Among Research Active Construction Education Programs

<table>
<thead>
<tr>
<th>Research Activity</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Externally Funded</td>
<td>113</td>
<td>45.93</td>
</tr>
<tr>
<td>Non-Funded</td>
<td>89</td>
<td>36.18</td>
</tr>
<tr>
<td>Internally Funded</td>
<td>44</td>
<td>17.89</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>246</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note. A research active construction education program was defined by a response of one or more faculty members engaged in one or more research activities (externally funded, internally funded, and non-funded).
Objective Five

Objective five of this study was to determine if a relationship existed between each of the 21 selected pairs of variables as outlined in the objectives of the study. The Pearson product-moment correlation coefficient was used to determine the bivariate relationships. Since the scope of this study was exploratory bivariate correlations, the following descriptors established by Davis (1971) were used for interpretation of the correlation coefficients:

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.90 to 1.00</td>
<td>very high association</td>
</tr>
<tr>
<td>.70 to .89</td>
<td>high association</td>
</tr>
<tr>
<td>.50 to .69</td>
<td>substantial association</td>
</tr>
<tr>
<td>.30 to .49</td>
<td>moderate association</td>
</tr>
<tr>
<td>.10 to .29</td>
<td>low association</td>
</tr>
<tr>
<td>.01 to .09</td>
<td>negligible association</td>
</tr>
</tbody>
</table>

Furthermore, for the purpose of generalizing the following findings, an $r \leq .22$, $n=79$, $p<.05$, two-tail, should not be considered meaningful.

a. Total required credit hours and current undergraduate student enrollment. For the purpose of unifying the summarized data, quarter hours were equated to semester hours by the following formula: quarter hours times .67 equals semester hours. These two variables had a
negligible association. The correlation coefficient was \( r = .06 \) (\( p = .598 \)).

b. Program age and graduate job placement rate. These two variables had a low association. The correlation coefficient was \( r = - .12 \) (\( p = .292 \)).

c. Number of construction content areas offered and graduate job placement rate. These two variables had a low association. The correlation coefficient was \( r = - .14 \) (\( p = .218 \)).

d. Number of construction content areas offered and graduate starting salaries. These two variables had a negligible association. The correlation coefficient was \( r = .06 \) (\( p = .598 \)).

e. Number of brand names of construction related computer software programs in use and graduate job placement rate. A negligible association was the descriptor of this correlation coefficient of \( r = .04 \) (\( p = .726 \))

f. Number of brand names of construction related computer software programs in use and graduate starting salaries. This correlation coefficient was \( r = - .18 \) (\( p = .112 \)), a low degree of association on the Davis scale.
g. Program age and number of construction content areas. These two variables had a negligible association. The correlation coefficient was $\rho = -0.04$ ($p = 0.726$).

h. Number of total required credit hours and number of construction content areas. For the purpose of unifying the summarized data, quarter hours were equated to semester hours by the following formula: quarter hours times $0.67$ equals semester hours. The Pearson product-moment correlation coefficient was $\rho = 0.05$ ($p = 0.662$). This was interpreted as a negligible association on the Davis scale.

i. Number of female faculty members and current female undergraduate student enrollment (full-time and part-time). These two variables had a correlation coefficient of $\rho = 0.15$ ($p = 0.188$). This was a low degree of association on the Davis scale.

j. Number of tenured faculty members and number of faculty members engaged in externally funded research. A correlation coefficient of $\rho = 0.38$ ($p < 0.001$) was observed between these two variables. This was a moderate association according to Davis (1971).

k. Number of tenured faculty members and number of faculty members engaged in internally funded research. These two variables had a moderate degree of association.
The Pearson product-moment correlation coefficient was $r = .46$ ($p < .001$).

1. Number of tenured faculty members and number of faculty members engaged in non-funded research. The correlation coefficient was $r = .12$ ($p = .292$), a low association on the Davis scale.

m. Number of full-time faculty members and number of faculty members engaged in research activities. The bivariate exploratory correlation of these two variables was interpreted as a substantial association. The Pearson product-moment correlation coefficient was $r = .69$ ($p < .001$).

n. Number of industry advisory board members and graduate job placement rate. The correlation coefficient was $r = .10$ ($p = .381$). The interpretation of this relationship was a low association.

o. Number of credit hours of lecture format construction courses and graduate job placement rate. This was a negligible association. The correlation coefficient was $r = -.07$ ($p = .539$).

p. Number of credit hours of laboratory format construction courses and graduate job placement rate. The Pearson product-moment correlation coefficient was $r = .07$ ($p = .539$), a negligible degree of association on the Davis scale.
q. Number of industry advisory board members and approximate dollar amount of external funding over a three-year period. These two variables had a correlation coefficient of $r = .06$ ($p = .598$). This was interpreted as a negligible association.

r. Program age and number of chartered student chapters of national organizations in the program. This association was interpreted as moderate. The correlation coefficient was $r = .37$ ($p < .001$).

s. Number of undergraduate students enrolled in the program and number of chartered student chapters of national organizations in the program. The correlation coefficient of these two variables was $r = .47$ ($p < .001$), a moderate association on the Davis scale.

t. Number of industry advisory board members and number of chartered student chapters of national organizations in the program. A low degree of association was the interpretation of this correlation coefficient of $r = .23$ ($p = .042$).

u. Program age and number of undergraduate students enrolled in the program. A correlation coefficient of $r = .22$ ($p = .051$) was obtained from these two variables. The Davis descriptor for this coefficient was a low association.
Additional Exploratory Bivariate Correlations

a. Program age and approximate dollar amount of external funding over a three-year period. A Pearson product-moment correlation coefficient of $r = .28$ ($p = .012$) was obtained between these two variables. This was interpreted as a low association.

b. Current undergraduate student enrollment and approximate dollar amount of external funding over a three-year period. A moderate association was interpreted for this bivariate relationship. The correlation coefficient was $r = .32$ ($p = .004$).

c. Number of faculty members engaged in research activities and approximate dollar amount of external funding over a three-year period. The Pearson product-moment correlation coefficient was $r = .65$ ($p < .001$), a substantial association according to Davis (1971).

Table 14 presents additional correlation coefficients and Davis descriptors of the number of tenured faculty members with each of the variables listed in the table. The number of male faculty members had a substantial association ($r = .57$, $p < .001$) with the number of tenured faculty members. The number of faculty with doctorate and masters degrees both had moderate association ($r = .45$, $p < .001$) with the number of tenured faculty members. All
other correlations had either a low or negligible
association.

Table 14

**Variables Correlated with the Number of Tenured
Construction Education Faculty Members**

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>(p)</th>
<th>Davis Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Male Faculty Members</td>
<td>.57</td>
<td>(&lt;.001)</td>
<td>Substantial Association</td>
</tr>
<tr>
<td>Number of Faculty with Doctorate Degrees</td>
<td>.45</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Number of Faculty with Masters Degrees</td>
<td>.45</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Number of Female Faculty Members</td>
<td>.27</td>
<td>(.012)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Faculty with Bachelors Degrees</td>
<td>.05</td>
<td>(.662)</td>
<td>Negligible Association</td>
</tr>
</tbody>
</table>

*Note. For the purpose of generalizing these findings, an r<.22, n=79, p<.05, two-tail, should not be considered meaningful.*

Table 15 presents a summary of the selected pairs of
variables of Objective Five and the additional exploratory
bivariate correlations of this study. It is arranged by
the magnitudes of the Pearson product-moment correlation
coefficients. For the purpose of interpretation, the Davis
descriptors are listed as well. For the purpose of
generalizing these findings listed in Table 15, an r<.22,
p<.05, two-tail, should not be considered meaningful.
Three correlations were found to be substantial while seven correlations were found to be moderate (see Table 15).

Table 15

<table>
<thead>
<tr>
<th>Variables</th>
<th>r</th>
<th>(p)</th>
<th>Davis Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Full-Time Faculty Members and Number of Faculty Members Engaged in Research Activities</td>
<td>.69</td>
<td>(&lt;.001)</td>
<td>Substantial Association</td>
</tr>
<tr>
<td>Number of Faculty Members Engaged in Research Activities and Approximate Dollar Amount of External Funding Over a Three-Year Period</td>
<td>.65</td>
<td>(&lt;.001)</td>
<td>Substantial Association</td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Male Faculty Members</td>
<td>.57</td>
<td>(&lt;.001)</td>
<td>Substantial Association</td>
</tr>
<tr>
<td>Number of Undergraduate Students Enrolled in the Program and Number of Chartered Student Chapters of National Organizations in the Program</td>
<td>.47</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty Members Engaged in Internally Funded Research</td>
<td>.46</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
</tbody>
</table>

(table con’d)
<table>
<thead>
<tr>
<th>Variables</th>
<th>$r$</th>
<th>$(p)$</th>
<th>Davis Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty with Doctorate</td>
<td>.45</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Degrees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty Members with</td>
<td>.45</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Masters Degrees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty Members Engaged</td>
<td>.38</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>in Externally Funded Research</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Age and Number of Chartered Student</td>
<td>.37</td>
<td>(&lt;.001)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Chapters of National Organizations in the Program</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Undergraduate Student Enrollment and</td>
<td>.32</td>
<td>(.004)</td>
<td>Moderate Association</td>
</tr>
<tr>
<td>Approximate Dollar Amount of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Funding Over a Three-Year Period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Age and Approximate</td>
<td>.28</td>
<td>(.012)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Dollar Amount of External Funding Over a Three-Year Period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of</td>
<td>.28</td>
<td>(.012)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Female Faculty Members</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Industry Advisory Board Members and Number of</td>
<td>.23</td>
<td>(.042)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Chartered Student Chapters of National</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizations in the Program</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(table con’d)
<table>
<thead>
<tr>
<th>Variables</th>
<th>$r$</th>
<th>$(p)$</th>
<th>Davis Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Age and Number of Undergraduate Students Enrolled in the Program</td>
<td>.22</td>
<td>(.051)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Brand Names of Construction Related Computer Software Programs in Use and Graduate Job Placement Rate</td>
<td>-.18</td>
<td>(.112)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Female Faculty Members and Current Female Undergraduate Student Enrollment</td>
<td>.15</td>
<td>(.188)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Construction Content Areas Offered and Graduate Job Placement Rate</td>
<td>-.14</td>
<td>(.218)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty Members Engaged in Non-Funded Research</td>
<td>.12</td>
<td>(.292)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Program Age and Graduate Job Placement Rate</td>
<td>-.12</td>
<td>(.292)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Industry Advisory Board Members and Graduate Job Placement Rate</td>
<td>.10</td>
<td>(.381)</td>
<td>Low Association</td>
</tr>
<tr>
<td>Number of Credit Hours of Lecture Format Construction Courses and Graduate Job Placement Rate</td>
<td>-.07</td>
<td>(.539)</td>
<td>Negligible Association</td>
</tr>
</tbody>
</table>

(table con’d)
<table>
<thead>
<tr>
<th>Variables</th>
<th>$r$</th>
<th>($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credit Hours of Laboratory Format and Graduate Job Placement Rate</td>
<td>.07</td>
<td>(.539)</td>
</tr>
<tr>
<td>Total Required Credit Hours and Current Undergraduate Student Enrollment</td>
<td>.06</td>
<td>(.598)</td>
</tr>
<tr>
<td>Number of Construction Content Areas Offered and Graduate Starting Salaries</td>
<td>.06</td>
<td>(.598)</td>
</tr>
<tr>
<td>Number of Industry Advisory Board Members and Approximate Dollar Amount of External Funding Over a Three-Year Period</td>
<td>.06</td>
<td>(.598)</td>
</tr>
<tr>
<td>Number of Total Required Credit Hours and Number of Construction Content Areas Offered</td>
<td>.05</td>
<td>(.662)</td>
</tr>
<tr>
<td>Number of Tenured Faculty Members and Number of Faculty With Bachelors Degrees</td>
<td>.05</td>
<td>(.662)</td>
</tr>
<tr>
<td>Computer Software Programs in Use and Graduate Job Placement Rate</td>
<td>.04</td>
<td>(.726)</td>
</tr>
<tr>
<td>Program Age and Number of Construction Content Areas Offered</td>
<td>-.04</td>
<td>(.726)</td>
</tr>
</tbody>
</table>

Note. For the purpose of generalizing these findings, an $r < .22$, $n=79$, $p<.05$, two-tail, should not be considered meaningful.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to describe and explore the current status of four-year undergraduate construction education programs in the United States. There were five objectives of this study.

Objective one was to describe the following selected program characteristics:

a. College or administrative unit name.
b. School or department name.
c. Program name.
d. Accreditation(s).
e. Program age.
f. Program evolution.
g. Program independence.
h. Industry advisory board involvement.
i. External funding from industry.
j. Graduate job placement rate.
k. Graduate starting salaries.

Objective two was to describe the following selected curriculum characteristics:

a. Academic structure (semester/quarter hour system).
b. Total required credit hours.
c. Required credit hours of lecture format construction courses.

d. Required credit hours of laboratory format construction courses.

e. Brand names of construction related computer software programs in use.

f. Number of construction content areas offered.

Objective three was to describe the following selected student characteristics:

a. Current undergraduate student enrollment (full-time and part-time).

b. Current male undergraduate student enrollment (full-time and part-time).

c. Current female undergraduate student enrollment (full-time and part-time).

d. Chartered student chapters of national organizations.

Objective four was to describe the following selected faculty characteristics:

a. Number of faculty members by highest degree held.

b. Number of full-time faculty members.
c. Number of part-time (adjunct) faculty members.
d. Number of shared faculty members.
e. Number of male faculty members.
f. Number of female faculty members.
g. Total number of faculty members.
h. Number of tenured faculty members.
i. Number of non-tenured faculty members.
j. Number of faculty members engaged in externally funded research.
k. Number of faculty members engaged in internally funded research.
l. Number of faculty members engaged in non-funded research.
m. Number of faculty members engaged in research activities.

Objective five was to determine if a bivariate relationship exists between each of the following selected pairs of variables:

a. Total required credit hours and current undergraduate student enrollment.
b. Program age and graduate job placement rate.
c. Number of construction content areas offered and graduate job placement rate.
d. Number of construction content areas offered and graduate starting salaries.
é. Number of brand names of construction related computer software programs in use and graduate job placement rate.
f. Number of brand names of construction related computer software programs in use and graduate starting salaries.
g. Program age and number of construction content areas offered.
h. Number of total required credit hours and number of construction content areas offered.
i. Number of female faculty members and current female undergraduate student enrollment (full-time and part-time).
j. Number of tenured faculty members and number of faculty members engaged in externally funded research.
k. Number of tenured faculty members and number of faculty members engaged in internally funded research.
1. Number of tenured faculty members and number of faculty members engaged in non-funded research.

m. Number of full-time faculty members and number of faculty members engaged in research activities.

n. Number of industry advisory board members and graduate job placement rate.

o. Number of credit hours of lecture format construction courses and graduate job placement rate.

p. Number of credit hours of laboratory format construction courses and graduate job placement rate.

q. Number of industry advisory board members and approximate dollar amount of external funding over a three-year period.

r. Program age and number of chartered student chapters of national organizations in the program.

s. Number of undergraduate students enrolled in the program and number of chartered student chapters of national organizations in the program.
t. Number of industry advisory board members and number of chartered student chapters of national organizations in the program.

u. Program age and number of undergraduate students enrolled in the program.

Since the early 1900's, construction education has evolved from three divergent disciplines. Construction technology programs evolved from industrial arts and technology disciplines. Construction engineering programs evolved from engineering/architecture design disciplines, and construction management evolved from business disciplines. All have been influenced in some way by national organizations dedicated to the construction industry. Furthermore, construction education programs have been influenced by three national accrediting agencies: ACCE, ABET, and NAIT. Their program philosophies and criteria have common elements that closely align the three divergent disciplines to the construction industry's standards and expectations.

Past survey research studies on construction education programs in the United States have included variables such as: credit hours in the curriculum; accreditation; program name; program age; student enrollment; faculty degrees;
research activities; graduate job placement rates; graduate starting salaries; and industry advisory board involvement.

The methodology of this study included a survey of 156 four-year undergraduate construction education programs in the United States. A 26 item survey questionnaire was mailed to 156 programs. Non-respondents were sent two follow-up postcards and a follow-up telephone call. In addition to this procedure, 25 non-respondents were sent a facsimile of the survey questionnaire as per their request. Upon further review of the 156 programs, 109 were classified as four-year undergraduate construction education programs as defined by: the program awards a bachelors degree and the curriculum has a construction emphasis. Responses were received from 79 of the 109 programs. This was a 72.48% survey response rate. Fifty-eight respondents’ programs were members of the Associated Schools of Construction, and they accounted for 73.42% of the survey response rate.

The following is a summary of the findings arranged by objectives of this study:

Engineering/architecture and technology/applied science each accounted for approximately 40% (approximately 85% collectively) of the program’s college or administrative unit name. Business/management accounted
for almost 10%, while 5% were classified as “other”. Construction management was the most frequently used school or department name, followed by engineering technology, civil engineering, construction technology, and industrial technology. More than half used construction management as their program name and all programs included the word “construction” as part of their program name. ACCE was the leading accreditation agency, followed by ABET and NAIT. This was also the ranking for candidate programs. Five percent of the programs had dual accreditation, while 11% had no accreditation. The average age of the programs was 25 years. Fifty-five percent of the programs evolved from other programs. Forty percent of the evolved programs came from industrial arts/technology while the remainder evolved from engineering/architecture, business, and agriculture. More than 80% of the programs were independent while the remaining programs were part of a design and/or technology program. Over 90% of the programs had an industry advisory board. The average number of board members was 14, and they met on an average of twice per year. Seventy-one percent of the programs received an average of $91,000 in external funding from industry over a three-year period. The average job placement rate was approximately 98%, and
the average annual starting salary was approximately $32,260 of the May/June 1997 graduating class.

Eighty-six percent of the programs were on a semester hour system. The average number of required credit hours of a curriculum was 129 semester hours. Lecture hour format construction courses accounted for an average of 30% of the curriculum while laboratory hour format construction courses accounted for almost 16% of the curriculum. Over 90% of the lecture and laboratory format construction courses were administered by their own departments. The three most common brand names of construction related software programs in use were as follows: Primavera, Timberline, and AutoCAD. Programs on an average offer six different construction content areas with electrical, mechanical, and commercial/building being the most common.

The average number of full-time undergraduate students enrolled per program was 129. The average number of part-time students was sixteen. They accounted for a total average of 145 undergraduate students per program of which approximately 10% were females. There was an average of two chartered student chapters of national organizations per program with AGC being the most common.

Forty-nine percent of the faculty had masters degrees, 40% had doctorate degrees, 10% had bachelors degrees, and
1% had other degrees. Sixty-one percent of the faculty were full-time, 29% were part-time, and 10% were shared with another program. The average number of faculty members per program was seven. Approximately 20% of the faculty were females. Forty-two percent of the faculty had tenure. Forty-five percent of the faculty were engaged in externally funded research, 36% were engaged in non-funded research, and 18% were engaged in internally funded research. Approximately 45% of the total faculty were engaged in research activities.

Three bivariate correlations had substantial associations (full-time faculty and research activities; research activities and external funding; and tenured faculty and male faculty). Seven bivariate correlations had moderate associations (tenured faculty correlated with externally funded research, internally funded research, doctorate degrees, and masters degrees; program age and chartered student chapters; student enrollment and chartered student chapters; and student enrollment and external funding). Nine bivariate correlations had low associations, and nine bivariate correlations had negligible associations.
Conclusions and Recommendations

The following conclusions and recommendations were formulated based on the findings of this study:

Construction education programs remain administered at the college or administrative unit level by design, technology, and business disciplines. Design and technology disciplines were found to administer approximately 80% of the programs (40% each) while business disciplines administered 10% of the programs. This was similar to the literature, particularly the Rogers and Weidman study of 1990 which found 52% of the programs administered by technology disciplines, and 3% of the programs administered by business disciplines. Further research is recommended to determine if differences exist among programs administered by design, technology, and business disciplines.

There is a trend toward a management emphasis among construction education programs. It was found that over half of the programs used the word "management" in their name and were accredited by ACCE. According to the literature, ACCE was the primary accreditation agency for the programs with a management emphasis. This was different than the Rogers and Weidman study of 1990 which found approximately 50% of the programs using the word
“engineering” in their name, and over half were accredited by ABET, an accreditation agency that accredits programs with an engineering and/or engineering technology emphasis according to the literature. A follow-up study is recommended to determine if this management trend will continue and what effects, if any, it will have on program resources, structure, philosophy, and outcomes.

There is a trend toward program independence at the departmental level among construction education programs. The literature states that construction education evolved primarily from industrial arts/technology programs and engineering/architecture programs. It was found that approximately 20% of the programs remain a part of these programs while 80% are independent. Furthermore, it was found that over 90% of the construction courses (lecture and laboratory format) were administered by their own departments, and 61% of the faculty were full-time while only 10% of the faculty were shared with another program.

Construction education programs are supported strongly by the construction industry. It was found that industry advisory board involvement had increased since the Adcox study of 1993, graduate job placement rates had increased since the 1996 AIC survey, externally funded research was up slightly higher than the Rogers and Weidman study of
1990, and 71% of the programs received an average of $91,000.00 in external funding. Further research is recommended to determine the factors that influence this successful rapport with the construction industry. Meanwhile, it is recommended that non-supported programs regard supported programs as a model in order to develop a successful rapport with the construction industry.

There is a diversity of construction content areas offered in the curriculums. Construction education programs on the average offer six different construction content areas. Furthermore, they offer them in the lecture format twice as much as the laboratory format. It is evident that this type of curriculum structure is successful due to the 90% average graduate job placement rate and the average annual starting salary increase since 1996.

Construction education on the average remains a young discipline in higher education. It was found that the average age of a program was 25 years. The Rogers and Weidman study of 1990 found the average age of the programs to be 18.5 years. The average ages of the programs are considered to be young when compared to the traditional disciplines of higher education.
Construction education programs continue to grow in the academic environment of higher education. It was found that student enrollment and faculty employment had increased on the average of 26% and 40% respectively from the Rogers and Weidman study in 1990. Furthermore, the number of full-time faculty, the number of tenured faculty, the number of externally funded research activities, and the number of advanced degrees (doctorate and masters) held by the faculty had increased by approximately 3% each since the 1990 study. All of the aforementioned elements are common to the successful traditional academic disciplines of higher education and were found to be substantially and moderately correlated with each other in this study. Therefore, it is recommended that construction education faculty engage in research activities and obtain advanced degrees in order for them as well as their respective programs to prosper in the academic environment of higher education in the United States.
BIBLIOGRAPHY


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APPENDIX A

Mailing List

ALABAMA

Auburn University
Building Science Department
College of Architecture, Design, and Construction
Auburn, AL 36849-5315
Attention: Department Chair/Head

Tuskegee University
Construction Science & Management
Dept. of Architecture, Wilcox A
Tuskegee, AL 36088
Attention: Department Chair/Head

ALASKA

University of Alaska - Anchorage
Civil Engineering Department
Engineering Building
Anchorage, AK 99508
Attention: Department Chair/Head

University of Alaska - Fairbanks
Department of Civil Engineering
Duckering Building
Fairbanks, AK 99775
Attention: Department Chair/Head

ARIZONA

Arizona State University
Construction Management
Del E. Webb School of Construction
Tempe, AZ 85287-0204
Attention: Department Chair/Head

Northern Arizona University
Department of Technology
College of Eng. and Tech. - Box 15600
Flagstaff, AZ 86011-1560
Attention: Department Chair/Head

ARKANSAS

John Brown University
Department of Construction Management
Engineering Division-Box 3020
Siloam Springs, AR 72761
Attention: Department Chair/Head

University of Arkansas - Little Rock
Construction Management
College of Science and Engineering Technology
Little Rock, AR 72204-1099
Attention: Department Chair/Head

University of Arkansas-Pine Bluff
Department of Industrial Technology
School of Science & Tech-UAPB-Box 4987
Pine Bluff, AR 71601
Attention: Department Chair/Head

CALIFORNIA

California Polytechnic State University
Construction Management Department
College of Arch. & Environmental Design
San Luis Obispo, CA 93407
Attention: Department Chair/Head

California State Polytechnic University
Engineering Technology Dept. - Bldg. 9
3801 West Temple
Pomona, CA 91768-4067
Attention: Department Chair/Head

California State University - Chico
Department of Construction Management
College of Eng., Computer Sci. & Tech.
Chico, CA 95929-0305
Attention: Department Chair/Head

California State University - Fresno
Construction Management Program
School of Engineering
Fresno, CA 93740-0094
Attention: Department Chair/Head

California State University - Long Beach
Department of Engineering Technology
College of Engineering
Long Beach, CA 90840-5602
Attention: Department Chair/Head

California State University - Sacramento
Construction Management Program
Civil Engineering - 6000 J Street
Sacramento, CA 95819-6029
Attention: Department Chair/Head

San Diego State University
Civil Engineering Department
424 Engineering Building
San Diego, CA 92182
Attention: Department Chair/Head

San Jose State University
Civil Engineering and Applied Mechanics Dept.
Building 26
San Jose, CA 95192
Attention: Department Chair/Head
Santa Clara University
Civil Engineering & Eng. Mechanics
Dept.
Bannan Engineering Center
Santa Clara, CA 95053
Attention: Department Chair/Head

Stanford University
Construction Eng. & Mgmt. Program
Civil Eng.-Terman Engineering Center
Stanford, CA 94305-4020
Attention: Department Chair/Head

University of California - Berkeley
Civil Engineering Department
Davis Hall
Berkeley, CA 94720
Attention: Department Chair/Head

University of California - Davis
Department of Civil Engineering
Walker Hall
Davis, CA 95616
Attention: Department Chair/Head

University of California - Irvine
Department of Civil Engineering
1101 ICEF
Irvine, CA 92717
Attention: Department Chair/Head

University of Southern California
Department of Civil Engineering
212 Kaprielian Hall
Los Angeles, CA 90007
Attention: Department Chair/Head

COLORADO
Colorado School of Mines
Department of Engineering
Brown Hall
Golden, CO 80401
Attention: Department Chair/Head

Colorado State University
Department of Manufacturing Technology & Construction Management
Fort Collins, CO 80523
Attention: Department Chair/Head

University of Colorado - Boulder
Dept. of Civil Eng. & Arch.
Engineering Engineering Center
Boulder, CO 80309
Attention: Department Chair/Head

University of Denver
Burns School of Real Estate and Const. Management
2020 South Race Street
Denver, CO 80208
Attention: Department Chair/Head

University of Southern Colorado
Department of Engineering Technology
264 Technology Building
Pueblo, CO 81001
Attention: Department Chair/Head

CONNECTICUT
Central Connecticut State University
School of Technology
Copernicus Hall
New Britain, CT 06050
Attention: Department Chair/Head

University of Connecticut
Department of Civil Engineering
United Technologies Engineering Building
Storrs, CT 06269
Attention: Department Chair/Head

FLORIDA
Florida A&M University
Construction Engineering Technology Program
Bannaker Engineering Complex
Tallahassee, FL 32307
Attention: Department Chair/Head

Florida International University
Department of Construction Management
College of Engineering & Design
Miami, FL 33199
Attention: Department Chair/Head

University of Florida
M.E. Rinker, Sr. School of Building Constr.
P.O. Box 115703
Gainesville, FL 32611-5703
Attention: Department Chair/Head

University of North Florida
Construction Technology
Division of Technology
Jacksonville, FL 32224-2645
Attention: Department Chair/Head

University of West Florida
Building Construction Program
Building 70
Pensacola, FL 32514
Attention: Department Chair/Head

GEORGIA
Georgia Institute of Technology
Building Construction
College of Architecture
Atlanta, GA 30332-0155
Attention: Department Chair/Head
Georgia Southern University
Building Construction and Contracting
Allen E. Paulson College of Science and Technology
P.O. Box 8047
Statesboro, GA 30460-8047
Attention: Department Chair/Head

Southern Polytechnic State University
Construction Department
1100 South Marietta Parkway
Marietta, GA 30060-2896
Attention: Department Chair/Head

IDAHO
Boise State University
College of Engineering
Dept. of Construction Management
1910 University Drive
Boise, ID 83725
Attention: Department Chair/Head

ILLINOIS
Bradley University
Department of Civil Engineering & Construction
College of Engineering & Technology
Peoria, IL 61625-9989
Attention: Department Chair/Head

Illinois Institute of Technology
Civil Engineering Department
Alumni Hall
Chicago, IL 60616
Attention: Department Chair/Head

Illinois State University
Department of Industrial Technology
College of Applied Science & Technology
Normal, IL 61790-5100
Attention: Department Chair/Head

Southern Illinois Univ. - Carbondale
Technology Department
Technology Building D
Carbondale, IL 62901
Attention: Department Chair/Head

Southern Illinois Univ. - Edwardsville
Department of Construction
School of Engineering
Edwardsville, IL 62026-1803
Attention: Department Chair/Head

University of Illinois - Urbana-Champaign
Department of Civil Engineering
Newmark Civil Engineering Laboratory
Champaign, IL 61820
Attention: Department Chair/Head

INDIANA
Indiana State University
Manufacturing & Construction Technology
School of Technology
Terre Haute, IN 47809
Attention: Department Chair/Head

Indiana University - Purdue University at Fort Wayne
Department of Civil & Architectural Engineering Tech.
250 Neff Hall
Fort Wayne, IN 46805
Attention: Department Chair/Head

Indiana University - Purdue University at Indianapolis
Department of Construction Technology
1307L Engineering Technology Building
Indianapolis, IN 46202
Attention: Department Chair/Head

Purdue University
Dept. of Building Construction & Contracting
1414 Knoll Hall
West Lafayette, IN 47907-1414
Attention: Department Chair/Head

Purdue University Calumet
Department of Construction Technology
230 Anderson Building
Hammond, IN 46323
Attention: Department Chair/Head

Rose-Hulman Institute of Technology
Department of Civil Engineering
Olin Hall
Terre Haute, IN 47803
Attention: Department Chair/Head

IOWA
Iowa State University
Civil and Construction Engineering
456 Town Engineering
Ames, IA 50011-3232
Attention: Department Chair/Head

University of Northern Iowa
Construction Management Program
Industrial Tech Center
Cedar Falls, IA 50614-0178
Attention: Department Chair/Head
KANSAS

Kansas State University
Dept. of Arch., Eng, & Construction Science
College of Engineering, Seaton Hall
240
Manhattan, KS 66506-2903
Attention: Department Chair/Head

Pittsburgh State University
School of Technology
Dept. of Engineering Technology
Pittsburgh, KS 66762
Attention: Department Chair/Head

University of Kansas
Architectural Engineering Department
Marvin Hall
Lawrence, KS 66045
Attention: Department Chair/Head

KENTUCKY

Eastern Kentucky University
Construction Technology Program
Applied Arts & Technology, 307 Whalin
Richmond, KY 40475-3115
Attention: Department Chair/Head

Murray State University
Construction Technology Program
Martha Layne Collins Center
Murray, KY 42071
Attention: Department Chair/Head

LOUISIANA

Grambling State University
Department of Ind. & Eng. Tech.
T.L. James Hall (Eng. Tech. Bldg.)
Grambling, LA 71245
Attention: Department Chair/Head

Louisiana State University
Department of Construction Management
Room 2519-B CEBA Building
Baton Rouge, LA 70803-6419
Attention: Department Chair/Head

Louisiana Technological University
Construction Engineering Technology
Bogard Hall
Ruston, LA 71272
Attention: Department Chair/Head

Northeast Louisiana University
School of Construction
College of Pure & Applied Sciences
Monroe, LA 71209-0540
Attention: Department Chair/Head

MAINE

University of Maine
School of Engineering
5725 East Annex, Room 221
Orono, ME 04469-5725
Attention: Department Chair/Head

MARYLAND

University of Maryland, College Park
Construction Engineering and Management Program
1179 Engineering Building
College Park, MD 20742
Attention: Department Chair/Head

University of Maryland, Eastern Shore
Construction Management Technology
Department of Technology
Princess Anne, MD 21853-1299
Attention: Department Chair/Head

MASSACHUSETTS

Wentworth Institute of Technology
Department of Civil, Construction, Environment, and Management
550 Huntington Avenue
Boston, MA 02115-5998
Attention: Department Chair/Head

Worcester Polytechnic Institute
Department of Civil Engineering
102 Kaven Hall
Worcester, MA 01609
Attention: Department Chair/Head

MICHIGAN

Eastern Michigan University
Department of Industrial Technology
Construction Program - 118 Sill Hall
Ypsilanti, MI 48197
Attention: Department Chair/Head

Ferris State University
Department of Construction
College of Technology - Swan 312
Big Rapids, MI 49307-2295
Attention: Department Chair/Head

Lawrence Technological University
Department of Civil Engineering
Engineering Building
Southfield, MI 48075
Attention: Department Chair/Head

Michigan State University
Building Construction Management
207 Farrall Hall
East Lansing, MI 48824-1323
Attention: Department Chair/Head
NEVADA

University of Nevada - Las Vegas
Coll. of Arch., Constr. Mgmt. & Planning
P.O. Box 454018
Las Vegas, NV 89154-4018
Attention: Department Chair/Head

NEW JERSEY

Fairleigh Dickinson University
Engineering Tech./Construction Program
Muscarella Center, 1000 River Road
Teaneck, NJ 07666
Attention: Department Chair/Head

Kean College of New Jersey
Department of Technology
Morris Avenue
Union, NJ 07083-9982
Attention: Department Chair/Head

New Jersey Institute of Technology
Department of Engineering Technology
University Heights
Newark, NJ 07102-1982
Attention: Department Chair/Head

Rutgers University
College of Engineering
Department of Civil & Environmental Engineering
Engineering Building, Busch Campus
New Brunswick, NJ 08903
Attention: Department Chair/Head

NEW MEXICO

New Mexico State University
Civil Engineering Technology Program
107 Goddard Hall
Las Cruces, NM 88003
Attention: Department Chair/Head

University of New Mexico
Construction Management
Department of Civil Engineering
Albuquerque, NM 87131-1351
Attention: Department Chair/Head

NEW YORK

Clarkson University
Department of Civil & Env. Engineering
CAMP Building
Potsdam, NY 13699
Attention: Department Chair/Head

Pratt Institute
Construction Management Program
School of Architecture, 4th Floor
295 Lafayette Street
Brooklyn, NY 10012
Attention: Department Chair/Head

Rochester Institute of Technology
Civil Engineering Technology
Gleason Building
78 Lomb Memorial Drive
Rochester, NY 14623-5604
Attention: Department Chair/Head

SUNY College of Environ. Sci. & Forestry
Wood Products Engineering - Const. Option
1 Forestry Drive
Syracuse, NY 13210-2786
Attention: Department Chair/Head

Utica College of Syracuse University
Management Studies
1600 Burrstone Road
Utica, NY 13502-4892
Attention: Department Chair/Head

NORTH CAROLINA

East Carolina University
Department of Construction Management
Industry & Technology-325 Rawl
Greenville, NC 27858-4353
Attention: Department Chair/Head

North Carolina A&T State University
Department of Construction Mgmt. & Safety
School of Technology
Greensboro, NC 27411
Attention: Department Chair/Head

North Carolina State University
Department of Civil Engineering
Mann Hall
Raleigh, NC 27695
Attention: Department Chair/Head

University of North Carolina at Charlotte
Department of Engineering Technology
College of Engineering, UNCC Station
Charlotte, NC 28223
Attention: Department Chair/Head

NORTH DAKOTA

North Dakota State University
Construction Management
CME Building, Room 120
Fargo, ND 58105
Attention: Department Chair/Head

North Dakota State University
Construction Engineering
CME Building, Room 120
Fargo, ND 58105
Attention: Department Chair/Head
OHIO
Bowling Green State University
Construction Management & Technology
College of Technology
Bowling Green, OH 43403-0301
Attention: Department Chair/Head

Case Western Reserve University
Construction Engineering & Mgmt. Program
Bingham Building
Cleveland, OH 44106
Attention: Department Chair/Head

Cincinnati State Tech. & Comm. College
Civil Engineering Technology
3520 Central Parkway
Cincinnati, OH 45223
Attention: Department Chair/Head

Ohio State University
Department of Civil Engineering
2070 Neil Avenue
Columbus, OH 43210
Attention: Department Chair/Head

Ohio State University - Wooster
Construction Technology
1328 Dover Road
Wooster, OH 44691-4000
Attention: Department Chair/Head

University of Akron
Construction Technology Program
Forge Building
Akron, OH 44325
Attention: Department Chair/Head

University of Cincinnati
OMS College of Applied Science
2220 Victory Parkway
Cincinnati, OH 45206-0103
Attention: Department Chair/Head

University of Dayton
Department of Civil Engineering
421 Kettering Lab Building
Dayton, OH 45469
Attention: Department Chair/Head

OKLAHOMA
Oklahoma State University
Dept. of Construction Management
CEAT
Stillwater, OK 74078-0157
Attention: Department Chair/Head

University of Oklahoma
Construction Science Division
College of Arch./Gould Hall
Norman, OK 73019-0285
Attention: Department Chair/Head

OREGON
Oregon Institute of Technology
Civil Engineering Technology
Department
Semen Hall
Klamath Falls, OR 97601
Attention: Department Chair/Head

Oregon State University
Dept. of C.E./Construction Eng. Management
Apperson Hall
Corvallis, OR 97331-2302
Attention: Department Chair/Head

PENNSYLVANIA
Drexel University
Construction Management Program
251 Curtis Hall
Philadelphia, PA 19104
Attention: Department Chair/Head

Penn State, Harrisburg
Civil Engineering Technology
777 W. Harrisburg Pike Olmsted Bldg.
Room W255
Middletown, PA 17057-4898
Attention: Department Chair/Head

Temple University
Department of Civil Engineering
Civil & Construction Eng. Technology
Philadelphia, PA 19122
Attention: Department Chair/Head

University of Pittsburgh
Department of Civil Engineering
949 Benedum Hall
Pittsburgh, PA 15260
Attention: Department Chair/Head

RHODE ISLAND
Roger Williams University
Construction Management Engineering Lab
1 Old Ferry Road
Bristol, RI 02809-2921
Attention: Department Chair/Head
University of Rhode Island  
Department of Civil & Env. Engineering  
Bliss Hall  
Kingston, RI 02881  
Attention: Department Chair/Head

SOUTH CAROLINA

Clemson University  
Department of Construction Science and Management  
Box 340507, 124 Lee Hall  
Clemson, SC 29634-0507  
Attention: Department Chair/Head

TENNESSEE

East Tennessee State University  
Construction Technology Program  
Wilson-Wallis Hall  
Johnson City, TN 37614  
Attention: Department Chair/Head

University of Tennessee, Chattanooga  
School of Engineering  
222 Grote Hall  
Chattanooga, TN 37403  
Attention: Department Chair/Head

University of Tennessee, Knoxville  
Construction Program  
220 Perkins Hall  
Knoxville, TN 37996  
Attention: Department Chair/Head

TEXAS

Texas A&M University - Commerce  
Dept. of Industrial and Engineering Technology  
East Texas Station  
Commerce, TX 75429-3011  
Attention: Department Chair/Head

Texas A & M University  
Department of Construction Science  
College of Architecture  
College Station, TX 77843-3137  
Attention: Department Chair/Head

Texas Southern University  
Department of Construction Technologies  
121 Technology Building  
Houston, TX 77004  
Attention: Department Chair/Head

Texas Technological University  
Department of Engineering Technology  
Construction Option  
Box 43107  
Lubbock, TX 79409-3107  
Attention: Department Chair/Head

University of Houston  
Department of Civil Technology  
325 T2  
Houston, TX 77204  
Attention: Department Chair/Head

University of North Texas  
Construction Technology Program  
Industrial Technology Building  
Denton, TX 76203  
Attention: Department Chair/Head

University of Texas, Austin  
Department of Civil Engineering  
5.2 Cockrell Hall  
Austin, TX 78712  
Attention: Department Chair/Head

University of Texas, El Paso  
Department of Civil Engineering  
Engineering Complex  
El Paso, TX 79968  
Attention: Department Chair/Head

University of Texas, San Antonio  
College of Business  
Humanities Business Building  
San Antonio, TX 78249  
Attention: Department Chair/Head

UTAH

Brigham Young University  
Technology Education & Construction Mgmt. Engineering & Technology-230 SNLB  
Provo, UT 84602  
Attention: Department Chair/Head

VIRGINIA

Hampton University  
Building Construction Technology Program  
Armstrong-Slater Building  
Hampton, VA 23668  
Attention: Department Chair/Head

Norfolk State University  
Building Construction Technology Program  
W.P. Robinson Technology Center  
Norfolk, VA 23504  
Attention: Department Chair/Head

Old Dominion University  
Civil Engineering Technology  
Kaufman Duckworth Hall-Room 214  
Norfolk, VA 23529-0204  
Attention: Department Chair/Head

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<table>
<thead>
<tr>
<th>Institution</th>
<th>Address</th>
<th>Department</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia Polytechnic Institute and State University</td>
<td>122 Burrus Hall, Blacksburg, VA 24061-0156</td>
<td>College of Architecture and Urban Studies</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington Central Washington University</td>
<td>400 East 8th Avenue, Ellensburg, WA 98926-7584</td>
<td>Construction Management</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>Eastern Washington University</td>
<td>101 Cheney Hall, Cheney, WA 99004</td>
<td>Department of Technology</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>University of Washington</td>
<td>116 Architecture Hall, Seattle, WA 98195-1610</td>
<td>Department of Building Construction</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>Washington State University</td>
<td>Carpenter Hall, Pullman, WA 99164</td>
<td>Construction Management Program</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>Washington State University (Spokane)</td>
<td>School of Architecture, Spokane, WA 99164-2220</td>
<td>Construction Management Program</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>Marquette University</td>
<td>Haggerty Engineering Building, Milwaukee, WI 53233</td>
<td>Department of Civil &amp; Env. Engineering</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>Milwaukee School of Engineering</td>
<td>Architectural Engineering &amp; Building</td>
<td>Department</td>
<td>Attention: Department Chair/Head</td>
</tr>
<tr>
<td>University of Wisconsin-Madison</td>
<td>Agricultural Engineering Department</td>
<td></td>
<td>Attention: Department Chair/Head</td>
</tr>
</tbody>
</table>

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APPENDIX B

Questionnaire

SURVEY QUESTIONNAIRE

FOR

THE CURRENT STATUS OF FOUR-YEAR UNDERGRADUATE CONSTRUCTION EDUCATION PROGRAMS IN THE UNITED STATES

1997

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DIRECTIONS: Answer all questions to the best of your ability. If you need to qualify your answer, use the margins.

1. What is the name of the college or administrative unit to which your program is assigned? (e.g. College of Applied Sciences)

2. What is the name of the school or department to which your program is assigned? (e.g. Department of Construction Management)

3. What is the name of your program? (e.g. Construction Management)

4. List all degree(s) offered in your program. (e.g. B.S., M.S.)

5. List the total number of undergraduate students currently enrolled in your program.
   ___________ (FULL-TIME)  ___________ (PART-TIME)

6. List the total number of male undergraduate students currently enrolled in your program.
   ___________ (FULL-TIME)  ___________ (PART-TIME)

7. Is your program based on a semester hour or quarter hour system? (Check One)
   _____ SEMESTER HOUR SYSTEM   _____ QUARTER HOUR SYSTEM

8. Indicate the total credit hours required in the curriculum.
   ___________

9. Is your program currently accredited?  
   _____ YES  _____ NO
   If yes, list the accrediting agency(ies) and the year it became accredited.
   ____________________________ AGENCY  _____YEAR
   ____________________________ AGENCY  _____YEAR

10. If no, is your program currently a candidate for accreditation?  
    _____ YES  _____ NO
If yes, list the accrediting agency.

_____________________________________________________________ AGENCY

10. List the year that your program became a four-year undergraduate construction education program.

19________

11. Did it evolve from another program? 

______ YES ______ NO
If yes, list the name of that program.

_____________________________________________________________

12. Is your program independent (e.g. Construction Management) or part of another program (e.g. Civil Engineering-Construction Management Option)?

______ INDEPENDENT _______ PART OF ANOTHER PROGRAM
If part of another program, list that program.

_____________________________________________________________

13. Does your program have an industry advisory board?

______ YES ______ NO
If yes, how many members serve on this board? ________________
How often do they meet (e.g. once a semester)? ________________

14. Indicate the chartered student chapters of national organizations in your program: (Check all that apply)

_____ AGC - Associated General Contractors
_____ ABC - Associated Builders and Contractors
_____ NAHB - National Association of Home Builders
_____ AIC - American Institute of Constructors
_____ Sigma Lambda Chi
_____ Others (Please Specify) __________________________

_____ None

15. Does your program receive any external funding from industry?

______ YES ______ NO
If yes, indicate the approximate dollar amount over the last 3 years.  

$________________________

16. Indicate the approximate job placement rate (in percent) of the May/June 1997 graduating class.  

__________ Percent

17. Indicate the approximate average annual starting salary of the placed May/June 1997 graduating class. Do not include any unemployed graduates.  

$________________________

18. Indicate the total number of faculty assigned to your program by highest degree held.  

_____ Doctorate  _____ Master's  _____ Bachelor's  _____ Other (Please specify) ____________________________

19. Indicate the total number of faculty members, excluding graduate assistants, assigned to your program who are:  

_____ Full-Time Within Your Program  

_____ Part-Time (Adjunct) Within Your Program  

_____ Shared With Another Program

20. Indicate the total number of male faculty members assigned to your program.  

__________

21. Indicate the total number of tenured faculty members assigned to your program.  

__________

22. Indicate the total number of faculty members assigned to your program currently engaged in:  

_____ Research Funded from External Sources  

_____ Research Funded from Internal Sources  

_____ Non-Funded Research

23. How many credit hours of lecture format construction courses are required in your curriculum?  

__________
24. How many credit hours of laboratory format construction courses are required in your curriculum?

Of these, how many credit hours are administered by your department?

25. List the brand names of construction related computer software programs currently being taught and/or used in your curriculum (e.g. AUTOCAD, TIMBERLINE, PRIMIVERA, etc.).

26. Indicate the total number of credit hours for each content area of construction offered in your curriculum, even if it is only a part of a course.

_____ RESIDENTIAL  _____ MUNICIPAL/CIVIL
_____ INDUSTRIAL  _____ COMMERCIAL/BUILDING
_____ HEAVY  _____ MARINE/OFFSHORE
_____ HIGHWAY  _____ ENVIRONMENTAL
_____ MECHANICAL  _____ OTHER (PLEASE SPECIFY)
_____ ELECTRICAL

If the address on the mailing label is incorrect, please list the correct address below:

If you have any comments you would like to share about your construction program, please indicate them in the comments space.

The code stamped on this questionnaire is for non-response tracking purposes only. Please staple the questionnaire and return it in the mail. Again, thank you for your prompt response, time, and cooperation.
APPENDIX C

Unabridged Comments

1. Would like a copy of the results.

2. Question 26 was difficult to answer.

3. Would like to know what kind of teaching load other programs have. Ours is 12 credit hours. Also send a copy of the results.

4. May I have a copy of your findings?

5. Please send copy of results.

6. Some questions (26 in particular) were difficult to answer.

7. The program is great! Students learn practical application.

8. Request copy of results. Program has strong emphasis in engineering mechanics, structures, and highway-heavy.

9. We try to provide a balance in our industry focus between the following areas: heavy/highway, commercial building, residential, environmental. We do offer electrical and mechanical.

10. We would appreciate a copy of whatever compilations you finally produce.

11. Lab hours are mandatory. No credit is given. Impossible to specify exact hours. It varies with market demands.

12. One of our faculty members has a reduced load because he is pursuing a master's degree.

13. Question 26 is not a clear question. Most courses contain elements of all topics listed.

14. A comprehensive study and report were done in 1991 by Robert Dorsey and Janet Yates.
15. Roger Williams University will apply for candidate status (ACCE).

16. Don't use this breakout (Question 26).

17. The chair has killed this program effective at the end of the year.

18. We try to teach principles that apply to all areas listed in Question 26.

19. Our program is a bit unique in that it utilizes a lot of integration across program boundaries. Sorry for the delay but the address was wrong. Please send a copy of the results.

20. Please forward a copy of the results.

21. Our dean decided construction management was not part of his CALS' mission and dropped the program. Students in the program are finishing. No new students admitted since 1994.
Dear Department Chair/Head:

Enclosed is a survey questionnaire designed to describe the current status of four-year undergraduate construction education programs in the United States. All four-year undergraduate programs are being invited to participate.

This initial survey will serve as a model for follow-up surveys, hopefully, on a periodic basis. In order to get an accurate representation of the current status, it is essential that every program is included. Please take a few minutes of your time to complete this questionnaire, staple it, and return it in the mail by October 10, 1997. Please feel free to comment on any survey items in the space provided at the end of the questionnaire.

A copy of the survey results will be made available upon request to all programs participating in this study.

Your prompt response, time, and cooperation are greatly appreciated. THANK YOU!

Sincerely,

Lawrence Leslie Rosso, Instructor
Department of Construction Management

Vincent F. Kuetemeyer, Associate Professor
Committee Chair
APPENDIX E

First and Second Follow-Up Postcards

October 6, 1997

Last week, a questionnaire seeking information about your program's current status was mailed to you. If you have already completed and returned it to me, please accept my sincere thanks. If not, please do so today. It is extremely important that your program's information be included in this study. If by some chance you did not receive it or if it was misplaced, please call me right now, collect (504-388-8760), and I will get another copy in the mail to you today.

Sincerely,

Lawrence Leslie Rosso

October 15, 1997

Some weeks ago, a questionnaire seeking information about your program's current status was mailed to you. If you have already completed and returned it to me, please accept my sincere thanks. If not, please do so today. It is extremely important that your program's information be included in this study. If by some chance you did not receive it or if it was misplaced, please call me right now, collect (504-388-8760), and I will get another copy in the mail to you today.

Sincerely,

Lawrence Leslie Rosso
APPENDIX F

Four-Year Undergraduate Construction Education Programs
in the United States

Auburn University
Tuskegee University
Arizona State University
Northern Arizona University
John Brown University
University of Arkansas-Little Rock
University of Arkansas-Pine Bluff
California Polytechnic State University-San Luis Obispo
California Polytechnic State University-Pomona
California State University-Chico
California State University-Fresno
California State University-Long Beach
California State University-Sacramento
University of Southern California
Colorado State University
University of Denver
Central Connecticut State University
Florida A&M University
Florida International University
University of Florida
University of North Florida
University of West Florida
Georgia Institute of Technology
Georgia Southern University
Southern Polytechnic State University
Boise State University
Bradley University
Illinois State University
Southern Illinois Univ.-Edwardsville
University of Illinois-Urbana-Champaign
Indiana State University
Indiana University-Purdue University at Fort Wayne
Indiana University-Purdue University at Indianapolis
Purdue University
Purdue University-Calumet
Iowa State University
University of Northern Iowa
Kansas State University
Pittsburgh State University
University of Kansas
Eastern Kentucky University
Murray State University
Louisiana State University
Louisiana Technological University
Northeast Louisiana University
University of Maine
University of Maryland-College Park
University of Maryland-Eastern Shore
Wentworth Institute of Technology
Eastern Michigan University
Ferris State University
Lawrence Technological University
Michigan State University
Western Michigan University
Mankato State University
Moorhead State University
Jackson State University
University of Southern Mississippi
Central Missouri State University
Southwest Missouri State University
Washington University
Montana State University
Northern Montana College
University of Nebraska-Kearney
University of Nebraska-Lincoln
University of Nebraska-Omaha
University of Nevada-Las Vegas
Fairleigh Dickinson University
Kean College of New Jersey
New Jersey Institute of Technology
New Mexico State University
University of New Mexico
Pratt Institute
Rochester Institute of Technology
SUNY College of Environ. Sci. & Forestry
Utica College of Syracuse University
East Carolina University
North Carolina A&T State University
University of North Carolina at Charlotte
North Dakota State University
Bowling Green State University
University of Cincinnati
Oklahoma State University
University of Oklahoma
Oregon State University
Drexel University Evening College
Penn State-Harrisburg
Temple University
University of Pittsburgh
Roger Williams University
Clemson University
Texas A&M University-Commerce
Texas A & M University
Texas Southern University
Texas Technological University
University of North Texas
Brigham Young University
Norfolk State University
Old Dominion University
Virginia Polytechnic Institute and State University
Central Washington University
Eastern Washington University
University of Washington
Washington State University-Spokane
Milwaukee School of Engineering
University of Wisconsin-Madison
University of Wisconsin-Platteville
University of Wisconsin-Stout
South Dakota State University

*Denotes participants in this study
VITA

Lawrence Leslie Rosso is the son of the late Myrle Bessie Tassin Rosso and the late Vincent Lawrence Rosso. He was born in Plaquemine, Louisiana, on July 31, 1953 and has one son, Lawrence Leslie Rosso, Junior.

He was a graduate of Plaquemine High School in 1971. He later attended Louisiana State University and Agricultural and Mechanical College where he received a bachelor of science degree in industrial arts education in 1978 and a master of science degree in industrial education in 1980.

Mr. Rosso began his college teaching career in 1980 in the L.S.U. Department of Construction Management where he currently holds the rank of instructor. His expertise is in residential construction graphics and estimating, and highway construction.

He is a member of Sigma Lambda Chi, Upsilon Chapter, and is currently the faculty advisor for this honor society as well as the Construction Students Association of L.S.U. He is also a Constructor Member of the American Institute of Constructors.

Mr. Rosso expects to fulfill the doctoral degree requirements in the School of Vocational Education at L.S.U. for the 1998 Spring Commencement.

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DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Lawrence Leslie Rosso

Major Field: Vocational Education

Title of Dissertation: The Current Status of Four-Year Undergraduate Construction Education Programs in the United States

Approved:

[Signatures]

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

EXAMINATION COMMITTEE:

[Signatures]

Date of Examination:

February 27, 1998