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General Principles of Engineering Ethics

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Chapter 1

Professional Responsibility

Engineering Ethics

Engineering ethics is (1) the study of moral issues and decisions confronting individuals and organizations involved in engineering and (2) the study of related questions about moral conduct, character, ideals and relationships of peoples and organizations involved in technological development (Martin and Schinzinger, *Ethics in Engineering*).

Principles of Professional Responsibility

We, as Professional Engineers, are expected to take reasonable precautions and care in fulfilling our engineering duties and uphold the honor and integrity of our profession. To understand further what this means, let's review the following principles of professional responsibility:

- *You must hold the utmost safety, health, and welfare of the public when practicing your profession.*
- *You must perform services only in the areas of your competence.*
- *You may issue public statements in an objective and truthful manner and disclose any personal connections you may have with the subject.*
- *You must represent each employer or client as a faithful trustee and avoid conflicts of interest.*
- *You must build your professional reputation on the merit of your services and must not compete with others unfairly.*
- *You must respect the proprietary information and intellectual property rights of other engineers.*

Now, to understand further what these principles mean, let's review the ethical standards associated with each principle individually.

How should you hold the utmost safety, health, and welfare of the public when practicing your profession?

If your professional judgment is overruled such that the safety, health and welfare of the public are compromised, you must inform your client, employer, or both of the possible outcomes or consequences.

If you believe that another person is in violation of engineering ethics, you must:

- present such information to the proper authority in writing, and
- cooperate with the proper authority in furnishing such information or assistance as required.

You must strive to advance the safety, health, and well-being of your community.

You must understand that the safety, health and welfare of the public are reliant on your sound engineering applications and judgments integrated into buildings, structures, machines, products, processes and devices.

You may approve or seal design documents only when they are:

- reviewed by you,
- designed safely, and
- in conformance with accepted engineering standards.

What does it mean to perform services only in the areas of your competence?

You must not affix your signature or seal to any plan or document if:

- it does not comply with applicable technical standards, or
- it was not prepared under your supervisory guidance and control.

You may conduct engineering work only when qualified by your academic background and professional experience in the specific field of engineering you are involved with.

You must always continue to advance your professional development in your engineering field by:

- engaging in professional practice,
- participating in continuing education programs,
- reading technical literature, and
- attending professional seminars.

You may accept an assignment requiring education and experience outside of your field of competence, provided that each technical segment of this assignment is reviewed, signed and sealed only by the qualified engineers who were in responsible charge of their respective segments.

Under what conditions you may issue public statements?

When serving as an expert or technical witness, you may express an engineering opinion only if it is founded on:

- your adequate knowledge of the facts,
- your technical competence in the subject matter, and
- your honest belief in the accuracy of your testimony.

You must not issue any statements, criticisms, or arguments on technical matters which are inspired or paid for by interested parties, unless you preface your comments by:

- identifying the interested parties on whose behalf the statements are made, and
- disclosing any financial interest you may have in such matters.

You must strive to extend the public knowledge and appreciation of engineering and its achievements and must avoid the use of untrue or exaggerated statements pertaining to engineering.

You must be objective and truthful in all your professional reports, statements, or testimony, and must include all relevant information in such reports, statements, or testimony.

You must be honest in explaining your work and merit, and must not promote your own interests at the expense of the integrity, dignity and honor of the profession.

How should you represent each employer or client as a faithful trustee, and avoid conflicts of interest?

You must avoid all known conflicts of interest with your employer or client and immediately inform your employer or client of any business relationship, interest, or other situations that could influence your judgment or quality of your services.

You must not accept payment or other types of compensation from more than one party for services pertaining to the same project, unless the conditions are fully revealed to, and agreed to by, all interested parties.

You must not accept employment outside of your regular work before notifying your employer.

You must not propose or receive gifts or gratuities from outside parties who have a business affiliation with your employer or client associated with professional work for which you are in responsible charge.

If you are a member, advisor, or employee of a governmental body, you must not participate in decisions or actions that involve services you or your organization provide in any type of engineering practice.

Based on your research and evaluation, you must advise your employer or client of your belief that a project will be unsuccessful.

You must not use confidential information provided to you while executing your assignment as a means of personal gain, if such action contradicts the interests of your employer, your client, or the public.

You must not solicit or accept financial or other valuable considerations from material or equipment suppliers for specifying their product.

You must not solicit or accept an engineering contract from a governmental body or other entity on which a principal, officer, or employee of your organization serves as a member.

How do you build your professional reputation on the merit of your services and not compete with others unfairly?

You must not influence the award of a contract. You may bid and negotiate a contract for professional services impartially based on your proven competence and qualifications for the type of professional service being solicited.

You must not strive to gain employment or advance your professional career by falsely condemning other engineers, or by other improper means.

You must not falsify your educational background, or your professional experience or qualifications.

You must not offer or accept any gift, gratuity or unlawful valuable consideration to secure work, exclusive of securing salaried positions through employment agencies.

You must not request, propose, or accept a commission on a provisional basis if your professional judgment may be compromised.

You must not use another engineer's ideas or written materials without due credit and advance notification to such engineer. You must, whenever possible, name the person who may be responsible for his or her designs, inventions, writings, or other accomplishments.

You must not harm the professional reputation, prospects, practice or employment of another engineer.

You may prepare engineering articles to be published provided:

- they are within the context of your competency, and
- you do not claim credit for work performed by others.

How should you handle proprietary information and intellectual property rights of other engineers?

You must not promote or arrange for new employment or practice in connection with a specific project in which you have gained specialized knowledge without the consent of all interested parties.

You must not disclose confidential information concerning the business affairs or technical processes of any present or former employer or client without the approval of your employer or client.

If you are using designs supplied by your client, you must be aware that such designs remain the property of your client and may not be duplicated for others without your client's expressed permission.

Before undertaking work for others in which you may make improvements, plans, designs, inventions, or other records that may justify copyrights, patents, or proprietary rights, you must enter into a positive agreement regarding ownership.

You must be aware that your designs, data, records and notes referring exclusively to your employer's work are the property of your employer.

Chapter 2

Professional Practice & Ethics: Case Studies

As explained in Chapter 1, we, as Professional Engineers, are expected to take reasonable precautions or care in the practice of our engineering profession as we must hold paramount the safety, health and welfare of the public. So, what happens when we fall short of our professional responsibilities, for which we were entrusted by the public when we earned our honorable title of “Professional Engineer”?

The following ethical case studies were randomly selected to emphasize the different scenarios of professional misconduct and their potential consequences.

CASE STUDY 1:

Omega, P.Eng., as a process engineer for Universal Chemical Corporation (Universal) signed a secrecy agreement with Universal that prohibits Omega from divulging information that the firm considers proprietary. Universal developed an adaptation of a standard piece of equipment that makes it highly efficient for cooling viscous plastics slurry. The company decided not to patent the idea but to keep it a trade secret.

Omega subsequently left the employment of Universal to work for a candy processing facility that is not in any way competition to Universal. Omega soon realized that a modification similar to Universal's trade secret could be applied to a machine used for cooking fudge and at once arranged for the change to be made.name on the report.

Has Omega acted unethically? Did he commit professional misconduct? What other steps, if any, should Omega have taken?

Omega has a duty to act with fairness and loyalty to his former employer and has a duty to regard as confidential information obtained as to the technical methods or processes of an employer.

As this is a specific process, it cannot be considered a skill of the engineer who is aware of it and therefore, by common law, Omega has a duty of confidence to his former employer.

Any process has a number of sub-processes and components associated with it. If the modification of the process used at Universal is only one sub-process that uses only a relatively small number of components, and it is reasonable to understand that the original process could not in any way be reconstructed from the modification, then it may be reasonable to use the modification.

If, however, the modification is only a small variation of the original process, it would be unreasonable to apply the modification without an agreement with Universal. The justification for this statement is that knowledge of the modified process may allow a third party to realize that it could have been used in a situation similar to the original purpose of the process and therefore potentially affect Universal.

If Omega had not arranged for the change yet, he should first approach his employer, indicate that there is a modification which exists which could improve upon the current processes and provide an estimate as to the savings. If his employer agrees, Omega could then act as an agent and approach Universal to determine if there are any conditions under which the trade secret could be licensed.

If Omega has already arranged for the change in such a way that others are aware of it, Omega may already be guilty of professional misconduct and his employer may be vicariously liable to Universal who may have the right to sue the company for damages. In this case, it is Omega's responsibility to inform his employer and to mitigate any potential damage caused by his actions.

CASE STUDY 2:

Alpha is a P.Eng. employed by EngInc, an engineering company. As Chief Project Engineering, Alpha is in charge of a project for BigGuy, an important client of EngInc. BigGuy and Alpha have several disagreements over the design that Alpha has developed. BigGuy wants a cheaper, more conventional solution. Alpha is convinced that the design is a "masterpiece" and believes that BigGuy "doesn't have an ounce of imagination". Alpha simply shrugs off BigGuy and refuses to discuss any other alternative.

BigGuy is furious and phones Beta, P.Eng., the president of EngInc, to yell and complain about Alpha. BigGuy threatens to hire another engineering firm to complete the design according to BigGuy's wishes.

You work for EngInc as an intermediate design engineer. Beta calls you into a private office and closes the door. Beta asks you to review Alpha's design and instructs you to keep the review a secret from Alpha. Beta explains that Alpha is a senior engineer who has been with EngInc for 28 years and could be "a bit sensitive at times".

What do you tell Beta?

Alpha is another professional engineer, and therefore it is necessary that you and Beta act at all times with fairness and loyalty and with courtesy and good faith. In addition, as Alpha is still employed by EngInc, it would be unethical to accept an engagement to review the work of another practitioner for the same employer except with the knowledge of the other practitioner.

One may suggest to Beta to discuss the issues with Alpha, but not in the presence of the client, BigGuy. It should be emphasized that the purpose of providing engineering services is to create a design that safeguards the economic interests, as well as others, of the client. Consequently, an unconventional design, no matter how imaginative or correct, that unnecessarily causes increased economic costs on the client, should be cautioned against if there are cheaper alternatives that continue to satisfy other requirements of protecting the public welfare, the environment, etc.

Additionally, it may be considered to be a professional misconduct to provide a design that does not make reasonable provision for safeguarding the finances of the client. If the masterpiece is unnecessarily extravagant with the sole purpose of allowing Alpha to demonstrate his abilities, this could even potentially be seen as negligence if the design would not meet the standards that a reasonable and prudent practitioner would maintain in these circumstances.

What do you think of Alpha's conduct in dealing with BigGuy? How should Alpha have responded to BigGuy's request?

By "shrugging off" the client and refusing to discuss any other alternatives, Alpha is neither acting with fairness nor with loyalty to his client. In addition to displaying hubris, a good engineering design does not require imagination. The purpose of a design is to satisfy the requirements of the client while maintain the protection of the safety and welfare of the public and other interests as well as complying with applicable statutes, regulations, standards, codes, by-laws, and rules. As the client is paying for the design, Alpha should address the concerns of BigGuy and indicate exactly why this design deviates so significantly from other conventional designs.

Additionally, as Alpha is an employee engineer of EngInc, by perhaps unnecessarily antagonizing a client, he may be threatening the relationship between EngInc and the client, and is therefore not acting with fairness to his employer.

CASE STUDY 3:

Omega, a P.Eng. with many years of experience and a valid Certificate of Authorization, was hired by ABC to design a fire protection system for a new building and supervise its installation. Omega produced the design and gave signed, sealed and dated copies of the final design to Theta (P.Eng.) of Faultless to install. Faultless is a contractor hired by ABC and Theta is their project manager.

Once the installation was complete, Omega provided the city with a sealed, signed and dated report affirming that the fire protection system had been installed as designed and that it met all codes and standards. Omega did not check the installation but had depended on the assurance of Theta who said that it had been installed as designed. Omega had worked with Theta and Faultless for many years and was very confident about their work.

Three months later the city conducted a building review and found twenty deficiencies in the as-built work. They issued a letter to Omega requesting that the construction be fixed to comply with the design and standards. Omega forwarded the letter to Theta and asked her to make the necessary changes. Theta made some modifications and informed Omega a few weeks later that all the changes had been made. Omega then sent the city another sealed, signed and dated report affirming that the fire protection system had been installed as designed and that it met all codes and standards.

A second building inspection by the city found that a number of significant deficiencies still remained.

What do you think of Omega's conduct? What consequences may he face? (Keep in mind that the deficiencies appear to be the result of the installation and not the design.)

First, Omega is expected to regard his duty to the public welfare as paramount. He is also expected to have fidelity to public needs by ensuring that the installation is safe. In devotion to high ideals of personal honor and professional integrity, he should not seal a report verifying that work had been performed when that work had not checked by himself.

On two occasions, Omega acted unprofessionally by signing and sealing a report that was not actually checked by himself. As a fire protection system is in place primarily for safeguarding the life of those using the facilities in which it is installed, checking the installation would be considered a reasonable provision the engineer should take into account. In addition, checking the installation would also be a responsible provision for ensuring the installation complies with applicable statutes, regulations, standards, codes, by-laws and rules in connection with the

work under the responsibility of the practitioner. Finally, given that the original installation had twenty deficiencies, to verify that those deficiencies had all been corrected would be an action that a reasonable and prudent practitioner would maintain in this circumstance, and failure to do so would therefore, again, constitute negligence. One may be able to argue that, while being unprofessional, the first lapse did not necessarily constitute negligence; however, the second lapse almost certainly did.

What do you think Theta’s conduct? What consequences may she face?

As Theta is overseeing the installation of a fire suppression system, she should regard her duty to public welfare as paramount. In addition, she should be faithful to the public needs in providing an environment that is safe.

Next, Theta should act toward Omega with good faith, and this would include inspecting the installation and conveying correct information to Omega. This also applies when the deficiencies were being corrected. In addition, by not verifying—or even possibly deceiving—Omega, this does not present the loyalty one would expect to one's associate.

By not ensuring that the installation was compliant with the design on two occasions, this would constitute a failure to make reasonable provisions for safeguarding the life and health of those using the facilities; a failure to make responsible provisions for complying with applicable statutes, regulations, standards, codes, by-laws and rules in connection with work being undertaken by the practitioner; an act that constitutes a failure to maintain the standards that a reasonable and prudent practitioner would maintain in the position of supervision the installation, and therefore negligence, and possibly conduct that would be regarded as dishonorable or unprofessional.

Appendix A

References

Engineers Canada – Code of Ethics

<https://engineerscanada.ca/publications/public-guideline-on-the-code-of-ethics#-the-code-of-ethics>

University of Waterloo - Professional Practice and Ethics: Case Studies

https://ece.uwaterloo.ca/~dwharder/PPE/Part_A_cases/

NSPE Code of Ethics

<http://www.nspe.org/resources/ethics/code-ethics>

ASCE Code of Ethics

<https://www.asce.org/career-growth/ethics/code-of-ethics>

ASME Code of Ethics

<https://www.asme.org/wwwasmeorg/media/resourcefiles/aboutasme/get%20involved/advocacy/policy-publications/p-15-7-ethics.pdf>