

CENG 6101 Project Management

Ethics in Civil Engineering

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What is Meant by Ethics?



What is Meant by Ethics?



- System of moral principles
 - Principles of right and wrong
- Principles of conduct governing behavior of an individual or a group

<http://www.yourdictionary.com/library/reference/define-ethics.html>

What is Meant by Ethics?

A person's behavior is always ethical when one:

- A. Does what is best for oneself
- B. Has good intentions, no matter how things turn out
- C. Does what is best for everyone
- D. Does what is legal

Ethics in an Engineering

We have been studying engineering, such as design, analysis, and performance measurement.



Where does ethics fit in?

<http://www.free-clep-prep.com/Business-Ethics-and-Society-DSST.html>

How Ethics Fits into Engineering

- Engineers . . .
 - **Build products** such as cell phones, home appliances, heart valves, bridges, & cars. In general they advance society by building new technology.
 - **Develop processes**, such as the process to convert salt water into fresh water or the process to recycle bottles. These processes change how we live and what we can accomplish.

Products and processes have consequences for society:

- If the bridge has an inadequate support, it will fail.
- If the gas tank is positioned too close to the bumper, it might explode from a small accident.
- If a medical instrument isn't accurate, improper doses of medication can be given.
- If the process for refining gas produces too much toxins, it harms the local community.



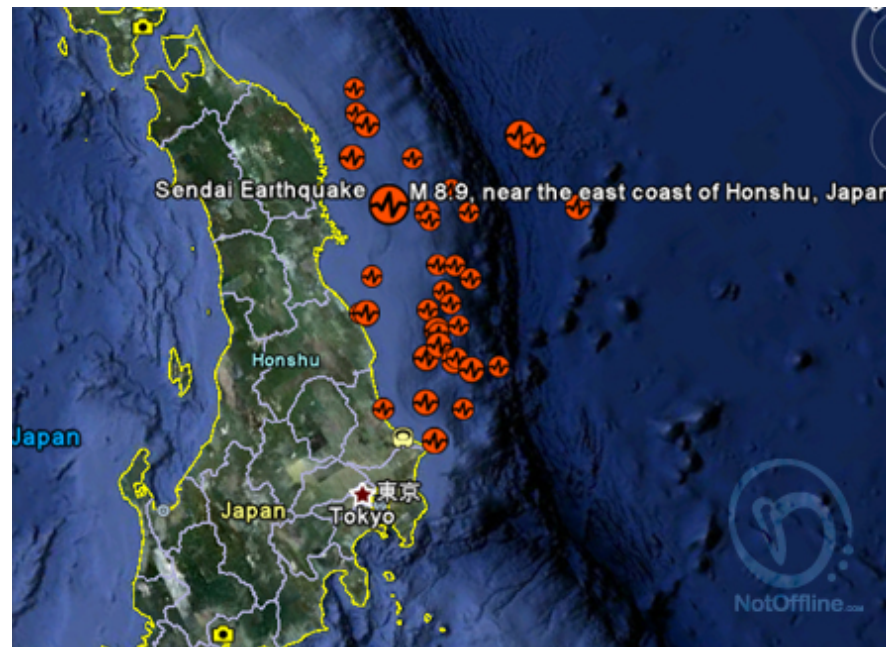
How Ethics Fits into Engineering

Decisions made by engineers usually have serious consequences to people -- often to multitudes of people.

Ethics and ethical reasoning guide decision-making.

How Ethics Fits into Engineering

Consider the March 11, 2011 8.9 magnitude earthquake near Sendai, Japan.



How Ethics Fits into Engineering

The damage to the Fukushima I Nuclear Power Plant (*Fukushima Dai-ichi*) has led people worldwide to rethink the ethics of nuclear power.



How Ethics Fits into Engineering

Notice the issues that come up in these discussions:

ISSUE #1: HEALTH AND SAFETY

RISKS: Danger to current and future generations from leakage of radio-isotopes used in nuclear power.

Plutonium-239 (half-life = 24,110 yrs) is a particularly toxic radio-isotope. Normally, 10 half lives are required before a Pu-239 contaminated area is considered safe again, in the case of plutonium, roughly **250,000 years**.

So if Pu leaked, -- say, due to an earthquake -- it would cause a health risk for roughly 8000 generations!!



How Ethics Fits into Engineering

Issues (cont.):

ISSUE #1: HEALTH AND SAFETY RISKS, FURTHER CONSIDERATIONS:

a) The possibility of medical science discovering a cure for cancer sometime in the current or next centuries adds uncertainty to the long-term health risks of leakages of radioactive isotopes.



How Ethics Fits into Engineering

Issues (cont.):

ISSUE #1: HEALTH AND SAFETY RISKS, FURTHER CONSIDERATIONS:

b) The use of nuclear power may increase our knowledge of radioisotopes used for medical purposes (possible benefit?).



How Ethics Fits into Engineering

Issues that come up in these discussions:

CONSEQUENCES OF ALTERNATIVES TO NUCLEAR POWER.

ISSUE #2: DEPLETION OF RESOURCES:

Fossil fuels, oil, natural gas and coal, are non-renewable. These resources also affect the goal of *health* because of their impact on pollution and climate changes.



How Ethics Fits into Engineering

Issues that come up in these discussions:

CONSEQUENCES OF
ALTERNATIVES TO NUCLEAR
POWER.

ISSUE #3: COMPARATIVE ECONOMIC
COSTS OF RENEWABLE SOURCES.

Renewable sources such as hydro-electric-power, wind power, solar power, geo-thermal heat, agricultural biomass and tides do not cause the environmental hazards that fossil-fuels do.

But renewable sources must be balanced with the amount of energy needed to produce and maintain them and consequent environmental hazards. Currently, for example, the energy required to manufacture and install solar energy systems **comes from fossil fuels**.



Reasoning

The kind of reasoning that goes on in such discussions involves certain *goals* such as, in this case, health, safety and biodiversity.

The reasoning then focuses on finding the best – or at least the reasonably better -- *means* for obtaining those goals.



How Ethics Fits into Engineering

- This type of reasoning is often called practical reasoning.

It uses different methods from mathematics and the sciences.

Ethical reasoning is a type of practical reasoning that concerns certain societal or life-form goals, such as justice, equality, freedom, health and safety.

The Essence of Your Engineering Career

- Engineering is one of the most important professions in society.
- As engineers we *don't just build things and develop processes.*
- We build things and make processes *in order to better society.*
- In order to make society better we have to reflect constantly on the products and processes that we make.

Social Responsibility

- One main connection between ethics and engineering comes from the impact that engineered products and processes have on society.
- Engineers have to think about designing, building, and marketing products that benefit society.
- **Social Responsibility** requires taking into consideration the needs of society.

Typical Ethical Issues that Engineers Encounter

- Safety
- Acceptable risk
- Compliance
- Confidentiality
- Environmental health
- Data integrity
- Conflict of interest
- Honesty/Dishonesty
- Societal impact
- Fairness
- Accounting for uncertainty, etc.

Professional Responsibility

- Ethics has a second connection with engineering.
- It comes from the way in which being socially responsible puts duties and obligations on us individually.
- Ethics fits into engineering is through **professional responsibility**.

Two Dimensions of Ethics in Engineering

- o Ethics is part of engineering for two main reasons.
 - a) Engineers need to be **socially responsible** when building products and processes for society.
 - b) Social responsibility requires **professional responsibility**.

Code of Professional Ethics

- Code of Professional Ethics for the Construction Manager (CMAA)
(<http://cmaanet.org/code-of-ethics>)
- Code of Ethics by ASCE
(<http://www.asce.org/inside/ethics.cfm>)
- Code of Ethics by AGC
(<http://www.agc.org>)
- Code of ethics by U.S. Department of Transportation – Federal Highway Administration (FHWA)
(<http://www.fhwa.dot.gov/construction/cqit/ethcguid.cfm>)

Construction Management Association of America

Code of Professional Ethics

As a professional engaged in the business of providing construction management services, and as a member of the CM profession, I agree to conduct myself in my business in accordance with the following:

1. **Client Service.** I will serve my clients with honesty, integrity, competence, and objectivity, establishing a relationship of trust and confidence and furnishing my best skills and judgment consistent with the interests of my client.
2. **Representation of Qualifications.** I will only accept assignments for which I am qualified by my education, training, professional experience and technical competence, and I will assign staff to projects in accordance with their qualifications and commensurate with the services to be provided.

Code of Professional Ethics: CMAA

3. Standards of Practice. I will furnish my services in a manner consistent with the established and accepted standards of the profession and with the laws and regulations which govern its practice.
4. Fair Competition. I will build my professional reputation on the basis of my direct experience and service provided, and I will compete fairly and respectfully with my professional colleagues.
5. Conflicts of Interest. I will seek to avoid any and all conflicts of interest and will immediately acknowledge any influences and offer to withdraw from any assignment when any actual conflict exists which may impair my objectivity or integrity in the service of my clients.

Code of Professional Ethics: CMAA

6. Fair Compensation. I will negotiate fairly and openly with my clients in establishing a basis for compensation, and I will charge fees and expenses that are reasonable and commensurate with the services to be provided and the responsibilities and risks to be assumed.
7. Release of Information. I will release public statements that are truthful and objective, and I will keep information and records confidential when appropriate and protect the proprietary interests of my clients and professional colleagues.

Code of Professional Ethics: CMAA

8. Public Welfare. I will not participate in any racial, sexual or political discrimination related to any assignment I may undertake. I will avoid any conduct that would be considered unethical or will interfere or conflict with any laws, statutes or regulations, and I will uphold the safety, health and welfare of the public in the performance of my professional duties.
9. Professional Development. I will continue to develop my professional knowledge and competency as a practitioner, and I will contribute to the advancement of CM practice as a profession by fostering research and education and through the encouragement of subordinates and fellow practitioners.

Code of Professional Ethics: CMAA

10. Integrity of the Profession. I will avoid actions which promote my own self-interest at the expense of the profession, and I will uphold the standards of the construction management profession with honor and dignity.

Code of Professional Ethics

Fundamental Principles

- Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:
- using their knowledge and skill for the enhancement of human welfare and the environment;
- being honest and impartial and serving with fidelity the public, their employers and clients;
- striving to increase the competence and prestige of the engineering profession; and
- supporting the professional and technical societies of their disciplines.

Code of Professional Ethics: ASCE

Fundamental Canons

- Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
- Engineers shall perform services only in areas of their competence.
- Engineers shall issue public statements only in an objective and truthful manner.
- Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

Code of Professional Ethics: ASCE

- Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
- Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
- Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

Handling Ethical Dilemmas Models for Behavior

- Step 1 – Define the problem and apply the guidelines while blocking out possible mitigating factors (stick to the facts).
- Step 2 - Select the Approach (Best Ratio, Black and White or Full Potential)
- Step 3 - Step 2 will dictate what you do in step 3. Consistency is critical, fairness is also important.

PLUS Model

- **P(olitics)** - is the decision consistent with organization policies, procedures and guidelines
- **L(egal)** is it acceptable under applicable laws or regulations
- **U(niversal)** does it conform with principles or values organization has adopted
- **S(elf)** does it satisfy my personal definition of right

CASE 1

- The client plans a project and hires Engineer A to furnish complete engineering services for the project. Because of the potentially dangerous nature of implementing the design during the construction phase, Engineer A recommends to the client that a full-time, on-site project representative be hired for the project. After reviewing the completed project plans and costs, the client indicates to Engineer A that the project would be too costly if such a representative were hired. Engineer A proceeds with his work on the project.

CASE 1

Question:

- Was it ethical for Engineer A to proceed with his work on the project knowing that the client would not agree to hire a full-time project representative?

CASE 1

Code of Ethics:

“Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property, and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property, or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.”

“Engineers shall advise their clients or employers when they believe a project will not be successful.”

CASE 2

- Engineer B submitted a proposal to a county council following an interview concerning a project. The proposal included technical information and data that the council requested as a basis for the selection. Smith, a staff member of the council, made Engineer B's proposal available to Engineer A. Engineer A used Engineer B's proposal without Engineer B's consent in developing another proposal, which was subsequently submitted to the council. The extent to which Engineer A used Engineer B's information and data is in dispute between the parties.

CASE 2

Question:

- Was it unethical for Engineer A to use Engineer B's proposal without Engineer B's consent in order for Engineer A to develop a proposal which Engineer A subsequently submitted to the council?

CASE 2

Code of ethics:

- *"Engineers shall not compete unfairly with other engineers by attempting to obtain employment or advancement or professional engagements by taking advantage of a salaried position, by criticizing other engineers, or by other improper or questionable methods."*
- *"Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others."*
- *"Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments."*

CASE 3

- Engineer A is employed as the City Engineer/ Director of Public Works for a medium-sized city and is the only licensed professional engineer in a position of responsibility in the city government. The city has several large food processing plants that discharge very large amounts of vegetable wastes into the city's sanitary system during the canning season. Part of the canning season coincides with the rainy season. Engineer A has the responsibility for the disposal plant and beds and is directly responsible to City Administrator C. Technician B answers to Engineer A.

CASE 3

- During the course of her employment, Engineer A notifies Administrator C of the inadequate capacity of the plant and beds to handle the potential overflow during the rainy season and offers possible solutions. Engineer A has also discussed the problem privately with certain members of the city council without the permission of City Administrator C. City Administrator C has told Engineer A that "we will face the problem when it comes." City Administrator C orders Engineer A to discuss the problems only with him and warns her that her job is in danger if she disobeys.

CASE 3

- Engineer A again privately brings the problem up to other city officials. City Administrator C removes Engineer A from responsibility of the entire sanitary system and the chain of command by a letter instructing Technician B that he is to take responsible charge of the sanitary system and report directly to City Administrator C. Technician B asks for a clarification and is again instructed via memo by City Administrator C that he, Technician B, is completely responsible and is to report any interference by a third party to City Administrator C. Engineer A receives a copy of the memo. In addition, Engineer A is placed on probation and ordered not to discuss this matter further and that if she does she will be terminated.

CASE 3

- Engineer A continues in her capacity as City Engineer/Director of Public Works, assumes no responsibility for the disposal plant and beds, but continues to advise Technician B without the knowledge of City Administrator C.
- That winter during the canning season, particularly heavy storms occur in the city. It becomes obvious to those involved that if waste water from the ponds containing the domestic waste is not released to the local river, the ponds will overflow the levees and dump all waste into the river. Under state law, this condition is required to be reported to the state water pollution control authority, the agency responsible for monitoring and overseeing water quality in state streams and rivers.

CASE 3

Questions:

- a) Did Engineer A fulfill her ethical obligation by informing City Administrator C and certain members of the city council of her concerns? If you were Engineer A, how would you respond to this situation? Explain your answer using the Code of Ethics provided below

CASE 3

Relevant Code of Ethics:

1. *"Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health and welfare of the public in the performance of their professional duties."*
2. *"Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate."*
3. *"Engineers shall act in professional matters for each employer or client as faithful agents or trustees."*
- 4 *"Engineers shall not complete, sign, or seal plans and/or specifications that are not of a design safe to the public health and welfare and in conformity with accepted engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project."*

CASE 3

b) If you were a member of CMAA or ASCE, explain your answer using the Code of Ethics of your affiliated organization.

References:

- *Ethics for Engineers, Lecture, San José State University.*
- *Ethics in Construction Engineering and Management, Online.*