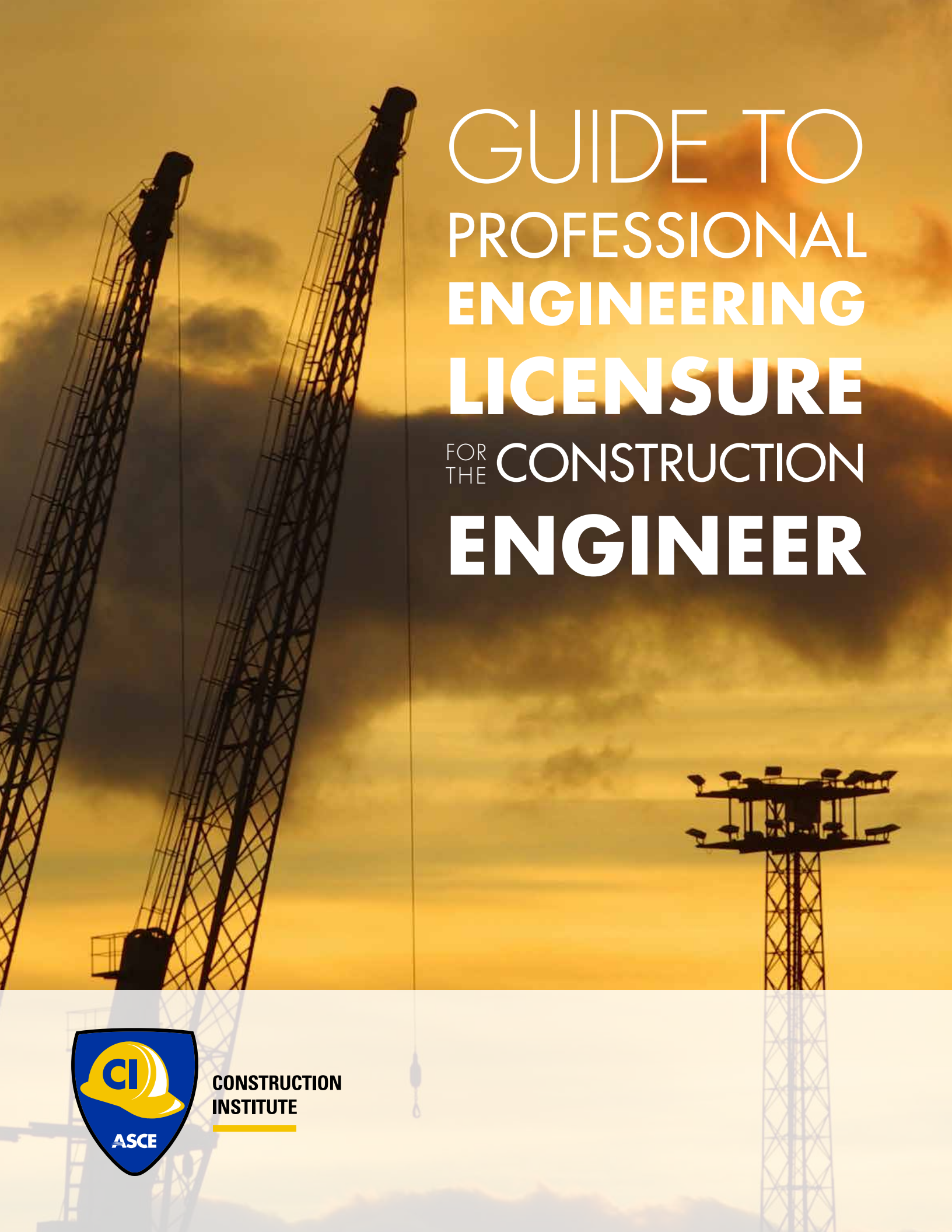

GUIDE TO PROFESSIONAL ENGINEERING LICENSURE FOR THE CONSTRUCTION ENGINEER

CONSTRUCTION INSTITUTE

INTRODUCTION

Many engineers elect to pursue their careers in construction. They may be graduates of construction engineering, civil engineering, mechanical engineering, or other engineering degree programs who have found excellent opportunities in the engineering and management of the construction process.

Although a substantial number of these engineering professionals have sought and attained licensure as a Professional Engineer (PE), the construction industry's need for licensed PE's has been increasing. Many new regulations and specifications (for example, those of OSHA and ACI) require a PE to design certain systems for execution of the construction process. In addition, the design-build process often needs a licensed professional within the construction organization to coordinate the work of other Professional Engineers and architects engaged for facility design.

Historically, the licensure process was primarily structured for evaluating those engineers whose work is primarily the engineering design of the constructed facility (buildings, bridges, roadways, etc.). However, since 2008, the licensure process has directly recognized the role of construction engineers in engineering design of the construction process and engineered systems for accomplishing the work and maintaining safety.

This guide is intended to assist the engineer working in construction in the process of pursuing licensure as a Professional Engineer.

PE LICENSURE **PROCESS IN THE US**

Each state handles PE licensure in accordance with its individual laws and rules. To promote uniformity, the National Council of Examiners for Engineering and Surveying (NCEES) was established. All state boards of licensure for engineers participate in NCEES and most have adopted, in part or in whole, its model rules for licensure. However, some state laws and rules vary from those recommended by NCEES, and thus individuals applying for licensure must consider the rules of each particular state.

NCEES maintains a website where its activities are summarized: www.ncees.org. This website also has convenient links to the websites of the boards of licensure in each state where their individual rules and application processes can be viewed.

Once licensure is attained in one state, it can often be attained in other states by comity if the rules of the first state are comparable to the rules of subsequent states in which licensure is sought.

Since state laws and rules on licensure vary, it is not feasible in this brief guide to cover all possibilities. Thus, the most typical processes and rules are the basis of this guide.

EDUCATION

Most states require that an applicant for licensure be a graduate of an engineering degree program accredited by the Engineering Accreditation Commission of ABET, Inc. (EAC-ABET). Universities may seek to have each of their engineering degree programs accredited individually.

It is important for the prospective engineering BS student to determine if the program being considered is accredited by EAC-ABET. At present, there are EAC-ABET-accredited BS programs titled Construction Engineering, Construction Engineering & Management, and Civil Engineering (in some cases) that produce graduates with education tailored to the needs of construction. A listing of accredited programs by university can be found at: www.abet.org.

Equivalent engineering education may be considered in some states. For example, an individual who did not graduate from an EAC-ABET-accredited BS program but later completed a master's degree in engineering at a university with an EAC-ABET-accredited BS program and made up any deficiencies



in relation to EAC-ABET requirements may be considered to have equivalent engineering education. Other paths, with education not founded in engineering, are possible in some states but often require eight years of experience under a licensed Professional Engineer.

FUNDAMENTALS **OF ENGINEERING EXAM**

During the last two semesters of undergraduate study, the BS engineering student is eligible in most jurisdictions to take the six-hour Fundamentals of Engineering (FE) exam developed by NCEES, the first of two exams required for PE licensure. The first group of topics of the FE exam covers the knowledge base contained in the first two to three years of engineering study, including mathematics, statistics, science, engineering mechanics, ethics and other introductory topics related to the engineering specialty. The second group of topics of the FE exam includes engineering design fundamentals for the particular engineering specialty. At present, there is not a construction engineering FE specialty exam so individuals should elect the specialty exam (civil, mechanical, electrical, etc.) that is closest to their educational background. Upon passing the exam, the individual becomes an Engineering Intern.

Students are encouraged to attend review sessions, if available, and to take the FE at the first opportunity. Waiting until after graduation usually makes preparation more difficult since the breadth of all this knowledge is not practiced regularly in most engineering jobs.

GAINING **ENGINEERING EXPERIENCE**

Before taking the second exam, an individual must usually accumulate four years of progressive engineering experience. If graduate study in engineering is undertaken, most states allow one year of experience for each graduate degree received, up to two years.

Experience in construction can be valid, but it must demonstrate the use of engineering principles, including design. This is not necessarily design in the traditional sense of design of the facility. Rather, it is important to understand that engineering design includes design of systems and processes. In construction, the construction engineer is involved in the design of the construction process and the design of systems (for example, safety systems) for execution of that process. Just as costs, specifications, materials, and coordination are part of the appropriate experience of the traditional design engineer for the facility, they are also part of the appropriate experience of the construction engineer.

When seeking and documenting appropriate experience in construction, the following activities should be considered:

- Design of equipment fleet operations and productivity
- Design of temporary support systems
- Design of formwork systems
- Design and optimization of project schedule
- Economic analysis of construction equipment replacement and maintenance alternatives
- Quality control
- Materials testing and review of test results
- Design of temporary works
- Construction plant design
- Review of shop drawings
- Design and inspection of safety systems
- Establishing and implementing horizontal and vertical control for location
- Design, control, and safety of blasting operations
- Design of tunneling systems
- Design of safe demolition systems for constructed facilities
- Estimating and budgeting construction costs
- Review and processing change orders
- Constructibility reviews
- Specification review and interpretation
- Value engineering analyses
- Modeling installation procedures
- Analysis of construction failures
- Coordination among professional disciplines



- Feasibility analysis
- Inspection of construction
- Review and evaluation of vendor submissions
- Design and control of construction operations for environmental hazards
- Review of operations for conformance with specifications
- Design of rigging and conveying systems
- Feasibility studies for engineered projects
- Design-Build coordination
- Design and inspection of site drainage and sedimentation control
- Design of storage and lay-down facilities
- Haul road design
- Contract review
- Progress reports and project communications
- Progress payment quantification and certification.

REFERENCES **FOR EXPERIENCE**

Documentation of experience requires a detailed description of your work activities and the time devoted to each. In addition, this experience is verified by submission of reference statements by licensed Professional Engineers who are familiar with your work. Usually, one is expected to be in the company in which you are working and therefore it is desirable to seek employment in companies that have a PE among their staff.

However, many states have a procedure for considering exceptions to the on-staff PE requirement when there is an external PE that the FE intern is regularly interacting with and who is in a position to serve this reference need. If you are in a situation in which there is not a PE on staff, you should seek to develop a PE as a mentor from among the PE's with whom you have regular work contact.

PRINCIPLES **AND PRACTICE EXAM**

Once you have accumulated the appropriate four years of experience and have been accepted for the second exam, preparation again becomes important. Many construction engineers have a background in civil engineering. The Civil Engineering PE exam is structured with a morning breadth exam portion and an afternoon depth exam portion.

In the morning breadth exam, the following areas are covered: project planning, means and methods, soil mechanics, structural mechanics, hydraulics and hydrology, geometrics, materials, safety, and site development. In the afternoon depth exam, the examinee chooses questions from one of five areas: construction engineering, geotechnical engineering, structural engineering, transportation engineering, or water resources/environmental engineering. Details of the exam specification and a listing of standards needed for the exam can be downloaded from the NCEES website. A booklet of example questions can also be ordered. All types of engineers, their work being specialized, find that they need to review those principles of their discipline in which they have been less active. Attending review sessions is often a desirable part of preparation.

BECOMING **A PROFESSIONAL**

Before and after licensure, you should maintain your professional growth by participation in the professional societies that represent construction. The ASCE Construction Institute is the largest organization of individual member construction professionals. You are invited to join, first through membership in an ASCE student chapter while in college, and as a regular member immediately upon graduation. Your PE application will be enhanced by demonstrating such professional involvement. ASCE Construction Institute application information can be found at:www.asce.org/ci

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Construction Institute • American Society of Civil Engineers
1801 Alexander Bell Drive • Reston, VA 20191-4400