How You Can Become Registered As An Architectural Engineer

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How *You* Can Become Registered as an Architectural Engineer

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COURSE CONTENT

1. THE OPPORTUNITY

This is an opportunity for *you*….

This is a career enhancing opportunity for engineers interested in the design of buildings and related infrastructure. It is an opportunity for *you* to take a leadership position in the enterprise of designing and constructing buildings.

But first, some background….

As we all know, the undertaking of design of buildings and related infrastructure is one of the most multidisciplinary activities in which engineers engage. It requires the skills, efforts and involvement of structural engineers, civil engineers, mechanical engineers, electrical engineers, fire protection engineers and traditionally trained architects. However….there has never existed a "platform" to bring these diverse skills and capabilities together in order to deliver coordinated services to the clients, companies and agencies needing a cost effective and efficient mechanism to deliver the buildings and related infrastructure they need.

This course will tell you about a "platform" you can now use to step forward and lead in delivering buildings and related infrastructure to enterprises in need….

2. SOME HISTORICAL PERSPECTIVE

The Academic Community

The initial impetus for an Architectural Engineer registration process came from within the academic community in the early 1990s. Prior to 1990 there were 13 ABET-approved four-year programs leading to a bachelor's degree in architectural engineering (Figure 1).

Figure 1 ABET-Accredited Four-Year Architectural Engineering Programs Prior to 1990	
Institution	Year AE Program Established
California Polytechnic State University, San Luis Obispo	1975
University of Colorado	1936
Kansas State University	1936
University of Kansas	1936
University of Miami	1962
Milwaukee School of Engineering	1988
North Carolina A&T State University	1969
Oklahoma State University	1986
University of Oklahoma	1960
Pennsylvania State University	1936
Tennessee State University	1977
University of Texas	1938
University of Wyoming	1986

Since 1990 four more ABET-accredited programs have been established (Figure 2), bringing the total number of accredited architectural engineering programs to 17. In addition there are eight ABET-accredited four-year programs leading to a bachelor's degree in architectural engineering *technology* (Figure 3).

Figure 2	
ABET-Accredited Four-Year Architectural Engineering Programs Established After 1990	
Institution	Year AE Program Established
Drexel University	1991
Indiana/Purdue University, Fort Wayne	2003
Missouri University of Science and Technology	2006
University of Nebraska, Lincoln	2004

Figure 3	
ABET-Accredited Four-Year Architectural Engineering *Technology* Programs	
Institution	Year AE Program Established
Bluefield (WV) State College	1992
University of Cincinnati	1983
University of Hartford (CT)	1997
Pennsylvania State University, Fayette (1)	1983
University of Southern Mississippi	1982
State University of New York, Farmingdale (2)	2007
Vermont Technical College	1997
Wentworth Institute of Technology (Boston, MA)	1981

(1) "Building Engineering Technology."
(2) "Architectural Technology."

There are also 15 ABET-accredited two-year programs in architectural engineering technology.

Academic emphasis and program content varies from institution to institution but in general course work covers all of the classical architectural engineering disciplines: structural, mechanical, electrical, civil and architectural, and provides an opportunity to concentrate in one of these disciplines. For example, a student interested in a career in design of mechanical systems for buildings would take more intensive upper division courses in HVAC, plumbing and fire protection systems design.

The graduate of a four-year architectural engineering or architectural engineering technology program thus has a solid understanding of all of the building design disciplines but with a concentrated emphasis in the one he or she saw as their career path of choice.

The problem these graduates faced, and which the academic community recognized, is that there was no professional registration path open to them. A graduate of an architectural engineering program who wanted to pursue a career in design of, for example, mechanical systems for buildings would be forced to take a mechanical engineering registration examination that required knowledge of technical areas for which he or she had received no training and were irrelevant to his or her planned career (for example, aerodynamics, open-channel flow, kinematics, etc.). In addition, in this example, the mechanical engineering registration examination would not cover the structural, electrical, civil and architectural features of buildings which had been part of his or her training and were essential to his or her planned career.

Professional

In order, largely, to enhance the career paths of graduates of architectural engineering programs, the academic community took the lead in establishment of the National Society of Architectural Engineers (NSAE). Although intended to provide a professional home for graduates of architectural engineering programs throughout their careers, NSAE developed primarily as a vehicle for student chapters at the colleges and universities that hosted architectural engineering programs.

Independently, the much larger American Society of Civil Engineers (ASCE) began discussion in the early 1990s of the need for a multi-disciplinary home for engineers and traditionally trained architects engaged in the design and construction of buildings and related infrastructure. At that time ASCE's technical activities were organized into "Divisions" which were focused on technical issues. Somewhat in contravention of that tradition, ASCE established an Architectural Engineering Division intended to focus more on professional and practice objectives than technical issues. Not long thereafter, in recognition of the fact there were important areas in which civil engineers practiced which were in-fact multi-disciplinary, ASCE converted its structure to one of "Institutes."

NSAE and the ASCE Architectural Engineering Division shared some leaders who were active in both societies and discussions ensued about their common objectives which led to their merger on July 25, 1998, into the Architectural Engineering Institute (AEI) of ASCE.

The AEI thereupon became the engine driving the development of a professional Architectural Engineer registration examination.

Registration

In 1992, prior to the merger with AEI, the NSAE initiated a discourse with the National Council of Examiners of Engineers and Surveyors (NCEES) the organization which leads in preparation of engineering registration examinations utilized essentially throughout the United States. The lead in this discussion was the architectural engineering academic community at Pennsylvania State University. The NCEES thereupon surveyed the 55 United States jurisdictions (states plus territories) for which it supplied engineering registration examinations. In response to this survey 44 of the

55 registration boards indicated they would offer an Architectural Engineer registration path and the examination if made available by NCEES. An additional 6 registration boards indicated openness to considering an Architectural Engineer registration if an appropriate examination were available.

Development of the Architectural Engineer Examination

Based on the survey results, NCEES moved in 1995 to approve the development of a principles and practices of engineering (PE) examination in Architectural Engineering. The PE examination is the second of the two examinations required for professional registration, the first being the fundamentals of engineering examination (FE….formerly called the "EIT" examination). The first step in the development of a NCEES PE examination is a "professional activities and knowledge" (PAK) survey and analysis. Undertaking of the PAK must be funded by proponents of the particular examination to be developed. In this case NSAE developed partial funding between 1995 and 1998, and upon merger with the AEI in 1998 the remaining required funding was obtained. A professional testing firm was employed by AEI to conduct a workshop of architectural engineering professionals to develop a survey of architectural engineering professionals regarding the appropriate content for an Architectural Engineer examination. The survey developed at the workshop was sent to 700 individuals demographically selected from a data base of 2900 architectural engineering practitioners provided by AEI. A second workshop of architectural engineering practitioners was held in 1999 to review the survey and establish the test specifications. The test specification for the first Architectural Engineer PE examination is shown in Figure 4.

Figure 4		
Subject Area	Sub-Category	No. of Questions
General Knowledge (13%)	Building Systems	4
	Construction and Building Materials	3
	Lateral Loads and Displacement Issues	1
	Codes, Regulations and Statutes	2
Construction Management (15%)	Economic and Financial Issues	5
	Construction Processes	3
	Project Management	4
Electrical and Lighting Systems (23%)	Basic Electrical Knowledge (includes grounding, lighting, emergency systems)	7
	Theory (includes power, circuits, loads)	11
Mechanical Systems (23%)	Theory (includes fan and pump laws, loads, psychrometrics)	6
	Basic Mechanical Knowledge (includes pumps, fire protection, pipe expansion, ducts, HVAC, chillers)	12
Structural Systems (27%)	Load and Analysis (includes material behavior, serviceability, indeterminate structures)	9
	Design (includes major material types, fire, codes, connections, foundations)	13
Total		80

AEI volunteer practitioners under the guidance of NCEES wrote questions and answers within this framework, each of which was reviewed for time and content by at least two additional practitioners. Once a question and answer was accepted by NCEES it is available for use on future examinations. In 2000 a panel of registered PEs experienced in building design who had passed the PE examination in another discipline (civil, mechanical, etc.) within the last ten years took a draft Architectural Engineer examination to ascertain its *difficulty*. In 2001 a different panel took the AE examination to determine if it could be *completed in the allotted time.* This examination was approved by NCEES in February 2002, and was offered for the first time in over 40 states in 2003.

In 2007-08 the NCEES undertook its first review of the Architectural Engineer examination in conjunction with AEI. NCEES reviews all engineering registration examinations periodically to assure that the examination specifications continue to reflect practitioners' professional activities and the knowledge need to engage in them. This review confirmed that the test specification indicated in Figure 4 continues to generally be valid. Figure 5 shows the distribution of knowledge among the architectural engineering disciplines identified by this 2007-08 review.

Knowledge	Figure 5 Area of Specialty of Survey Respondents							
	No. of Knowledge Statements	Architecture	Construction Management	Electrical	Mechanical	Structural	Other	Total Professional Activities Passed by All Groups
Building Systems Integration	**9 (13%)**	8	9	8	9	5	9	5
Electrical Systems	**18 (25%)**	3	4	17	18	0	7	0
Mechanical Systems	**20 (28%)**	14	9	20	20	1	15	1
Structural Systems	**11 (15%)**	11	11	11	10	11	11	10
Project Management and Construction Administration	**14 (19%)**	14	14	11	14	13	14	11
Total	**72**	49	47	67	71	30	56	27
Percentage	**100%**	69%	65%	93%	99%	42%	78%	37%

Figure 5 represents one of the intermediate steps NCEES goes through in regular updating and validating the examination. The survey in Figure 5 needs to be interpreted within the framework of the NCEES test validation methodology, but in general it confirms the test specification represented in Figure 4 continues to be valid. This means examinees can expect to be called upon to answer questions distributed about as indicated in Figure 4.

Examination Format

There are two basic types of format for PE examinations: "breadth-and-depth" and "no-choice." A breadth-and-depth examination consists typically of a four-hour morning session which examines general knowledge and a four-hour afternoon session that examines a primary subject area. All examinees are required to take the morning examination but in the afternoon they take different examinations which they select based on their primary subject area of interest. For example, the Civil Engineer examination typically consists of a morning session covering general civil engineering principles such as statics and hydraulics, and offers a choice of afternoon modules such as environmental, geotechnical, structural, transportation and water resources. This breadth-and-depth format is used in the long established disciplines (civil, mechanical, electrical, etc.) with large numbers of examinees.

With newer examinations and those with fewer examinees NCEES, for reasons of statistical validity, requires use of the no-choice format in which all examinees are required to answer all questions. Because the Architectural Engineer examination is new and has, at this time, a relatively small number of examinees, NCEES requires the Architectural Engineer examination be in the no-choice format.

This is not considered an ideal format by some in the architectural engineering community because practitioners have a general knowledge of all facets of building design but almost always are specialized in only one area. For example, a practitioner may be focused in his or her career on designing electrical systems for buildings and will have substantial knowledge and expertise in that primary subject area, but only a general level of knowledge in the structural, civil, mechanical and architectural areas. Although the breadth-and-depth format may have additional benefits, examinees should not have concerns about the no-choice format. This is because, essentially, all examinees "are in the same boat." For example (refer to Figure 4), all examinees can be expected to have sufficient knowledge to answer the General Knowledge and Construction Management portions of the examination (a total of 28% of the examination questions) and to answer the questions in one of the three other portions (Electrical, Mechanical, Structural) which constitute between 23 and 27%. This means everyone has an opportunity to answer between 51 and 55% of the examination questions, which is a fair distribution of opportunity.

3. THIS IS AN OPPORTUNITY NOT JUST FOR GRADUATES OF ARCHITECTURAL ENGINEERING PROGRAMS

It is important to appreciate that registration as an Architectural Engineer is not restricted to persons who are graduates of architectural engineering or architectural engineering technology programs. Requirements to take the PE examination vary somewhat from state to state but in general they are:

- A four year degree from an ABET-approved engineering curriculum
- Passage of the Fundamentals of Engineering (FE/"EIT") examination
- An additional two to four years of experience in the field in which licensure is sought

For example, if a person is (a) a graduate of a four year ABET-approved electrical engineering curriculum, (b) has taken and passed the FE examination, and (c) has four years of additional experience engaged in the design of electrical systems for buildings, he or she can be expected to be allowed to sit for *either* or *both* the Electrical Engineer *and/or* the Architectural Engineer PE examination. Thus he or she can chose registration as *either* an Electrical Engineer *or* an Architectural Engineering, or can elect to obtain *both* registrations by taking both PE examinations, one after the other.

Following is selected language from a few states illustrating the requirements to take the PE examination (*note carefully that these are only partial excerpts from information provided by selected state boards; be sure to check with your state board for complete and specific requirements*):

CALIFORNIA

What type of activity constitutes qualifying experience for a professional engineer license and how many years of credit may be obtained for each type?

a. Credit is given toward the six-year qualifying experience requirement as follows:

(1) Undergraduate Education

(a) Four years' credit for graduation with an engineering degree from a Board approved engineering curriculum.

(b) Two years credit for graduation with a bachelor's level engineering technology degree, or one year credit for graduation with an associate level engineering technology degree, from a technology curriculum which has been accredited by the Technology Accreditation Commission (TAC) of ABET.

(c) Two years credit for graduation with an engineering degree from any school whose engineering curriculum is not Board approved (this includes all foreign schools). Transcripts from foreign universities must be translated if not in English.

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(4) Engineering Work Experience

Qualifying engineering work experience is that experience in the appropriate branch of engineering which has been gained while performing professional level engineering tasks under the direction of a person authorized to practice in the branch of engineering in which the applicant is seeking licensure. There is no limit to the amount of such qualifying experience which will be accepted by the Board, provided that the experience meets the other requirements indicated herein. Applied engineering research is considered to be an engineering task, which may constitute qualifying experience.

TEXAS

Education

You must have earned one of the following degrees or degree combinations:

1) An accredited degree, as described in subparagraphs A & B of this paragraph:
A) Bachelor of Science degree in engineering from an EAC/ABET accredited program in the United States ….

Examinations

All applicants for licensure must take and pass the Texas Ethics of Engineering examination....Applicants must also take and pass or qualify for waivers of two examinations - the National Council of Examiners for Engineering & Surveying (NCEES) Fundamentals of Engineering (FE) examination and the NCEES Principles and Practice of Engineering (PE) examination….Applicants with appropriate experience must apply and get approval to take the PE exam.

Experience

Basic Requirements
You must meet the following experience requirements prior to application with the Board:

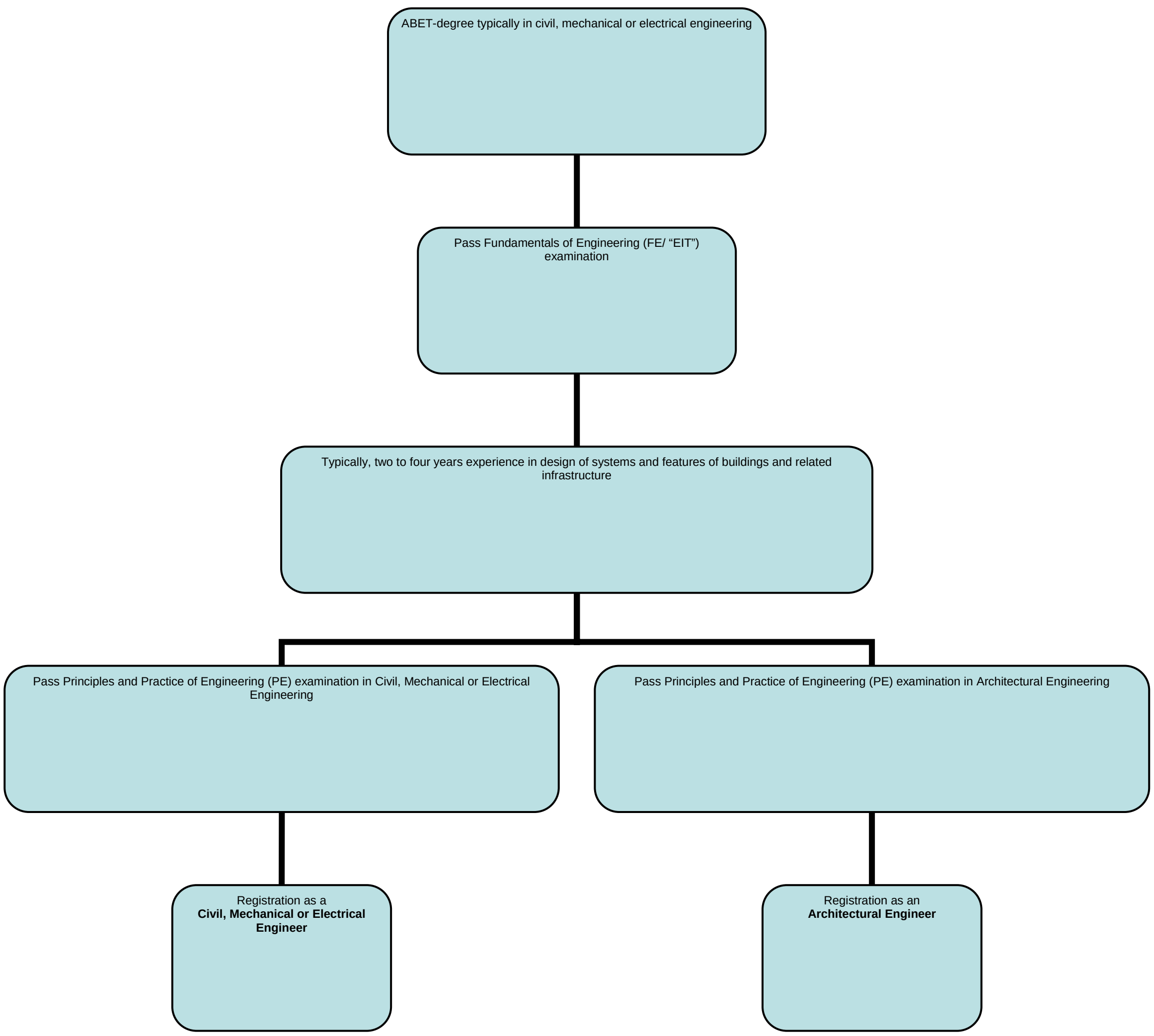
1. With an accredited engineering degree you must have a minimum of 4 years of active practice in engineering work, of a character satisfactory to the Board, indicating that you are competent to be placed in responsible charge of such work.

Experience that is considered most acceptable for licensure purposes generally falls into one of two categories: design or analysis…..

NEW YORK

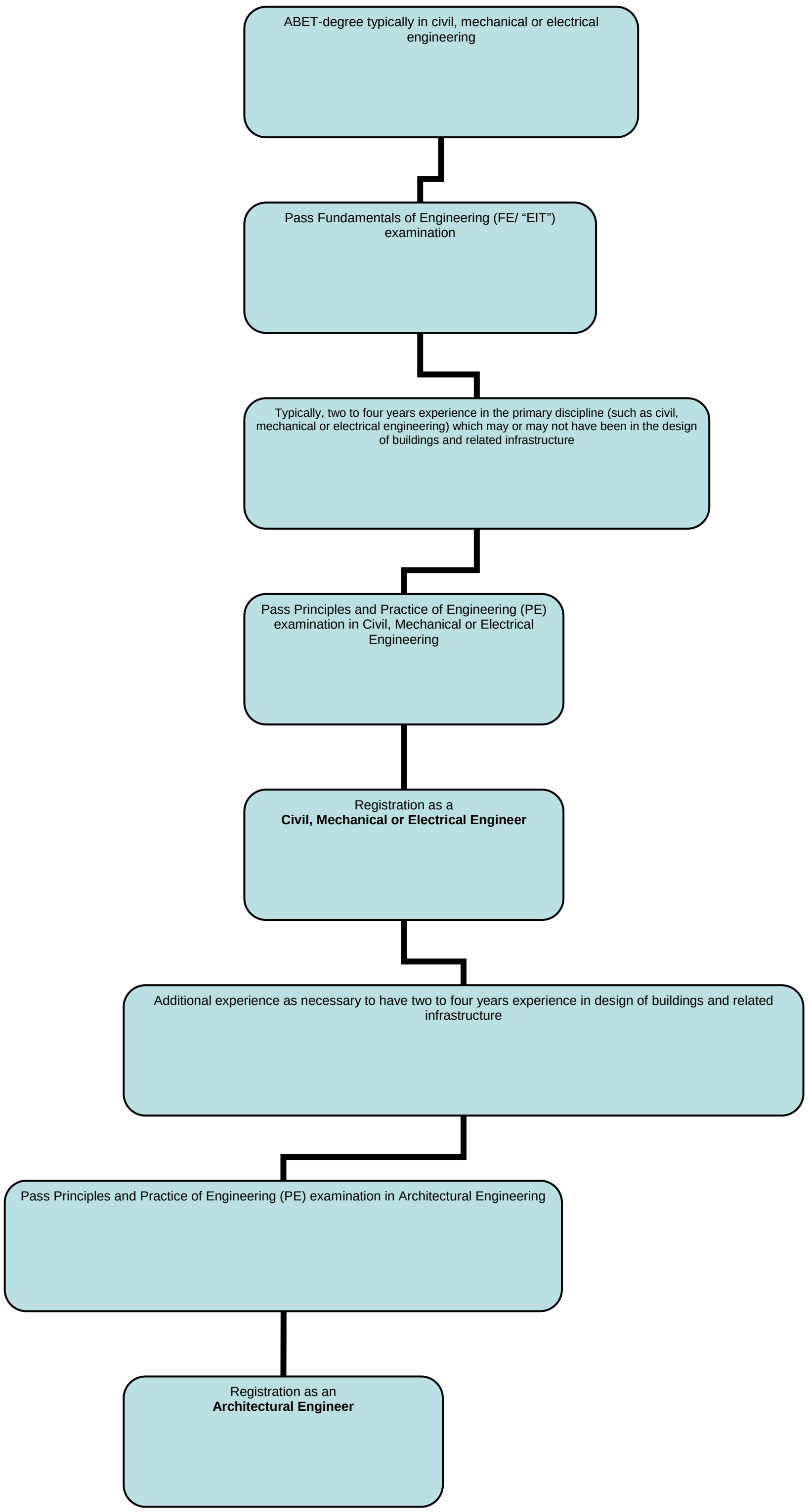
Education/Experience Credits for NYS Licensure					
Degree:	**Field of Study:**	**Accreditation:**	**Credits based on Education:**	**Work Experience Credits Required for Part A, Fundamentals Exam:**	**Additional Work Experience Credits Required for Part B, Principles & Practice Exam *and for* Licensure:**
Bachelor	Engineering	ABET/EAC	8	0	4
Bachelor	Engineering Technology	ABET/TAC	6	0	6
Associate	Engineering Technology	ABET	3	3	6
Bachelor	Engineering	Regional	6	0	6
Bachelor	Technology	Regional	4	2	6
Bachelor	Architecture	Regional	4	2	6
Bachelor	Science related to engineering	Regional	3	3	6
Associate	Engineering Science/Pre-Eng. equivalent	Regional	3	3	6
Associate	Technology	Regional	2	4	6
Bachelor	Not directly related to engineering	Regional	2	4	6
Associate	Not directly related to engineering	Regional	1	5	6
None	No college study	N/A	0	6	6

Education and experience requirements in other states follow a similar pattern. This gives graduates of accredited engineering programs in *any* of the non-architectural engineering technical disciplines related to building design registration options that look like this:



4. THIS IS AN OPPORTUNITY FOR PEs ALREADY REGISTERED IN OTHER DISCIPLINES

It is also important to note the opportunity the Architectural Engineer registration provides to professional engineers experienced in the design of buildings and related infrastructure who are currently registered in another discipline, such as Civil Engineer, Structural Engineer, Mechanical Engineer or Electrical Engineer. For example, a graduate of an ABET civil engineering program might take and pass the FE/EIT examination, acquire sufficient experience to take and pass the PE examination in civil engineering, and become registered as a Civil Engineer. He or she might then acquire additional experience as needed to have the required two to four years of experience in design of buildings and related infrastructure required to sit for and pass the PE architectural engineering examination, thereby becoming registered as an Architectural Engineer. This is how a career path might look:


ABET-degree typically in civil, mechanical or electrical engineering
Pass Fundamentals of Engineering (FE/ "EIT") examination
Typically, two to four years experience in the primary discipline (such as civil, mechanical or electrical engineering) which may or may not have been in the design of buildings and related infrastructure
Pass Principles and Practice of Engineering (PE) examination in Civil, Mechanical or Electrical Engineering
Registration as a
Civil, Mechanical or Electrical Engineer
Additional experience as necessary to have two to four years experience in design of buildings and related infrastructure
Pass Principles and Practice of Engineering (PE) examination in Architectural Engineering
Registration as an
Architectural Engineer

5. THE EXAMINATION

The Architectural Engineer examination is an 8-hour no-choice, open-book examination with 80 multiple-choice questions conforming to the specifications shown in Figure 4. There is no penalty for wrong answers, so examinees should answer all questions. This having been said, examinees should probably devote more time to "general knowledge" questions and questions within their technical discipline (i.e. "mechanical"), and less on questions outside their technical discipline (i.e. "electrical", "structural") since questions outside an examinee's technical discipline may be susceptible to answer selection arrived at "by inspection" or even random chance. Following is an illustration of the type of questions that might be anticipated on the examination:

Morning Session (4 hours)

- Building systems requiring emergency power for life safety
- Roof location of plumbing vents
- Factors influencing structural performance of concrete beams in a fire
- Efficiency of frame types in resisting lateral loads
- HVAC system response upon fire alarm
- Project-level cost estimation based on similar completed projects
- Use of Construction Change Directives
- Time-and-material cost estimation
- Resolution of non-conforming construction work issues
- Life-cycle cost estimation
- Critical path scheduling
- 3-phase, Y-connected electrical circuit basics
- Size feeder for branch circuit serving multiple motors
- Calculate kVA on 3-phase panel, with loads given

- Full-load amps available at secondary terminals of transformer, with transformer characteristics given
- With photometric data given, determine zonal lumens at specified elevation angle
- Calculation of capacitive reactance required in kVAR, with given system characteristics
- Identify correct phasor diagram for a 3-phase system, with given current lag
- NEC limitations on bends in rigid metal conduit
- With photometric data and design factors given, determine average, uniform, luminance level
- Design options to prevent cooling tower freezing
- CFM required, with building heat loss, room temperature and supply air temperature given
- Heat (btu/hr) rejected to a mechanically induced draft cooling tower, given chiller capacity, load and energy input
- Most energy-efficient way to control a cooling tower fan using a two-speed motor
- Given a roof plan, riser diagram and required data tables, size a vertical riser of a roof drainage leader
- Calculate U-value for a given wall section
- Temperature range suitable for ordinary-temperature fire sprinklers
- Given a friction loss vs. air quantity graph, cfm, distance and duct size, determine static pressure at given point in duct
- Application of static pressure sensor to control fan supply temperature in a VAV HVAC system
- Given a roof plan and lateral wind force, determine maximum required capacity of a flexible roof diaphragm
- Given footing dimensions, axial load and overturning moment, determine maximum soil pressure under the footing
- Calculate tension in a single anchor bolt where base plate grout has been omitted under a given column base plate under given load conditions

- For a given building structure and load condition, calculate minimum compressive strength of concrete required to limit inter-story drift to specified amount
- For a given floor framing plan and live load reduction formula, calculate live load reduction factor for a specified girder
- For a wood beam of given dimensions and properties, calculate the allowable bending stress for a given span, support reaction conditions and load.
- For the same wood beam, determine slenderness ratio.
- For the same wood beam and specified shear conditions, determine ratio of actual to allowable shear stress
- For a given reinforced concrete column section, determine required tie spacing
- For a given truss configuration and load conditions, determine the force in a specified member
- For the same truss, and a specified force and end conditions for a specified member, determine the lightest double angle capable of resisting the member force

Afternoon Session (4 hours)

- Requirements for sloping plumbing vents
- Term for ratio of luminance leaving a surface to luminance arriving
- Relative fire resistance of specified wood, steel and concrete materials
- By code, direction of external design pressures on a flat roof due to a horizontal wind blowing across the roof
- Per ADA, toilet rooms not required to comply with accessibility requirements
- Masonry labor crew productivity required to meet schedule and budget requirements
- Effect of unforeseen site conditions in a bidding process where site access available to bidders was limited
- Allowable masonry crew time to construct a specified CMU wall, for a given labor budget
- Analysis of a given CPM chart to determine the total days needed to construct a slab on grade

- Evaluation of a contractor’s payment application to determine the amount that should be paid this month for drywall and ceiling work
- Conditions under which a construction manager is liable to the owner under a “CM-at-risk” contract
- Determine minimum standard size transformer required for a specified load and power supply configuration
- For a given power triangle, the amount of capacitance in kVAR that must be added to bring the power factor to 0.95
- For a given building load and power factor conditions, determine total kVA and overall power factor
- For a given power circuit, determine the correct location for a clamp-on multimeter to measure the current flowing in a specified load
- Construction of a single phase, series vector diagram
- For given lamp characteristics, determine per NEC the maximum number of exterior security lighting luminaires that can be put on a 20A/1P circuit breaker
- For a given room configuration and photometric data, determine the illuminance at a specified point
- For a given available fault current at the service entrance, determine per NEC the minimum allowable interrupting rating of the main circuit breaker at the service entrance
- Per the ASHRAE Energy Code, for a given room conditions, determine the proper UPD to use in calculating the lighting power allowance and the LPB
- Application of pump laws to determine expected total head of a new pump, from known characteristics of a dynamically similar pump
- Per NFPA 13, the maximum floor area on any one floor to be protected by any one system riser for ordinary hazard occupancy
- Given a chilled water and hot water primary system, identify the air handling system that delivers supply air at a constant temperature when operating in the cooling mode
- Using a given psychrometric chart and return and outside air conditions, determine the mixed air conditions entering a cooling coil
- Pumped water system where elevation head must be taken into account when selecting a pump
- Primary components in an HVAC system condensing unit

- Calculation of cost of fan motor energy savings when CFM is reduced
- Calculate required GPM of chilled water required, with psychrometric chart and air conditions given
- With constant head and pump performance chart given, determine GPM increase if the motor for a given pump is increased from 1/3 to 1/2 HP
- For a given column footing and load conditions, determine footing thickness required to resist punching shear
- For a given rigid frame and load conditions, determine most probable moment diagram
- Determine the minimum required length of a given fillet weld for given load conditions
- For a defined composite wood-steel plate-wood beam, determine the transformed wood moment of inertia
- For a given roof framing plan and wind force loading, determine the maximum required capacity of the rigid diaphragm
- For given soil conditions and geotechnical properties, determine the maximum allowable capacity for a straight shaft drilled pier of given depth and diameter
- For the same soil conditions, geotechnical properties and drilled pier diameter, determine required depth of pier to develop a required load bearing capacity
- For a given beam span, loading and properties, determine the minimum moment of inertia required to limit mid-span deflection to a given amount
- For a given retaining wall and footing geometry and load conditions, determine the overturning moment at the top of the footing
- Calculate shear force on a shelf angle supporting a brick veneer wall for a given configuration and load
- Determine maximum long-term deflection of concrete mezzanine slab with load, configuration and material properties given

A useful tool you can use to prepare for the examination is *Principles and Practices of Engineering: Architectural Engineering Sample Questions and*

Solutions developed by the Architectural Engineering Institute. It is available online from ASCE at:

https://www.asce.org/bookstore/book.cfm?book=4287

6. INFORMATION YOU NEED TO TAKE INTO THE EXAM

Since the Architectural Engineer PE examination is open-book you need to think about the reference books you will take into the examination. Listed in Figure 6 are some you might consider. You should review the contents of all before the examination and determine which you will be able to utilize in a time-efficient manner during the examination. You will probably find that references within your individual technical focus will be most useful to you in the examination because you are likely already familiar with them. In all cases the latest editions should be used.

Figure 6 Suggested Examination References
Occupational Safety and Health Standards for Construction Industry, US Department of Labor
A good engineering economy textbook
ACI Formwork for Concrete
ICBO Uniform Building Code
BOCA National Building Code
SBCCI Standard Building Code
ICC International Building Code
ASCE 7, Minimum Design Loads for Buildings and Other Structures
ASHRAE Fundamentals Handbook
ASHRAE Applications Handbook
ASHRAE Systems and Equipment Handbook
ASHRAE Refrigeration Handbook
ASHRAE Principles of Heating, Ventilating and Air Conditioning
ASHRAE Standard 90.1, Energy Standard for Buildings
IEEE Color Books Set

IESNA Lighting Handbook
SFPE Handbook of Fire Protection Engineering
ASPE Data Book, Vols. 1-3
NFPA 70 National Electric Code
NFPA 13 Standard for the Installation of Sprinkler Systems
NFPA 14 Standard for the Installation of Standpipe, Private Hydrant and Hose Systems
NFPA 72 National Fire Alarm Code
NFPA 99 Standard for Health Care Facilities
NFPA 101 Life Safety Code
ACI 318 Building Code Requirements for Structural Concrete
ACI 530 Building Code for Masonry Structures
ACI 530.1 Specifications for Masonry Structures
AISC Manual of Steel Construction, Allowable Stress Design
AISC Manual of Steel Construction, Load and Resistance Factor Design
National Design Specification for Wood Construction
PCI Prestressed Concrete Design Handbook

7. CAREER DEVELOPMENT

After you have passed the PE examination and are a registered Architectural Engineer you will have a professional credential that will open the door for you to a leadership position in the building design and construction industry. This will increase your value to your company or public agency, and will provide you with business opportunities should you be with a private engineering firm. It will also allow you to take a principal role in the "design-build" approach to delivery of building and infrastructure construction.

To maximize the value of your Architectural Engineer registration you should become a member of the Architectural Engineering Institute (AEI). AEI is the professional home for all professionals in the building industry including, of course, those registered as Architectural Engineers. It provides a multi-disciplinary national forum for members of, but not limited to, the architectural, civil, structural, mechanical, and electrical engineering communities. AEI works to facilitate the crucial communication among members of the building team, both on a technical basis and in the professional arena. In addition, it strives to be the premier organization for timely quality technical literature, professional advocacy, and educational opportunities. Its mission is to serve the building community by promoting an integrated, multi-disciplinary approach to planning, design, construction and operation of buildings and by encouraging excellence in practice, education and research of architectural engineering. You can learn more about AEI at:

www.aeinstitute.org .

GOOD LUCK!