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Title: ***A Viability Study of the Building Inspections Technology Program at North Hennepin Community College***

The accompanying research report is submitted to the **University of Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS Career and Technical Education

Research Adviser: Urs Haltinner, PhD

Submission Term/Year: Spring, 2012

Number of Pages: 102

Style Manual Used: American Psychological Association, 6th edition

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Simoneau, Matthew, W. ***A viability study of the Building Inspections Technology Program at North Hennepin Community College***

Abstract

This descriptive study sought to identify the likely future of Building Inspection Technology (BIT) programs and to determine how and if the Building Inspection Technology program at North Hennepin Community College can adapt to meet these projections. The subjects of this study encompassed building inspectors, building officials, construction management experts, hiring managers, academics, contractors, students, and state regulatory agencies. Data was collected by utilizing a structured interview and web-facilitated focus groups during the Spring semester of 2012.

The study reveals that current and emerging building technologies, materials, and legal requirements hold the key for the jobs, duties and tasks that BIT prepares its graduates to be competent in. Data highlights that BIT, as a program, consider structural design changes in the following areas; the addition of focused construction code coursework, program designs that respond to a changing industry, and program delivery is accessible to prospective students. Additionally, findings support that licensing agencies reexamine standards that inform the credentialing and hiring of building inspectors. Recommendations of this study may also have implications to similar programs beyond the state and educational system that it was set in. For a BIT program to remain viable it requires that its graduates possess skill sets different from those currently required.

Acknowledgements

I would like to thank my research committee, Urs Haltinner, Glendali Rodriguez, and Sylvia Tiala for their direction and input on this project. I would also like to thank Dr. Carol Mooney for her support, counsel and advice during my undergraduate and graduate journey at the University of Wisconsin-Stout.

Special acknowledgements go to Scott Holm and Tom Williamson who have provided me with opportunities, support, resources, and advice to make this possible. To Pearl, Bill, Helen, Rex, Mary, Jack, Billy, and Richard, who left us too soon, yet their influences and memories remain. And finally to my faithful companion Mojo who made sure I never sat in front of the computer for too long.

Most importantly thank you Nancy, my beloved wife; without your support, encouragement, and trust in me, this journey would not have been possible. Thank you for believing in me and enduring the countless hours and revisions. Without you, this accomplishment would have never been realized.

Table of Contents

List of Tables

Chapter I: Introduction

Building inspectors, also commonly referred to as construction inspectors, protect the public's health, safety, and welfare by regulating the built environment. The Building Inspection Technology program (BIT) at North Hennepin Community College and its partner institution, Inver Hills Community College, provide the Career and Technical Education programs (CTE) for those seeking a career in the field of building inspection. The purpose of CTE is to prepare students for a wide range of careers and further educational opportunities (Association for Career and Technical Education, 2010) and as the program is currently structured, it is unable to fulfill students' needs as evidenced by low enrollment, low program completion rates, and low placement rates. A comprehensive review and analysis of the program and factors that influence it establish how the program can be redesigned to meet the needs of the students, institutions, and industry, as well as align with the Minnesota State Colleges and Universities goal to strategically place CTE programs within the broader mission, vision, and goals for education in the State of Minnesota (Minnesota State Colleges and Universities, 2007).

The need for an educational program for building inspectors started in 1971when the Minnesota Legislature enacted legislation (MN statute 544) which established the first Minnesota State Building Code (SBC) that was adopted and enforced statewide. A condition of MN statute 544 included the creation of the State Building Inspectors Office and certification requirements for municipal building inspectors (Session Laws of the State of Minnesota, 1971). At that time, 287 existing building officials were grandfathered into the certification; thereby, exempted from the testing requirements (Commissioners Legislative Committee, 1977). There were no standard qualifications or educational programs to become certified at that time (S. Hendrickson, former State Building Official, personal communication, February 15, 2011). As a

result, the Minnesota Department of Administration hired personnel to start an in-house training program for building officials so that they could become certified. Shortly after, the State hired a State Building Inspector who approached the junior colleges to start a formal Building Inspections Technology program. The State Building Inspector obtained curriculum from a school in California that was used as the model for the program in Minnesota (S. Hendrickson, personal communication, February 15, 2011). The first courses were offered in 1973 as part of a certificate program. The program was first offered as an Associate of Applied Science Degree in 1974 (Inver Hills Community College, 1974).

The goals of the program were to introduce students to the Construction Code profession, to provide a better understanding of codes to those who work in the profession, and to enhance the abilities of individuals currently involved in the Construction Codes profession (Inver Hills Community College, 2010). The certificate program was designed as a training ground for building inspectors to gain certification and quickly grew into an associate degree program that was intended to raise the professionalism of the industry (S. Hendrickson, personal communication, January 18, 2011). The program was originally offered at North Hennepin Community College, Inver Hills Community College, and Hennepin Technical College. Hennepin Technical College later discontinued the Building Inspections Technology program.

The program originally offered five content-specific courses. With the establishment of the Associate of Applied Science (A.A.S.) degree, it grew to offer between 14 and 17 different technical courses during its history. In 2005 an attempt was made at offering a four-year BIT degree at Southwest State University however, because of funding issues, the project never materialized (S. Holm, advisory board chair, personal communication, February 11, 2011). Also in 2005, a grant from the Minnesota Department of Administration was issued to develop all of

the BIT courses into an online format with the intention that students would be able to complete their degree online and to attract students from across Minnesota and beyond. Additionally, a program coordinator was hired to oversee this project and facilitate the program between North Hennepin and Inver Hills Community colleges.

Historically, staffing for the BIT program required between six to ten adjunct instructors, some of who taught multiple classes. Even though the BIT program was not a credentialed field (Minnesota State Colleges and Universities, 2006), the colleges implemented a faculty credentialing policy in 2010. The current ten adjunct instructors have a minimum of 15 years of experience in the field and their education levels break down as follows: some college, no degree (one); Bachelor's degree (five); and Master's degree (four).

The program is shared (both online and face-to-face) between two institutions, Inver Hills Community College and North Hennepin Community College. Currently, shared courses are held at a remote site that is located halfway between the two campuses. The program serves a wide range of students including: returning adults seeking a career change, injured and displaced workers, employed code officials looking to upgrade their skills, tradespersons seeking State Building Official Certification, and high school graduates exploring career fields. Students in the program are predominantly white males (100%) with an average age of 35 (W. Marson, Institutional Researcher, personal communication, May 10, 2012). An advisory board made up of industry members and other stakeholders make curriculum, policy, and other general recommendations to the BIT program faculty. The BIT program currently offers the following degree and certificate options:

- 60 credit Associate of Applied Science (A.A.S.) Degree, Building Inspection Technology

- 10-11 credit Building Inspection Technology CORE Certificate
- 17 credit Building Permit Technician Certificate
- 29 credit Building Inspection Technology Certificate
- 16 credit Housing Inspection Certificate

(Programs of Study, Building Inspection Technology, 2009)

Over the past 10 years the BIT program has seen a 58 percent decline in enrollment (Holm, 2009). Holm (2009) indicates during that same time period only 29 of degreed students and 61 certificate holders obtained full-time employment in or related to their program. Because of the technical nature of the program, students are unable to transfer credits into related programs such as Construction Management, Architecture or to a four-year institution. Factors affecting the programs' decline include: alternative pathways to state certification, lack of a formal education requirements specified by the hiring municipalities, a decline in construction activity, and lack of industry support for the program. Further impacting low enrollments are the programs' low completion rates. Data indicates that in 2010, there were five out of 22 students who persisted from fall to spring semester (North Hennepin Communty College, 2010). This is lower than the national average of fewer than half of students completing no more than eight or fewer months of post-secondary education (Scott & Sarkees-Wircenski, 2008).

Statement of the Problem

In its current state, it appears that the BIT program does not appeal to students or prospective employers. It can be argued that it is because of alternative pathways to state certification, lack of a credential requirement by municipalities for hires in these positions, the decline of construction activity, and diminishing industry support for the program. Further jeopardizing the program's continuation is the mission of Career and Technical Education, which

is to prepare students for careers in current or emerging employment sectors (U.S. Department of Education, 2011a). The literature review also yielded little data to suggest that there are viable career opportunities outside of municipal employment for building inspectors. The combination of these factors has resulted in the suspension of the BIT AAS degree, the closure of the Housing Inspection Certificate, and the closure of the BIT program at Inver Hills Community College after Spring semester of 2012. If these trends continue, there is a threat that the BIT program at North Hennepin Community College could also see its demise.

Purpose of the Study

The purpose of this study was to identify the future of Building Inspection Technology (BIT) programs. More specifically, the study sought to determine how and if the BIT program at North Hennepin Community College merits continuation. This study identified the current status of Building Inspection Technology programs nationwide, the future of Building Inspection Technology programs as well as the possible methods of delivery of future programs. The results of the research could lead to recommendations for structural, curriculum, and delivery modifications guiding the North Hennepin Community College BIT program. Findings may also provide insight into transfer or educational advancements opportunities with baccalaureate degree programs.

Research Questions

This study attempted to answer the following questions:

1. What is the current status of local and national Building Inspection Technology programs?
2. What is the likely future for Building Inspection Technology programs?
3. What methods of delivery will Building Inspection Technology programs utilize?

Importance of the study

The following statements indicate the importance of this study:

1. The BIT program at North Hennepin Community College is in jeopardy of closure. Low enrollment and completion rates as well as limited job opportunities have caused the suspension of the A.A.S. degree and the closing of the Housing Inspection Certificate program. Future projections and delivery methods will need to be researched in order to keep the program viable.
2. There is an anticipated 22% growth in employment for building inspectors by the year 2014 (Ridgeway & Uphoff, 2008). If this prediction is accurate, an educational program for building inspectors needs to exist in order to produce a highly trained workforce that will be able to accommodate the employment demands of industry.
3. Building inspectors need both technical and soft skills in order to survive in the workplace. A comprehensive career and technical program will give students the opportunity to apply academic knowledge and skills to real world situations (Education, 2011) in addition to learning 21st Century skills such as communication, collaboration, social responsibility, critical thinking and problem solving which, are desired by employers.
4. There is little data to suggest that there are viable employment opportunities outside of municipal employment for building inspectors. Results from this study have the potential to redefine the building inspections industry and how the educational institutions deliver curriculum to train the workforce.

5. The results of this study may have applications and implications for other BIT programs across the country. The BIT program is one of only a small number of programs in the country. Some programs in other states have been suspended or closed. The results of this study may allow others to examine their current and future programs.

Assumptions of the Study

The following were the assumptions of this study:

1. The researcher assumes that there is a need for the BIT program.
2. The research assumes that there is a perceived value in education within the building inspections industry.
3. The researcher assumes that there is a need to alter the BIT program at North Hennepin Community College.
4. The researcher assumes that academic institutions are willing to, and have the ability to, adapt to changes in the building inspections industry.
5. The researcher assumes that the building inspections industry includes other professionals in addition to municipal building inspectors.
6. The researcher assumes that all participants are knowledgeable about the building inspections industry and are able to provide informed answers.

Definition of Terms

The following terms and their definitions are provided for clarity in understanding the content of this study.

Building Code. A legal document that regulates the construction of structures and buildings (International Code Council, 2008).

Building Inspections Technology Program. A program of study designed to enhance the competencies of present building inspectors, to prepare persons for state examination and certification as building officials, to prepare persons for a career in building inspection, and to provide training to satisfy the continuing education requirements for building inspectors (Inver Hills Community College, 2010).

Building Inspector. A person who enforces regulations to the design, construction and use of buildings (International Code Council, 2008).

Building Official. The person who is designated by the Department of Labor and Industry and is responsible for all aspect of code administration for which they are certified (Revisor of Statutes, 2009).

Building Permit Technician. A person who assists architects, engineers, contractors and homeowners by providing routine and technical information related to the issuance of permits, provides technical information regarding routine building code requirements and ordinances, and assists the public in completing applications and other required forms (City of Foster City, 2011).

Career and Technical Education. Programs of study that prepare both youth and adults for a wide range of careers and further educational opportunities. These careers may require varying levels of education—including industry-recognized credentials, postsecondary certificates, and two- and four-year degrees (Association for Career and Technical Education, 2010).

Home Inspector. A person hired by prospective home buyers to inspect and report on the condition of a home's systems, components, and structure who do not have the power to enforce compliance with the codes (Bureau of Labor Statistics, 2010).

International Code Council. A nonprofit organization dedicated to developing a single set of comprehensive and coordinated model construction codes (International Code Council, 2008).

Model Code. A written set of regulations that provide the means for reasonable control over construction, which, is available for adoption by cities, counties, states or countries, with such changes as may be desirable for legal or local needs (International Code Council, 2008).

Plans Examiner. A person who studies proposed construction documents for code compliance in new buildings as well as additions and alterations to existing buildings (International Code Council, 2008).

Limitations of the Study

The following limitations applied to this study:

1. The study was limited to the building inspections industry in Minnesota. The results from the study reflected data on the building inspections industry and BIT program in Minnesota.
2. There is limited prior research on the building inspections industry. A literature review yielded limited results because of the small size and uniqueness of the industry.
3. Data gathered represented an industry of approximately 1200 members as defined by the Minnesota Department of Labor Building Official Certification standards.
4. The instruments were developed by the researcher and were not tested for reliability or validity. Every effort was made to develop a valid and reliable instrument and modifications were made after the pilot study.

5. Due to the researchers' relationship with, and proximity to the building inspections industry and BIT program, bias may be present in the recommendations.

Chapter II: Literature Review

Introduction

The purpose of this study was to identify the likely future of Building Inspection Technology (BIT) programs. More specifically, the study sought to determine how and if the BIT program at North Hennepin Community College merits continuation. The following narrative will present the context that guides and impacts BIT. This is presented though the following literature structure; Career and Technical Education, development of model codes and model code agencies, construction activity, alternative pathways to State of Minnesota certification, model code agency certification, changes in regulations affecting construction codes, and the hiring practices of municipalities.

Career and Technical Education

According to the Association of Career and Technical Education (2010), the purpose of a Career and Technical Education (CTE) program is to prepare students for a wide range of careers and further educational opportunities. Born out of vocational programs, modern CTE programs are developing people with the skills, credentials, and technical knowledge needed in order to stay on the leading edge of innovation and global competitiveness (National Association of State Directors of Career and Technical Education Consortium, 2011a). At the postsecondary level, CTE programs are described as formal undergraduate programs designed to impart relevant knowledge and skills that relate to the requirements of specific occupations or careers (Levesque et al., 2008).

Career and Technical Education curricula include materials that focus on the development of foundational skills, such as basic skills, thinking skills, and personal qualities, as well as workplace competencies and specific occupational competencies (Scott & Sarkees-

Wircenski, 2008). In addition, CTE provides students with experiential learning, which offers meaningful opportunities for learners to apply their academic and technical skills and realize the value of these skills (Scott & Sarkees-Wircenski, 2008). Postsecondary CTE programs are offered at both public and private institutions and include a broad range of career paths, such as educational programs leading to an associate's degree, a diploma, or an occupational certificate (Scott & Sarkees-Wircenski, 2008). In addition to traditional classroom experiences, some postsecondary CTE students can take advantage of work-based options like cooperative education, internships, practicums, and clinical experiences (Scott & Sarkees-Wircenski, 2008).

According to Levesque et al. (2008), around 5,700 postsecondary institutions offered career education in 2005, including programs that led to postsecondary certificates, associate's degrees, and bachelor's degrees in career fields. Of those institutions about 1,300 were less-than-two year for profit, around 1,100 were two-year public, and about 1,100 were four-year private not-for-profit institutions. Combined, public and private two-year and four-year postsecondary institutions provided 36% of career education and 28% were provided by less-than-two-year institutions. According to the National Association of State Directors of Career Technical Education Consortium (2011), there are some 14 million students enrolled in CTE nationwide at the secondary and postsecondary levels. Within Minnesota there are over 306,000 students enrolled in CTE. Of that number, more than 125,000 of those students are enrolled in postsecondary CTE courses.

Career and technical education students seeking associate's degrees differ from those seeking academic majors at two-year institutions in several ways. Hirschy, Bremer, and Castellano (2011) support understanding this difference is essential for creating effective approaches to improve retention and other outcomes for occupational students. In a 2004 study, a

comparison between academic and CTE majors in associate degree programs revealed that CTE students were more likely to be female (61.9% vs. 58.8%), 24 years old or older (37% vs. 25%), married (27.7% vs. 18.6%), first-generation college students (40.9% vs. 35.8%), and financially independent from their parents (64.6% vs. 49.5%). In addition, CTE students were more likely to work fulltime (40.6% vs. 34.7%), identify themselves as an "employee who studies" rather than a "student who works" (33.4% vs. 27.3%), have taken vocational curriculum in high school (18.5% vs. 11.4%), and have a postsecondary grade point average (GPA) of 3.5 or higher (29% vs. 25%) (Hirschy, Bremer, & Castellano, 2011, pp. 298-299).

It is predicted that by the year 2018, there will be 46.8 million new jobs, 63 percent of which will require workers with some college education. Of those new jobs, 30 percent will require some college or an associate's degree. Virtually all of these sub-baccalaureate jobs will require the kinds of real-world skills students master in career and technical education (Pathways to Prosperity Project, 2011). In addition to increased employment opportunities, CTE has academic benefits; at the secondary level 80 percent of CTE concentrators persist (either attained a credential or were still enrolled) within two years after high school (U.S. Department of Education, 2011b).

Development of Model Codes and Model Code Agencies

Written in 2200 B.C., the building code of Hammurabi, King of the Babylonian Empire, is the earliest known code of law. The code did not give exact requirements for construction; rather, it assessed penalties if the building was not constructed properly (International Code Council, 2008). During Greek and Roman times, laws were enacted to restrict construction types, roofing materials, size of buildings, density of land use, and lot coverage (International Code Council, 2008). Centuries later, in response to the Great Fire of London, Parliament

enacted the London Building Act in 1667 (O'Bannon, 1989), which required that all houses be built of either brick or stone (Manco, 2009).

Early controls in the United States started in response to the widespread use of combustible materials for construction. The City of Chicago enacted a building code and a fire-prevention ordinance in 1875; four years after the Great Chicago fire destroyed 17,000 buildings (O'Bannon, 1989). In 1905, the National Board of Fire Underwriters (now the American Insurance Institute) published the National Building Code, which included provisions to not only reduce fire hazards, but to protect the public health, safety, and welfare (International Code Council, 2008). The National Building Code was the first model code that could be utilized by communities to regulate construction and it was the only code of its kind in the United States for 22 years (O'Bannon, 1989).

According to O'Bannon (1989) the Building Officials Conference of America (BOCA) was established in 1915 in order to serve the special needs of building officials, provide a forum for the exchange of ideas, and provide mutual assistance. In 1950, BOCA published its own model code know as the Basic Building Code, which in 1982 became the National Building Code after the demise of the National Building Code, which, was published by the National Board of Fire Underwriters (International Code Council, 2008).

In 1922, the Pacific Coast Building Officials Conference, later to become the International Conference of Building Officials (ICBO), was formed for the purpose of developing a model code and to provide uniformity amongst city and state codes that were in existence at the time (O'Bannon, 1989). In 1927 they published the Uniform Building Code, which was developed through a series of regional meetings to gather data and to discuss the various problems attendant upon formulation of the code (O'Bannon, 1989).

The Southern Building Code Congress (SBCC) was established in 1940 in Birmingham Alabama. Their purpose, in addition to the publication of codes, was to provide services in the areas of plan checking, product research (or evaluation), and education and training programs (O'Bannon, 1989). In 1946, the SBCC published their first model code, known as the Southern Standard Building Code, which was written to address environmental issues in the southern states that were not addressed by other model codes at the time (O'Bannon, 1989). In 1974 the SBCC added the word "International" to their name and were then know as the Southern Building Code Congress International (SBCCI) (O'Bannon, 1989).

In 1994, members from ICBO, BOCA, and the SBCCI founded the International Code Council (ICC) in response to technical disparities among the three sets of model codes that were previously used in the United States (International Code Council, 2008). In 2000, the ICC published the International Building Code which is now in-use or adopted in all 50 states as well as the District of Columbia, the U.S. Virgin Islands, New York City, Guam, and the Northern Marianas Islands (International Code Council, 2012). In 2003, ICBO, BOCA and the SBCCI consolidated into one model code agency: the International Code Council (International Code Council, 2008).

Construction Activity

Construction employment is always sensitive to fluctuations in the economy (University of Minnesota, 2010). According to the Bureau of Labor Statistics (2012) the construction industry has been strongly affected by the credit crisis and recession that began in December of 2007. In addition, new construction is usually cutback during periods when the economy is not expanding or interest rates are high (Bureau of Labor Statistics, 2010b). According to Greg Ip (2010), the housing market is a form of consumer spending and it is one of the most volatile

things in the economy. In addition, because a house is a significant commitment and sensitive to interest rates, it is the first expenses consumers postpone when interest rates rise or they lose their jobs (Ip, 2010).

Construction activity is measured in several different ways, the most common are construction spending, new housing starts, and building permits. Construction spending is a measure of the dollar value of new construction activity and includes data on residential projects, nonresidential projects, and public projects (Economic and Statistics Administration, 2012). The Census Bureau also issues monthly reports covering new housing starts, the number of new homes on which construction begins, and building permits. Building permits, like housing starts, are used to track construction (Ip, 2010). Together, along with other economic indicators, businesses rely heavily on these indicators to make decisions every day (Economic and Statistics Administration, 2012).

The United States Census Bureau has been collecting data on construction spending since 1960 and provides monthly estimates of the total dollar value of construction work done in the United States (U.S. Census Bureau, 2012a). The monthly survey covers construction work done on new structures or improvements to existing structures and includes the cost of labor and materials, cost of architectural and engineering work, overhead costs, interest and taxes paid during construction, and contractor's profits (U.S. Census Bureau, 2012a).

The U.S. Census Bureau (2011c) reports that from 1970 to 2011 there has been a steady increase in total construction spending each year until 2006 when it peaked at $1,167,222 (in millions of dollars and reflected in current dollars). Since 2006, there has been a decline in construction spending and in 2011 was at $789,791(in millions of dollars and reflected in current

dollars). In March 2012, the U.S. Census Bureau (2012) reported that construction spending had increased 6% from March 2011 predictions to a total annual rate of $808.1billion.

Since 1959, the U.S. Census Bureau has been collecting data on building permits. They provide national, state, and local statistics on new privately owned residential construction. Data collected includes number of buildings, number of housing units, and permit valuation by size of structure (U.S. Census Bureau, 2012b).

Building permit data from 1970 to 2011 revealed that annual new housing units peaked in 1972 at 2,218.9 units (in thousands) and once again in 2005 at 2,155.3 units (in thousands). Since 2005, new housing units decreased to a low of 583.0 units (in thousands) in 2009 and reached 610.7 units (in thousands) in 2011 (U.S. Census Bureau, 2011d). In April 2012, the U.S. Census Bureau (2012b) reported that new housing units were at an annual rate of 747.0 units which represents a 30% increase over March 2011 predictions. According to the Builders Association of Minnesota (2012), in the state of Minnesota, there has been a 54% increase in the number of building permits issued in February 2012 compared to the number of building permits issued in February 2011.

Alternative Pathways to State of Minnesota Certification

Minnesota Statute 326B.133 Subdivision 1 requires that each municipality shall designate a building official to administer the code. In addition, according to Subdivision 2, the Commissioner of Administration must certify that person. Subdivision 3 of the statute gives the Commissioner of Administration the authority to establish by rule certification criteria as proof of qualification for Subdivision 2 (Revisor of Statutes, 2009). Minnesota Administrative Rules 1300.200 (Revisor of Statutes, 2012a) establishes four forms of certification:

- Certified Building Official: A person with this certification may serve as the building official for any jurisdiction.
- Class I Certification: This classification restricts the holder to administering the code only for one-and two-family dwellings and their accessory structures and is no longer issued as of July 1, 1990.
- Building Official-Limited: A person with this classification may perform code administration for one- and two-family dwellings, their accessory structures, and exempt classes of buildings.
- Accessibility Specialist: A person with this classification is limited to the administration of those provisions of the Minnesota State Building Code which provide access for persons with disabilities.

In addition, according to the Revisor of Statutes (2012a) all forms of certification are issued only after the applicant has successfully passed the written examination prepared by the state.

Prior to taking the written examination for certification, the Commissioner of Administration establishes by rule prerequisite requirements (Revisor of Statutes, 2009). According to Administrative Rule 1300.0300 (2012b), prior to making application for certification as a certified building official, a person shall accumulate a minimum of 100 points and a person shall accumulate a minimum of 30 points prior to making application for certification as a building official-limited. In addition, a person making application for certification as a building official-limited shall attend a course specified by the state building official. Also, a person making application for certification, an accessibility specialist shall attend a course specified by the state building official. The prerequisite requirements established by administrative rule provide multiple avenues for accumulating points prior to taking the

certification examinations. Administrative rule1300.0300 (2012b) defines the prerequisite requirements as follows:

A. Education: BIT refers to building inspection technology programs offered in the community college system. Points must be awarded as follows for successful completion of the programs or courses listed:
    a. BIT AAS degree, 100 points;
    b. BIT certificate, 60 points;
    c. BIT code-related courses:
        i. field inspection, nonstructural plan review, building department administration, and building codes and standards, 20 points total for all four courses; zero points if any of the courses in this unit have not been successfully completed;
        ii. upon successful completion of the courses named in unit (a), additional BIT building code courses, four points each up to a maximum accumulation of 40 points;
    d. postsecondary courses in building construction, building construction-oriented architecture or engineering, or public administration, one point each up to a maximum accumulation of 30 points;
    e. an associate's degree in building construction, building construction-oriented architecture or engineering, or public administration, 30 points;
    f. a bachelor's degree in building construction-oriented architecture or engineering, 60 points. If points are claimed in this category, additional points may not be claimed in sub item (4) or (5).

B. Certifications: Points must be awarded for certifications obtained as follows:

    a. Council of American Building Officials building officials examination:

        i. legal and management module, 50 points;

        ii. technology module, 50 points;

    b. International Conference of Building Officials examination:

        i. building inspector, 40 points;

        ii. plans examiner, 60 points;

    c. Minnesota Class I certification, 10 points;

    d. Minnesota certified building official-limited certification, 20 points.

C. Experience: Points shall be awarded for experience obtained as follows:

    a. municipal building code inspection or plan review experience under the supervision of a currently certified building official. Twenty points must be awarded for each 12-month period of employment, with a maximum accumulation of 80 points;

    b. experience in the design of buildings or in the construction of buildings with specific skilled participation in the construction of foundations, superstructures, or installation of the building's mechanical, plumbing, electrical, or fire suppression systems. Ten points must be awarded for each 12-month period of employment, with a maximum accumulation of 30 points.

D. Other education, certifications, and experience relating to the field of the construction industry that is not enumerated in items A to C must be given credit as determined by the state building official based on comparison with the prerequisites in items A to C.

The point system for certification creates a two-tiered system where persons can obtain the building official-limited certification at 30 points and accumulate points towards becoming a certified building official at 100 points. The accumulation of points can be obtained through either the educational requirements of section A, the certification requirements of section B, the experience requirements of section C, or the miscellaneous requirements of section D, which are subject to the discretion of the state building official.

The certification program has gone through numerous changes since building official certifications began as promulgated by law in 1971 (Session Laws of the State of Minnesota, 1971). At that time, in order to become certified, an applicant must either 1) Pass an oral, written, and practical examination prepared and administrated by the State Department of Civil Service; or must 2) pass a training program in Building Inspection through the University of Minnesota, Extension Division, or other program approved by the Department of Civil Service (The Office of Revisor of Statutes, 1971). According to Hendrickson (2011), the written and oral exams were developed with the input of ten building officials and a person skilled in building exams, and that between 1972 and 1982, there were no prerequisite requirements prior to taking the building official exams.

In 1982, Minnesota Rules Chapter 5, Subdivision 1.10007 required that all building officials shall be certified in one of the following:

- Class I certification shall permit building code administration limited to evaluation and inspection of one and two family dwellings and their accessory structures.
- Class II certification shall permit building code administration including evaluation and inspection of all buildings and structures within the scope of the Code.

In addition to the two types of certifications, the rules also, for the first time, established prerequisite requirements for the building official certification exam:

A. Before making application for Class I certification each individual shall meet the following prerequisites:
    a. three years of experience in any of the skilled construction trades; or
    b. three years of experience in complete design of one and two family dwellings and accessory buildings thereto; or
    c. two years of experience in municipal building construction inspection; or
    d. twenty four credits in Building Inspection Technology program in a community college system, plus one year experience in A. 1., A. 2., or A. 3. of this rule. Building Inspection Technology courses must include courses in Field Inspection, Plan Review Non-structural, Plan Review Structural, Administration, Building Codes and Standards and Energy Conservation;
    e. or International Conference of Building Officials certification in building inspection, plus one year experience in A. 1., A. 2., or A. 3. of this rule; or
    f. two years in post high school construction oriented architectural or engineering courses, plus one year experience in A. 1., A. 2., or A. 3. of this rule.

B. Before making application for Class II certification, each individual shall meet the following prerequisites:
    a. five years of experience in one or a combination of the prerequisites described in A. 1., A. 2., or A.3. of this rule; and two years of general construction supervision or building code administration experience which may be concurrent with the required five years of experience; or

b. 24 credits in Building Inspection Technology program in a community college system, plus three years of experience in one, or a combination of prerequisites described in A. 1., A. 2., or A. 3. of this rule, and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience; or

c. International Conference of Building Officials certification in building inspection; and three years of experience in one or a combination of prerequisites described in B. 1., A. 2., or A. 3. of Section A. of this rule; and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience; or

d. two years in a post high school course in construction or construction oriented, architectural or engineering courses plus three years of experience in one, or a combination of prerequisites described in A. 1., A. 2., or A. 3. of this rule, and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience. (The Office of the Revisor of Statutes, 1982a)

From 1982 to 1990, the two types of certifications and prerequisite requirements remained unchanged. In 1991 Minnesota rules 1301.0300 were changed to the following prerequisite requirements for building official certification:

A. possess a certificate as a certified building official issued following successful passage of a written examination given by the Council of American Building Officials;

B. be certified as a certified building inspector and a certified plans examiner by the International Conference of Building Officials;
C. have a certificate issued by a nationally recognized testing agency in subject matter that would compare to item A or B;
D. have a certificate offered through a community college system in the discipline of building inspection technology and a minimum of two years of experience with a building inspection department of a municipality; or
E. have an Associate in Applied Science degree in building inspection technology offered through the community college system. (The Revisor of Statutes, 1991b)

In addition to the prerequisite requirements, two new levels of certification were created; Grandfathered Certification and State Certification (The Revisor of Statutes, 1991b).

In 1994, Minnesota Rules 1301.0300 was changed to include new forms of certification as well as new prerequisite requirements (Minnesota Department of Labor and Industry, 2012). The new forms of certification included; Certified Building Official, Grandfathered Certification, Class I Certification, Certified Building Official-Limited, and Accessibility Specialist (The Revisor of Statutes, 1995c). The prerequisite requirements were changed to the requirements that are currently in effect, however, in 1995, the building official-limited certification was worth 50 points towards the 100 points needed for certification. This was changed in 2003 when the points awarded for the building official-limited certification were reduced to 20. In addition, the Grandfathered Certification was deleted from the rules in 2003 (The Revisor of Satutes, 2003d).

The Minnesota Department of Labor issued 913 Building Official Certifications between 1973 and 2011. In addition, the department issued 620 Building Official Limited certifications between 1994 and 2011. Building Official certification reached a low of five issued in 1981 and

peaked at 84 certifications issued in 2003 (M. Godfrey, Manager Department of Labor, personal communication, March 7, 2012).

Model Code Agency Certification

Model code agencies, such as the ICC, provide voluntary certification programs that are nationally recognized evidence of competence and professionalism in construction code knowledge and can be achieved in various occupational categories (International Code Council, 2008). According to the ICC (2008), proof of code knowledge can best be shown by examinations that provide candidates the opportunity to:

- Demonstrate a solid commitment to a profession
- Enhance professionalism
- Build self-esteem
- Establish professional credentials
- Improve career opportunities
- Receive greater on-the-job responsibilities
- Realize greater earning potential
- Receive greater professional recognition from peers

These certification examinations have been developed by nationally recognized testing organizations (International Code Council, 2008), and maintained to the highest standards and include continuous review by committees of experienced professionals (International Code Council, 2012a). In addition, the certification program has a maintenance provision to ensure that those who become certified maintain a reasonable level of knowledge as new methods and technology are developed (International Code Council, 2008).

With the exception of special inspector certifications such as pre-stressed concrete, structural welding, and reinforced concrete, most ICC examinations are open to all individuals with no prerequisite for experience or education (International Code Council, 2012a). ICC certifications are valid for three years. Prior to renewal, the certificate holder must accrue the number of continuing education units (CEU) required for the type of certification they hold. CEU's can be obtained by participating in continuing education and professional development activities (International Code Council, 2012b).

Model code agency certifications have been around since the early 1970's (O'Bannon, 1989) and the ICBO started certifying individuals in 1973 after a culmination of five years of planning and development (International Conference of Building Officals, 1989). Around that same time, BOCA went about developing an academic institution known as the National Academy of Code Administration with the goal to develop and conduct a certification program for building officials. The academy never materialized due to insufficient funding sources (O'Bannon, 1989). Soon after, CABO developed its own certification program which was the first truly national certification program because it dealt with subject matter of a universal nature as opposed to code specifics (O'Bannon, 1989).

In the late 1970's, the State of New Jersey enacted a new law entitled the State Uniform Construction Code Act*, which* held the requirement that code enforcement officials become certified. The model code groups, BOCA, SBCCI and the ICBO worked together to develop the National Certification Program for Construction Code Inspectors (NCPCCI) (O'Bannon, 1989). The NCPCCI, is still in existence today and in collaboration with Prometric Inc. provides testing that is nationally recognized evidence of competence and professionalism in construction code knowledge (Prometric Inc., 2011).

With the consolidation of BOCA, SBCCI, and the ICBO in 2003 (International Code Council, 2008), certifications were relegated to the ICC. The former model codes are now referred to as Legacy Codes and the certifications that were issued under these codes are now referred to as ICC Legacy Certifications (International Code Council, 2012b). In 1989 the ICBO provided 10 different types of certification examinations (O'Bannon, 1989). Today, the ICC provides 45 certification examinations in various occupational categories (International Code Council, 2012a).

The ICC issued 16,816 Building Official Certifications between 1974 and 2007; these figures include Legacy Certifications issued by the ICBO, BOCA, and the SBCCI. Certifications reached an annual low of 102 in 1978 and reached a high of 962 certifications issued in 1994. Certifications also peaked in 2000 with 950 issued and there was 132 certificates issued in 2007 (M Duda, Sr. Technical Assistant, ICC, personal communication, March 8, 2012).

Currently, 17 states have no requirements for the certification or licensing of building inspectors or building officials. Twenty-three states have a state certification or licensing requirement, 12 of which will accept a model code agency certification as an equivalent. Nine states have a requirement for certification from a model code agency and one state requires both a state certification and model code agency certification.

Changes in Regulations Affecting Construction Codes

As construction technology, methods and materials are constantly changing, model codes are undergoing review and a process for updating at periodic intervals to keep up with these changes. The International Codes are revised and updated through an open process that invites participation by all stakeholders and often includes research, review, discussion, and debate of the issues. New additions of the International Codes are published every three years and reflect

the results of the code development hearings (Van Note, 2010). The code development process is open to the general public, and any interested party may submit a proposed code change. The proposed code change progresses through a series of public hearings, and final voting on the proposal is done by the code officials responsible for enforcing the codes (International Code Council, 2008).

The 2009 edition of the International Residential Code (IRC) contains provisions for the mandatory installation of automatic fire sprinkler systems in townhouses and one-and two-family dwellings (International Code Council, 2010). Prior to the 2009 edition, the IRC did not have provisions for automatic fire sprinkler systems in one-and two-family dwellings (International Code Council, 2007). Currently, in the State of Minnesota, the installation of an automatic fire sprinkler system is only required in townhomes that exceed 9,250 square feet of aggregate floor area (Minnesota Office of the Revisor of Statutes, 2012). Due to the slowdown in construction activity and other economic based factors, the State of Minnesota has not adopted the 2009 edition of the IRC (Hernick & Rosendahl, 2009). The Minnesota Department of Labor is currently in the process of adopting by rule, the 2012 edition of the IRC with an effective adoption date of July 20, 2013 (Minnesota Department of Labor, 2011).

According to the Builders Association of Minnesota (BAM) (2012), 32 states have adopted the 2009 edition of the IRC without a residential sprinkler requirement for single family homes; 28 of which also do not require sprinklers in two-family dwellings. Ten states, including Minnesota, have action pending on the adoption of the 2009 IRC, two states, California and Maryland, have adopted the IRC with the sprinkler provisions, one state, Kentucky, has chose not to adopt the IRC, three states, Illinois, New York and Wyoming, have taken no action towards adoption, and two states, Colorado and Delaware, do not have a statewide building code.

Residential fire sprinkler systems are less complicated than commercial systems, and therefore require less training. (R. Bierwerth, Fire Protection Engineer, personal communication, April 3, 2012). Because residential sprinkler systems are designed by licensed engineers using either a pipe schedule or hydraulic design, inspectors will only need to verify compliance with the approved designs (R. Bierwerth, personal communication, April 3, 2012). Also, according to Bierwerth (2012), a person with a background in fire sprinkler systems would require minimum training on the new codes, while a person with no background would require around two full days of training to fully understand the new code requirements. Bierwerth (2012) also indicated that the new fire sprinkler requirements should be integrated into building inspection technology courses such as Plan Review and Field inspections and should be taught as a standalone module.

According to the U.S. Environmental Protection Agency (2010), green building, also known as sustainable or high performance building, is the practice of increasing the efficiency with which buildings and their sites use and harvest energy, water, and materials. In addition, green building is also the practice of protecting and restoring human health and the environment, throughout the building lifecycle, siting, design, construction, operation, maintenance, renovation, and deconstruction. In 2009, the ICC launched the development of a new International Green Construction Code (IgCC) initiative, subtitled Safe and Sustainable: By the Book, committed to developing a model code focused on new and existing commercial buildings addressing green building design and performance (International Code Council, 2012c). According to the ICC (2012), there has been an increasing call for a green code that addresses safe and sustainable design and construction practices and that the IgCC provides a practical, enforceable regulatory framework that will help reduce the environmental impact of commercial construction.

The IgCC was developed in cooperation with the American Institute of Architects (AIA), the American Society for Testing and Materials (ASTM), the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), and the U.S. Green Building Council (USGBC). The presence of the AIA will ensure a focus on their 2030 Carbon Neutrality Goal. In addition, the IgCC will work in tandem with leading green rating systems and is designed with local, state, and federal laws in mind (International Code Council, 2012e). The IgCC was also developed as a way to integrate green building into the International Codes, and provides an even balance of green building practices and codes (P. Kulczyk, technical staff-ICC, personal communication, March 19, 2012).

Adoption of the IgCC by a jurisdiction is strictly voluntary; however, many cities across the country are already adopting the code for both voluntary and mandatory compliance (P. Kulczyk, personal communication, March 19, 2012).In addition, the IgCC has also been adopted by the state of Maryland to apply to all commercial buildings as well as residential properties more than three stories in height (International Code Council, 2011f). According to Kulczyk (2012), adoption of the IgCC in Minnesota may be slow-coming due to the fact that there is a perception that green building adds 3% to 5% more to the cost of a commercial or residential project. Also, according to Kulczyk (2012), there are discussions on forming a state-wide committee to discuss green codes, and the IgCC may become an appendix chapter to the State Building Code, available for adoption by local jurisdictions.

According to Kulczyk (2012), in order for building inspectors to understand the requirements of the IgCC, formal training would require over 24 hours of instruction, or one course in green codes in a Building Inspection Technology program. Green codes would also need to be integrated into plan review and field inspections courses. In addition, the IgCC will

require inspectors to have greater knowledge of building electrical and mechanical systems. As an alternative, inspectors could participate in ICC training seminars on the IgCC, or self-study for one of the five IgCC certifications that the ICC offers. The IgCC will also require building commissioning, which will require additional training by design professionals.

In addition to the IgCC, the ICC also publishes the *ICC 700*, which is the 2008 *National Green Building Standard* (NGBS) for residential construction. The NGBS is also a voluntary code, but contains most of the requirements already enforced as part of the Minnesota Energy Code. Training needs for inspectors in Minnesota would be minimal because of the similarity of the two codes (P. Kulczyk, personal communication, March 19, 2012).

In 2011, President Obama introduced the Better Buildings Initiative, which is aimed at investing in innovative clean energy technologies and doubling the share of electricity from clean energy sources by 2035. In addition, the proposal will make commercial buildings 20% more energy efficient by the year 2020 by catalyzing private sector investment through a series of incentives to upgrade offices, stores, schools and other municipal buildings, universities, hospitals, and other commercial buildings. The Better Buildings Initiative also includes a Race to the Green component that encourages states and local jurisdictions to streamline regulations which will encourage upgrade and attract private sector investment (The White House Office of Media Affairs, 2011).

President Obama's Better Buildings Initiative also includes provisions for training the next generation of commercial building technology workers. The administration is currently working to implement reforms such as improving transparency around energy efficiency performance, launching a Building Construction Technology Extension Partnership, and providing more workforce training in areas such as energy auditing and building operations (The

White House Office of Media Affairs, 2011). According to Lane Burt (2011) of the U.S. Green Building Council (USGBC), the workforce development side of the green building industry is crucial and that it takes the right type of building professional to design, build, operate, and maintain a high-performance green building.

On July 20, 1999, the State of Minnesota adopted the self-developed Minnesota Energy Code known as chapters 7676 and 7678: prior to 1999, Minnesota adopted and enforced the CABO Model Energy Code (Minnesota Department of Labor, 2012). The State of Minnesota is currently in the process of adopting the 2012 edition of the International Energy Conservation Code (IECC) with an enforcement date of July, 2013 (Minnesota Department of Labor, 2011). The new IECC is more stringent than the current Minnesota Energy Code, is more technical than the current code, and will require a greater understanding of building envelope requirements (T. Manz, Mechanical Engineer, personal communication, March 23, 2012). There is also less clarity with the IECC, which will require a deeper understanding of building systems and ventilation requirements (T. Manz, personal communication, March 23, 2012). In addition, according to Manz (2012), the IECC will force the industry to come up with higher efficient, more durable, and sustainable products, and contains compliance provisions that are similar to the building commissioning requirements of the IgCC. According to Manz (2012), it will take two to three days of training for a knowledgeable inspector to fully understand the new code, and the IECC will substantially change the rigor of the Building for Energy Conservation Course that is currently taught in the Building Inspections Technology program.

Hiring Practices of Municipalities

The minimum qualifications required for the hiring of building inspectors and building officials vary by municipality. According to the League of Minnesota Cities (2010), there are

two key goals that a city needs to achieve in the hiring process; 1) recruit and select the best candidate for the job; and 2) comply with applicable laws so the city is able to defend itself if legally challenged. In regards to building inspectors, Minnesota Statue 326B requires that a municipality who enforces the State Building Code must have a designated building official and this person must be certified by the Department of Labor (League of Minnesota Cities, 2011b).

The following outlines the minimum and preferred qualifications from position descriptions for suburban municipality building officials, rural municipality building officials, suburban municipality building inspectors, rural municipality building inspectors, urban municipality building inspectors and state regulatory agencies in Minnesota.

Suburban building official position descriptions: minimum and preferred qualifications.

City A minimum qualifications.

- Four-year college degree, two-year vocational degree, or certificate in apprenticeship program relating to construction.
- State certification as a Building Official.
- Five years of progressively responsible experience in construction inspection management, preferably in a municipal organization, or equivalent in education/training. Also, a thorough knowledge of codes affecting construction, fire, and health.
- Demonstrated ability to supervise and educate others.
- Effective working knowledge of principles, practices and techniques of protective and construction inspections, as well as administrative, management, and supervisory functions.

- Ability to communicate effectively, both orally and in writing.
- Ability to perform all essential position functions under the working conditions as described.
- Must be capable of safely performing physical actions necessary to conduct inspections at/above/below ground level of construction sites.
- Valid driver's license.

City A preferred qualifications.

- More than one year municipal building inspections experience.
- Certification by National Code Organization (ICC).
- Supervisory experience.
- Word processing skills.

City B minimum qualifications.

- Certification as MN state Building Official; and
- Three years of experience as a Building Inspector including residential and commercial inspections and plan review: and
- A valid Minnesota Class D driver's license or equivalent with no suspensions or revocations in the last three years.

City B preferred qualifications.

- Five years supervisory experience in general building construction.
- An associate's degree in building inspection or equivalent.
- Additional years experience as a building official with experience in commercial, mechanical, or plumbing inspections.

City C minimum qualifications.

- High school diploma or GED.
- State certification as Class II building Official.
- ICBO certification as a Plans Examiner or equivalent credentials.
- Two years of supervisory experience.
- Minimum seven years progressively responsible experience in the building inspection field including at least two years of municipal building inspector experience.

City C preferred qualifications.

- Bachelor's degree in Architecture, Engineering, Construction, or related field.
- Minimum of two years journeyman experience in the building trades.

City D minimum qualifications.

- Associate's or two year degree from an accredited technical school, college or university in building inspection technology, construction management, engineering, architecture, or related field.
- Certification from the State of Minnesota as a Certified Building Official.
- Four or more year's progressively responsible experience in municipal inspection department or equivalent construction management/supervisory experience.
- Knowledge and demonstrated proficient computer skills.
- Certification in Emergency Response within six months of hire date.
- Must possess a valid driver's license.

City D preferred qualifications.

- International Code Council Building Official's Certification.
- Bachelor's degree or equivalent form an accredited college or university in construction management, engineering, architecture, or related field.
- Fluently speak, read or write any language other than English, including sign language.

Rural building official position descriptions: minimum and preferred qualifications.

City A minimum qualifications.

- Certified Minnesota Building Official license.
- Certified Minnesota Building Official-Limited, or the ability to obtain one within a reasonable timeframe.
- Valid driver's license.

City A preferred qualifications.

- Advanced degree with training in Building Inspection Technology or related field.

City B minimum qualifications.

- Associate's degree in Building Inspection Technology or related field.
- Minimum of five years of building inspection experience; or
- An equivalent combination of education and experience.
- Certified by the State of Minnesota as a Building Official.
- Must be certified as a Plans Examiner and Building Inspector by the International Code Council within six months.

City B preferred qualifications.

- Bachelor's degree in administration, architecture, engineering, or related field.
- Two years of supervisory experience of building inspectors.
- Two years of experience as a municipal Building Official.
- Certified as a Plans Examiner and Building Official by the International Code Council.

City C minimum qualifications.

- Minnesota Building Official Certification.
- Completion of an associate's degree in Building Inspection Technology.
- Two years experience in building code enforcement with an ISTS certification.
- Must possess a valid Minnesota driver's license.
- Must possess a high school diploma or GED.

City C preferred qualifications.

- Three years experience in building code enforcement with a municipality.
- Continuing education credits in building inspections.
- Two-year degree in business management, or related experience.
- Experience or education in community/urban planning.

Suburban building inspector position descriptions: minimum and preferred qualifications.

City A minimum qualifications.

- A commitment to and belief in City A's shared values.
- Thorough knowledge of building fundamentals and procedures.

- Minnesota Certified Building Official or ability to obtain certification within six months of appointment.
- The ability to conduct on-site inspections of construction projects.
- Excellent written and verbal skills.
- Valid driver's license.

City A preferred qualifications.

- Degree in Building Inspection Technology, Construction Management, or other closely related program.
- National certification.

City B minimum qualifications.

- High school graduate/equivalent plus three years experience in commercial/industrial/residential construction.
- Current and valid ICC building Inspector or Certified Building Official certification in the State of Minnesota.
- Valid Class D driver's license with good driving record.

City B preferred qualifications.

- Technical degree in Building Inspection Technologies.
- Municipal inspections experience.

City C minimum qualifications.

- Some experience in building construction or inspection.
- High school graduation supplemented by college level coursework in construction, inspection, or a related field.

- Or any equivalent combination of experience and training which provides the knowledge, skills, and abilities to perform the work.

City C preferred qualifications.

- Some knowledge of the modern principles, practices, methods, and techniques of building inspection; of applicable codes, laws, and regulations of building inspections; of local ordinances and policies; of basic engineering and construction practices.
- Skill in reading and interpreting blueprints, specifications and building codes.
- Skill in the use of a microcomputer and related software.

City D minimum qualifications.

- High School Diploma, GED or equivalent.
- Minnesota Building Official's Certificate.
- Knowledge of housing codes and code enforcement.
- General knowledge of the housing construction industry, plus mechanical, electrical, plumbing, and fire suppression systems.
- Computer experience.
- Valid Minnesota driver's license.

City D preferred qualifications.

- Three years municipal inspection experience.

City E minimum qualifications.

- Two years of college/university coursework, or two years of vocational training in a related building construction trade, or two years of pre-engineering structural

coursework, or four years as a journeyman in carpentry profession, or completion of BIT program.

- Three years of inspection experience with one year of municipal inspection experience.
- Certification as a Certified Building Official-Limited (State of Minnesota).
- Valid MN driver's license.

City E preferred qualifications.

- Certification as a Certified Building Official (State of Minnesota).

City F minimum qualifications.

- Five years experience in commercial/industrial/residential construction.
- State Certification as a Building Official or equivalent.
- Valid driver's license.
- Must be able to communicate effectively both orally and in writing.
- Working Knowledge of the State Building Code.
- Ability to develop and maintain positive and effective working relationships with the general public, contractors, architects, and other employees.
- Must be capable of safely performing physical actions necessary to conduct inspections at, above, or below ground level construction sites.
- Must be able to perform all essential position functions under the working conditions as described.
- Experience as a municipal inspector.

City F preferred qualifications.

- Previous supervisory or lead worker experience.
- Five years experience as a municipal inspector.
- Familiarity with municipal ordinances and enforcement procedures.
- Four to five years' apprenticeship program or two-year degree in construction field.
- At least one year of plan review experience.
- ICBO/ICC certification as building inspector, combination inspector, or plans examiner.
- Journeyman of master plumber license.
- Knowledge of computers and ability to enter inspection results.

Rural building inspector position descriptions: minimum and preferred qualifications.

City A minimum qualifications.

- Minnesota Building Official certification limited.
- Experience in the building trades or inspections.
- Some commercial experience as a building inspector.

City A preferred qualifications.

- Two years municipal experience in residential, commercial, and industrial construction.
- Minnesota certification.

City B minimum qualifications.

- High School Diploma or general education degree.
- Valid MN driver's license or the ability to obtain prior to employment.
- A certificate in Housing Inspections or in Building Inspection Technology plus one year of experience in one of the following:
    - Housing, building, or zoning code administration or inspection-or-
    - Verifiable electrical, plumbing, or carpentry experience in a position which has provided a good working knowledge of housing construction ordinances in the areas of wiring, plumbing, heating, gas piping, ventilation, lighting, and health and safety hazards-or-
- Possess an associate's degree in Building Inspection Technology-or-
- Have a minimum of four years of verifiable experience as stated directly above.
- MN Department of Labor and Industry Boiler's License or ability to obtain within six months of employment.

City B preferred qualifications.

- International Code Council Property Maintenance and Housing Inspector Certification within one year of hire date.
- Building Official Limited Certification.

City C minimum qualifications.

- High school graduate or equivalent degree.
- At least five years of work experience in a recognized construction trade-or-
- Three years in a municipal inspections department-or-

- A degree or certificate in Building Inspection Technology.
- Construction plan reading ability and general knowledge of the municipal permit issuance and field inspection process.

City C preferred qualifications.

None listed.

Urban building inspector job description: minimum and preferred qualifications.

City A minimum qualifications.

- Must have a High School Diploma or General Education Development Certificate GED) and must meet any one of the following:
    - Five years of experience as a journey-level carpenter.
    - Five years of experience as a construction superintendent.
    - Five years of experience in engineering work in the design and construction of buildings, at least three years of which is on-site construction experience or two years in the reviewing of plans and specifications for compliance with building codes at the at the level of Plans Examiner II or higher.

City A preferred qualifications.

None listed

City B minimum qualifications.

- Two years of responsible experience in the building trades or building inspections-or-
- Two years of college courses in Building Inspections Technology or Construction Management-or-

- Two years of trade school.
- Possession of, or ability to secure within one year of employment, a State of Minnesota Building Official Certification.

City B preferred qualifications.

- Bachelor's degree in Construction Management, Architecture, engineering, or related field.
- International Code Council Certification as a Plans Examiner.

State regulatory agency building code representative position description: minimum and preferred qualifications.

Agency A minimum qualifications.

- Must hold a current a current Certified Building Official certification by the State of Minnesota. In order to be considered further, you must meet one of the following or a combination of the following criteria:
    - Must have five years experience in municipal building code administration or enforcement-or-
    - Must have four years experience in municipal building code administration or enforcement and five years experience in construction regulated by State Building Code-or-
    - Must have four years experience in municipal building code enforcement and AA degree in Building Inspection Technology-or-
    - Must have four years experience in municipal building code administration or enforcement and post-secondary coursework in Building Inspection Technology, Building Construction Architecture, Building

Construction Engineering (one year full-time coursework for six months not to exceed one year substitution).

Agency A preferred qualifications.

- International Code Council Certifications

Chapter III: Methodology

Introduction

This chapter will outline procedures and methods employed to complete this study. The purpose of this study was to identify the likely future of Building Inspection Technology programs. More specifically, the study sought to determine how and if the BIT program at North Hennepin Community College merits continuation. The following questions formed the foundation of the data collected: (1) *What is the current status of local and national Building Inspection Technology programs?* (2) *What is the likely future for Building Inspection Technology programs?* (3) *What methods of delivery will Building Inspection Technology programs utilize?*

Description of the Study

There has been limited prior research on this topic, for this reason, a descriptive thematic study utilizing both qualitative and quantitative research methods was chosen. This mixed methods approach aimed at providing a snapshot of the status of Building Inspections Technology programs nationwide, as well as to provide a look into the future of the building inspections industry and its relationship to Building Inspections Technology programs.

According to Gall, Gall, and Borg (2003) the purpose of a descriptive study is to examine phenomenon as they exist at one point in time. In addition, descriptive studies are concerned primarily with determining *what is*. Descriptive studies generally involve the administration of questionnaires and interviews. This type of research has yielded much valuable knowledge about opinions, attitudes, and practices and this knowledge has helped shape educational policy and initiatives to improve existing conditions (Gall, Gall, & Borg, 2003). Descriptive studies are limited by the types and quality of available measures, for this reason, the researcher must

develop new measure in order to describe precisely and accurately the phenomena of interest to them (Gall, Gall, & Borg, 2003).

To achieve the purpose of a descriptive study, a two-phased design approach was used to gather data (Creswell, 1994). This mixed methods approach involves the collection of both qualitative and quantitative data with the advantage being that the two paradigms are clearly separate. In addition, this method enables the researcher to present thoroughly the paradigm assumptions behind each phase (Creswell, 1994). Greene, Caracelli, and Graham (1989) outline five purposes for combining methods in a single study:

1. Triangulation: In the classic sense of seeking convergence of results.
2. Complimentary: In that overlapping and different facets of a phenomenon may emerge.
3. Developmentally: Wherein the first method used sequentially to help inform the second method.
4. Initiation: Wherein contradictions and fresh perspectives emerge.
5. Expansion: Wherein the mixed methods add scope and breadth to the study.

According to Creswell (1994) a disadvantage to a two-phased design approach is that the reader may not discern between the two phases. In addition, advocates of methodological purity argue that a single evaluator cannot be both deductive and inductive at the same time when using mixed methods (Patton, 1990).

Purely quantitative research methods administered through a survey were considered for this study. Due to the complexity and uncertainly of the responses, the use of quantitative research would have only constrained the data to predetermined categories of analysis (Patton, 1990). In addition, both qualitative and quantitative data can be collected in the same study

(Patton, 1990). This method can yield data that can be productive for descriptive, reconnoitering, exploratory, inductive, opening-up purposes (Miles & Huberman, 1994).

Quantitative data was collected by utilizing structured interviews that involved a set of closed-formed questions that could be answered from among a set of short-answer choices (Gall, Gall, & Borg, 2003). The distinct advantage that the structured interview has over a questionnaire is that the researcher can interact with the respondent, thereby reducing the number of unusable or *don't know* answers (Gall, Gall, & Borg, 2003). Quantitative research of this nature will yield statistical data that will provide a succinct and parsimonious summary of major patterns that are essential in a descriptive study (Patton, 1990).

An eight step design was used in constructing and administering the structured interviews: 1) defining the research objectives; 2) selecting the sample; 3) designing the questionnaire format; 4) pretesting the questionnaire; 5) pre-contacting the sample; 6) writing a cover letter and distributing the questionnaire (via interviews); 7) following up with non-respondents; 8) analyzing questionnaire data (Gall, Gall, & Borg, 2003).

Focus groups were utilized to collect qualitative data because of their ability to obtain perceptions on a defined area of interest (Kruger, 1988). In addition, focus groups produce data that provides insight into attitudes and opinions of participants and presents a natural environment where participants are influencing and influenced by others, just as they do in real life (Kruger, 1988). This forum also tends to provide a system of checks and balances that weed out false or extreme views (Patton, 1990). Kruger (1988) acknowledges that there are some limitations to focus groups which include; the researcher has less control in the group compared to an individual interview; the sharing of group control results in some inefficiencies such as detours in the discussion and the raising of irrelevant issues; data is more difficult to analyze,

care is needed not to lift comments out of context; groups tend to vary considerably; groups are difficult to assemble and; the discussion must be conducted in an environment conductive to conversation.

A challenge of a qualitative study is to minimize the bias and opinions of the researcher. According to Patton (1990) critics of qualitative inquiry have charged that the approach is too subjective because the researcher is the instrument of both data collection and data analysis. For this reason, a process of self-reflection was completed by the researcher. Qualitative inquiry requires the investigator to carefully reflect on, deal with, and report on potential sources of bias and error (Patton, 1990).

According to Bernardo (2012) qualitative research is interpretive, therefore, it behooves any author to perform self-reflection prior to and during writing. Reflexivity is the focus on the researcher's self as an integral constructor of the social reality being studied (Gall, Gall, & Borg, 2003). Self-reflective journals were used by the researcher before and during the research to facilitate reflexivity (Ortlipp, 2008). The self-reflection journals were used to monitor and control biases (Johnson, 1997).

Selection and Description of Sample

The population for this study consisted of building inspectors, building officials, hiring managers, construction management experts, contractors, students, state regulatory agencies, and academic construction program experts nationally and within the State of Minnesota. The sample of building inspectors in Minnesota was stratified to include both outstate and metropolitan areas.

The population used for question one: *What is the current status of local and national Building Inspection Technology programs?* consisted of Building Inspection Technology

program chairs, department chairs, faculty, and academic deans that were identified through the literature review. Criterion sampling was used to determine subjects (Gall, Gall, & Borg, 2003). The criteria for the selection of subjects included the following: administration of a BIT program, supervisory role in a BIT program, or faculty within a BIT program.

The population for question two: *What is the likely future for Building Inspection Technology programs?* utilized building inspectors and officials (stratified by region), construction management experts, contractors, students, academic construction program experts, hiring managers, and state regulatory agencies. Purposeful random sampling was used to establish that the sampling process was not biased (Gall, Gall, & Borg, 2003). In order to solicit volunteers for the study, separate requests were sent to the following organizations: 10,000 Lakes Chapter of the ICC (metropolitan area), Arrowhead Chapter of the ICC (outstate Minnesota), University of Minnesota Construction Management advisory board, Builders Association of Minnesota, North Hennepin Community College BIT Student Association, North Hennepin Community College Construction Programs advisory board, Minnesota City/County Management Association, and the Minnesota Department of Labor and Industry.

The population for question three: *What methods of delivery will Building Inspection Technology programs utilize?* contained representatives from the same group of occupations as question two; however, alternate subjects were selected. The same process was used as in question one to solicit volunteers for the study.

Instrumentation

For this study, an interview protocol and focus group questions were developed using the research questions and literature review as a guide. All instruments were designed specifically for this study.

Reliability: To maximize validity of question items the researcher used a peer review process and finally applied the data collection tools to a sample subject to further make certain that subjects would understand the questions. An ad-hoc committee was formed to provide an outline of questions for the study that were both relevant and comprehensible. Once the questions were formulated, peers were used to test the instrument to ensure that the questions yielded consistent results. Awareness of cultural sensitivity and appropriate use of language was used. In addition, the use of biased or leading questions was avoided.

Validity: Since this research set out to understand and describe it yields data that is not generalizable beyond the programs and subjects being studied. Additionally this was a custom developed questionnaire therefore no claims made relative to reliability.

To answer research question one: *What is the current status of local and national Building Inspection Technology programs?* an interview protocol was designed to gather quantitative data from Building Inspection Technology programs as identified by the International Code Council. A 23 question closed form, structured interview protocol was developed in order to make quantification and analysis of the results easier (Gall, Gall, & Borg, 2003). The literature review determined the questions that were used in the interview. A pilot test was administered to peers and their answers were used to further identify responses for the closed form. In instances where unusual responses were predicted, a response item of *other* was added to the possible choices. The protocol was used to determine enrollment numbers, graduation rates, placement rates, type of program, number of courses offered, delivery method, years the program has been offered, level of program, as well as demographic data. The interview protocol is located in Appendix A.

Question two: *What is the likely future for Building Inspection Technology programs?* was answered by using a facilitated web-based focus group (Focus Group A). Four questions were formulated to provide a framework for research question two. Peer reviewers were used to determine the relevancy of the four questions to the research questions. A pilot test was launched and adjustments were made to the protocol. Structured questions were used to determine possible outcomes, which were then grouped according to similar themes. The protocol for Focus Group A is located in Appendix B.

Data collection for question three: *What methods of delivery will Building Inspection Technology programs utilize?* was completed by a facilitated web-based focus group (Focus Group B) using structured questions to determine outcomes. The questions were formulated from the responses given in Focus Group A and are located in Appendix C.

Data Collection Procedures

Data collection was completed in three phases: a structured interview and two online facilitated focus groups. The structured interview was conducted with 17 out of 31 academic institutions that were identified by the ICC as offering a Building Inspections Technology program. Of the 31 institutions listed, one never offered a BIT program, two offered one course in building codes, one was part of multi-campus institution and was a duplicate, and one for-profit institution was no longer in business. The interviews were conducted during Spring semester of 2012 with academic deans, program directors, faculty chairs and program coordinators of Building Inspection Technology programs located in the United States. The interviews were conducted via telephone or electronic communication to gather data. Respondents were informed of their implied consent to participate as well as their ability to choose not to participate with any adverse consequences.

Focus Group A was conducted on April 4, 2012 with nine participants that included building inspectors, building officials (stratified by region), hiring managers, construction management experts, contractors, students, state regulatory agencies, and academic construction program experts. Participants were given four questions about the building inspections industry and Building Inspection Technology programs. The responses were recorded electronically using Adobe Connect and then transferred to a Microsoft Word document for analysis. Subjects were informed of their implied consent, UW-Stout IRB approval, as well as their ability to choose not to participate with any adverse consequences.

Focus Group B was conducted on April 9, 2012 with 10 participants that included building inspectors, building officials (stratified by region), hiring managers, construction management experts, contractors, students, state regulatory agencies, academic construction program experts, and academic deans of Building Inspection Technology programs from out-of-state. Participants were given four questions about possible delivery methods of a Building Inspections Technology program that were identified in Focus Group A. The responses were recorded electronically using Adobe Connect and then transferred to a Microsoft Word document for analysis. Subjects were informed of their implied consent, UW-Stout IRB approval, as well as their ability to choose not to participate with any adverse consequences. In addition to the researcher, an additional facilitator was present during both focus groups.

Data Analysis

Data was compiled and analyzed by the researcher using multiple methods. Frequency distribution tables were used for ease of comprehension and comparison. Any identifiers from the raw data were removed prior to data analysis.

Quantitative data gathered from the structured interviews was analyzed using descriptive statistical methods in order to present a summarization of the interviews (Patten, 2004). A process was used to calculate the percentage of respondents who indicated each response option for each item (Gall, Gall, & Borg, 2003). Results of the data were then transcribed into a narrative of the findings.

Patton (1990) recommends that qualitative data be analyzed using a process of identifying, coding, and categorizing the primary patterns in the data. According to Kruger (1988) focus group data analysis must be systematic and verifiable; systematic in the sense that it follows a prescribed sequential pattern, and verifiable that the process would permit another researcher to arrive at similar conclusions using available documents and raw data. For these reasons, an interpretational analysis process was used to analyze data from Focus Group A (Gall, Gall, & Borg, 2003). Interpretational analysis is used to find constructs, themes, and patterns that can be used to describe and explain the phenomenon being studied (Gall, Gall, & Borg, 2003).

After an extensive process of reading and rereading the transcripts, the data was placed into segments of comprehensible information and then into categories based on the type of phenomenon that was mentioned in the data (Gall, Gall, & Borg, 2003). The segments were then coded according to theme and placed in one or multiple categories. The category segments were then grouped according to themes. Finally, conclusions were drawn based on the salient themes that surfaced from the final grouping and were converted into questions for Focus Group B.

Data from Focus Group B was analyzed using the same process as described for focus group A. In addition, ancillary data was reviewed and recorded in a *miscellaneous* category. The resulting data is presented and discussed in Chapter Four.

Limitations

The researcher acknowledged that there were limitations to the study. The following limitations applied to this study:

1. The study was limited to the building inspections industry in Minnesota. The results from the study only reflected data on the building inspections industry and the BIT program in Minnesota.
2. There is limited prior research on the building inspections industry. A literature review yielded limited results because of the uniqueness of the industry.
3. Data gathered represented an industry of approximately 1200 members as defined by the Minnesota Department of Labor Building Official Certification standards.
4. There is limited specific statistics on employment trends for building inspectors. Although there is numerous data available for employment trends, the information does not specifically address building and construction inspectors.
5. The results of the study may be more qualitative than quantitative. Due to the lack of prior research, the study will incorporate qualitative research methods such as focus groups and interviews for data collection.
6. The instruments were developed by the researcher and were not tested for reliability or validity. Every effort was made to develop a valid and reliable instrument.

Summary

This thematic descriptive study was designed to answer the research questions through a series of interviews and focus groups. Data was compiled and analyzed by the researcher using descriptive statistical methods and interpretational analysis, keeping in mind that certain

limitations applied to this study. Salient themes were developed and provided a descriptive picture of the data collected. The analyzed data is presented and discussed in its entirety in Chapter Four.

Chapter IV: Results

The purpose of this study was to identify the likely future of Building Inspection Technology programs. More specifically, the study sought to determine how and if the BIT program at North Hennepin Community College merits continuation. The study was designed to answer the following research questions: (1) *What is the current status of local and national Building Inspection Technology programs?* (2) *What is the likely future for Building Inspection Technology programs?* (3) *What methods of delivery will Building Inspection Technology programs utilize?* Data was collected by utilizing structured interviews and focus groups during Spring semester 2012. Data was compiled and analyzed by the researcher using descriptive statistical methods.

Research Question One Findings

Results from interview question one: *How long has your institution had a Building Inspections Technology program?* revealed the following data; 59% of institutions reported having a program for over 20 years; 24% reported having a program for 16-20 years; 6% reported having a program for 11-15 years; 12% reported having a program for 6-10 years and no one reported having a program for less than five years.

Results from interview question two: *What type of Building Inspections Technology program does your institution offer?* resulted in the following information; 12 respondents (70%) indicated that they offer both an associate's degree and a certificate; one institution offers an associate's degree; three institutions offer a certificate; three institutions offer a continuing education program; and one institution offers a bachelor's degree.

Results from interview question three: *What are your current enrollment numbers?* revealed the following data; six institutions (35%) reported having zero to 10 students enrolled;

three institutions (18%) reported having 11-20 students enrolled; two institutions (12%) reported having 21-30 students enrolled; one institution (6%) reported 31-40 students enrolled; and three institutions (18%) reported having over 40 students enrolled. In addition, one institution in responding to the choice *other* indicated that they had 477 students enrolled.

Results from interview question four: *what were your historic enrollment numbers?* yielded the following; zero institutions reported having zero to ten students enrolled; four institutions (25%) reported having 11-20 students enrolled; three institutions (19%) reported having 21-30 students enrolled; zero institutions reported having 31-40 students enrolled; and seven institutions (44%) reported having 40 or more students enrolled. One institution, in responding to the choice *other* indicated that they had 525 students enrolled. Of the 14 institutions reporting; eight (57%) reported a decline in enrollment; four (28%) reported no change in enrollment; one (.07%) reported an increase in enrollment; and one institution reported no prior enrollment data.

Interview question five*: If applicable, when did your institution start to see a decline in enrollment?* yielded the following information; 13 institutions (93%) reported that a decline in enrollment started between zero and five years ago and one institution (7%) reported that a decline in enrollment started between six and 10 years ago. Three institutions did not report a decline in enrollment.

Interview question six: *What are your institutions graduation rates per year?* resulted in the following findings; six institutions (43%) reported zero to five graduates per year; one institution (7%) reported six to 10 graduates; two institutions (14%) reported 16-20 per year; two institutions (14%) reported more than 20 students; and six institutions did not know their graduation rates.

Interview question seven: *If your institution offers a certificate, what are your completion rates per year?* resulted in the following data; four institutions (27%) reported zero to five completers per year; one institution (7%) reported six to 10 students per year; one institution (7%) reported 11-15 students per year; one institution (7%) reported 16-20 students per year; one institution (7%) reported over 20 students per year; and seven institutions (47%) do not track certificate completion rates.

Interview question eight: *What are your placement rates in field of study for graduates per year?* revealed the following statistics; three institutions (18%) reported zero to five students placed in field of study per year; and 14 institutions (82%) reported that they did not track placement rates of students.

Interview question nine: *How is your program delivered?* yielded the following data; 13 institutions offer their program in a face-to-face format; two institutions offer their program in a fully online format; one institution reported that they offer their program face-to-face, online, and blended/hybrid formats as well as offered there courses in off-site locations.

Interview question 10: *How many courses (concentration specific) are offered or have been historically offered?* revealed the following data: one institution (6%) reported offering zero to five courses; five institutions (29%) reported offering six to 10 courses; 8 institutions (47%) offer 11-15 courses; and three institutions (18%) offer more than 15 courses.

Interview question 11: *What is your program intended for?* three institutions reported that their program was intended for entry level employment; five institutions reported that their program was intended for professional development; six institutions indicated that their program was intended for entry level employment and professional development; two institutions reported that their program was intended for entry-level employment, professional development, and

training. One respondent reported that their certificate was for professional development for those working in the field and the degree was intended for entry-level employment.

Table 1 is a graphical representation of question 12: *What are your states licensing or certification requirements for building inspector?*: and question 13, *What are the educational prerequisite requirements prior to obtaining licensing or certification?* In addition to the data presented in Table 1, two institutions reported that they did know what the certification or licensing requirements are and three institutions reported that their state did not have certification or licensing requirements for building inspectors.

Table 1

State Certification/Licensing and Educational Prerequisite Requirements

State Certification/Licensing Requirements				Educational Prerequisites			
Institution	Certification	License	Model Code Certification	AAS Degree	BIT Certificate	Coursework in BIT	No Educational Requirements
1			X		X		
2			X				X
3			X				X
4	X						X
5	X			X	X		
6	X	X					X
7	X		X		X		
8	X					X	
9	X						X
10	X						X
11			X				X
12			X				X

Interview question 14: *What was the impetus for your institutions Building Inspection Technology program?* revealed the following data; one respondent (6%) indicated that there was a state requirement (e.g. legislation); five institutions (29%) reported that there was a request from industry to start the program; five institutions (29%) stated that there was interest from other sources (students and labor unions); three institutions (18%) reported that it was self-started by the institution; four institutions indicated that it was started for other reasons (joint

effort between the ICC and the colleges construction and emergency management programs, identified a need in the field for a program, received a state grant to start a program, started a program to retrain workers after two plants closed in the area); and three institutions (18%) did not know why the program was started.

Interview question 15: *If applicable, what is the reason for closing and/or modifying the program?* revealed that six institutions (86%) have closed or modified their programs due to low enrollment; three institutions (43%) have closed or modified their programs because of a lack of employment opportunities for graduates; and one institution (14%) closed or modified their program because of budget issues.

Interview question 16: *What are the future plans for the program?* yielded the following results; two institutions (13%) indicated that they will close the program; three institutions (19%) plan to keep the program open in its current form; two institutions (13%) plan to modify the program (add more classes to attract students, revise curriculum); seven institutions (44%) plan to reevaluate the program at a future date; one program plans on adding course in green codes; one program is being converted to customized training; and one respondent indicated that their program has already been closed.

Question 17 asked respondents whether or not their program is served by an advisory board. Thirteen institutions (81%) responded “yes”, and three (19%) responded “no”. Institutions that responded *yes* reported the following makeup of their advisory boards: instructors-85%; building officials or building inspectors-85%; academic deans-62%; program coordinators or directors-38%; department or faculty chairs-31%; students-38%; and contractors-46%; labor unions-15%. In addition, one institution reported that there was a building envelope specialist who serves on their advisory board.

Interview question 19 asked respondents if they felt there was industry support for their program. Thirteen institutions (81%) indicated "yes", and three institutions (19%) indicated "no". Of those who answered "yes", the following forms of support were stated: financial support-17%; help with advertising or public awareness-33%; free or reduced student memberships at chapter meetings-17%; and other (58%), of which four respondents indicated that the local municipalities provided reduced tuition or full tuition reimbursement for their employees; one institution responded that local municipalities will give a pay grade increase for completing the certificate; and one institution stated that local building inspectors will take on students for their required internships and value the quality of students entering into the field.

Interviewees were asked what other educational components were part of their Building Inspection Technology programs. Twenty-seven percent responded that they incorporate cooperative learning experiences; 55% indicated they require structured internships; 9% required ride-along with building departments; 27% provide field trips; and one institution requires an off-site capstone project.

Interview question 22: *If your program has been closed, how are people in your region obtaining the skill sets needed for employment as building inspectors or building officials?* disclosed the following data: one respondent indicated that people were obtaining training from national model code groups; one respondent did not know; and one respondent stated that there was another associate's degree program an hour from their campus that was still offering the program.

Research Question Two Findings

Table 2 indicates the themes that surfaced from respondents for question one: *What do you anticipate will be the role of the building inspector/official in the next ten years?*

Respondents also indicated that “these conditions will require professional code officials with advanced degrees to properly manage people and programs” and that “the inspector/official will need to maintain a combination of construction experience, code knowledge and has developed solid problem solving skills.” One respondent indicated “the role of the building official will be secondary to other more prominent tasked positions within the jurisdiction.” Another respondent indicated that they “see the building inspector in the next ten years to be lacking field training along with a lack of education.”

Table 2

Themes from Question One

The following are the reported roles that the Building Inspector will need to be competent in.

1. Expert in building codes by continually remaining abreast of changes or pending changes.
2. General practitioner of the inspection industry.
3. Administrator of property maintenance, rental, and other city programs.
4. Manger and leader of emerging specialty inspectors.

Table 3 describes the themes that emerged from question two: *What do you anticipate to be the skills and abilities needed or building inspectors and building officials in the next 10 years?* Other comments from respondents included; “we will have smaller staffs and will be expected to do more with electronics”, and that “customers will expect plan reviews and inspections with more accuracy and quicker than ever.” One respondent indicated that “an inspector will need to be capable of rental, housing, property maintenance, zoning, and/or management of performed tasks.”

Table 3

Themes from Question Two

1. Ability to understand the big picture needs of the jurisdiction.
2. Understand the evolving changes in codes, especially green codes.
3. Inspectors must understand intent and interpretation of the code more completely.
4. Understand the science of energy conservation, ventilation, and moisture.
5. Understand building systems.
6. Understand the design process.
7. Understand current trends and techniques in construction.
8. Demonstrate effective writing and communication skills.

Table 4 indicates themes that surfaced from question 3: *How will future workers develop these skills and abilities?* One respondent indicated that in the future "The building inspector would be a manager of private, third-party entities that hire specialized individuals necessary to consult with and assist the local code officials." Another respondent indicated that "Inspectors may become more like project managers and quality control; however at this time; I do not think that it is the direction of the industry." Other respondents stated that "most every field has some form of quality control or evaluation" and there should be "regulated testing to keep up with new materials and the International Energy Conservation Code."

Table 4

Themes from Question Three

1. Formal education (architecture, engineering, housing, planning, community development).
2. Training on new products and methods, code changes, energy efficiency, and moisture intrusion.
3. Continuing education from model code groups.
4. Mentoring and on-the-job training.

Themes that were identified from question four: *Thinking about the three previous questions, how do you see a Building Inspection Technology program fitting into the future of the building inspections industry?* are outlined in Table 5. For the post associate's degree certificate, respondents indicated that the associate's degree would be in fields such as planning, community development, housing studies, public health, fire technology, architecture, engineering, or construction management. Two respondents indicated that a building inspections technology degree was necessary to enter the field and one respondent felt that "practical construction experience is beneficial to code enforcement." One respondent stated that "the reality is that an inspection specific education might be too specific to be supported in our economy." Respondents specified that an undergraduate certificate could be offered in programs such as construction management, architecture, and engineering. One respondent stated that "many other states have architects or engineers in their building departments."

Respondents indicated that classroom instruction "should extensively cover the provisions of the building code and review the latest materials and construction methods" "energy codes and moisture intrusion issues" as well as "the technology of building systems, if they are to inspect them, particularly the building envelope and the rapidly changing theory about it." Respondents felt that on-the-job training could be delivered through internships that are a requirement of a Building Inspections Technology program (paid or unpaid) or through an apprenticeship program at a jurisdiction.

Regarding continuing education, one respondent stated "specialized, intense continuing educational training should be designed to supplement and support the general education that the individual has received from another program." Respondents surmised that continuing education could be sponsored through the continuing education (for-profit) arm of a community college and also "could be marketed through trade associations and in conjunction with the ICC, something more than a one-day seminar, and something different than just taking an online class."

Table 5

Themes from Question Four

1. Post associate's degree certificate.
2. Undergraduate certificate (minor).
3. Classroom instruction with on-the-job training.
4. Continuing education (non-degree related).

Research Question Three Findings

To answer Research Question Three, four different models of Building Inspection Technology programs were presented. The results of possible delivery methods for a post associate's degree certificate are summarized and illustrated in Table 6. Respondents felt that a combination of face-to-face and online delivery could be offered through for-profit agencies and professional trade organizations. One respondent believed that this type of format should be "partnered with the State of Minnesota (or other governing body) and to have this as required curriculum/training to become a State Certified Building Official." In addition, this model "would not require some of the administrative approvals necessary for a college recognized curriculum."

Four respondents agreed that a post associate's degree certificate should be tied to a construction management program and that "both classroom experience and field experience are important for inspecting." One respondent viewed the post associate's degree certificate as independent learning where the "student and advisor work to develop a program to meet the needs of the student."

Table 6

Possible Delivery Methods for a Post Associates Degree Certificate

1. Combination face-to-face and online delivery
2. Face-to-face, online, and hands-on educational experiences
3. Independent learning

Table 7 represents themes derived from the question: *What are possible delivery methods for an undergraduate certificate (minor)?* One respondent stated that because of time constraints of fulltime students "a hybrid or totally online approach would be the choice of students" and "to make it a viable and respected minor, an institution covering all programs of study would be the best fit." One respondent indicated that the hybrid model "will help each student not only learn from the instructor and the course material, but from the other students as well." One respondent preferred "that the system not be associated with code groups like the ICC, they appear to be in it for the extension of the operation."

Table 7

Possible delivery Methods for an Undergraduate Certificate (minor)

1. Fully online
2. Classroom, online, and apprenticeship
3. Hybrid (online with face-to-face components)

Table 8 outlines the themes that surface from the question: *What are the possible delivery methods for classroom instruction with on-the-job training?* The respondents indicated that formal internships would need to be structured and part of an academic program and that, "on the job training would need to be facilitated with the governing bodies responsible for enforcing the codes and standards." One respondent (an engineer) stated that she "started working for a city in mid-career and found that I needed to have inspection skills I did not have, I would have really benefited from an apprenticeship program." Respondents also indicated that there may be limitations to internships and apprenticeships because of insurance liability reasons, but felt that

these costs could be off-set through student fees and funds from local and state agencies. One respondent preferred the apprenticeship model to an internship because "some internship programs appear to be used as cheap employment." Another respondent added that this model "should be 80% classroom and 20% internship." One respondent indicated that "this model will only be accomplished by garnering the support of the local building official chapters" and added that "this is a must."

The respondents also described a co-op model with on-the-job training reinforced by classroom instruction stating "it is the best balance between education, application and work experience." Respondents also viewed post-degree internships as "practical experience prior to examination, much like engineers and sanitarians." They saw these programs being offered as part of the degree, through an accredited institution, but "would prefer it to not come from the ICC."

Table 8

Possible Delivery Methods for Classroom Instruction with On-The-Job Training

1. Formal apprenticeships with jurisdictions
2. Co-op programs
3. Post-degree internships

Table 9 represents themes extracted from the question: *What are possible delivery methods for continuing education (non-degree related)?* In both themes, respondents indicate that a combination of online and face-to-face delivery would be "necessary in order to capture the largest audience." Respondents indicated that continuing education could be delivered from

for-profit agencies and professional trade organizations in cooperation with local building official chapters. Respondents also identified a model in which a variety of certificates would be delivered through a consortium of academic institutions. For example, they felt that a technical college could issue a plumbing or mechanical certificate; an engineering program could offer an engineering certificate; and a management program could offer a certificate in management. The culmination of these certificates could then be collected and brought to one institution for college credit.

Table 9

Possible Delivery Methods for Continuing Education (Non-Degree Related)

1. Online and face-to-face by for-profit entities
2. Online and face-to-face by a consortium of academic institutions

Chapter V: Discussion

The purpose of this study was to identify the likely future of Building Inspection Technology programs. More specifically, the study sought to determine how and if the BIT program at North Hennepin Community College merits continuation. The study was designed to answer the following research questions: (1) *What is the current status of local and national Building Inspection Technology programs?* (2) *What is the likely future for Building Inspection Technology programs?* (3) *What methods of delivery will Building Inspection Technology programs utilize?* This chapter provides the conclusions and recommendations derived through this descriptive study. In addition, recommendations for the education of building inspectors, modifications of BIT programs and further research are provided.

Restatement of the Problem

In its current state, it appears that the BIT program does not appeal to students or prospective employers. It can be argued that it is because of alternative pathways to state certification, lack of a credential requirement by municipalities for hires in these positions, the decline of construction activity, and diminishing industry support for the program. Further jeopardizing the program's continuation is the mission of Career and Technical Education, which is to prepare students for careers in current or emerging employment sectors (U.S. Department of Education, 2011a). The literature review also yielded little data to suggest that there are viable career opportunities outside of municipal employment for building inspectors. The combination of these factors has resulted in the suspension of the BIT AAS degree, the closure of the Housing Inspection Certificate, and the closure of the BIT program at Inver Hills Community College after Spring semester of 2012. If these trends continue, there is a threat that the BIT program at North Hennepin Community College could also see its demise.

Restatement of the Limitations of the Study

The following limitations applied to this study:

1. The study was limited to the building inspections industry in Minnesota. The results from the study reflected data on the building inspections industry and BIT program in Minnesota.
2. There is limited prior research on the building inspections industry. A literature review yielded limited results because of the small size and uniqueness of the industry.
3. Data gathered represented an industry of approximately 1200 members as defined by the Minnesota Department of Labor Building Official Certification standards.
4. The instruments were developed by the researcher and were not tested for reliability or validity. Every effort was made to develop a valid and reliable instrument and modifications were made after the pilot study.
5. Due to the researchers' relationship with, and proximity to the building inspections industry and BIT program, bias may be present in the recommendations.

Methods and Procedures

Data collection for this study was conducted in three phases; a structured interview and two web-based facilitated focus groups. The structured interviews were conducted with 17 out of the 31 academic institutions that were identified by the ICC as offering a BIT program. The interviews were conducted with academic deans, program directors, faculty chairs, and program coordinators of Building Inspection Technology programs in the United States using a 23 question interview protocol developed by the researcher.

The web-based facilitated focus groups were conducted with building inspectors, building officials (stratified by region), hiring managers, construction management experts, contractors, students, state regulatory agencies hiring managers, and academic construction program experts. The first focus group was given four questions about the building inspections industry and BIT programs. Their responses were used to formulate four questions about possible delivery methods of BIT programs posed to the second focus group. All data was collected during the Spring semester of 2012.

Data was compiled and analyzed by the researcher. Quantitative data gathered from the structured interviews was analyzed using descriptive statistical methods in order to present a summarization of the interviews. In addition, qualitative data from the interviews was analyzed to develop themes, other than those that were uncovered using the descriptive statistics and interpretational analysis. Qualitative data from the focus groups was analyzed using a process of reading, reviewing, and coding. Responses were compared, coded, and grouped into core themes. Ancillary data was reviewed, compared, coded and grouped by theme to develop further discussion of the data collected.

Major Findings

Major findings for research question one: *What is the current status of local and national BIT programs?* revealed the following; 1) most BIT programs are considered mature programs of study and are established at their institutions; 2) the majority of BIT programs are experiencing low enrollment due to the slowdown in construction activity; 3) BIT programs are being closed or modified in response to low enrollment and: 4) successful BIT programs have industry and local support.

Major findings for question two: *What is the likely future of BIT programs?* revealed the following; 1) the role of building inspector will change into more of a management position as construction codes become more complex; 2) there is a need for building inspectors to have a base education in a construction related occupation such as construction management, architecture, or engineering; 3) there is a need for programs that teach construction codes and: 4) there are four possible formats for a BIT program; post associate's degree certificate, undergraduate certificate (minor), classroom instruction with on-the-job training, and non-degree related continuing education.

Major findings for research question three: *What methods of delivery will BIT programs utilize?* revealed the following; 1) a combination of online, hybrid/blended, and face-to-face delivery is preferred; 2) a structured internship, mentorship, or co-op needs to be embedded in a BIT program; 3) BIT programs could be delivered through an academic institutions' customized training arm or for credit and; 4) BIT programs could be delivered through for-profit agencies or professional trade organizations.

Conclusions for Research Question One

Research question one provided an overview of the current status and future of local and national BIT programs. The main conclusion drawn is that BIT programs are dependent on industry advocacy for sustainability. For example, successful BIT programs reported that they have backing from industry with financial support, help with advertising and public awareness, and free or reduced student memberships with local building inspector organizations. Institutions reported that municipalities in their areas provided, full or partial tuition reimbursement, pay grade increases for completing the BIT certificate, internship sponsorship and advisory board

participation. In addition, 29 percent of the institutions reported that there was a request from industry to start a BIT program.

State certification requirements are a factor in the completion rates of students enrolled in BIT programs. Institutions who are located in states with licensing or certification requirements for building inspectors reported more robust and stable enrollment numbers. Four institutions reported that their states had educational prerequisites prior to certification, which helped maintain enrollment numbers. In addition, four institutions who are located in states with licensing or certification requirements reported no decline in enrollment and one reported an increase in enrollment. Nationally, certification rates started dropping in 2000, compared to Minnesota which experienced a drop in certification numbers starting in 2003, both ahead of the downturn in construction activity and construction spending.

Another factor influencing the success of BIT programs is the hiring practices of municipalities. A degree in BIT is not mandated nor required as a minimum qualification by all municipalities in Minnesota for employment as a building inspector or building official. In addition, a BIT degree does not necessarily give a competitive edge to applicants while seeking employment. It may be concluded that the hiring practices of municipalities in Minnesota have an effect on the enrollment numbers and completion rates of the BIT program at North Hennepin Community College.

Conclusions for Research Question Two

In regard to the likely future of BIT programs, it can be concluded that the role of the building inspector is changing: educational institutions need to stay current or the result will be a lack of a qualified workforce when there is a rise construction activity.

Construction codes are constantly evolving and becoming more complex. Because of this, respondents indicated that there is a need for a program to teach construction codes. In addition, the building inspector will need extensive training in: new methods and materials, green building practices, energy codes, moisture intrusion issues, and residential fire sprinkler systems.

Due to the complexities of construction, a building inspector or building official will need to have a base education in a construction related field. Because of the emphasis on building systems, green construction practices, envelope requirements, and building science, building inspectors will require a much broader education than just construction experience. Academic programs in construction management, architecture, and engineering most closely resemble the skill sets that will be needed for future building inspectors.

Based on responses, it can be concluded that the role of the building inspector will change to that of a manger of specialized inspectors and other city functions. As construction codes become more complex and specialized, it will be unrealistic for one person to possess all of these skill sets and knowledge. The building inspector will manage and coordinate these specialized inspectors whether they are municipal employees or third party private firms. In addition, because of diminishing city budgets, the building inspector will need to have a broader skill set that will allow him or her to manage other city functions such as housing, rental licensing, and property maintenance programs. In addition to construction code knowledge, this will require the building inspector to have an advanced degree.

It can also be concluded that the composition of a building department will change. The building official will possess a four year degree and have specialty training in construction codes. This person will be responsible for the management and coordination of specialty

inspectors and field inspectors. The building inspector, who conducts on-site field inspections, will possess a two year degree and have specialty training in construction codes.

Four themes emerged as possible formats for BIT programs: a post associate's degree certificate, an undergraduate certificate (minor), classroom instruction with on-the-job training, and non-degree related continuing education. In all four instances, it was concluded that there is a need for a structured internship, mentorship or co-op component to the program in order to teach hands-on practical knowledge. The post associate's degree certificate is best suited for delivery from trade associations, while the undergraduate certificate is best suited for academic programs such as construction management, architecture or engineering. Customized training is best suited for the for-profit arm of an educational institution, private firms specializing in specific areas, and trade associations who are experts in their fields.

Conclusions for Research Question Three

The main conclusion drawn from question three is that there are viable methods of delivery for BIT programs: academic institutions must embrace these methods in order for their programs to thrive. Although no single best method was identified, a combination of delivery methods would capitalize on busy schedules as well as attract the widest audience of students and participants.

Delivery methods for a post associate's degree certificate and an undergraduate certificate include face-to-face, blended/hybrid and online. An independent learning certificate could also be arranged in specific discipline such as green construction, or energy conservation. A fully online undergraduate certificate as part of a construction management, architecture, or engineering degree, would allow students to pursue the certificate outside of their normal coursework.

It is also concluded that the delivery of customized training, if offered online, would need to be closely monitored to avoid deception by participants. For-profit and trade organizations are not bound by the same standards as academic institutions for required Carnegie units, and therefore may not offer enough contact hours for academic credit. This may also hold true for required hours for continuing education units for professional licensure and certifications.

Recommendations Related to This Study

Based on the findings and conclusion of this study, it is recommended that the BIT program at North Hennepin Community College conduct a needs assessment and task analysis to determine if the program is prepared to teach the emerging skill sets needed by building inspectors. The BIT program should also work with industry and other stakeholders to garner support for the program and to establish requirements for the licensing and hiring of building inspectors.

It is further recommended that the BIT program explore alternative methods of delivery, alternative formats for the program, and the integration of emerging technologies and construction practices into the curriculum. In addition, the use of structured internships, mentorships, or co-op programs should become a required component of the curriculum.

Recommendations for Further Study

Based on the results of this research, a recommendation for further study is to perform research on factors that influence enrollment trends of BIT programs that reported little or no decline in enrollment. In addition, the factors that affected the early decline in enrollment numbers of BIT programs in Minnesota should be studied.

This study revealed possible recommendations for other programs: research should be conducted to determine if BIT programs would be willing to make these modifications. It is

further recommended that a study be performed to understand industry perceptions of BIT programs as well as the hiring practices and licensing of building inspectors. In addition, a study should be conducted on academic institutions that are willing to keep low performing BIT programs open.

A final recommendation is to study factors that will gain industry support as well as research ways to work with the ICC and other stakeholders as allies to develop and deliver BIT programs.

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Appendix A: Interview Protocol

1) How long has your institution had a Building Inspection Technology program?
    i) 0-5 years
    ii) 6-10 years
    iii) 11-15 years
    iv) 16-20 years
    v) Over 20 years
2) What type of program is it?
    i) Associate of Applied Science Degree
    ii) Certificate program
    iii) Customized training
    iv) Continuing education
    v) Other (please specify)
3) What are your current enrollment numbers?
    i) 0-10 students
    ii) 11-20 students
    iii) 21-30 students
    iv) 31-40 students
    v) Over 40 students
    vi) Other (please specify)
4) What are your historic enrollment numbers?
    i) 0-10 students
    ii) 11-20 students
    iii) 21-30 students
    iv) 31-40 students
    v) Over 40 students
    vi) Other (please specify)
5) If applicable, when did you start to see a decline in enrollment?
    i) 0-5 years ago
    ii) 6-10 years ago
    iii) 11-15 years ago
    iv) Over 15 years ago

6) What are your graduation rates per year?
    i) 0-5 students
    ii) 6-10 students
    iii) 11-15 students
    iv) 16-20 students
    v) More than 20 students

7) If it is a certificate program, what are your completion rates per year?
    i) 0-5 students
    ii) 6-10 students
    iii) 11-15 students
    iv) 16-20 students
    v) More than 20 students

8) What are your placement rates in field of study for graduates per year?
    i) 0-5 students
    ii) 6-10 students
    iii) 11-15 students
    iv) 16-20 students
    v) More than 20 students

9) How is the program delivered? (face to face/online/hybrid etc)
    i) Face-to-face
    ii) Online
    iii) Hybrid
    iv) Off-site
    v) Other
10) How many courses (concentration specific) within the program are offered or have been historically offered?
    i) 0-5 courses
    ii) 6-10 courses
    iii) 11-15 courses
    iv) more than 15 courses
11) Is your program intended for:
    i) Entry-level employment
    ii) Professional development
    iii) Training
    iv) Other (please Specify)
12) Does your State require any of the following for building inspectors:
    i) State certification
    ii) State licensing
    iii) National certification
    iv) Other (please specify)
    v) No certification or licensing requirements

13) If there are licensing or certification requirements for building inspectors, what are the educational prerequisites?
    i) A.A.S. degree in Building Inspection Technology
    ii) Certificate in Building Inspection Technology
    iii) Coursework in Building Inspection Technology
    iv) No educational requirements
    v) Other (please specify)
14) What was the impetus for your Building Inspections Technology program?
    i) State requirement (e.g. legislation)
    ii) Industry request to start program
    iii) Interest from other sources (please specify)
    iv) Self-started by academic institution
    v) Other (please specify)
15) If applicable, what was the reason for closing/modifying the program?
    i) Low enrollment
    ii) Low graduation rates
    iii) Low completion rates
    iv) Lack of employment opportunities for graduates
    v) Other (please specify)
16) What are the future plans for the program?
    i) Close program
    ii) Keep program open in current form
    iii) Modify program (please specify)
    iv) Reevaluate program at future date
    v) Other (please specify)
17) Is your program served by an advisory board?
    i) Yes
    ii) No
18) If you answered yes to number 17, who of the following are on your advisor board (you may choose more than one)?
    i) Instructors
    ii) Building officials/inspectors
    iii) Academic deans
    iv) Program coordinators/directors
    v) Department or faculty chairs
    vi) Students
    vii) Contractors
    viii) Labor unions
    ix) Others (please specify)

19) Is there industry support for the program?
    i) Yes
    ii) No
20) If yes, how is it supported?
    i) Financially
    ii) Help with advertising and public awareness
    iii) Free or reduced student membership fees at trade organizations
    iv) Other (please specify)
21) Does your program incorporate;
    i) Cooperative learning experiences
    ii) Structured internships
    iii) Job shadowing
    iv) Ride-alongs
    v) Field trips
22) If the program has been closed, how are people in your region obtaining the skills sets needed for employment as building official/inspectors?
    i) National model code groups
    ii) Training from state or local organizations
    iii) Customized training
    iv) Self-study and certifications
    v) Do not know
    vi) Other (please specify)
23) If you are interested in participating in a focus group about delivery methods for Building Inspection Technology programs, please provide your name, title, and contact information.

Appendix B: Focus Group A-Questions

1. What do you anticipate will be the role of a building inspector/building official in the next 10 years?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) How is that role different than it is now?
        iii) Do you see that role becoming more technical or less technical?
2. What do you anticipate will be the skills and abilities needed for building inspectors/building officials in the next 10 years?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) How are these skills and abilities different than the skills and abilities needed now?
        iii) Will these skills and abilities continue to change and evolve over time?
3. How will future workers develop these skills and abilities?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) How will future workers maintain these skills and abilities?
4. Thinking about the three previous questions, how do you see a Building Inspection Technology program fitting into the future of the building inspections industry?
    a) Possible follow-up questions:
        i) Please expand on your answer

Appendix C: Focus Group B-Questions

1. What are possible delivery methods for Model 1: Post associates degree certificate?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) What could be an alternate delivery method for this model?
2. What are possible delivery methods for Model 2: Undergraduate certificate (minor)?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) What could be an alternate delivery method for this model?
3. What are possible delivery methods for Model 3: Classroom instruction with on-the-job training (formal internships, apprenticeships)?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) What could be an alternate delivery method for this model?
4. What are possible delivery methods for Model 4: Continuing education (non-degree related)?
    a) Possible follow-up questions:
        i) Please expand on your answer
        ii) What could be an alternate delivery method for this model?