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Project and Construction Management Certification

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The construction industry accounts for greater than one-tenth of the global Gross Domestic Product (GDP). Evolving sophistication and demands of clients and changes to laws and regulations profoundly impact the environment and dynamics of this enormous sector. To deal with modifications, the construction industry is bringing changes to the construction methods and practices by formalizing the project management approach using specialized methodologies. Construction professionals enroll in construction and project management certification programs to stay current with industry processes and practices. Numerous organizations, institutions, and associations offer various types of construction and project management certification. In this paper, the certification programs of Associated General Contractors of America (AGC), Associated Builders and Contractors (ABC), National Center for Construction Education and Research (NCCER), The Institute of Project Management, American Institute of Constructors (AIC), Construction Management Association of America (CMAA), Project Management Institute (PMI) and International Project Management Association (IPMA) are evaluated. This research provides accurate and updated information on the types of certifications, eligibility criteria, exam formats, cost, validity, and renewal process of the project and construction management certifications offered by certification bodies recognized by the construction industry in the United States.

Keywords: Construction Management, Project Management, Training, Certification, Accreditation

Introduction

Construction, which includes buildings, infrastructure, and industrial structures, is the world's most important industry, accounting for 13% of the global Gross Domestic Product (GDP) (McKinsey and Company, 2020). Customer demand alterations and changes to laws and regulations profoundly impact the environment and dynamics of this sector. The customer demand and market rules and regulations, such as cost pressure with limited funding and affordable housing concerns, large-scale and complex projects, increased limitation on work-site sustainability and safety, and evolving sophistication and needs of clients, drastically alter the characteristics of the construction projects (Remer & Ross, 2014). To meet demand, the construction industry is making adjustments and bringing improvements to the processes and dynamics of construction methods and practices by formalizing the project management approach using specialized methodologies (Soroka-Potrzebna, 2021). Hence, construction and project management competencies and skills are becoming more and more significant (Aslam & Bilal, 2021). To build necessary capabilities, construction professionals

have increasingly enrolled in construction and project management certification programs (Remer & Ross, 2014).

Professional certification is the process of providing written assurance that an individual conforms to specified requirements or standards for professional competence (Remer & Ross, 2014). Professional certification typically requires some level of professional experience. Certification is earned by passing one or more exams developed by an organization or association that implements the prescribed industry standard. To maintain their credentials, individuals must be involved in profession or professional development and fulfilling the requirements. In short, the certification confirms that the person has passed an appropriate exam that ensures the individual meets industry standards (Remer & Ross, 2014).

Certification was common for technicians and craftworkers in the past. Currently, voluntary/specialty certifications are gaining popularity among engineers and practitioners (Blomquist et al., 2018). In the United States, many firms and agencies are considering certifications as one of their selection criteria for their construction and project managers (Farashah et al., 2019). Numerous organizations, institutions, and associations offer various types of construction and project management certification. This research aims to provide accurate and updated information on voluntary project and construction management certifications for individuals offered by certification bodies accredited by an authoritative organization to ensure that their certification meets international standards and updated practices of the construction industry.

Methodology

For this study, a literature review was conducted to investigate the project and construction management certifications recognized and highly valued by the construction industry in the United States. The literature search was performed using the keyword strategy. The words ‘certification’, ‘construction management,’ ‘project management’, ‘engineering management’, and ‘management training’ were searched in web sources such as Web of Science, Google Scholar, and Scopus. All relevant publications have been downloaded and carefully reviewed. Key terms in the certification process are defined as follows:

- Certification— the process by which a certification body assesses and acknowledges the fulfillment of established quality standards and usually grants certain privileges to the certification holder (Vlasceanu et al., 2007).
- Certification Body— the association, institution, organization, or agency performing the certification process.
- Accreditation— the process by which an accreditation body assesses and evaluates the quality certification program to formally recognize it as satisfying specific minimum requirements or standards (Vlasceanu et al., 2007).
- Accreditation Body— the authoritative governmental or non-governmental body performing the accreditation process.

In this study, the project and construction management certifications are reviewed. Figure 1 shows the research methodology.

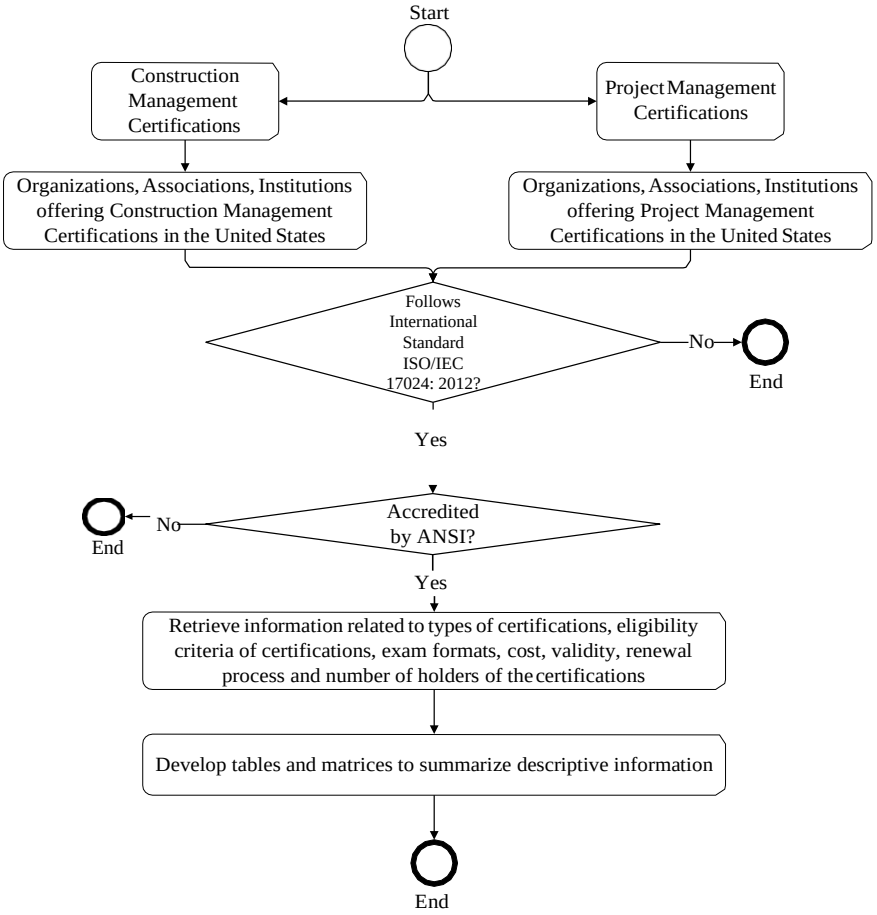

Figure 1. Research Methodology

The International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) collaborate to create a specialized system for worldwide standardization (ISO, 2022). The ISO and IEC establish technical committees, and member countries participate in particular fields of technical activity, developing international standards (ISO, 2022). The International Standard ISO/IEC 17204:2012 (Conformity assessment — General requirements for bodies operating certification of persons) has established internationally accepted guidelines that provide the basis for the recognition of the certification bodies and individual certification process (ISO, 2022). The International Standard ISO/IEC 17204:2012 contains principles, guidelines, and requirements for the development of the professional certification process (ISO, 2022). In this study, International Standard ISO/IEC 17024: 2012 was selected as the first gateway for the certification process of the certification bodies evaluated. The International Standard serves as a criterion for the recognition and national and global acceptance of a certification process.

Accreditation bodies in the United States, such as the Council of Engineering and Scientific Specialty Boards (CESB), accredit certification programs that entities offer. CESB accredits programs seeking accreditation based on its own standards and guidelines and does not accredit under ISO/IEC 17024

(CESB, 2022). The National Commission for Certifying Agencies (NCCA) is another accreditation body certifying the programs conforming to the NCCA standards. NCCA also does not accredit the ISO/IEC 17024 requirements but has its own standards. The American National Standard Institute (ANSI) has accredited certification programs since 1970. ANSI is a member of the International Accreditation Forum (IAF) (ANSI, 2022). The United State government highly relies on ANSI accreditation to assess the quality of certification programs offered by certification bodies (ANSI, 2022). The ANSI accreditation board provides an accreditation process that improves industry practices and differentiates the quality certification program (ANSI, 2022). ANSI accredits the certification bodies under ISO/IEC 17204. While several other accreditation bodies exist, ANSI is highly respected worldwide (ANSI, 2022). ANSI, the most highly recognized accreditation body in the United States, has been considered the second gateway for the certifications evaluated in this research. ANSI accreditation provides increased value, reliable examinations, broader global recognition, greater security, increased professionalism, third-party evaluation, and test development benefits to the certification process (CMAA, 2022).

Considering the criteria mentioned above, construction and project management certification were examined. The certifications satisfying both criteria were further investigated. Tables have been created to summarize descriptive information on eligibility criteria, exam formats, cost, validity, and renewal process of the certifications to update the knowledge of professionals and practitioners in the field.

Literature Review

A literature review was conducted to investigate organizations offering construction and project management certifications in the United States. The organizations and their certifications are discussed below:

Associated General Contractors of America (AGC). In its mission statement, the AGC describes itself as "the voice of the construction industry." With more than 27,000 member firms and 89 chapters, AGC of America is the leading organization for the construction sector (AGC, 2022). AGC of America offers various educational programs designed to improve individual career options and the performance of construction companies and the industry. In project and construction management, AGC of America offers nationally recognized Certification of Management-Lean Construction (CM-Lean (AGC, 2022)). CM-Lean does not follow ISO/IEC 17024 and is not accredited by ANSI; therefore, it is not included in the list for further investigation.

Associated Builders and Contractors (ABC). *With* the voice of merit shop as its slogan, the Associated Builders and Contractors is a nationwide trade group for the construction industry with more than 21,000 members. The 69 chapters of ABC assist members in developing expertise to deliver the projects in a safe, proper, and profitable manner (ABC, 2022). The Project Management Institute of the ABC offers an 80-hour project and construction management course divided into two 40-hour sessions. The break between two sessions is for practical work and reporting (ABC, 2022). The ABC program and courses do not follow ISO standards and are not ANSI accredited. Hence, they were not further investigated.

National Center for Construction Education and Research (NCCER). NCCER works toward building a safe, productive, and sustainable workforce. NCCER is a recognized organization by the private and public sectors for the training and certification of construction practitioners. The

certification and accreditation of NCCER are primarily focused on technicians, operators, and craftsmanship (NCCER, 2022). NCCER offers Management Learning Series to provide qualified management professionals to the industry. Fundamentals of Crew Leadership, Project Supervision, and Project Management are important construction and project management programs offered by NCCER (NCCER, 2022). The teaching series of NCCER is not ANSI certified. Therefore, it falls beyond the scope of this study, and it is not examined any further.

The Institute of Project Management. The Institute of Project Management is the only internationally recognized certification authority that offers project management certification, training, and postgraduate opportunities (IPM, 2022). The Institute of Project Management is the official evaluator and issuing authority for Certified Project Office (CPO), Certified Project Professional (CPP), Certified Project Master (CPM), and Certified Project Director (CPD). Although some certifications require renewal every few years, The Institute of Project Management certifications is lifetime certifications awarded without conditions (IPM, 2022). The Australian government accredits the Institute of Project Management certification, and it does not follow the rigorous requirement of ANSI specified for further investigation in this research.

American Institute of Constructors (AIC). American Institute of Constructors promotes professionalism and excellence in construction-related fields. The certifications offered by AIC support professional growth and high-performance standards and provide testing to become a qualified constructor (AIC, 2022). AIC offers Associate Constructor (AC) certification, recently named Certified Associate Constructor (CAC) as the first level certification, and Certified Professional Constructor (CPC) as the highest level of certification in their certification program (AIC, 2022). ANSI has accredited the AC and CPC certification programs under ANAB/ISO/IEC 17024 for personal certification bodies. (AIC, 2022) and (ANSI, 2022). Further information regarding eligibility criteria, exam formats, cost, and validity for AC and CPC is provided in the next section of this paper.

Construction Management Association of America (CMAA). CMAA develops standards for construction project management. CMAA's focus is to provide support for professionals in the field of construction to prepare to succeed regardless of the scale and complexity of the project. (CMAA, 2022). In the CMAA professional development program, the Construction Manager in Training Program (CMIT) and Certified Construction Manager (CCM) are the two certifications offered by CMAA. CMIT is not ANSI accredited. However, CCM certification of CMAA is accredited under ANAB/ISO/IEC 17024 for personal certification bodies by ANSI (CMAA, 2022) and (ANSI, 2022). Further information on CCM certification is provided in the next section.

Project Management Institute (PMI). Project Management Institute is the world's leading authority on project management (PMI, 2022). PMI offers certification for every stage of a person's career. Based on rigorous standards and ongoing research, PMI offers various certifications to help run a project effectively and successfully (PMI, 2022). In the field of construction and project management, PMI offers certifications- PMI Project Management Ready, Certified Associate in Project Manager (CAPM), Project Management Professional (PMP), Program Management Professional (PgMP), Portfolio Management Professional (PfMP) (PMI, 2022). Among all PMI certifications, PMP certification is accredited under ANAB/ISO/IEC 17024 for personal certification bodies by ANSI (ANSI, 2022). Further information on PMP is provided in the next section.

International Project Management Association (IPMA).

IPMA develops project management competencies through its 70 member associations. IPMA offers four-level (4LC) competence-based certification processes for individuals, level A, level B, level C, and level D. Level D is an entry-level, and Level A is the highest level of certification. IPMA certification process requires self-assessment to assist the candidate in applying for the most appropriate certification level. Candidates that meet the qualifications can apply directly for the desired level (IPMA, 2022). All four certifications offered by IPMA follow the ISO standards but are not accredited by ANSI. Hence, it was not further investigated.

Certifications

This section discusses the certifications meeting the criteria of accreditation by ANSI under the International Standards ISO/IEC 17024:2012:

Associate Constructor (AC)

Associate Constructor (AC) is the entry-level certification in the AIC constructor certification program. This level of certification is developed for graduates of a four-year construction program or individuals interested in construction management with four years of Acceptable Professional Experience. Acceptable Professional Experience refers to the experience of managing the execution of construction work. Working in a related profession such as architecture, engineering design, inspection, land surveying, or accounting is not counted as Professional Experience. The last commission meeting changed this certification name to Certified Associate Constructor. For simplicity and familiarity, the name AC is used in this research. AC certification covers ten essential concepts and sections for managing construction processes. Communication skills, engineering management concepts, materials, methods & project modeling, bidding & estimating, budgeting, costs & cost control, planning, scheduling & schedule control, construction safety, construction geomatics, and project administration (AIC, 2022).

The AC exam consists of 300 multiple-choice questions. The exam duration is two 4-hour sessions on a single day. The exam covers ten sections to determine if the applicant has a core competency in construction and is ready to contribute meaningfully to the construction industry. The exam is offered twice yearly (spring and fall) at more than 60 locations across the country (AIC, 2022). Table 1 provides summarized information about the AC certification. The exam is paper-based, computer-based, and administered through university partners or a test center network. The price for the paper-based exam is $165, while the cost for the computer-based exam at partnered universities is $200, and at test centers, it is $235. To help applicants prepare for the AC exam, AIC offers the AC Prep Course for $25 (AIC, 2022). AC certification holders must remain in the construction industry as full-time employees during their tenure as an AC.

Table 1 Associate Constructor Certification Information

Eligibility Criteria	**Exam Format**	**Cost**	**Validity**	**Renewal Process**
Have four-year acceptable experience or education (Ideal for recent graduates of the construction management degree program)	300 multiple choice questions to be completed in two 4-hour sessions	$165 paper-based $200-$235 computer-based	Two years	Continuous work in the construction industry and CPD validated by the supervisor

Certified Professional Constructor (CPC)

Certified Professional Constructor (CPC) is the highest level of certification in the AIC constructor certification program. This level of certification is designed for established constructors with several years of professional experience to take their careers to the next level. Qualifications for CPC Exam are that the individual must have passed or been exempted from AC Level 1 and attain four years of additional Acceptable Professional Experience. The CPC certifications cover nine major subjects and content areas of construction. They are designed to evaluate the applicant's ability to apply recognized principles to solve problems, assess information, and predict outcomes. The covered areas for CPC certification are project scope development, employment practices, working relationships, construction start-up and support, construction resource management, construction cost control, project closeout, construction safety management, and ethics (AIC, 2022).

The CPC exam is composed of 175 multiple-choice questions. The exam duration is a 4-hour session. The exam is divided into nine major subject and content areas testing the applicant's analysis and problem-solving skills. The exam is offered twice yearly (spring and fall) at more than 60 locations across the country. The exam fee for individuals with AC certification is $575, and for non-certified AC is $675. Re-examination costs $500. To help applicants prepare for the CPC exam, AIC offers the CPC Prep Course for $200 for AIC members and $300 for Non-members (AIC, 2022). Table 2 shows summarized information about the CPC certification. AIC offers Continuing Professional Development (CPD) for recertification of CPC. CPD is intended to ensure that certificate holders maintain a high level of expertise throughout their careers. CPC certification holders must earn 32 CPD credits in two years. These credits are classified into two areas- Education (20) or Membership and Service (12) (AIC, 2022).

Table 2 Certified Professional Constructor Certification Information

Eligibility Criteria	**Exam Format**	**Cost**	**Validity**	**Renewal Process**
Completion or Exemption from AC and Four years of Acceptable Professional Experience	175 multiple-choice questions to be completed in one 4-hour session	$575 Current AC and $675 Non-AC	Two years	32 CPD credits hours every 24 months

Certified Construction Manager (CCM)

The Certified Construction Manager (CCM) is a construction and management professional. The purpose of the CCM is to improve the delivery of construction projects with the highest quality and ethical conduct. CCMs provide professional services that involve planning, designing, and constructing a project using effective management approaches. (CMAA, 2022). The CCM certifications cover ten major construction and project management domains- Program/project management, cost management, time management, contract administration, quality management, safety management, risk management, sustainability, technology, and professional practice (CMAA, 2022). Table 3 provides summarized information on the CCM certification.

The eligibility requirement for CCM is a four-year degree in engineering, construction, or architecture-related fields. In addition to a degree, the applicant must have four years of Responsible in Charge (RIC) experience in project supervision, cost control, time and quality management, and contract administration. Applicants with a two-year degree must have four years of experience in

addition to four years of RIC experience. Those with no degree must have eight years of experience plus four years of RIC experience. The applicants are required to submit their resumes, project experience documents, and references. The references should validate the applicant's experience. Each application is assessed by the CMAA's Certification Board of Governors (CMAA, 2022).

The exam is 175 multiple choice questions with a 4-hour session to complete. The recertification must be done every three years. The certification office will notify the CCM holder of an upcoming expiration date. The CCM holders are required to submit a Certification Renewal Application to the certification office every three years with earned renewal points information and a renewal fee of $200. 25 Renewal Points are required to maintain certification. These points are earned by involvement in the construction management profession or professional development. The CCM Renewal Handbook describes how to earn CCM renewal points. For example, attending the CMAA conference earns CCM holder 1 Renewal Point. The certification cost is $325 for CMAA members and $425 for non-members (CMAA, 2022).

Table 3 Certified Construction Manager Certification Information

Eligibility Criteria	Exam Format	Cost	Validity	Renewal Process
College degree with four years of RIC experience or Two years degree with four years of experience and four years of RIC experience or No degree, eight years of experience, and four years of RIC experience	175 multiple-choice questions to be completed in one 4-hour session	$325 for CMAA members $425 for Non-members	Three years	25 Renewal Points every three years, earned by involvement in profession or professional development and a renewal fee of $200

Project Management Professional (PMP)

PMP is PMI's most popular and internationally recognized certification. A PMP certification indicates that the recipient has sufficient knowledge and experience to perform their duties and complete projects within schedule, budget, and scope constraints. PMP certification covers domains of project initiation, project planning, project execution, project monitoring and control, and project closing (PMI, 2022). Table 4 shows the summary of the PMP certification information.

The prerequisite for PMP certification is a four-year degree and 36 months of leading projects. This does not mean the applicant has the title of the project manager but an experience that falls under any of the five process phases of a project— initiation, planning, execution, monitoring and controlling, and closing. In addition, the applicant must have 35 hours of project management education or a Certified Associate Project Manager (CAPM) certification. If they do not have a bachelor's degree, then a high school diploma or an associate degree (or global equivalent), 60 months of leading projects, and 35 hours of project management education or CAPM Certification. The exam consists of 180 multiple-choice questions, of which five questions are pretest questions and are unscored (PMI, 2022). PMI designed a Continuing Certification Requirements (CCR) Program for maintaining the certifications. Professional Development Units (PDUs) are blocks of one hour spent learning, instructing, or volunteering. The certification holder can maintain their certification by earning PDUs over three years (PMI, 2022). PMP certification is valid for three years and requires 60 PDUs for maintaining certification status.

Table 4 Project Management Professional Certification Information

Eligibility Criteria	Exam Format	Cost	Validity	Renewal Process
A four-year degree, 36 months of leading projects, and 35 hours of project management education or CAPM Certification or A high school diploma or an associate degree (or global equivalent), 60 months of leading projects, and 35 hours of project management education or CAPM Certification	180 multiple choice questions to be completed in 230 minutes	$405 for PMI members $555 for Non-members	Three years	60 PDUs every three year

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