

Steps to Professional Licensure for PSPE Members

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October 2018



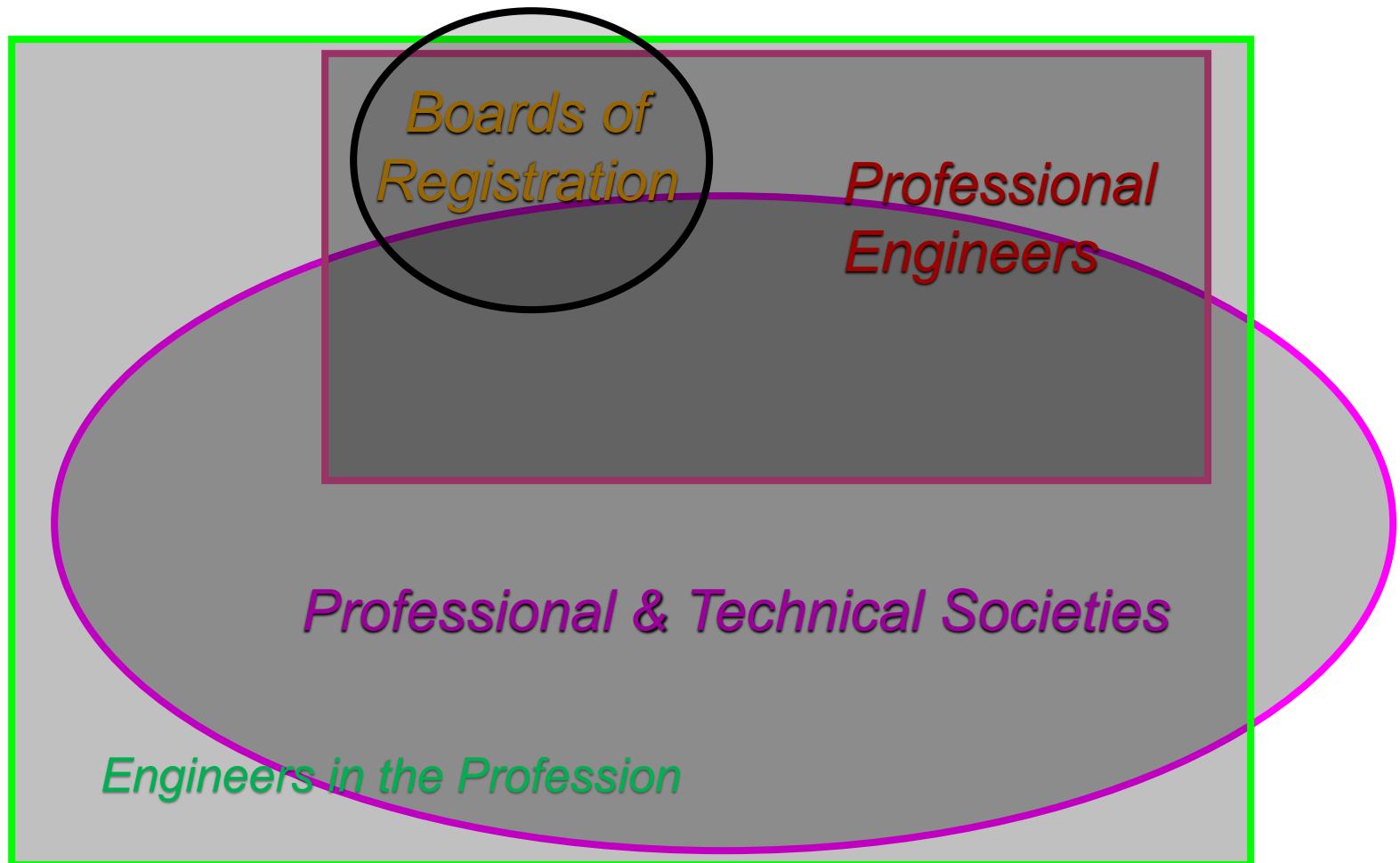
Disclaimer

The information provided by this lecture is that of Prof. Drnevich as an individual and does not represent an official position of the Indiana Registration Board for Professional Engineers or the Indiana Society of Professional Engineers.

Topics:

- Engineers in the profession
- Law on the Practice of Engineering
- Why get licensed?
- Professional Registration
- Contemporary Issues
- Professional/Technical Societies
- Concluding Thoughts
- Address questions

Engineers in the profession



Professional Engineer

IC 25-31-1-2 (b)

- "Professional engineer" means an individual who, by reason of that individual's special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design which are acquired by education and practical experience, is qualified to engage in the practice of engineering as attested by that individual's registration as a professional engineer.

Who can practice engineering?

- According to the law, only licensed professional engineers can practice engineering



Practice of Engineering

IC 25-31-1-2 (d)

"Practice of engineering" means any service or creative work that the adequate performance of requires engineering education, training, and experience in the application of special knowledge of the mathematical, physical, and engineering sciences to services or creative work that includes the following:

- (1) Consultation.
- (2) Investigation.
- (3) Evaluation.
- (4) Planning, including planning the use of land and water.
- (5) The design of or the supervision of the design of engineering works and systems.
- (6) Engineering surveys and studies or the supervision of engineering surveys and studies, ...
- (7) Evaluation of construction for the purpose of assuring compliance with specifications, plans, and designs, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, work systems, or projects.

Industrial Exemption

IC 25-31-1-20

Exempt persons

- (a) An employee or a subordinate
- (b) This chapter does not require registration for the purpose of practicing engineering by an individual or a business:
 - (1) on property owned or leased by that individual or business unless the engineering practice involves the public health or safety, or the health or safety of the employees of that individual or business;
 - (2) for the performance of engineering which relates solely to the design or fabrication of manufactured products; or
 - (3) that is registered as a landscape architect under IC 25-4-2 and while the individual or business is engaged in the practice of landscape architecture planning the use of land or water.

Professional Registration

- Required by law for the professional practice of engineering
- Each state and territory has a “registration law”
- Implemented by a Board of Registration
<http://www.in.gov/pla/engineer.htm>
- National Council of Examiners for Engineering and Surveying (NCEES) generate and grade the FE and PE exams used by boards of registration
<http://www.ncees.org>

Why Get Licensed?

- Mark of a professional
- Required for practice engineering involving health, welfare, and safety of the public
- Ethics requirements
- Career development and growth
- Continuing Education
- Prestige and respect
- Flexibility
- Salary



Steps to Professional Licensure

1. Graduation from program in engineering acceptable to the Board (ABET accredited)
2. Passing the Fundamentals of Engineering (FE) Exam
3. Four years of engineering practice experience
 - One year granted for MS degree in engineering
 - Two years granted for PhD degree in engineering
4. Passing the Principles and Practice (PE) Exam

Computer-Based FE Exam

- Started in January 2014
- Is taken at Pearson-Vue Testing Centers
- Available over four, three-month-long testing windows each year
 - Window 1: Jan-Mar
 - Window 2: April-June
 - Window 3: July-Sept
 - Window 4: Oct-Dec

Computer-Based FE Exam, Cont'd.

- Apply to NCEES to register for FE and FS exams (<http://ncees.org/engineering/fe/>)
 - Provide information
 - Pay \$175 fee
- Schedule Exam with Pearson-Vue
 - Choose location (Purdue is among 7 in Indiana; many in every state to choose from)
 - Choose from dates available.

Computer-Based FE Exam, Cont'd.

- The FE exam is a computer-based test (CBT). It is closed book with an electronic reference.
- Examinees have 6 hours to complete the exam, which contains 110 multiple-choice questions.
 - The 6-hour time also includes a tutorial, a break, and a brief survey at the conclusion.
- The FE exam uses both the International System of Units (SI) and the US Customary System (USCS).

Computer-Based FE Exam, Cont'd.

- Seven separate exams:
 - Chemical CBT Exam Specifications
 - Civil CBT Exam Specifications
 - Electrical and Computer CBT Exam Specifications
 - Environmental CBT Exam Specifications
 - Industrial CBT Exam Specifications
 - Mechanical CBT Exam Specifications
 - Other Disciplines CBT Exam Specifications
- Get exam day testing details at:
 - www.youtube.com/watch?v=5YbpV48rNK4

Chemical CBT FE Exam

<https://ncees.org/wp-content/uploads/FE-Chem-CBT-specs-1.pdf>

Knowledge Area	Number of Questions
1. Mathematics	8-12
2. Probability and Statistics	4-6
3. Engineering Sciences	4-6
4. Computational Tools	4-6
5. Materials Science	4-6
6. Chemistry	8-12
7. Fluid Mechanics/Dynamics	8-12
8. Thermodynamics	8-12
9. Materials/Energy Balance	8-12

Chemical CBT FE Exam, Cont'd.

<i>Knowledge Area</i>	<i>Number of Questions</i>
10. Heat Transfer	8-12
11. Mass Transfer and Separation	8-12
12. Chemical Reaction Engineering	8-12
13. Process Design and Economics	8-12
14. Process Control	5-8
15. Safety, Health, and Environment	5-8
16. Ethics and Professional Practice	2-3

Civil CBT FE Exam

<https://ncees.org/wp-content/uploads/FE-Civil-CBT-specs.pdf>

Knowledge Area	Number of Questions
1. Mathematics	7–11
2. Probability and Statistics	4–6
3. Computational Tools	4–6
4. Ethics and Professional Practice	4–6
5. Engineering Economics	4–6
6. Statics	7–11
7. Dynamics	4–6
8. Mechanics of Materials	7–11
9. Materials	4–6

Civil CBT FE Exam, Cont'd.

<i>Knowledge Area</i>	<i>Number of Questions</i>
10. Fluid Mechanics	4–6
11. Hydraulics and Hydrologic Systems	8–12
12. Structural Analysis	6–9
13. Structural Design	6–9
14. Geotechnical Engineering	9–14
15. Transportation Engineering	8–12
16. Environmental Engineering	6–9
17. Construction	4–6
18. Surveying	4–6

Electrical & Computer CBT FE Exam

<https://ncees.org/wp-content/uploads/FE-Ele-CBT-specs.pdf>

Knowledge Area	Number of Questions
1. Mathematics	11-17
2. Probability and Statistics	4-6
3. Ethics and Professional Practice	3-5
4. Engineering Economics	3-5
5. Properties of Electrical Materials	4-6
6. Engineering Sciences	6-9
7. Circuit Analysis (DC and AC Steady State)	10-15
8. Linear Systems	5-8
9. Signal Processing	5-8

Electrical CBT FE Exam, Cont'd.

<i>Knowledge Area</i>	<i>Number of Questions</i>
10. Electronics	7-11
11. Power	8-12
12. Electromagnetics	5-8
13. Control Systems	6-9
14. Communications	5-8
15. Computer Networks	3-5
16. Digital Systems	7-11
17. Computer Systems	4-6
18. Software Development	4-6

Industrial CBT FE Exam

<https://ncees.org/wp-content/uploads/FE-Ind-CBT-specs.pdf>

Knowledge Area	Number of Questions
1. Mathematics	6-9
2. Engineering Sciences	5-8
3. Ethics and Professionalism	5-8
4. Engineering Economics	10-15
5. Probability and Statistics	10-15
6. Modeling and Computations	8-12
7. Industrial Management	8-12
8. Manufact., Prod., and Service Systems	8-12
9. Facilities and Logistics	8-12

Industrial CBT FE Exam, Cont'd.

<i>Knowledge Area</i>	<i>Number of Questions</i>
10. <i>Human Factors, Ergonomics, and Safety</i>	8-12
11. <i>Work Design</i>	8-12
12. <i>Quality</i>	8-12
13. <i>Systems Engineering</i>	8-12

Mechanical CBT FE Exam

<https://ncees.org/wp-content/uploads/FE-Mec-CBT-specs.pdf>

Knowledge Area	Number of Questions
1. Mathematics	6-9
2. Probability and Statistics	4-6
3. Computational Tools	3-5
4. Ethics and Professional Practice	3-5
5. Engineering Economics	3-5
6. Electricity and Magnetism	3-5
7. Statics	8-12
8. Dynamics, Kinematics, and Vibrations	9-14
9. Mechanics of Materials	4-6

Mechanical CBT FE Exam, Cont'd.

<i>Knowledge Area</i>	<i>Number of Questions</i>
10. Material Properties and Processing	8-12
11. Fluid Mechanics	9-14
12. Thermodynamics	13-20
13. Heat Transfer	9-14
14. Meas., Instrumentation, and Controls	5-8
15. Mechanical Design and Analysis	9-14

OTHER DISCIPLINES

CBT Exam Specifications

<https://ncees.org/wp-content/uploads/FE-Other-CBT-specs-1.pdf>

Knowledge	Number of Questions
1. Mathematics and Adv. Engineering Mathematics	12–18
2. Probability and Statistics	6–9
3. Chemistry	7–11
4. Instrumentation and Data Acquisition	4–6
5. Ethics and Professional Practice	3–5
6. Safety, Health, and Environment	4–6
7. Engineering Economics	7–11

OTHER DISCIPLINES

CBT Exam Specifications, Cont'd.

<i>Knowledge</i>	<i>Number of Questions</i>
8. Statics	8–12
9. Dynamics	7–11
10. Strength of Materials	8–12
11. Materials Science	6–9
12. Fluid Mechanics and Dynamics of Liquids	8–12
13. Fluid Mechanics and Dynamics of Gases	4–6
14. Electricity, Power, and Magnetism	7–11
15. Heat, Mass, and Energy Transfer	9–14

Engineer-in-Training (EIT)

- Once the required education is completed and the FE exam is passed, must apply to State Board for certification as an EIT.
 - Requires submitting transcripts
 - Must be certified as EIT before taking PE exam.
 - All state boards accept passed FE exam
 - FE exam does not expire
 - Indiana Board information available at:
<http://www.in.gov/pla/engineer.htm>

FE Exam Takers and Pass Rates

Exam	Volume	Pass rate
FE Chemical	1076	74%
FE Civil	6062	69%
FE Electrical and Computer	1399	71%
FE Environmental	807	76%
FE Industrial and Systems	300	61%
FE Mechanical	4559	77%
FE Other Disciplines	1289	74%

Register for Exams at NCEES, LLC.

- Handles registration and administration of exams
<https://ncees.org/engineering/>
- NCEES Examinee Guide
<https://ncees.org/exams/examinee-guide/>
 - Very strict rules and security
 - Closed book; on-line booklet provided
- Preparation Materials

<https://ncees.org/exams/exam-preparation-materials/>

<http://pearsonvue.com/demo/>

Calculator Policy

- Only models of calculators listed below are permitted in the exam room.
 - Hewlett Packard—HP 33s and HP 35s models, but no others.
 - Casio—All fx-115 and fx-991 models. Any Casio calculator must contain fx-115 or fx-991 in its model name.
 - Texas Instruments—All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

Principles and Practice (PE) Exams

(Taken after 4 years of engineering practice experience*)

- PE Agricultural & Biological
- PE Architectural
- PE Chemical
- PE Civil
- PE Control Systems
- PE Electrical and Computer
- PE Environmental
- PE Fire Protection
- PE Industrial
- PE Mechanical
- PE Metallurgical and Materials
- PE Mining and Mineral Processing
- PE Naval Architecture and Marine Engineering
- PE Nuclear
- PE Petroleum
- PE Structural I
- PE Structural II
- PS Surveying

* Some states now do not require any waiting time after passing the FE exam to take the PE exam.

PE Agricultural Engineering Examination

(8-hour exam)

*Paper & pencil; Available only in April of each year;
CBT in 2021
40 multiple choice questions in five topic areas.*

Agricultural Exam	
Engineering Principles and Professional Practices	20%
Facility Engineering: Plant, Animal, and Commodity Environments and Structures	15%
Machine Systems: Power, Electrical/Electronic, Machines, Controls, and Sensors	25%
Natural Resource Engineering: Soil, Water, and Plant Systems	30%
Process Engineering: Food, Feed, Fiber, and Fuel Products	10%
TOTAL	100%

PE Chemical Engineering Examination (9-hour CBT* exam)

https://ncees.org/wp-content/uploads/PE-Che-Jan_2018_CBT-1.pdf

80 multiple choice questions in five topic areas

<i>Topic</i>	<i>No. Ques.</i>
1. Mass/Energy Balances and Thermodynamics	16–24
2. Heat Transfer	11–16
3. Kinetics	8–12
4. Fluids	11–16
5. Mass Transfer	10–15
6. Plant Design and Operation	14–21

*Computer-Based Exam started in January 2018; Available year-round

PE Civil Engineering Examination

(8-hour exam)

- *Paper & pencil; Available only in April and October;*
- *CBT in 2023; then available year-round*
- *80 multiple choice questions in five topic areas.*
- *Morning covers breadth; afternoon depth*
 - *PE Civil: Construction*
 - *PE Civil: Geotechnical*
 - *PE Civil: Structural*
 - *PE Civil: Transportation*
 - *PE Civil: Water Resources and Environmental*

PE Elec. & Computer Engineering Exam. (8-hour exam)

- *Paper & pencil; Available only in April and October;*
- *CBT in 2021*
- *80 multiple choice questions in five topic areas.*
 - Computer Engineering Single-day (date TBD)
 - Electronics, Controls, and Communications Single-day (date TBD)
 - Power Year-round

PE Indust. and SystemsEngineering Exam. (8-hour exam)

- *Paper & pencil; Available only in April and October;*
- *CBT in 2020; then Single-day (date TBD)*
- *80 multiple choice questions in five topic areas.*

Subject	No. of Ques.
<i>I. Systems Definition, Analysis, and Design</i>	16
<i>II. Facilities Engineering and Planning</i>	16
<i>III. Supply Chain and Logistics</i>	16
<i>IV. Work Design</i>	16
<i>V. Quality Engineering</i>	16

PE Mechanical Engineering Exam. (8-hour exam)

- *Paper & pencil; Available only in April and October;*
- *CBT in 2020; then available year-round*
- *80 multiple choice questions in five topic areas.*
 - HVAC and Refrigeration
 - Machine Design and Materials
 - Thermal and Fluids Systems

PE Exam Pass Rates

Exam	First-time takers		Repeat taker	
	Volume	Pass Rate	Volume	Pass Rate
PE Agricultural and Biological	27	70%	5	80%
PE Architectural	101	62%	17	6%
PE Chemical (CBT)	285	80%	3	67%
PE Civil: Construction	904	58%	736	28%
PE Civil: Geotechnical	528	61%	357	28%
PE Civil: Structural	1728	59%	696	29%
PE Civil: Transportation	1741	64%	1013	38%
PE Civil: Water Res. and Env.	1728	71%	866	44%
PE Control Systems	240	73%	52	48%
PE Computer Engineering	24	50%	5	20%
PE Electr., Contrls., and Com.	124	59%	31	26%
PE Power	1024	57%	667	35%

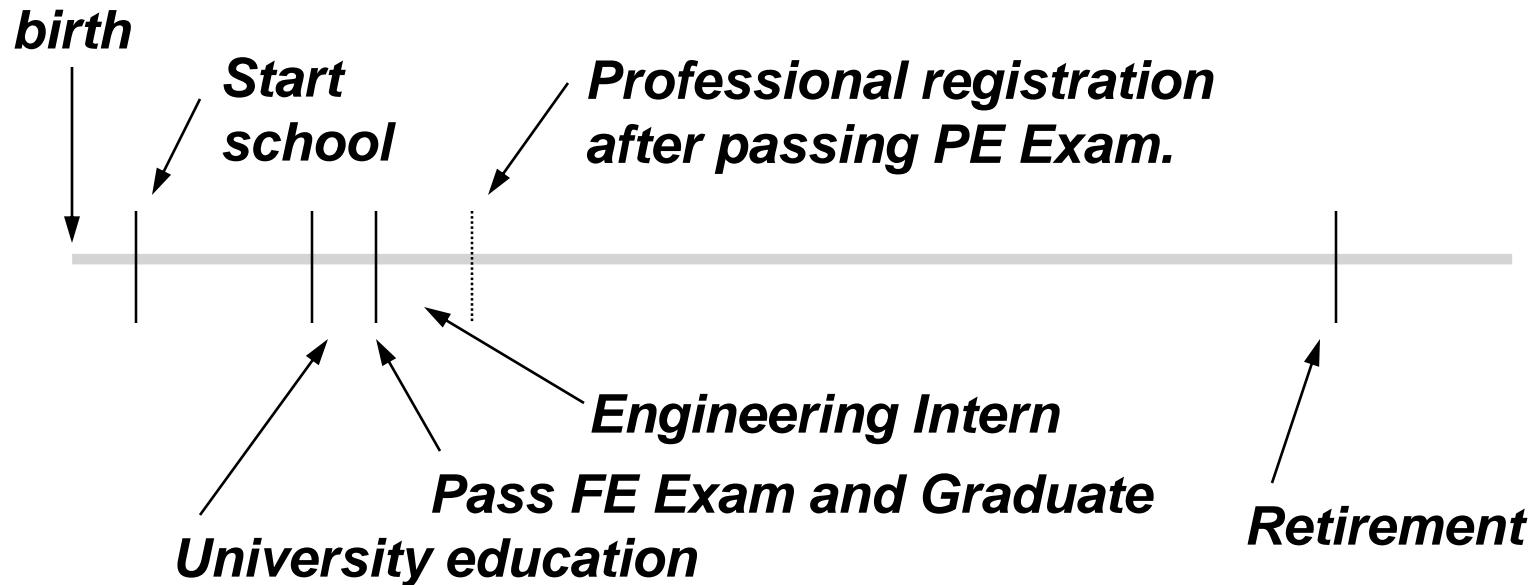
PE Exam Pass Rates

<i>Exam</i>	<i>First-time takers</i>		<i>Repeat taker</i>	
	<i>Volume</i>	<i>Pass Rate</i>	<i>Volume</i>	<i>Pass Rate</i>
<i>PE Environmental</i>	314	69%	115	43%
<i>PE Fire Protection</i>	189	60%	77	48%
<i>PE Industrial and Systems</i>	86	66%	13	8%
<i>PE HVAC and Refrigeration</i>	648	72%	216	49%
<i>PE Machine Design & Materials</i>	492	74%	119	39%
<i>PE Thermal and Fluids Systems</i>	539	70%	254	45%
<i>PE Metallurgical and Materials</i>	63	70%	11	36%
<i>PE Mining and Mineral Proc.</i>	61	57%	15	60%
<i>PE Naval Arch. and Marine Eng.</i>	46	57%	14	36%
<i>PE Nuclear (October 2017)</i>	34	71%	7	29%
<i>PE Petroleum (October 2017)</i>	187	70%	51	33%
<i>PE Software</i>	12	42%	3	0%

Frequently asked questions

- See:
 - <http://ncees.org/exams/fe-exam/>
 - https://engineering.purdue.edu/Engr/Academics/FE_FS_Exams/apply
- Review Sessions sponsored by Chi Epsilon and PSPE
 - <https://engineering.purdue.edu/~xe/FEReview.html>

Time line for Engineers



Note: For surveyors, the corresponding exams are the FS and PS exams.

Continuing Education

- 40 of the states now have Continuing Education requirements for maintaining licenses.
 - Typically require 24 to 30 hours per biennium for renewal of license
 - Approved activities vary, but always include courses and short courses related to the practice of engineering
 - Rules for Indiana were established in 2010 and updated in 2014

Continuing Education Question

- How does a professional acquire new knowledge and keep up with developments in the field?
- Answer: By continuing your education by formal and self study and by becoming involved with professional and technical societies.

Contemporary Issues

Recent issues of major importance to engineers

- *State Building Inspector*
- *Jobs Creation Committee*

State Building Inspector (April 2015)

- HB 1507 was an effort to remove requirement that the State Building Inspector be licensed Architect or Professional Engineer

<https://iga.in.gov/legislative/2015/bills/house/1507>

- Passed the House, Senate assigned to Commerce & Technology Committee
- Indiana AIA, ACEC Indiana, ASCE, SEA-IN and ISPE opposed this bill
- Professional Engineers studied HB 1507 and expressed their opinions on it to their legislators
- Bill never came out of Committee

Jobs Creation Committee (JCC)

- The Job Creation Committee (JCC) was established by the Indiana General Assembly in 2014 (<http://www.in.gov/pla/3144.htm>) to assess the efficiency and effectiveness of all professional licenses regulated by the Indiana Professional Licensing Agency (IPLA). The IPLA is an umbrella agency for 38 boards, commissions and committees
- JCC reviewed Engineering in January 2015.

Jobs Creation Committee (JCC)

- The JCC issued a report on July 1, 2015 to the governor and the Legislative Services Agency on Engineering, Architecture, Surveying, Landscape Arch., and other boards.
 - June 17, 2015 Draft of report recommended: *The Job Creation Committee recommends that the State of Indiana no longer require the licensing of engineers and eliminate the State Board of Registration for Professional Engineers. all license under this profession.*
 - ISPE, ACEC, and other Indiana professional and technical organizations took immediate action.
 - July 1, 2015 Final Report recommended: *The Jobs Creation Committee voted to recommend changes to the regulatory structure of the State Board of Registration for Professional Engineers and the licenses it issues. As such, and pursuant to IC 25-1-16-14, the JCC shall seek public input regarding these proposed changes at a future public meeting.*

Jobs Creation Committee (JCC)

- On August 20, 2015 , a hearing by the JCC occurred for professions to respond
- Professions mobilized by:
 - Writing Letters to the JCC
 - Contacting legislators
 - Contacting the Governor
 - Publicizing the issue in professional and technical organizations
- At the hearing, which I attended, there were several formal presentations and many questions asked by the JCC members.
- At the end of the hearing, the JCC members voted 4 to 1 in favor of rescinding their previous recommendation and to have the Registration Board and the Licensing of Engineers in Indiana continue without any changes.

Professional and Technical Societies

- Source of new knowledge and technologies – Continuing Education
- Sense of identity to the professional
- Represents the profession to government and society
- Codes of Ethics
- Develop leadership skills
- Networking
- Other



Recommended Prof./Tech. Orgs.

□ Professional Org.

- NSPE/ISPE with local chapters and student chapters (PSPE at Purdue)
- SWE, NSBE

□ Technical Orgs.

- Basic Founder Societies, e.g. ASABE, ASCE, ASME, IEEE, IIE, etc.
- Specialty Societies, e.g. ASTM , ITE

Indiana Society of Professional Engineers (ISPE)

<http://www.indspe.org>



Inside ISPE

Membership

Education | Events

The PE | Licensure

A large, abstract graphic featuring several circular icons containing white silhouettes of people. These icons are connected by lines forming a network. The background has a blurred, futuristic feel with blue and purple hues, and faint outlines of buildings and charts.

Chart Your Career

ISPE Membership Tools help get you there.

Indiana Professional Engineer Journal

https://indspe.org/ispe>About/IPEJ/ISPE/IPE_Journal.aspx?hkey=367183c2-f556-4691-b717-fcf14a909130&WebsiteKey=03a07aba-86ed-43bc-95fe-b15a6650bfb6

The cover of the Indiana Professional Engineer Journal features a large, dark-colored electrical pylon with multiple cross-arms and wires, set against a clear blue sky with a few wispy clouds. In the upper left corner, there is a white rectangular logo containing the text "NSPE-IN" in a bold, teal-colored font. A small "TM" symbol is located at the top right of the logo. Below the logo, the text "INDIANA SOCIETY OF PROFESSIONAL ENGINEERS" is written in a large, white, sans-serif font. On the right side of the cover, there are two main article titles: "Wind Turbine Installation: The Long & Windy Road" and "Getting Better: Come On Indiana We Can Do Better". Both titles are in a large, white, bold font. Below each title is a "PAGE 10" or "PAGE 4" indicator in a smaller, teal-colored font.

Wind Turbine Installation: The Long & Windy Road
PAGE 10

Getting Better: Come On Indiana We Can Do Better
PAGE 4

National Society of Professional Engineers (NSPE) www.nspe.org



Student Membership

You qualify for a **FREE** NSPE national **student membership** if you are: a **student** enrolled full-time ... free **NSPE Student Membership** and get the following:

Free Resources for **Students** Looking for a job after graduation

... **student membership** entitles you to deep discounts on a wide variety of publications including FE/PE Exam ...

<https://www.nspe.org/membership/type-membership/student-membership>

NSPE Membership Types

Engineer Professional

Open to anyone holding either a valid PE license in the U.S. or Canada, or an Engineer-In-Training or Engineering Intern.

Enterprise

Through the Enterprise program, NSPE will develop a package perfectly suited to your company's needs.

Student

Full time student? NSPE has a special package just for you.

Life and Retired Members

To recognize NSPE members for years of service to the Society and the profession, NSPE grants life-member and retired-member status.

*NSPE is Free!
(Local PSPE dues
are \$15/semester,
\$25/year)*

<https://boilerlink.purdue.edu/organization/pspe>

Active Participation in Prof/Tech Student Organizations



Our History, Events, Membership, Research Roundtable, Rube Goldberg Competition, Order of the Engineer, Field Trips, MathCOUNTS, Community and Social Activities

<http://purdueepspe.com/>

<https://engineering.purdue.edu/PSPE/>

Concluding Thoughts

- Reasons to become licensed:
 - Required by the law to practice engineering
 - Money
 - Status/Respect
 - Career Flexibility
- Licensure is a 4-step process
 1. Education from ABET accredited program
 2. Pass FE Exam (exam is changing to CBT in 2014)
 3. Four years of experience as an EIT
 4. Pass the PE Exam
- Professional and Technical Societies play an important role in the professional lives of engineers.

Things you need to do:

- Obtain a broad engineering education
 - Keep in mind the topics covered in the FE Exam
- Plan to take the FE Exam
 - Apply for it at the beginning of the last semester before graduating
- Choose a job that provides qualifying work experience for the PE Exam
- Prepare for and take the PE Exam at your earliest possible date
- Continue participating in professional and technical organizations after graduation
- Continue to learn about your profession

Questions and Discussions

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Thanks for listening!

Vince Drnevich



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