Ethics in Professional Practice

Course No: LE2-007

Credit: 2 PDH

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NOTE: This course provides background information on the philosophical models that guide ethical behavior, and then applies these models to specific situations in engineering codes of ethics.

*Some of the links contained in the course no longer function, but despite their unavailability, the course **still presents** an informative and practical guide to engineering ethics.*

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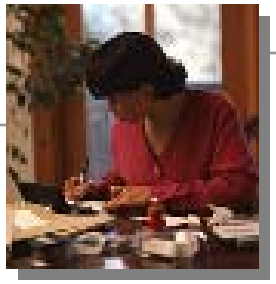

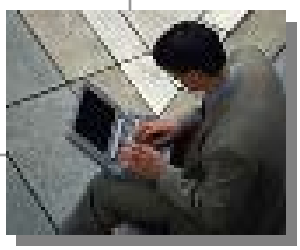

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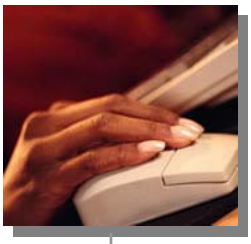

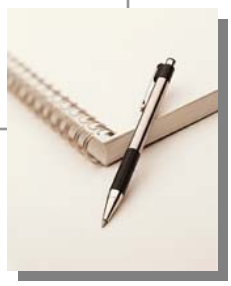

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Engineering Ethics

Introduction

Ethical misconduct seems to be the stuff of everyday headlines and news shows - we are bombarded with stories about the moral failings of our political leaders, top athletes, and entertainers. Engineers are also subject to public scrutiny: consider the attention that the media has given to cases such as the Challenger disaster, the Kansas City Hyatt-Regency Hotel walkways collapse, and the Exxon oil spill. New and expanding technological capabilities confront us with ethical temptations and dilemmas. For example, never before have we had to consider the ethical issues of human cloning, or ponder the possibility of a world-wide banking collapse. Computer-assisted design permits architects and engineers to refine their calculations so that they construct buildings with the thinnest, least expensive materials, reducing margins of error. Technology allows us to introduce innovations into our homes and work places, but we don't always take time to conduct research on the social, economic, and medical impacts they may have on our lives. The 21st Century promises to bring enormous ethical challenges. As a response to this concern, a new discipline, engineering ethics, is emerging.

Educational Goals

After you complete the this module, you will be able to:

- Determine ethical behavior using several philosophical models
- Evaluate a practical situation in terms of your professional code of ethics
- Be able to identify situations that represent conflicts of interest and formulate a proper response
- Apply the standards of professional ethics in technical communication

What exactly is "ethics?" In the literal context, ethics can be defined as "a body of moral principles." Professional ethics and conduct constitutes a set of rules and behaviors which facilitates effective interaction on professional matters. In this respect, ethical rules are very much like laws or standards that govern social and professional interactions. Ethical behavior may broadly be equated with the respect for one's colleagues, and for their rights.

Engineering is similar to professions such as law and medicine in that it has specialized knowledge, the privilege of self-regulation, and a responsibility to the public. We use our training and abilities to benefit society, and society expects that we will oversee and regulate the performance of our fellow engineers. Thus, our education and our professional practice must consider the ethical dimensions of engineering.

Professional ethics are not just a personal preference established and governed by the individual engineer. Because of the importance of professional behavior, most companies and professional societies have drafted codes of ethics to which their members are required to commit. Overall, the codes tend to be very similar. The ASME codes http://www.asme.org/asme/policies/p15-7.html are based on several fundamental principles, which provide guidance to professional engineers in commonly-encountered situations.

Nevertheless, there are many "gray areas" that can challenge engineers as they struggle to behave in an ethical and moral manner. In this course, we attempt to provide some background on the philosophical models that guide ethical behavior and then to apply these models to specific situations in engineering codes of ethics. Of course, it is incumbent on any professional practitioner to decide which principles apply in any given circumstance. When there is conflict between these guidelines, an engineer must use appropriate philosophical models and standards to decide.

Models of Ethics

There are various philosophical models and standards to ethics. The decision as to what constitutes ethical or unethical behavior may vary, depending upon the model applied to the situation. In this module, we'll look at specific cases from the perspectives of various models, including the following:

Engineering Ethics

Malpractice, or Minimalist, Model

This is a minimalist model in which the professional is concerned only with meeting standards and requirements of the profession and any other laws or codes that apply. This model looks to find fault when problems or accidents arise from someone's failure to meet a requirement.

Reasonable-Care, or Due-Care, Model

A model of engineering practice in which the engineer is expected to take reasonable precautions or care in the practice of his profession. The model strives to prevent harm, and it appeals to a "standard of reasonableness as seen by a normal, prudent nonprofessional."

Good Works Model

A model of engineering practice in which engineers go beyond the basics of what is required by standards and codes and do what they “ought” to do to improve product safety, social health or social well-being.

1 Canon #1

Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.

Overview

> *a) Engineers shall recognize that the safety, health and welfare of the public are dependent upon engineering decisions and practices incorporated into structures, machines, products, processes and devices.*
>
> *b) Engineers shall not approve or seal plans or specifications that are not designed safely and in conformity with accepted engineering standards.*
>
> *c) Whenever an engineer's professional judgments are overruled such that the safety, health, and welfare of the public are endangered, the engineer shall inform the client, the employer or both of the possible consequences.*
>
> *d) If an engineer believes that another person or firm may be in violation of any of the provisions of these canons, the engineer shall present such information to the proper authority in writing and shall cooperate with the proper authority in furnishing such further information or assistance as may be required.*

This first Canon clearly states that you must hold paramount the health and safety of society in the performance of your professional duties. The interpretations attempt to provide additional details, but a close reading shows they provide little true guidance. Interpretation (a) states that the decisions you make as an engineer have an impact on the welfare of the general public, and (b) says you must make plans and structures according to accepted engineering standards. Interpretations (c) and (d) describe the steps you could take to uphold the safety, health, and welfare of the public if you believe Canon 1 is being violated.

Interpretations a) and b)

The various models of engineering practice can also be considered when interpreting Canon 1. The Malpractice (or minimalist) model would assert that as long as standards are being followed, you have acted appropriately. The Reasonable Care (or Due-Care) model suggests that you must consider likely outcomes of your work and provide for them in the engineering design. The Good Works model extends the Reasonable Care approach to consider

what "should" be done to protect the public health and welfare.
Consider, for example, the location and support of the Ford Pinto gas tank. Was the Ford design a minimalist, reasonable care, or good works approach?

A minimalist might suggest that proper use of a car does not include accidents, and from this point of view, the original design is acceptable. Reasonable people know that accidents do happen, however, and most consumers would argue that vehicle designers should take a reasonable care approach and consider probable accidents, such as moderate-impact, rear-end collisions. According to this approach, the gas tank assembly should have been redesigned. A "good works" design might include a multi-cell bladder such as those in racecars, so that fuel spill and fire hazard are minimized if an accident occurs. But would consumers pay the additional cost for a "good works" design?

Canon 1 states that engineers will hold paramount the safety, health, and welfare of the public in the performance of their duties, but in reality, engineers must make tradeoffs between safety and cost when designing vehicles. The $11 bracket for the Pinto ($60 in 2009) does not seem like much, and increasing the price by this amount would probably not affect a purchase decision. There could be hundreds of such parts, though, and upgrading all of them might add thousands to the sticker price. To put things in perspective, note that the inflation-adjusted value of a human life, which was $200,000 in 1970 according to the NHTSA, is about $1,100,000 now.

Under Canon 1, what is the responsibility of the engineers working on the Pinto design or performing the economic analysis to justify a redesigned gas tank assembly? They could use the reversibility principle and ask themselves whether they would drive the car or, better still, whether they would let their teenage child drive it.

At a larger scale, what level of natural occurrence (e.g. hurricane; Mississippi River flooding) should the levees protecting New Orleans be designed to withstand? While Hurricane Katrina exposed some design and maintenance flaws, it also raised the issue of the level of protection that should be the basis for the design. Utilitarianism is the ethical model used to answer this type of question, but, as Hurricane Katrina demonstrated, costs and benefits are difficult to quantify. Our role as engineers is not only to ensure that the design is correct but also to question the design basis.

Interpretations c) and d)

Interpretations (c) and (d) describe steps you could take to uphold the safety, health, and welfare of the public if you believe Canon 1 is being violated, such as informing your clients and employers, or the proper authority. This is commonly called "whistleblowing" and is required, in many cases, by federal and state law. While interpretation (c) is not whistleblowing per se, since it requires only that you inform your clients and employers, it implies that you must determine whether appropriate corrective action has been taken. If not, then interpretation (d) becomes active and whistleblowing is required.

Consider the hypothetical case of an engineer reviewing plans, which have been approved by her supervising engineer, for a pedestrian overpass. When the engineer notices that safety railings are not on the drawings, she has a professional obligation under Canon 1 to alert her client or supervisor. She alerts her supervisor by e-mail, and several weeks later gets a new set of approved plans without the safety railings. Has the engineer satisfied her professional obligation to "hold paramount the safety, health, and welfare of the public"?

A classic case, prepared by the National Society of Professional Engineers (NSPE), is "Gilbane Gold." This short video raises a number of Canon 1 (and Canon 8) issues, and is especially recommended for young engineers.

A real case is that of Inez Austin, who followed interpretation (c) and raised her concerns with direct management and, as time went on, with higher levels of management. When the issue was not resolved to her satisfaction, she made her concerns public and was dismissed from her job.

2 Canon #2

Engineers shall perform services only in the areas of their competence; they shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

The ASME offers several interpretations of this canon:

a) Engineers shall undertake responsible charge of engineering assignments only when qualified by education and/or experience in the specific technical field of engineering involved.
b) Engineers may accept an assignment requiring education and/or experience outside of their own fields of competence, so long as those aspects and phases of the project are under the supervision and review responsibility of qualified associates, consultants, or employees with responsible charge.
c) Engineers shall negotiate contracts for professional services on the basis of demonstrated competence and qualifications for the type of professional service required.
d) Engineers shall not request, propose, or accept professional commissions on a contingent basis if, under the circumstances, their professional judgments may be compromised.
e) Engineers shall not falsify or permit misrepresentation of their, or their associates, academic or professional qualification. They shall not misrepresent or exaggerate their degrees of responsibility in or for the subject matter of prior assignments. Brochures or other presentations used to solicit personal employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or their accomplishments.
f) Engineers shall prepare engineering and technical articles for the lay or technical press which are only factual and within the context of the engineer's competency and level of experience.
    a. Technical Communications for publication (theses, articles, papers, reports, etc.) which are based on research involving more than one individual (including students and supervising faculty, industrial supervisor/researcher, or other co-workers) must recognize all significant contributors. Co-authors listed on proposed and accepted publications should have entered the joint authorship arrangement by mutual consent prior to submittal of the document for publication and should have received written permission to use any unpublished work of others which serves as the major basis or key component of the publication.
    b. Technical Communications should adhere to clearly defined and appropriately disseminated guidelines on authorship. These guidelines should be promulgated and publicized in corporate, university or other employer's policies and should be in accord with professional and technical society's recommendations on ethical practice.
    c. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.
g) Engineers shall not engage in plagiarism. The act of substantially using another's ideas or written materials without due credit and advance notification is unethical.
h) Engineers neither shall maliciously or falsely, directly or indirectly, injure the professional reputation, prospects, practice, or employment of another engineer, nor shall they indiscriminately criticize another's work. Engineers shall inform in advance another engineer whenever they plan to publicly criticize or critically comment upon another's work.
i.) Engineers shall not use equipment, supplies, and laboratory or office facilities of their employers to carry on outside private practice without consent nor without offering reimbursement for employers' costs.

Interpretations a), b), and c)

Clearly, in order to protect the safety, health and welfare of the public, you must be competent to provide professional advice. Professional licensure is a process managed by states and territories of the U.S. to certify that professionals in a variety of occupations, including engineering, are minimally competent. It is illegal to offer certain kinds of professional services to the public without a valid license. The issue of competence adds an ethical dimen-

sion, however. As with Canon 1, various models can be considered when interpreting Canon 2.

According to the Malpractice Model, if you meet the letter of the law, you have met the standard for competence. For example, in some states, professional engineering licensure is by discipline. If you are licensed as a mechanical engineer, having passed an examination and a review of your educational credentials and experience to establish your competence, you are legally permitted to design a mechanical system. Does it make any difference if the project you are working on is the design of a bridge crane, when all of your recent practice has been in HVAC? A Malpractice Model would say that you are legally permitted to work in your area of licensure as long as you follow all of the current codes and specifications. Competent engineers should be able to access and utilize codes and standards applicable to their disciplines.

The Due Care Model imposes a different standard. You must have the appropriate experience and training to complete the project without endangering the public, and you, or perhaps your employer, must decide whether you have the appropriate expertise to carry out a project. In this model, the legal issue of licensure is less important than the consequences of your professional activities on the health and safety of the public. Under this model, your licensure status alone is not an adequate guide to your competence. In many workplace settings, particularly within industries, professional licensure is neither required nor widely expected for those engineers who do not offer their services to the public.

The Good Works Model strives to best serve the interests of the public. This model focuses not on legality, but on what provides the greatest benefit to society.

Here is a case study of an engineer's professional qualifications to certify an installation: http://www.onlineethics.org/CMS/profpractice/ppcases/NSPEcases/BERindex/CompetenceBER.aspx. A licensed engineer is asked by his supervisor, who is also a military superior, to certify a facility. The engineer does not feel qualified. What should his response be? The Malpractice Model suggests that the engineer has the appropriate license, and could therefore legally sign the certification, even though he does not feel competent to do so. The Due-Care Model, however, would require that the engineer be confident in his ability to make a competent professional judgment.

In this case, the supervisor is also a military superior. How is the engineer to resolve the apparent conflict between his military duty and his professional engineering obligations? In a situation like this, the engineer might refuse his superior's request because he does not believe he (the engineer) is competent to certify the facility.

As you advance in your career, you are likely to manage increasingly complex projects that involve many people. It is incumbent on you to ensure that your subordinates are competent, since you probably won't have the expertise to oversee the technical details in all areas, but are responsible for ensuring that the public's safety is protected. As the manager, you bear ultimate responsibility for the entire project. The Malpractice Model requires that each engineering decision is approved by a licensed engineer. The Due-Care Model calls for you to determine whether each of the engineers involved is able to undertake his or her assignments, regardless of licensure. The critical issue is your responsibility to the public. You may not undertake projects unless you are technically qualified to do so. However, you may delegate portions of a project to other qualified personnel. Your responsibility in that case is to be secure in your determination that everyone working on the project is qualified to carry out his or her assignment.

Interpretation d)

Interpretation (d) states that engineers shall not request, propose, or accept professional commissions on a contingent basis if, under the circumstances, their professional judgments may be compromised. Work on a contingent basis means an engineer is engaged in an open-ended project with no fixed outcome, and the engineer's income derived from this work depends on the deliverables. The engineer may negotiate a fixed, dollar-per-hour professional service fee in advance.

This is essentially a conflict of interest issue (Canon 4). As noted in many texts, conflicts of interest can be per-

ceived, potential, or actual conflicts of interest. When your reward, commission, or fee is dependent, or appears to be dependent, upon your judgment of successful completion of the work, it will be difficult to avoid, at a minimum, the appearance of a conflict of interest. If successful completion of the work is judged solely by external reviewers (e.g. the contractor, independent review process), then the conflict tends to disappear. Thus proposing or requesting a contingent fee arrangement is most likely not in your best interest as it will be difficult to avoid conflicts with your professional judgment. However, if the contractor proposes the arrangement and defines the performance measures, then a contingent fee arrangement is most likely acceptable.

Consulting engineers are sometimes contracted to provide engineering services for projects that are in various phases of development, and, depending on the project's feasibility, the engineering services may continue to be needed. Thus there arises the potential conflict between the best interests of the consulting engineer and the client. Canon 4 should be reviewed, especially Interpretation (i), which states, "When, as a result of their studies, Engineers believe a project(s) will not be successful, they shall so advise their employer or client."

Consider the following situations of a consultant engineer working on a contingent contract (adapted from www.onlineethics.org/CMS/profpractice/ppcases/NSPEcases/BERindex/ContingentBER.aspx):

Mary Smith, P.E., a consulting engineer whose primary work is industrial product design, is requested by the XYZ Manufacturing Company to review an amplifier design. XYZ is under pressure to deliver a final model to a customer within three months, but has not yet developed an acceptable product. Smith spends a few days reviewing the XYZ design and makes several recommendations to improve it. She is paid her usual per diem fee, as agreed upon earlier. XYZ asks Smith for further assistance, to make the product fully acceptable, and proposes to pay her a fee for the additional service only if the amplifier, as a result of her assistance, will meet the company's requirements. During this period XYZ will pay Smith's out-of-pocket costs, such as travel, lodging and computer time.

Would it be ethical for Smith to enter into a contract arrangement as described?

It is important to note that XYZ made the offer to Smith; she did not propose the contingent arrangement as a device to secure work. It would be ethical for her to accept the offer, provided that her professional judgment will not be comprised by the outcomes of each phase of the project. Smith's judgment should also be guided by Canon 4, Interpretation (i), which states, "When, as a result of their studies, Engineers believe a project(s) will not be successful, they shall so advise their employer or client."

Interpretation (e)

Before the 1980s, most engineering codes contained provisions severely limiting advertising and price competition by engineers in private practice. Since then, the U.S. Supreme Court has issued decisions relaxing such restrictions in advertising and competitive bidding. Advertising can help a potential client become more knowledgeable about the services engineers provide, and competitive bidding may benefit the public by lowering costs for professional service. Canon 2 interpretations do not provide a standard of what constitutes "unfair" competition in advertising and competitive bidding.

If you are an engineer in private practice and you wish to advertise your service, what should you do? Examples of proper advertising, together with the interpretation of the NSPE's Board of Ethical Review, can be found in http://www.onlineethics.org/CMS/profpractice/ppcases/NSPEcases/BERindex/AdvertisingBER.aspx. These two cases address the appropriateness of giving calendars and pencils imprinted with the names of engineering service providers to potential clients.

Consider the following situation (Case Two, http://www.onlineethics.org/CMS/profpractice/ppcases/NSPEcases/BERindex/SlogansBER.aspx): Alfred is a sole practitioner in search of a new advertising slogan. He hires Francy, a professional marketing executive, to help him out. Francy suggests that Alfred market himself as "The Everything Engineer" in his promotions. But Alfred is concerned the slogan implies that he can do everything; that is, that he is competent as an engineer in all disciplines, contexts and areas. This might be misleading. On the other hand,

there are no limits placed on a practitioner's ability to practice several disciplines in several contexts. Should Alfred use this slogan for his campaign? Are there any other relevant factors that Alfred did not think of? Can Alfred market himself as "The Everything Engineer?"

Alfred should not use the slogan "The Everything Engineer" for his advertising campaign. This slogan does imply that he has prior professional experience in all areas of engineering, and would be in violation of Interpretation (c) which states engineers "shall not misrepresent or exaggerate their degrees of responsibility in or for the subject matter of prior assignments."
See also the discussion below relative to interpretation (g) [plagiarism] and its applicability to this interpretation.

Interpretation (f)

Interpretation (f) states that engineers shall prepare articles for the lay or technical press that are only factual. Does this interpretation imply that a registered engineer could not write an article about the future of engineering? Very often, distinguished engineers are asked by engineering societies or professional journals to comment on the current state of a specific engineering discipline and to speculate on future development. Since the article will be future oriented, its substance will not be based on facts that are verifiable, but the article may still be valuable to the engineering community and the public. Or, the engineer may be a practicing author as well as an engineer.

Suppose you are requested by the local chapter of a professional engineering society to give a public presentation on the future of engineering in an area in which you have expertise. Should you accept the invitation?

It is ethical for you to accept the invitation to speak on an area in which you have expertise and to speculate about its future development. You are providing a service to the professional engineering society by sharing your experience with fellow engineers. Your audience, because of their own professional training, will be able to differentiate between the facts and the speculation

This interpretation applies to current or past technical knowledge. If you are authoring a forward looking article / book / story, then competence and factual matters (while perhaps important) do not matter. Isaac Asimov was a well recognized scientist, but his science fiction stories did not necessarily draw on his competence as a biochemist.

Progress in science and engineering increasingly is becoming a collaborative effort. Publication of work is one of the ways our contributions are communicated to, and recognized by, other professionals. Not acknowledging collaborators is similar to plagiarism in that you are claiming other's work as your own. The tricky and sticky point with acknowledgment of collaborators is what constitutes a significant contribution to the work. Is the technician who built the apparatus to your design a collaborator? How about the statistician who did the analyses? Acknowledging collaborators and team members is a difficult task and is safest (and appropriate) to err on the side of inclusion rather than exclusion.

In professional practice, in which publication is not a major component of our professional reputation, this issue is often not of great importance. However, it is still expected that the contributions of professional colleagues be appropriately acknowledged. In the academic and research environments, authorship of publications is a key component of one's reputation, and collaboration is the name of the game, so it is important to properly acknowledge significant contributions. The line between co-authorship and acknowledgment is also wide and gray. Good judgment is needed. Perhaps it is best to think in terms of the Good Works model and do what "ought" to be done.

Interpretation (f) requires that publications recognize all authors and contributors, and that the authors of any published work on which another work is based must give written permission for their work to be used. It further requires that all technical communications must adhere to accepted guidelines. But how should we recognize the contribution of colleagues and sources in situations that are less formal, such as job interviews? Consider the situation described in "Jack Fry's Interview"
(http://www.onlineethics.org/CMS/research/rescases/gradres/gradresv1/jackfry.aspx):

Jack Fry was a chemical engineering postdoctoral fellow in a multidisciplinary group of engineers, biologists and medical doctors. Jack was now close to the end of his post-doctoral fellowship, and was seeking a faculty position in a chemical engineering department. Jack presented his research at a job interview, including the results of several collaborators. Jack did not mention any collaborators who had helped him or contributed to his own work in his talk, but his last slide, entitled "Acknowledgments," did list contributors. The department, very impressed with the wide range of Jack's skills described in his presentation, offered him a tenure-track position.

To what extent does a presentation at an interview resemble a publication? To what extent does it differ? Did Jack adequately acknowledge the contributions of others in his multidisciplinary group of researchers?

A job interview is a less formal setting than a professional conference, so there are fewer established protocols for recognizing the contribution of collaborators in multidisciplinary projects. The key point is that Jack acknowledged the contribution of others and did not give the impression that he was solely responsible for the accomplishments. Again, applying the concept of the Good Works model, it would have been better, however, if Jack had acknowledged in each slide the contributor whose work was being cited.

Interpretations (g) and (e)

These two interpretations raise issues of honesty and integrity. Plagiarism (interpretation (g)) is claiming someone else's work as your own. Interpretation (e) is a false claiming of background or competence. Each violates normal standards of honesty and integrity. It should be noted that interpretation (e) is done knowingly while some incidents of plagiarism are both accidental and incidental. That is, if you obtain a copy of a competitor's proposal, modify perhaps the cost or price analysis, and submit the proposal as your own, you have knowingly and willfully committed plagiarism (and perhaps fraud and theft as well). However, it is also possible that you might remember a particular paragraph from a proposal or article you read and use it in a proposal, report, or article. While technically plagiarism, in most cases this would be considered accidental or incidental. An interesting dilemma is arriving at proper citing of previous work, is what constitutes common knowledge (basic chemistry, mechanics, etc.) vs. more recent discoveries that require acknowledgement.

Your professional reputation rests on others view of your honesty and integrity. Falsely claiming accomplishments or claiming other's work as your own will undermine or destroy your reputation. Once your reputation for honesty and integrity is question, it is difficult to restore it.

Interpretation h)

The reputation of a practicing engineer is equivalent to the brand image created by corporations. It is intangible, requires significant effort to create and can be destroyed relatively easily. Operating with honesty and integrity requires that we do not make false and malicious statements about another professional or professional entity. (There are legal issues associated with libel as well, but our concern here is the ethical component.) Indiscriminate criticism implies that facts are missing or limited factual knowledge is extended to a much broader criticism. Such criticism could be construed as libel with resulting legal action. However, if we have factual knowledge that another's work is substandard or incorrect, Canon 1 may require public exposure of such knowledge.

Professional courtesy (a Due Care or Good Works model) suggests that the engineer (or firm) being critiqued should be notified.

Interpretation i)

Use of someone else's equipment, facilities, or other resources for our own private gain is really a form of theft. Upholding the honesty, integrity, and dignity of the professions requires that we avoid such actions. Not only should we offer reimbursement for such use, it is critical the permission and the offer of reimbursement should occur before the use of the resources, not after the fact. It is important to note that there might be legal issues sur-

rounding such use, such as liability or intellectual property ownership that also should be addressed prior to use. For those working in an academic environment, this is a very gray area. Colleges, universities, and research institutes, provide laboratories, equipment, and other facilities for faculty use in teaching, research and development. Use of these facilities for private consulting on a limited basis is often condoned (or even encouraged) as it elevates the reputation of both you and your institution. But excessive use constitutes a conflict of interest issue as the work you do could very well be a contract with the institution with subsequent overhead and other benefits accruing to the institution. As with other conflict of interest concerns, full disclosure to the affected parties is critical. [There are also some thorny liability and intellectual property issues as well. To what extent does the institution stand behind the work of its faculty who are engaged in professional consulting activities using institutional property? To what extent does the institute have an ownership interest in the work carried out on their premises with their equipment?]

3 Canon #3

Engineers shall continue their professional development throughout their careers, and shall encourage and provide opportunities for the professional and ethical development of those engineers under their supervision.

Our Interpretation of Canon 3 is as follows:

a) Engineers should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

In a field as technically complex as engineering, new discoveries and changes in practice occur frequently. In order to stay current, you must take steps that go beyond your job, such as participating in professional societies, attending continuing education courses, and reading professional publications. Some states and territories have a continuing education requirement, with a system of points or credit hours to be completed each year, as part of the professional engineer's licensing process. Other states are less specific, but still expect their licensees to keep up with changes is the field. It is your responsibility to manage your life-long professional education. Further information will be provided in the PPC module on Life-long Learning.

Let's examine the implications of various ethical models for this Canon. A Malpractice Model implies that you must meet the legal requirements for continued licensure, whatever those criteria are in your state. In some jurisdictions this may mean attendance at a number of continuing education courses or professional meetings to obtain the required credits. A Good Works Model makes it your responsibility to engage in life-long learning and to judge for yourself whether your professional skills are adequate.

The professional-growth activities you choose will depend on your employment situation. If you are in a major urban area, you will have many options through a large professional network and through nearby educational institutions. In other circumstances, it may be more difficult for you to participate in organized continuing education and professional development.

Consider the following:
Which of these activities contribute to your professional development? In how many must you participate and how active must you be to stay up-to-date in your profession?

- Maintaining your annual membership in ASME, either by asking your employer to pay for your annual dues and subscriptions or by paying for them yourself
- Reading the monthly ASME publication Mechanical Engineering
- Skimming the titles in one of the ASME Transactions journals
- Attending the annual ASME national professional meeting (actually attending some technical sessions and professional discussions, not just playing in the golf tournament and taking the city tour)

- Participating in local ASME chapter activities
- Serving on professional subcommittees and working groups that develop codes and standards
- Registering and attending a continuing education course offered by a professional society or educational institution
- Developing a network of fellow professionals with whom you can discuss technical issues

It is important that you continue your education, whether formally or informally, so that you remain aware of current practices in your profession. You can do this by reading on your own, attending presentations, or simply networking with other professionals.

Under this Canon, engineering managers are expected to encourage the professional growth and service of their subordinates. This could mean paying for their continuing education, allowing them to attend professional meetings, or giving employees paid time off to participate in professional activities, to make public presentations, to hold office or to do committee work in local, regional, or national professional organizations. Such activities may result in a loss of local productivity while the employee is not working on his or her normal assignments, but they also increase the employer's visibility, support the employee's growth, and further the engineering profession.

Although support for professional development is not explicitly required in the Malpractice Model, a Good Works Model would argue that such support brings benefits both to the engineering profession and to society.

4 Canon #4

Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest or the appearance of conflicts of interest.

Conflict of Interest focuses upon the difficulties that arise when competing considerations, such as personal gain, can influence your professional decision-making. Conflict of interest can arise in a variety of situations, and the items below further clarify this canon.

a. Engineers shall avoid all known conflicts of interest with their employers or clients, and shall promptly inform their employers or clients of any business association, interests, or circumstances that could influence their judgment or the quality of their services.

b. Engineers shall not undertake any assignments they know could create a conflict of interest between themselves and their clients or their employers.

c. Engineers 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.

d. Engineers shall not solicit or accept financial or other valuable considerations, for specifying products or material or equipment suppliers, without disclosure to their clients or employers.

e. Engineers shall not solicit or accept gratuities, directly or indirectly, in connection with work for which they are responsible. Where official public policy or employers' policies tolerates acceptance of modest gratuities or gifts, engineers shall avoid a conflict of interest by complying with appropriate policies and shall avoid the appearance of a conflict of interest.

f. *When in public service as members, advisors, or employees of a governmental body or department, engineers shall not participate in decisions or actions that involve services they or their organizations provide.*

g. Engineers shall not solicit an engineering contract from a governmental body or other entity on which a principal, officer, or employee of their organization serves as a member, without disclosing their relationship and removing themselves from any activity of the body which concerns their organization.

h. Engineers working on codes, standards or government rules and specifications shall exercise careful judgment in their determinations to ensure a balanced viewpoint and avoid a conflict of interest.

i. When, as a result of their studies, engineers believe a project will not be successful, they shall so advise their employer or client.

j. Engineers shall treat information coming to them in the course of their assignments as confidential, and shall not use such information as a means of making personal profit if such action is adverse to the interests of their clients, their employers or the public. (1) They will not disclose confidential information concerning the business affairs or technical processes of any present or former employer or client or bidder under evaluation, without consent, unless required by law or court order. (2) They will not reveal confidential information or findings of any commission or board of which they are members, unless required by law or court order. (3) They will not duplicate for others any designs supplied to them by clients without the express permission of the clients.

k. Engineers shall act with fairness and justice to all parties when administering a contract.

l. Before undertaking work for others in which Engineers may make improvements, plans, designs, inventions, or other records which may justify seeking copyrights, patents, or proprietary rights, Engineers shall enter into positive agreements regarding the rights of respective parties.

m. Engineers shall admit their own errors when proven wrong, and refrain from distorting or altering the facts to justify their mistakes or decisions.

n. Engineers shall not accept professional employment or assignments outside of their regular work without the knowledge of their employers.

o. Engineers shall not attempt to attract an employee from other employers or from the marketplace with false or misleading representations.

Discussion

Determination of whether there is a conflict of interest frequently depends on the degree of influence you have as a professional, and the extent of any potential benefit to you. For example, suppose that a mutual fund you've selected for your Individual Retirement Account holds some shares of Xerox Corporation. Can you ethically engage in discussion of the purchase of copy machines for your employer? Several aspects of this situation suggest that this isn't a serious conflict of interest. Even though a decision by your employer to purchase or lease Xerox equipment would be expected to benefit Xerox and consequently your own retirement fund, the connection is remote and diffuse. You don't have any controlling interest or significant influence on the management of either the mutual fund or Xerox Corporation. Thus, this situation does not present an actual conflict of interest. If your influence and wealth grow to the level at which your influence and potential return are substantial, however, the possibility of a conflict of interest grows. Politicians or directors of government regulatory agencies often place their assets in blind trusts to avoid conflicts of interest between their political and regulatory duties and the businesses they affect.

Here's another situation: Suppose your spouse owns a construction company. Can you ethically participate in the

selection of a contractor to build your company's expansion facility? Here, the connection between the decision process and the potential payoff to you is much more obvious. If the contract is awarded to your spouse's company, the economic impact on your own family could be significant and immediate. At the very least, your associates involved in the selection process should be made aware of your family connection with one of the bidders. Most likely, you should be excluded from the decision process.

Here is another case in which an engineer may be personally affected by his or her professional decision: http://www.onlineethics.org/CMS/profpractice/ppcases/NSPEcases/BERindex/DisclosureBER.aspx . In this hypothetical case, Engineer A is asked to study and report on a highway project being considered for an area near his home. The study will likely affect the property value of his home and his residential environment, presumably offering easier access to the highway and increasing local traffic and noise. What are the obligations of the engineer? Certainly, reporting the proximity of the project to his home should be an obligation under this Canon. At a minimum, even apparent conflicts should be acknowledged. However, going a bit further, when is the conflict so great that the engineer should decline the assignment?

If you are involved in large public works projects in your own community, they might frequently affect you personally. But we don't generally expect that only engineers who live elsewhere should work on public projects. In fact, it's probably better that those who contribute to the decision-making process experience the consequences of their decisions.

There may be situations in which the consequences are more immediate and severe, however. If, for example, a proposed highway would cut across your property, or a proposed landfill would be across the street from your house, you probably should not make the site decision, although your input might be very valuable to local community organizations. As a general rule, if your professional judgment could be significantly affected because of the potential consequences to your personal situation, you should make these circumstances known and remove yourself from decision-making authority.

Contingent fee contracts also provide a potential for a conflict of interest. This is covered in some detail in the discussion of interpretation (d) of Canon 2.

Offering or Accepting Gifts:

Gifts from clients, customers, suppliers, and bidders are a particularly sticky issue because they are sometimes part of accepted practice, and it is expected that token gifts may be exchanged. You must, however, avoid selecting a bidder based on anything other than the bidder's professional competence, product quality, or price. Accepting a "gift" could give a bidder an unfair advantage, so it's important for you to know what the standard is for your situation.

How big a gift is too big? Some businesses are quite explicit about setting a threshold value, perhaps $10 or $25, allowing coffee mugs, pens, calendars, and memo pads (all with the provider's company logo, of course), but not Caribbean cruises, cases of bourbon, or vacation weekends at a skiing or golf resort. Presumably, a gift becomes a bribe when it affects your professional judgment.

Incidentally, ethicists make a distinction between bribery (payment to get an unfair advantage) and extortion (payment to get what you should receive anyway). The former is unethical, while the latter is not, at least for the payer of extortion.

Here is an ethics module on political contributions: http://www.murdough.ttu.edu/EthicsModule/Ethics2.htm In this situation, an engineer is asked to contribute to the political campaign of a local official who will have some decision-making authority on the engineer's business.

Here is an ethics module on the acceptance of free registration for a seminar: http://www.onlineethics.org/CMS/

profpractice/ppcases/NSPEcases/ec87-5.aspx. In this case, Terry must decide whether to attend an educational seminar sponsored by a potential vendor. He is not sure whether attending the free seminar, along with a buffet lunch and a cocktail reception, will affect his future professional purchases.

For further reading, consider this ethics module on the acceptance of gifts: http://ethics.tamu.edu/ethics/giftgive/giftgiv1.htm. It contains an extensive discussion on the issue of gift-giving and the question of when a gift becomes a bribe.

Fairness in employment:

U.S. law promotes fairness in employment and contracts. While there is continuing discussion on how to reconcile the apparently conflicting mandates of affirmative action and non-discrimination, our society strives to treat all people fairly. This is not necessarily the case in other countries, however. If an American company operates overseas, should the standards for fairness be those of the U.S. or of the host country? The Malpractice Model would require you to obey whatever laws apply. This might require that management clearly state company obligations both to its home office and to the host country, its local employees and its contractors. A Good Works Model would ask what actions produce the most desirable outcome. For example, a major U.S.-based company operating in South Africa in the days of apartheid paid all of its employees on the same scale, regardless of race. Although this practice ran counter to South African policy and probably created some discomfort, it also exemplified a standard of fairness promoted by the U.S.

Professional Service:

Although engineers provide an important service to society when they offer their technical expertise to civic, governmental, and regulatory organizations, you should not participate in any decision that directly affects your own business. Furthermore, your professional affiliation should always be fully disclosed so that it is clear to everyone why you are not participating in a particular decision.

Clearly, some of those most qualified to make decisions in a field are those with experience gained from working in that field. That situation can easily translate into a conflict of interest. Your experience puts you in an excellent position to contribute to the development of codes and standards, because you understand what's both technically and economically feasible. However, it also means that you might encounter a conflict between the interests of the public and those of your employer. For example, a less stringent regulatory environment makes business easier for your employer, while there may be undesirable effects on society due to the lack of standards.

Consider this interesting situation. Your church is undertaking a major addition. One of the church members is an architect, and the firm that employs her has won the contract for the work and has assigned her to be the architect in charge of the construction project. On the one hand, it’s nice to have a competent and well-informed professional watching out for the church’s interest, but there is a concern about potential conflict between what is in the best interest of the church, her employer, and her own professional career. Is the problem solved by having several other church members also watching carefully the execution of the project? This situation is fraught with potential for serious conflicts.

Intellectual Property:

As an engineer, you have an obligation to protect your employer's or client's proprietary information. Often you will be expected to sign a confidentiality agreement, especially if you are allowed into a manufacturing facility. This can result in an ethical balancing act if you find yourself in competitors' facilities.

For example, an engineer who designs and sells fluid handling systems might visit competing customers' facilities. The engineer owes each client the best professional advice in the selection of appropriate equipment, without divulging how competitors run their facilities.

Engineering Ethics

The issue of how to manage information from former employers can be particularly challenging. In the course of your professional activities, you learn information that is a mix of both private intellectual property and general knowledge. If you've left one employer to work for another employer in the same kind of business, there is likely to be information that you learned in your previous job that is relevant to your current employer. While you may always use broadly-applicable professional information, it is unethical to reveal your previous employer's proprietary and trade secrets. For an in-depth discussion of Intellectual Property, please visit the PPC modules "Introduction to Intellectual Property" and "Patent Law."

Outside Employment:

Some employers explicitly prohibit additional employment. They might require new hires to agree, as a condition of employment, that any outside employment, whether or not it's related to the profession, must be reported and sometimes even approved by the employer. In the absence of a stated company policy, you are expected to provide your best effort in return for your salary and benefits, and outside activities that interfere with that should be avoided. If the outside work is related to your primary job, you run the risk of competing with your employer.

Case Study: A chemical engineer, hired by a manufacturer, signed over to his employer the rights to any inventions. While fishing one weekend, he developed a patentable fishing lure. Even though this extra-professional activity was unrelated his employer's core business, he informed his employer of his wish to patent and market his invention. In this case, the employer provided a written disclaimer of ownership of the invention, allowing the engineer to proceed with his plans.

Was this formal communication necessary? In this case, the activity was not professional, nor was there any likelihood of competition with his principal employer. However, the engineer took the safer, more conservative path by informing his employer. Does an employer have any right to rule on your activities outside your employment? Generally, your evenings and weekends are considered your discretionary time, and your employer should not care what you do with this time as long as you report for work as expected and meet your assigned responsibilities. The critical factor regarding outside employment, hobbies, or volunteer activities is not whether the activity produces extra income, but whether the amount of time devoted to the hobby affects what you owe your primary employer.

Engineering Ethics

5 Canon #5

Engineers shall respect the proprietary information and intellectual property rights of others, including charitable organizations and professional societies in the engineering field.

Our Interpretations of Canon 5 are as follows:

a) 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.
b) Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

The ethical considerations of Canon 5 are very similar to those involved in Canon 4, especially interpretation (j) and the discussions concerning Professional Service and Intellectual Property. As indicated in those prior discussions, professional services are generally part of, and covered by, confidentiality agreements. Violations of such agreements can result in legal action as well as injuring your professional reputation. However, as indicated in the discussion on Intellectual Property, determining what is specific knowledge and what is more general knowledge can often be a difficult decision. As with technical information, business information and business processes should be treated as confidential information even thought they may not be considered intellectual property.

Canon 1 requires that we hold public safety, health, and welfare paramount in the performance of our professional duties. Canon 8 states that environmental impact and sustainable development shall be considered in the performance of our professional duties. You worked with a client on the design of near-shore LNG unloading and transfer station. While the design work was clearly done to current standards, you have gained specific knowledge about the forces of tides and winds and firmly believe that the current design guidelines are insufficient to provide proper, safe operation. You reported your concerns to your supervisor and to the client. The response was that the current design conforms to the all laws and regulations.

Your firm's design work on the LNG facility is complete and the project has been approved by the various state and federal authorities. As a member of a local environmental organization (which is opposed to the LNG plant on environmental grounds), you have often been asked to join them in their suit against your former client. Until now, you have declined – and Canon 4 supports your position. However, now you believe the design is possibly faulty and the public welfare is endangered. What do you do?

This is a difficult dilemma. Interpretation (b) of this Canon prohibits you from joining the legal action. And while Canon 1 clearly indicates a higher duty to protect the public health, safety and welfare, the current design is not faulty nor has it been shown that the concerns you have about wind and tides are truly valid. There is some probability that you are correct, but that value is unknown. Or, said in another way, are the confluence of events that concern you a 1-in-10 year event, a 1-in-100 year event, a 1- in-1000 year event?

There is no easy, simple answer for this type of question. Adopting a high, rigid moral standard will probably leave you unemployed, while accepting the minimalist model may leave you with a high level of guilt should you be proven correct. Seeking a creative, middle way is often the best, yet most difficult, route (c.f. Chapter 3 of *Engineering Ethics: Concepts and Cases*. 2000. Harris, C., Pritchard, M., and Rabins, M. Wadsorth /Thomson Learning, Belmont, CA.

Engineering Ethics

6 Canon #6

Engineers shall associate only with reputable persons or organizations.

Overview

Our interpretation of Canon 6 is as follows:

a) *Engineers shall not knowingly associate with, or permit the use of their names or their firm's names in business ventures by any person or firm they know, or have reason to believe, is engaging in business or professional practices of a fraudulent or dishonest nature.*
b) *Engineers shall not use association with non-engineers, corporations, or partnerships to disguise unethical acts.*

This canon speaks directly to the fundamental principle of upholding and advancing the integrity and honor of the profession. It is clearly stated that it is a violation of the ASME Code of Ethics to knowingly associate with persons or firms engaged in fraudulent or dishonest work. In interpretation (a), the phrase "or have reason to believe" imposes a higher standard of behavior and is one that can be problematical in application. Consider the hypothetical situation in which your firm is one of several working on a major project. One of the other firms is "Jones Brothers Construction" which "everybody" knows is connected to the criminal underworld and uses extortion and violence to obtain contracts. Nothing has ever been proved, and, in fact, Jones Brothers have never been accused in a court of law. The Minimalist Model suggests that without proof, there is no reason not to work with Jones Brothers. The Good Works Model puts forth a higher standard and, depending upon the strength of your belief in the probable illegal behavior of Jones Brothers, you may want to reconsider your involvement with them.

Does Canon 6 preclude an engineer from forever associating with someone who has been convicted and sent to prison or who has been reprimanded for violating the Codes of Ethics? Can an engineer associate with someone who is accused but not indicted, or indicted but not convicted (under the U.S. judicial system, people are presumed innocent until proven guilty), or indicted but the case was settled out of court without the party admitting wrongdoing? What happens if that someone is a close relative of the family? Can an engineer seek employment in a firm that has been fined for having previously violated environmental regulations?

Redemption and Salvation

In the United States, criminals may be accepted back into society after they have served the sentence for their crimes. Canon 6 and its interpretations do not provide sufficient guidance in these circumstances. Consider the case of an engineering supervisor who is considering whether to hire an engineer who has been reprimanded for violating the Code of Ethics (http://www.onlineethics.org/cms/7700.aspx):

Jane Smith was a registered engineer and the head of a state agency that administered a large public works program. She and James Jones, her assistant, also a registered engineer, were charged with establishing dummy agencies within the state to receive funds from the program. Those funds were channeled into their personal accounts. Smith and Jones were fined and convicted of fraud and embezzlement, and sentenced to prison terms. The state registration board revoked their engineering licenses while they were serving the last several months of their prison terms. Smith qualified for a work-release program under state law, which allowed her to work during the day and return to prison each night.

The XYZ Engineering Firm, located near the prison where Smith is serving her term, proposes to hire Smith as a technician. Smith will not be in responsible charge of engineering, and will not sign or seal engineering documents. Is the head of XYZ Engineering ethical in offering an opportunity to Jane Smith?

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Because Jane Smith will not have engineering responsibilities, the head of XYZ Engineering can ethically offer her the job. The head of XYZ is perhaps even laudable in offering Jane a second chance to become a useful member of society.

7 Canon #7

Engineers shall issue public statements only in an objective and truthful manner and shall avoid any conduct which brings discredit upon the profession.

Our interpretations of Canon 7 are as follows:

a) Engineers shall endeavor to extend public knowledge, and to prevent misunderstandings of the achievements of engineering.

b) Engineers shall be completely objective and truthful in all professional reports, statements or testimony. They shall include all relevant and pertinent information in such reports, statements or testimony.

c) Engineers, when serving as expert or technical witnesses before any court, commission, or other tribunal, shall express an engineering opinion only when it is founded on their adequate knowledge of the facts in issue, on their background of technical competence in the subject matter, and on their belief in the accuracy and propriety of their testimony.

d) Engineers shall issue no statements, criticisms, or arguments on engineering matters which are inspired or paid for by an interested party, or parties, unless they preface their comments by identifying themselves, by disclosing the identities of the party or parties on whose behalf they are speaking, and by revealing the existence of any financial interest they may have in matters under discussion.

e) Engineers shall be truthful in explaining their work and merit, and shall avoid any act tending to promote their own interest at the expense of the integrity and honor of the profession or of another individual.

Interpretations (a) to (e) attempt to provide guidance to engineers on how to make objective and truthful public statements. Interpretation (a) suggests that engineers should strive to prevent misunderstandings of engineering achievements, but does Canon 7 require engineers to respond to statements by others that give an incorrect account of engineering achievement? For example, suppose your local newspaper reports a self-proclaimed inventor has created a perpetual motion machine and is holding a demonstration to prove his invention. Do you feel an obligation to attend the demonstration and challenge his claim?

This scenario has less to do with professional ethics than personal ethics and value. Professionally, you are not obligated to prevent or correct misunderstandings about engineering other than to be objective and truthful in your own public statements and with your affiliates. The decision whether to attend the demonstration and voice your objection to the claim is a matter of personal choice.

Interpretation (b) requires engineers to include all pertinent information in professional reports, statements, and testimony, but should a report omit data that is inconclusive (either because of experimental errors or because the phenomenon is not well understood)? Perhaps the motivation behind the omission is the determining factor. If the purpose is to deceive the audience, then clearly the omission is unethical. Consider the case, "Falsified Data," published in Chemical Engineering (May 5, 1980, pp. 100-107) by Roy V. Hughson and Philip M. Kohn. In this case, a young chemical engineer collected inconclusive data on two catalysts, but his division head asked him to write a report favoring one catalyst and to "make the numbers look good" by doing the math backwards. What would you do?

If you "cook" data, then you violate Canon 7.

Interpretation (c) requires that engineers who make statements in legal proceedings, for example offering expert witness testimony, must base their statements on adequate knowledge of the facts, their competence in the subject matter, and their belief in the accuracy and propriety of their testimony.

Interpretation (d) attempts to prevent potential or apparent conflicts of interest. One of the characteristics of a profession is that society invests members with a level of trust so that when we speak on matters (for which we are assumed to be competent), then society expects an honest, unbiased discussion. The existence of a fee or other compensation arrangement for a presentation of some form (public statement, competitor critique, etc.) potentially compromises this presumption of honesty. As with other types of conflicts of interest, prior disclosure helps ameliorate any concerns. As a common example of this type of problem, consider the issues that are currently being raised about medical journal articles where one or more of the authors was compensated by a medical device or pharmaceutical company.

8 Canon #8

Engineers shall consider environmental impact and sustainable development in the performance of their professional duties.

Our interpretation of Canon 8 is as follows:

a) *Engineers shall concern themselves with the impact of their plans and designs on the environment. When the impact is a clear threat to health or safety of the public, then the guidelines for this Canon revert to those of Canon 1.*
b) *Engineers shall consider development that meets the needs of the present without compromising the ability of future generations to meet their own needs. When the impact of the trade-off between economic, ecological, and social issues forms a clear threat to health or safety of the public, then the guidelines for this Canon revert to those of Canon 1.*
c) *"Sustainable development" is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.*

This canon is relatively new to the ASME code, and is a result of the rising awareness of sustainable development, of the impact of human activity on the earth, and of the substantial role that engineers play in that activity.

It is important to note the difference between the phrasing of this canon and of the other canons. Canons 1 - 7 prescribe a behavior that is reasonably well-defined. Canon 2, for example, states that engineers shall perform services only in their area of competence. But Canon 8 does not state or give guidance on how to resolve the conflicts unless the conflict involves a clear harm to the public (Canon 1). It only states that engineers shall consider the impact of the design and the interpretations attempt to clarify the definitions of environmental impact and sustainable design.

The Three Gorges Dam on the Yangtze River in China is an example of a project that could cause an engineer concern. This project might be the largest construction project in human history; it will result in the resettlement of many people, it will flood agricultural lands and historic relics, and will provide flood control and clean electricity to millions. The impact on the environment, both physical and social, is immense and immediate. The benefits are distributed and in the future. How does an engineer decide?

Similar concerns arise around the development of alternative energy sources, reduction of "carbon footprint", and other "green" projects and policies. Consider, for example, the issue of installing wind turbines in Nantucket Sound (off Cape Cod in Massachusetts).. Wind data suggest it would be feasible and it would provide power to a portion of the country that is heavily dependent on fossil fuels for electrical power. On the other hand, residents of Cape Cod, Martha's Vineyard, and Nantucket claim such a wind farm would spoil their visual environment, be a hazard to navigation and injure migrating birds. (See http://www.capecodonline.com/apps/pbcs.dll/article?AID=/20090322/NEWS/903220326/-1/SPECIAL01 and http://www.capewind.org/ for more details on this on-going debate.)

The utilitarian model provides a method for evaluating the impact of such projects, although some of the values needed for the evaluation may be difficult to obtain. If the benefits outweigh the costs, then the project should proceed. The respect for persons model suggests that the rights of the potentially adversely affected persons supersede the societal benefits.

Thus, while this canon requires the engineer to consider environmental impacts and sustainability, it is necessary to refer to other canons and perhaps moral models to help an engineer make a decision. It also requires the engineer to make judgments between competing models of environmental impact, future development, and future technologies. In the words of Edward Deming, *the most important things are unknown and unknowable. (Deming, W. E. 1986. Out of the Crisis MIT Press) and in that framework the engineers must make decisions, and also remember that not making a decision is a type of decision.*

9 Canon 9

Engineers shall not seek ethical sanction against another engineer unless there is good reason to do so under the relevant codes, policies and procedures governing that engineer's ethical conduct.

a) Frivolous or malicious use of ethics complaints have occurred in the past. Any person who engages in such activity is subject to being charged with a violation of this ethics policy.

10 Canon 10

Engineers who are members of the Society shall endeavor to abide by the Constitution, By-Laws and Policies of the Society, and they shall disclose knowledge of any matter involving another member's alleged violation of this Code of Ethics or the Society's Conflicts of Interest Policy in a prompt, complete and truthful manner to the chair of the Committee on Ethical Standards and Review.

Discussion

These two new canons speak to ethical activities of members and non-members. Canon 10 states that members strive to abide by the rules of ASME and that they have a duty to inform the appropriate committee of an alleged violation of the Code of Ethics or the Conflicts of Interest Policy. But Canon 9 says such allegations should not be frivolous – there must be a basis for such allegations. The gray area is readily evident. What you think may be strong evidence may be viewed as weak or frivolous by the "accused". As professionals, we have the obligation to be honest and truthful in our professional dealings with others. It is unethical (and perhaps libelous) to bring unsubstantiated charges against another. At the same time, however, we have duty to uphold the integrity of the profession which may require informing appropriate ASME committees of suspected unethical behavior.

Should a complaint be made under Canon 10 and subsequent investigation reveals that there was no violation of the code, then further action on the complainant's part would violate Canon 9.

It is important to realize that there may be a legal duty to inform authorities if the suspected behavior violates federal, state, or local law. For example, you are required to inform federal officials of violations of certain environ-

Conclusion

Handling ethical dilemmas and making ethical decisions are important parts of being a professional. As engineers, the decisions we make will have a direct effect on society; therefore, it is important that we maintain a high ethical standard. In the practice of the profession, it is up to you, the engineer, to adhere to high principles of ethical conduct on behalf of the public, your clients and employers, and the profession.

This module has introduced you to ethical definitions and considerations, and to the ASME Canons, which can provide guidance in commonly-encountered situations. Our rules and beliefs will help guide us to a higher level of respect and professionalism.

There are many other resources for learning more about the emerging field of engineering ethics and for addressing ethically significant problems that arise in your work life. Please visit the resource page of this module to continue your exploration of engineering ethics in further detail.

Resources

Web sites with excellent overviews of engineering ethics, including a wide range of case studies and discussions:

http://onlineethics.org/cases/nspe/ The Online Ethics Center for Engineering and Science at Case Western Reserve University.

http://www.niee.org/index.htm National Institute for Engineering Ethics, Murdough Center for Engineering Professionalism, College of Engineering, Texas Tech University.

http://www.murdough.ttu.edu/ Murdough Center for Engineering Professionalism, College of Engineering, Texas Tech University.

http://ethics.tamu.edu/ Engineering Ethics Web site, Texas A&M University, College Station, TX.

Textbooks on Engineering Ethics:

Engineering Ethics: Concepts and Cases, by Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, Wadsworth Publishing; 2nd edition, Book and CD-ROM, 2000.

Ethics In Engineering, by Mike W. Martin, Roland Schinzinger, McGraw-Hill Science/Engineering/Math; 3rd edition, 1996.

Engineering Ethics, by Charles B. Fleddermann, Prentice Hall, 1999.

Hold Paramount: The Engineer's Responsibility to Society, by Alastair S. Gunn and P. Aarne Vesilind, Thompson, Brooks/Cole, 2003.

Michael Davis, "Conflict of Interest," *Business and Professional Ethics Journal*, Vol. 1, No. 4, 17-27, 1982.

Glossary

Act Utilitarianism - Act utilitarianism focus on the consequences of an action, rather than the moral rules involved in the action. That is, actions should be judged based on whether the most good was produced in a given situation, and rules should be broken if doing so will lead to the most good. (Fleddermann, pg 35)

Actual Conflict of Interest - An actual conflict of interest occurs when a professional, acting in a professional role, is subject to influences that tend to make the professional's judgment less likely to benefit the customer or client than the customer or client can reasonably expect. (Harris, Pritchard and Rabins, pg 138) This is the normal interpretation of conflict of interest. Consider this simple example. John is working for a design firm, and he will be responsible for developing specifications for the 100,000 bolts needed for the project and for choosing the vendor that will supply the bolts. John has strong family ties to a firm that manufactures bolts. John has an actual conflict of interest, as he could specify the bolts in such a way that they would have to be purchased from his family's firm. (After Harris, Pritchard and Rabins, pg 139)

Apparent Conflict of Interest - An apparent conflict of interest is also called a perceived conflict of interest. In this situation, a third party perceives that the decision-maker's ability to make a proper judgment is subject to influences that will bias his judgment. Consider this simple example. John is developing the specifications for 100,000 bolts needed for a major design project. His wife's family owns a bolt manufacturing business, but, for a variety of reasons, she has long since sold her interest in the family business and has been estranged from her family for some time. A third party, not knowing all the facts of the situation, might conclude that John will be biased in his development of the bolt's specification to favor his wife's family business. However no such conflict exists on John's part.

Business Model - A description of professional organizations that suggests they exist primarily to further their members' economic advantage. According to this view, professional organization are labor unions for the elite, controlling the numbers of members, setting working conditions, and artificially inflating members' wages. (Fleddermann, pg 20)

Common Morality - The stock of common moral beliefs, analogous to "common sense". Just as most of us share a common body of beliefs about the world and what we must do to survive -- a body of beliefs that we call common sense --- so we share a common stock of basic beliefs about moral standards, rules, and principles we believe should guide our lives. (Harris, Pritchard and Rabins, pg 32)

Conflict of Interest - "A person has a conflict of interest if a) he is in a relationship with another requiring him to exercise judgment in that other's service and b) he has an interest tending to interfere with the proper exercise of judgment in that relationship." (Davis, 1982. Davis considered this definition too rough to be final, but it is sufficient to be useful.) Note that judgment is critical to have a conflict. If a decision is made according to a set of rules, then there is no conflict of interest even though there may be competing claims on the part of the person making the decision. Conflict of interest is divided into three subcategories: Actual, Potential, and Apparent.

Due-Care Model - A model of engineering practice in which the engineer is expected to take reasonable precautions or care in the practice of his profession. The model strives to prevent harm, and it appeals to a "standard of reasonableness as seen by a normal, prudent nonprofessional." (Curd & May, as quoted in Harris, Pritchard and Rabins, pg 103)

Ethics & Morality - Ethics and morality are often used interchangeably. Dictionaries provide separate meanings, but neither textbooks nor ordinary language show any clear, consistent differences in meaning between these terms. (Harris, Pritchard , Rabins, pg. xix)

Good Works Model - A model of engineering practice in which engineers go beyond the basics of what is required by standards and codes and do what they "ought" to do to improve product safety, social health or social well-

being. See Harris, Pritchard and Rabins, pg 104-6.

Malpractice Model - This is a minimalist model in which the professional is concerned only with meeting standards and requirements of the profession and any other laws or codes that apply. This model looks to find fault when problems or accidents arise from someone's failure to meet a requirement.

Moral Theory - Defines terms in uniform ways and links ideas and problems together in consistent ways. A moral theory performs much like a scientific theory. (Fleddermann, pg 34)

Potential Conflict of Interest - A potential conflict of interest exists when a situation is such that a reasonably foreseeable change in circumstances will create an actual conflict of interest. Consider this simple example. John is working for design firm and will be responsible for developing specifications for the 100,000 bolts needed for the project as well as for choosing the vendor that will supply the bolts. John is engaged to Veronica, whose family owns a bolt-manufacturing firm. If John marries Veronica, he will become a stockholder in the firm. John has a potential conflict of interest because he will be in a position, when he marries Veronica, to benefit from specifying the bolts. (It can be argued that he is already subject to a conflict of interest, since his engagement to Veronica affects his ability to write impartial bolt specifications.)

Respect for Persons - In this moral model, humans are considered to have certain rights and duties. John Locke said people have the right to life, liberty, and property, and Immanuel Kant said it is the duty of a moral person is to respect the rights of others. It is interesting to note that Thomas Jefferson is claimed to have substituted "pursuit of happiness" for "property" in the United States' Declaration of Independence to avoid the issue of slaves as "humans" or "property." (Gunn and Vesilind)

Reversibility - This principle postulates that a moral course of action in a particular situation would also be the moral course of action if the roles of the participants were reversed. It is based on the Golden Rule, a principle found in the religious and ethical writings of most cultures, which advises: treat others as you would have them treat you. (Harris, Pritchard and Rabins, pg 37)

Rule Utilitarianism - From a rule-utilitarian point of view, actions are justified if they serve utilitarian ends and abide by rules or practices that apply to the situation at hand. (Harris, Pritchard and Rabins, pg 83)

Social Contract Model - A description of professional organizations that suggests they exist to enhance the public good. Society grants the members of the organization special privileges, such as high wages and self-regulation, in return for the services rendered by the profession and its members. (Fleddermann, pg 20)

Universalizability - A moral concept that whatever is right or wrong in one situation is right or wrong in any relevantly-similar situations. (Harris, Pritchard and Rabins, Pg 37)

Utilitarianism - A moral theory commonly associated with John Stuart Mill that holds that those actions are good which serve to maximize human well-being. The focus is on society as a whole, not the individual. Utilitarianism is closely associated with cost-benefit analysis and risk-benefit analysis. There are two main "flavors" of utilitarianism -- act utilitarianism and rule utilitarianism.

Whistle Blower - A person who takes a concern (such as a concern about safety, financial fraud, or mistreatment of research animals) outside of the organization in which the abuse or suspected abuse is occurring and with which the whistle-blower is affiliated. Not all whistle-blowing is equally adversarial to the affected organization, even though it is at least an embarrassment to the organization. There are many regulatory agencies such as OSHA (the Occupational Safety and Health Organization) to which whistle-blowers can go anonymously. This is usually seen as much less adversarial than, for example, going to the media. Some people have used the term "whistler-blower" to describe those who raise an issue within their organization, but the more general term for a person who raises an issue inside or outside an organization is "complainant."