Engineering Ethics

IEEE – IAS Chapter Meeting

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Ethics

- **Do we need Ethics in ???**
- In Politics
- In Engineering
- In Life

Definitions of Ethics

- Moral principles that govern a person's behavior or the conducting of an activity
- Moral principles that govern a person or groups behavior
- Rules of behavior based on ideas about what is morally good or bad
- The basic concepts and fundamental principles of decent human conduct

NSPE™ NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Code of Ethics for Engineers

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act for each employer or client as faithful agents or trustees.
5. Engineers shall avoid deceptive acts.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
2. Engineers shall at all times strive to serve the public interest.
3. Engineers shall avoid all conduct or practice that deceives the public.
4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
5. Engineers shall not be influenced in their professional duties by conflicting interests.
6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.

8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.

9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.

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IEEE Code of Ethics

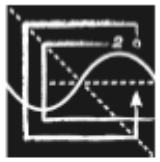
The following is from the IEEE Policies, Section 7 - Professional Activities (Part A - IEEE Policies).

7.8 IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;

5. to improve the understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.



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240.15 Rules of Professional Conduct

To safeguard the health, safety, and welfare of the public and to maintain integrity and high standards of skill and practice in the engineering and surveying professions, the rules of professional conduct provided in this section shall be binding upon every licensee and on all firms authorized to offer or perform engineering or surveying services in this jurisdiction.

A. Licensee's Obligation to the Public

1. Licensees shall be cognizant that their first and foremost responsibility is to safeguard the health, safety, and welfare of the public when performing services for clients and employers.
2. Licensees shall sign and seal only those plans, surveys, and other documents that conform to accepted engineering and surveying standards and that safeguard the health, safety, and welfare of the public.
3. Licensees shall notify their employer or client and such other authority as may be appropriate when their professional judgment is overruled under circumstances in which the health, safety, or welfare of the public is endangered.

4. Licensees shall, to the best of their knowledge, include all relevant and pertinent information in an objective and truthful manner within all professional documents, statements, and testimony.
5. Licensees shall express a professional opinion publicly only when it is founded upon an adequate knowledge of the facts and a competent evaluation of the subject matter.
6. Licensees shall issue no statements, criticisms, or arguments on engineering and surveying matters that are inspired or paid for by interested parties, unless they explicitly identify the interested parties on whose behalf they are speaking and reveal any interest they have in the matters.
7. Licensees shall not partner, practice, or offer to practice with any person or firm that they know is engaged in fraudulent or dishonest business or professional practices.
8. Licensees who have knowledge or reason to believe that any person or firm has violated any rules or laws applying to the practice of engineering or surveying shall report it to the board, may report it to appropriate legal authorities, and shall cooperate with the board and those authorities as may be requested. (*Section 150, Disciplinary Action, NCEES* Model Law)
9. Licensees shall not knowingly provide false or incomplete information regarding an applicant in obtaining licensure.
10. Licensees shall comply with the licensing laws and rules governing their professional practice in each of the jurisdictions in which they practice.

B. Licensee's Obligation to Employer and Clients

1. Licensees shall undertake assignments only when qualified by education or experience in the specific technical fields of engineering or surveying involved.
2. Licensees shall not affix their signatures or seals to any plans or documents dealing with subject matter in which they lack competence, nor to any such plan or document not prepared under their responsible charge.
3. Licensees may accept assignments and assume responsibility for coordination of an entire project, provided that each technical segment is signed and sealed by the licensee responsible for preparation of that technical segment.
4. Licensees shall not reveal facts, data, or information obtained in a professional capacity without the prior consent of the client, employer, or public body on which they serve except as authorized or required by law or rules.
5. Licensees shall not solicit or accept gratuities, directly or indirectly, from contractors, their agents, or other parties in connection with work for employers or clients.
6. Licensees shall disclose to their employers or clients all known or potential conflicts of interest or other circumstances that could influence or appear to influence their judgment or the quality of their professional service or engagement.
7. Licensees shall not accept compensation, financial or otherwise, from more than one party for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to in writing by all interested parties.
8. Licensees shall not solicit or accept a professional contract from a governmental body on which a principal or officer of their organization serves as a member. Conversely, licensees serving as members, advisors, or employees of a government body or department, who are the principals or employees of a private concern, shall not participate in decisions with respect to professional services offered or provided by said concern to the governmental body that they serve.

9. Licensees shall not use confidential information received in the course of their assignments as a means of making personal profit without the consent of the party from whom the information was obtained.

C. Licensee's Obligation to Other Licensees

1. Licensees shall not falsify or permit misrepresentation of their, or their associates', academic or professional qualifications. They shall not misrepresent or exaggerate their degree of responsibility in prior assignments nor the complexity of said assignments. Presentations incidental to the solicitation of employment or business shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or past accomplishments.
2. Licensees shall not offer, give, solicit, or receive, either directly or indirectly, any commission, or gift, or other valuable consideration in order to secure work, and shall not make any political contribution with the intent to influence the award of a contract by public authority.
3. Licensees shall not injure or attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other licensees, nor indiscriminately criticize other licensees' work.
4. Licensees shall make a reasonable effort to inform another licensee whose work is believed to contain a material discrepancy, error, or omission that may impact the health, safety, or welfare of the public, unless such reporting is legally prohibited.

Rules of State Board of Registration for Professional Engineers and Land Surveyors

Rule 180-6-.01 General

(1) In order to safeguard the life, health, property and welfare of the public and to establish and maintain a high standard of integrity, skills, and practice in the professions of engineering and land surveying, the following Rules of Professional Conduct are promulgated in accordance with O.C.G.A. 43-15-6(1). The following rules shall be binding upon every individual who possesses a certificate or a certificate of registration issued by the Board and upon every firm, professional corporation, association, governmental agency, partnership, corporation or other legal or commercial entity offering engineering or land surveying services to the public and to all personnel of such firm, corporation, partnership, association, or entity who act in its behalf in the practice of engineering or land surveying in this state.

(2) The Rules of Professional Conduct as promulgated herein are an exercise of the police power vested in the Georgia Board of Registration for Professional Engineers and Land Surveyors by virtue of the acts of the legislature. By that investment, the said Board is authorized to establish conduct, policy, and practices in accordance with the powers hereinabove stated.

(3) All persons registered under O.C.G.A. Chapter 15, Title 43, are charged with having knowledge of the existence of these Rules of Professional Conduct and shall be deemed to be familiar with their several provisions and to understand them. Such knowledge shall encompass the understanding that the practice of engineering or land surveying is a privilege as opposed to a right. The registrant shall be forthright and candid in his/her statements or written response to the Board or its representatives on matters pertaining to professional conduct.

Rule 180-6-.02 Protection of the Public

The engineer or land surveyor shall at all times practice in such a manner as to protect the safety, health and welfare of the public. If a registrant's engineering or land surveying judgment is overulled under circumstances where the safety, health or welfare of the public are endangered, he/she shall inform the proper authorities and his/her employer of the situation as may be appropriate.

Rule 180-6-.03 Rules of Practice

(1) The engineer or land surveyor shall perform services only in areas of his/her competence. The engineer or land surveyor shall undertake to perform engineering or land surveying assignments only when qualified by education or experience in the specific technical field of professional engineering or land surveying involved.

Rule 180-6-.05. Conflict of Interest

(1) The engineer or land surveyor shall avoid conflicts of interest. The engineer or land surveyor shall conscientiously avoid conflict of interest with his/her employer or client, but, when unavoidable, the engineer or land surveyor shall forthwith disclose the circumstances to his employer or client.

(2) The engineer or land surveyor shall avoid all known conflicts of interest with his/her employer or client and shall promptly inform his/her employer of any business association, interests, or circumstances which could influence his/her judgment or the quality of his/her services.

(3) The engineer or land surveyor shall not accept compensation, financial or otherwise, from more than one party for services on the same project or for services pertaining to the same project unless the circumstances are fully disclosed to and agreed to by all interested parties.

(4) The engineer or land surveyor shall not solicit or accept financial or other valuable considerations, directly or indirectly, from material or equipment suppliers, or their representatives, for specifying their products.

(5) The engineer or land surveyor shall not solicit or accept gratuities, directly or indirectly, from contractors, their agents, or other parties in connection with work for which he/she is responsible.

(6) The engineer or land surveyor in public service as a member, advisor, or employee of a governmental body or department shall not participate in considerations or actions with respect to matters involving him/her or his/her organization's private or public engineering or land surveying practices.

(7) The engineer or land surveyor shall not solicit or accept an engineering or land surveying contract from a governmental body on which a principal or officer of his/her organization serves as a member.

180-6-.06 Conduct.

(1) The engineer or land surveyor shall solicit or accept professional employment only on the basis of his/her qualifications and competence for proper accomplishment of the work. No engineer or land surveyor may provide a fee proposal to a potential client until he/she (a) established or reviewed the scope of services for the project, (b) determined that, based on his/her review of the scope of services, that he/she is competent to provide the professional services required, and (c) made his/her qualifications known to the prospective client. On proposals including more than one engineer or land surveyor, each individual shall be responsible for complying with this rule for his/her respective portion of the proposal. The engineer or land surveyor shall not offer to pay, either directly or indirectly, any commission, political contribution, gift, or other consideration in order to secure work, exclusive of securing salaried positions through employment agencies.
(2) The engineer or land surveyor shall not falsify or permit misrepresentation of his/her or his/her associate's academic or professional qualifications. He/she shall not misrepresent or exaggerate his/her degree of responsibility for prior assignments in brochures or other presentations for the solicitation of employment. He/she shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or his/her or their past accomplishments with the intent and purpose of enhancing his/her qualifications or work.

180-6-.07 Ethics. Amended.

(1) The engineer or land surveyor shall associate only with reputable persons or organizations. The engineer or land surveyor shall not knowingly associate with or permit the use of his/her name, or firm name, in a business venture by any person or firm which he/she knows, or has reason to believe, is engaging in business or professional practices of a fraudulent or dishonest nature.

(2) If the engineer or land surveyor has knowledge or reason to believe that another person or firm may be in violation of any of these provisions or of O.C.G.A. 43-15, he/she shall promptly present such information to the Board in writing and shall cooperate with the Board in furnishing such further information or assistance as may be required by the Board.

Your Practice is Your Ethics

By: Mr. Jon A. Schmitdt
September 5/12, 2016 – Engineering News Record

- Quote: "Perhaps at least part of the problem is confusion about the nature of engineering ethics. It is simply a set of rules to follow or a group of behaviors to avoid, over and above the technical aspects of the profession? Could there be more to ethics that that – maybe even something positive?"
- Quote: " I advocate treating ethics as something that is ***integral*** to practice, not supplemental to it."
- He goes on in the article to state that this is known as "virtue ethics"

  Quote: **"Virtue ethics is less concerned with what someone has done and will do than with what kind of person and engineer someone is and will become"**

Advertising—Inclusion of Material on Web Site from Former Employment

Case No. 10-6

Facts:

Engineer A, a licensed professional engineer in private practice, designs low-voltage electrical systems for commercial buildings and other facilities. Recently, Engineer A started his own consulting engineering firm. Engineer A would like to include on his firm's Web site several projects that Engineer A designed over the years, including some work that Engineer A designed while employed with other consulting firms. All Web content would be original and the content would be non-confidential. The content would include a picture of the project building and a short, generic narrative of the work performed. Work performed by Engineer A while under employment with the other firms would be described accordingly. Engineer A would claim credit for the design work only and would not state or imply that clients of other consulting firms are a client of Engineer A. None of the subject projects are covered by any employment agreements with any of Engineer A's previous employers.

Question:

Is it ethical for Engineer A to reference previous projects he has worked on for other employers on his Web site in the manner indicated?

Conclusion:

It would be ethical for Engineer A to use his work while under employment with the other firms in the manner indicated provided there is no misrepresentations or misleading information either expressed or implied and provided there is full disclosure and attribution accorded to the former employer engineering firm. In addition, any references to Engineer A's services either in a resume or on the Web site should also describe the scope and limits of Engineer A's contributions and provide appropriate credit/acknowledgements of Engineer A's former employer (e.g., include a brief synopsis or summary of the nature of the project) so that the former employer is accorded appropriate recognition and Engineer A's contributions are placed in proper context.

Public Health and Safety - Delay in Addressing Fire Code Violations

Case No. 13-11

Facts:
Engineer A, a fire protection engineer, is retained by Client to provide a confidential report in connection with the possible renovation of an old apartment building owned by Client. Engineer A conducts an audibility test of the fire alarm inside occupied residential units. The audibility test showed the alarm could not be heard within all of the residential units, which is in violation of the local fire code. The problem with the alarm may have existed since the time the building was constructed or when the fire alarm system was replaced in 1978. Engineer A advises the Client regarding the results of the audibility tests and the code violation. In a follow-up telephone conversation with Client, Engineer A is told that the financing for the renovation has fallen through and that the renovation project will be delayed, which means that the problems with the fire alarm system will not be addressed immediately but in the future when funding is available. Engineer A is paid for his services.

Question: What are Engineer A's obligations under the circumstances?

Discussion:

Professional engineers play a critical role in advising their clients about local code requirements. Professional engineers have a fundamental obligation to act consistently with regard to such requirements because of their impact on the public health, safety, and welfare. In determining that it was unethical for Engineer A not to report the safety violations to the appropriate public authorities, the Board of Ethical Review first noted that the facts presented raised a conflict between two basic ethical obligations of an engineer: The obligation of the engineer to be faithful to the client and not to disclose confidential information concerning the business affairs of a client without that client's consent, and the obligation of the engineer to hold paramount the public health and safety. In its review, the Board noted that NSPE Code of Ethics Section III.4 can be clearly understood to mean that an engineer has an ethical obligation not to disclose confidential information concerning the business affairs of any present client without the consent of that client. That provision makes no specific exception to the language.

It is the Board's view that Engineer A's obligations hinge on his professional judgement regarding the level of risk posed by this fire code violation. An engineer with expertise in this area may determine the violation in this case to be an imminent and ongoing risk to the health, safety, and welfare of the building occupants. If Engineer A so determines the presence of such an imminent risk, he should immediately advise the Client that appropriate steps must be taken to protect the occupants of the building from the risks associated with the fire code violation. Then, if the Client does not address these issues, Engineer A would be obligated to report the violation to code enforcement officials. The Board further felt that the fire alarm defect in this case does in fact rise to the level of an imminent and ongoing public safety risk.

Conclusion:

Engineer A should immediately advise the Client that appropriate steps must be taken to protect the occupants of the building from the risks associated with the local fire code violation. If Engineer A determines there is an imminent and ongoing risk to the health, safety, and welfare of the building occupants, and if the Client does not address these issues, Engineer A would be obligated to report the violation to code enforcement officials.

Objectivity and Truthfulness—Use of Drone

Case No. 18-11

Facts:

Engineer A is a consulting engineer who performs structural inspections using mechanical drones. The scope of Engineer A's services is solely to identify the physical conditions of the bridge and make recommendations regarding bridge repairs. Engineer A deploys a drone to perform a series of bridge inspections as part of Engineer A's contract for inspection services with the state Department of Transportation. During one of Engineer A's drone inspections for the state Department of Transportation, the drone unexpectedly records an encounter between a law enforcement officer and a motorist that results in the exchange of gunfire. Following his review of the drone recording, Engineer A relays it to the state Department of Transportation noting the gunfire event. The state Department of Transportation advises Engineer A that it does not plan to share the information with state or local law enforcement unless so requested by state or local authorities.

Question:

What are Engineer A's ethical obligations under the circumstances?

Discussion:

When performing professional engineering services, professional engineers sometimes encounter unexpected circumstances that may raise ethical questions or concerns. From time to time, the NSPE BER has addressed these situations.

Turning to the facts in the present case, while the events and circumstances observed by Engineer A and his drone recording device did not directly relate to his role as a professional engineer or within the scope of Engineer A's services as a professional engineer, the issues involved occurred during the performance of Engineer A's professional services and are a matter of significant public interest and concern. Under the facts, Engineer A took appropriate steps to bring this matter to the attention of the state Department of Transportation, Engineer A's client and an appropriate authority. While the BER believes Engineer A fulfilled his ethical responsibility under the NSPE Code of Ethics, since this is a matter of significant public interest and concern and relates to the public health and safety, the BER is of the view that Engineer A should also, consistent with the NSPE Code of Ethics, properly bring the existence of the drone recording to the attention of appropriate local or state law enforcement authorities for further review and investigation, and also advise the state Department of Transportation.

Conclusion:

Engineer A took appropriate steps to bring this matter to the attention of the state Department of Transportation, Engineer A's client and an appropriate authority. While the BER believes Engineer A fulfilled his ethical responsibility under the NSPE Code of Ethics, since this is a matter of significant public interest and concern and relates to the public health and safety, the BER is of the view that Engineer A should also properly bring the existence of the drone recording to the attention of appropriate local or state law enforcement authorities for further review and investigation, and also advise the state Department of Transportation.

January 1986 – The Challenger Space Shuttle Disaster

We all remember that morning, watching the launch on TV and happened in the first minute and a half. I will review this in a little more detail later in this presentation, but wanted to get to this point:

In a powerful book about the disintegration immediately after the launch of the Challenger in January 1986, Sociologist Diane Vaughan described a phenomenon inside engineering organizations that she called the **"Normalization of Deviance"**.

She augured, there can be a tendency to slowly and progressively create rationales that justify ever-riskier behaviors. The Challenger shuttle had been through nine successful launches, in progressively lower ambient temperatures. Each time the launch team got away with lower temperature launches, Vaughan argued, engineers noted the deviance, then decided it wasn't sufficiently different from what they had done before to constitute a problem. They effectively declared the mildly abnormal normal, making deviant behavior acceptable.

Think about this in your profession and what it means to your designs.

An Engineering Theory of the Volkswagen Scandal

Article By Paul Kedrosky, October 16, 2015

As per this article, Mr. Kedrosky states, “Volkswagen of American C. E. O. Michael Horn told a House Subcommittee investigating his company’s ongoing emissions scandal that it wasn’t a corporate decision to cheat emissions test by installing “defeat’ software in eleven million diesel cars. Instead, Horn said, it was “a couple of software engineers. Indeed, it is hard to believe a couple of rouge engineers took it upon themselves to writ and install software that slashed emissions on Volkswagen diesels, but only when the cars were being tested, then kept it from senior company figures?”

After much investigation this is what Mr. Kedrosky states:

“If this was, in fact, the case, then Horn was basically right, that engineers were responsible. The Scandal wouldn’t have been caused by a few rouge engineers, though, so much as be the nature of engineering organizations themselves. Faced with an expensively engineered diesel engine that couldn’t meet strict emissions standards, Volkswagen engineers “tuned’ their engine software. And they kept on tuning it, normalizing deviance along the way, until they were far from where they started, to the point of gaming the emissions test by detecting test conditions and re-calibrating the engine accordingly on the fly.”

See that term – **Normalization of Deviance** again!!

Speaking of the Challenger Space Shuttle Disaster

Who knows who Al McDonald is????

How does he fit into this discussion???

Al McDonald – Directed the Booster Rocket Project for Morton Thiokol.

He stated in an interview with Mark Maier of Chapman University:

He was at the Kennedy Space Center in Florida for the launch of the Challenger "to approve or disapprove a launch if something came up," he told me in 2016, 30 years after Challenger exploded.

His job was to sign and submit an official form. Sign the form, he believed, and he'd risk the lives of the seven astronauts set to board the spacecraft the next morning.

Refuse to sign, and he'd risk his job, his career and the good life he'd built for his wife and four children.

"And I made the smartest decision I ever made in my lifetime," McDonald told me. "I refused to sign it. I just thought we were taking risks we shouldn't be taking.“

"There are two ways in which [McDonald's] actions were heroic," recalls Mark Maier,

"One was on the night before the launch, refusing to sign off on the launch authorization and continuing to argue against it," Maier says.

"And then afterwards in the aftermath, exposing the cover-up that NASA was engaged in."

Twelve days after Challenger exploded, McDonald stood up in a closed hearing of a presidential commission investigating the tragedy. He was "in the cheap seats in the back" when he raised his hand and spoke. He had just heard a NASA official completely gloss over a fundamental fact.

McDonald and his team of Thiokol engineers had strenuously opposed the launch, arguing that freezing overnight temperatures, as low as 18 degrees F, meant that the O-rings at the booster rocket joints would likely stiffen and fail to contain the explosive fuel burning inside the rockets. They presented data showing that O-rings had lost elasticity at a much warmer temperature,

53 degrees F, during an earlier launch.

The NASA official simply said that Thiokol had some concerns but approved the launch. He neglected to say that the approval came only after Thiokol executives, under intense pressure from NASA officials, **overruled the engineers**.

"What we should remember about Al McDonald [is] he would often stress his laws of the seven R's," Maier says.

"It was always, always do the right thing for the right reason at the right time with the right people. [And] you will have no regrets for the rest of your life.“

"It's really that simple if you just keep it focused that way," McDonald told me in 2016.

Remember, this Engineer was willing to risk everything

TO DO THE RIGHT THING

Conclusions:

- **Ethics in Engineering** is of upmost importance
- It is your duty as a Professional Engineer to **"safeguard life, health and property and promote the public welfare.**

- **As stated by Luther Cox, P. E.**

a. Know your limitations, know your subject matter well
b. Learn your limitations, learn from your mistakes
c. Always check your work

- **Respect** your Professional Engineer License and Stamp, provide Honest Service
- Always do the **RIGHT** and **ETHICAL** things in both your Professional and Personal Life
- Be **Totally Transparent** in all that you do

Questions ???

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