Supporting Engineers in Their Ethics Character Development

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A licensed engineer is legally and ethically obliged to protect the public's health, safety, and welfare—not just to *protect*, but according to many codes of ethics to *hold paramount*. He or she must abide by the laws and rules that govern the practice of engineering in the state in which he or she is licensed. A state's laws and rules lay out the responsibilities of engineers, requiring them to meet specified minimum standards, follow certain procedures, and practice professionally and responsibly. When a licensed engineer violates those laws or rules, the honor of the engineering profession is compromised, along with the public's trust. More importantly, the public's health, safety, and welfare can be at risk, and therefore, the state's licensing board has the authority to take disciplinary action and impose penalties on the engineer.

From my experience serving on the licensing board of professional engineers in Florida, complaints are often filed against engineers by building officials after they review drawings submitted for permitting purposes. Some are filed by homeowners who, for example, are angry about an insurance claim and an engineer's report that is not in their favor. Sometimes a complaint is made by an engineer from a competing firm. (But anyone can make a complaint.) Common disciplinary cases include:

- Practicing outside one's area of competence
- "Plan stamping," where the engineer signs and seals drawings for which he or she did not have personal professional knowledge or did not author
- Missing details on design drawings
- Performing inadequate or non-code-conforming design calculations (or not doing them at all)
- Failing to report a felony criminal conviction (whether or not it is related to the practice of engineering)

Many engineering societies have codes of ethics. Although a licensed engineer is not legally bound to these ethics codes, many aspects of the laws and rules by which an engineer must abide are based on them. In addition to holding paramount the public's health, safety, and welfare, some codes of ethics include protection of the environment as a responsibility. This may include life-cycle design or disposal of a project or product at the end of its service life.

In recent decades, the subject of engineering ethics has earned its place as a broad professional concern rather than a philosophical issue or personal concern. This is evidenced by the establishment of several bodies to study and bring awareness to ethics-related issues, such as the National Institute for Engineering Ethics, the Murdough Center for Engineering Professionalism, the Center for Engineering Ethics and Society and their Online Ethics Center, codes of ethics established by most engineering societies, the National Society of Professional Engineers' (NSPE's) Board of Ethical Review, and NSPE's annual Milton F. Lunch Ethics Contest. In the past, ethics discussions were usually centered around major catastrophic failures or design flaws; lately, the discussions have expanded to include day-to-day dilemmas that involve the integrity of the profession.

Ethics is taught in engineering curricula for all disciplines. This can be attributed mostly to ethics criteria for engineering program accreditation. Programs can provide instruction on ethics in several ways, for example, by requiring an ethics course taught in a humanities department, by requiring a stand-alone engineering ethics course, or by teaching ethics throughout the curriculum. Case studies, such as those published by the NSPE's Board of Ethical Review, are excellent educational tools. Ring ceremonies for the Order of the Engineer also bring attention to ethical practice. (For more on the Order of the Engineer, see the sidebar.)

Teaching ethics to engineering students has its challenges, though. Throughout most of the curriculum, students are taught to solve problems where there is one clear, correct answer (in design courses, there may be multiple correct solutions). But some ethical dilemmas do not have a right or wrong answer, which can be uncomfortable to students and unchartered territory for faculty.

Some ethical dilemmas have multiple constraints that cannot all be addressed simultaneously. Other challenges to teaching ethics include an already tight curriculum and faculty who are committed to teaching courses in their area of expertise. Faculty are usually well-versed in responsible conduct of research and probably have access to training in this area. However, many have never practiced as an engineer and do not have firsthand knowledge of the day-to-day challenges of being in responsible charge of a design. They may not feel prepared or comfortable teaching ethical dilemmas because they are generally nontechnical in nature.

Team projects in school do not always effectively teach students about individual professional responsibility; teamwork sometimes sends the wrong message that it "just needs to get done in the end." It gets even more complicated in the office: an engineer completes only a part of design, while other engineers do the rest. Who is responsible for the design? Legally,

the engineer who signs and seals the documents is responsible. A developing engineer might take too much comfort in this; he or she shouldn't assume that the Engineer of Record will be able to pick up all errors that the engineer interns or junior engineers make.

Engineering firms that have a culture of quality control—checking calculations and drawings to identify errors and deficiencies before they leave the office—understand this. However, this type of quality control is rarely taught or carried out in academic coursework and is even lacking in some engineering firms.

Developing engineers (recently graduated), who are not yet licensed, are impressionable and perhaps even vulnerable. They need nurturing by employers and mentors to help them develop professional character. New engineers might put too much trust in others, be afraid of looking dumb and therefore not ask questions when needed, or avoid challenging authority when something doesn't seem professionally or technically correct.

This is a call for senior engineers to help engineering trainees develop their ethics character.

They might not fully understand their responsibilities in design and how they fit with colleagues' work. They may struggle with meeting multiple constraints such as getting the job done on time, economy, reputation, or profitability. Or they might not know how to prioritize their obligations to society, clients, employer, supervisor, and profession. Developing engineers climb a steep learning curve with regard to technical matters. The same is true for ethical matters. This is a call for senior engineers to help engineering trainees develop their ethics character. They will remember your guidance for years to come and will carry on your legacy.

After becoming licensed, engineers should stay current with a state's laws and rules as well as ethics. Several licensing boards require continuing education courses in laws, rules, or ethics to be completed for licensure renewal. I hope that in the future more boards will require this.

The ethics conversation is not just about avoiding the next disaster; it's also about ordinary decisions that engineers make to serve society well and to preserve our profession's integrity and respect.

What about engineers who practice in exempt disciplines but never get licensed or who work for governmental agencies that do not require licensure? Professional societies should also continue to do their part to reach them.

All engineers are responsible for engineering ethics education: faculty, employers, mentors, supervisors, licensing boards, and engineering societies. It is good that many professional societies and organizations are rallying around the need for more ethics' education. They are providing faculty and practitioners with much-needed resources for this endeavor. However, there is still work that needs to be done to help recent graduates who are gaining their experience towards licensure.

The ethics conversation certainly needs to happen in the workplace—not just about the "no-brainer" dilemmas, but the subtle ones, too. Daily, mentors can identify situations where they made an ethical choice and use them to coach developing engineers. The ethics conversation is not just about avoiding the next disaster; it's also about ordinary decisions that engineers make to serve society well and to preserve our profession's integrity and respect. A

EDITOR'S NOTE

NSPE's Code of Ethics can be read or downloaded from this webpage: https://www.nspe.org/resources/ethics/code-ethics.

The Order of the Engineer

The Order of the Engineer is a national organization whose purpose is to:

- Foster a spirit of pride and responsibility in the engineering profession
- Bridge the gap between training and experience
- Show the public a symbol (a ring) that identifies the engineer

During a ring ceremony, an initiate takes the "Obligation of the Engineer" oath and receives a stainless-steel ring to wear on the pinky finger of the working hand. When signing and sealing design plans, the engineer is reminded of his/her obligation when the ring makes a clanking sound against their seal embosser. The obligation contains parts of the ethics codes of major engineering societies. It is akin to the Hippocratic oath that doctors take at the beginning of their medical practice.

Eligibility includes licensed professional engineers, graduates from ABET-accredited programs, and senior students within one academic year of graduation. Engineers from all disciplines may be inducted. Individuals with other credentials can ask for approval from the Order's board. Induction is for life, but there are no membership meetings or dues to pay. Several societies and universities hold Order of the Engineer ceremonies for students and practicing engineers.

For more information, visit www.order-of-the-engineer.org.

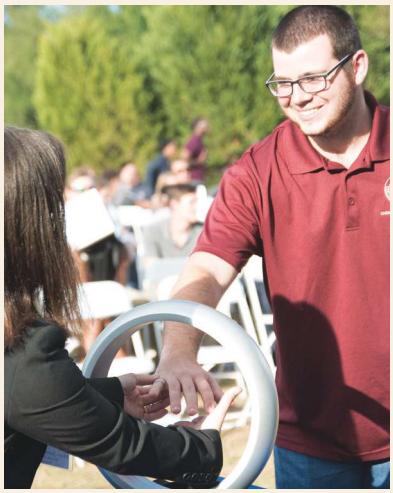

Photo: Kevin Hubbard