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AMIDEAST's TAG Project

The Transparency and Accountability Grants (TAG) project, funded by the US Agency for International Development and managed by AMIDEAST, provides small grants to local organizations for activities that address corruption and promote good governance. This project is a continuation of media, journalism, and local government programs launched by USAID- Lebanon since 1999.

In describing the importance of TAG project, Jon Breslar, the Director of USAIG in Lebanon, commented, "Over the past two years we have found increasing commitment on the part of the government, the private sector, and civil society to eliminate corruption in Lebanon. This is crucial not only for economic growth and investment, but for all aspects of Lebanon's development. These TAG grants represent another step in promoting an open and transparent environment in which Lebanon can thrive and prosper."

AMIDEAST, an American non-governmental organization, has maintained an office in Lebanon since 1967. AMIDEAST has been conducting educational and developmental programs throughout the Middle East and North Africa for 50 years, "and we look forwards to working with Lebanese organizations to launch new activities in an area which is so important for Lebanon's development."

TAG Grants are given to local organizations and individuals to conduct short-term, high impact activities that help strengthen transparency and accountability in Lebanon. Activities which partner local organizations with government agencies are especially encouraged, thereby building a public-private partnership in the effort to increase transparency.

Acknowledgments

The support of USAID AMIDEAST, Lebanon under Transparency and Accountability Grant (TAG) is greatly acknowledged. The contributions of LibanCell to this project are also appreciated. The cooperation of the Lebanese Order of Engineers and Architects was instrumental in making this manual relevant to the Lebanese engineering community. The help of Mr. Ghassan Ali from Qualitech International in preparing the local case studies is greatly valued. We thank Captain Saadallah Shalak Chief of Protection at AUB for his documentation support in some local cases. Netways professional efforts- (responsible for handling and maintaining the corresponding website www.ethicsengineering.org) - are acknowledged in helping to reach and hopefully affect a large community of conscious engineers and engineering students trying to do their job ethically. Special thanks to Mr. Burhan Kreitem for reviewing this manual.

All hosting institutions of the seminar associated with this manual are greatly appreciated for their wonderful interest and encouragement. Finally, we are grateful to the institution that offered the environment and opportunities to discuss professionalism and teach future engineers, the American University of Beirut.

We especially appreciate the understanding and support of our families towards completion of this manual.

Contents

I. Introduction

Objectives:
This project was based on personal initiatives and was strongly encouraged and supported by the sponsors. The activity is intended to expose professional engineers in the field and engineering students to professional ethics, professional value systems, and their relation to every day experiences. We aim to raise the understanding and appreciation level of the concept of engineers acting as responsible agents and decision-makers in the profession affecting the public safety, health and welfare.

Stakeholders:
This compiled manual is based on professional societies codes of conduct and ethics. Readers' ethical imagination will be stimulated through exercises, case studies, and discussions. As part of improving engineering education, we hope to stimulate ethical practices while studying and to eliminate irresponsible behaviors related to cheating and other misconducts based on student convection rather than fear of being caught. When students develop good ethical understanding, they will become accountable and responsible citizens.

The main stakeholders of this project are:

- Engineering Students
- Engineering Faculties
- Practicing Engineers
- Engineering Professional Societies
- Society at large

Project Deliverables
The outputs of this project are correlated and complementary. Specifically:

- Project web site and links (www.ethicsengineering.org)
- Six seminars at engineering schools and the Order of Engineers and Architects
- Exercises
- Local Case studies
- This manual on Engineering Professional Ethics

Overview of Engineering Ethics
The engineering profession differs from other learned professions in a number of ways: in the type of service provided, in the training requirements for its practitioners, in the diversity of its leadership, and in the flexibility and lack of uniformity in its registration laws.

" The great liability of the engineer compared to men in other professions is that his works are out in the open where all can see them. His acts, step by step, are in hard substance. He cannot bury his mistakes in the grave like doctors. He cannot argue them into thin air or blame the judge like lawyers. He cannot, like the architect, cover his failures with trees and vines. He cannot, like politicians, screen his shortcomings by blaming his opponents and hope that people will forget. The Engineer simply cannot deny that he did it. ... To the engineer falls the job of clothing bare bones of science with life, comfort, and hope." [2].

Engineering Ethics represent the attempts of professional engineers to define proper courses of action in their dealings with each other, with their clients and employees, and with the general public. The problem with professional ethics begins with the fact that specialized knowledge of the profession is superior to that possessed by clients, employers, or the general public. With this knowledge, a responsible and honest engineer can be a very useful member of the society. An irresponsible or corrupt engineer can weaken the confidence of the public in the engineering profession. Engineering is the largest of the learned professions, and it affects all of us in most aspects of our lives. The decisions of physicians and attorneys normally affect one person at a time; the judgment of a design engineer can influence hundreds of lives at once [2]. Registered practicing engineers in the Lebanese Order of Engineers & Architects (OEA) are around 30,000, while registered lawyers are around 7,000.

Engineering ethics involve the study of moral issues and decisions seeking answers to questions about conduct and behaviors that are morally correct.

Engineers make decisions crucial to society at large, and therefore shoulder an enormous burden of public trust and safety. The complexity of modern technology forces the public to depend on engineers for expert judgments. People can sometimes do what is good on the basis of instinct alone. However, this may not be enough to prepare us for making the right decisions in this technological complicated culture that we live in today, and the evolving complex ethical problems that we are facing which often require choosing between unpleasant alternatives. These problems need approaches that rely on more than gut instinct or simple rules. Professional demands for social responsibility, public safety and accountability go well beyond intellectual ability proven in passing tests for a professional license. Moreover, in design tradeoffs, there is a further discovery that traditional codes of professional ethics do not cover strenuous ethical dilemmas that are now generated. Engineers must take into account the social, economic, legal and political context, a reflection that all engineered artifacts are designed for people [4].
Professional engineering societies do maintain formal codes of ethics to remind engineers of the high ethical standards expected at work and help

professional societies take legal actions against violators. However, codes suffer great limitations in the real world where no list of rules or ideals can possibly give enough guidance in all complex situations that can arise. Shades of gray areas are always there where no right or wrong solution is obvious, and an exercise of discretion or judgment is needed where the engineer, besides his technical expertise, needs the skills of a judge in weighing alternative courses of action once these are formulated.

Ethical dilemmas are summarized in three kinds [3]. The first kind deals with managing risk where a margin of safety is involved and can be expressed in technical terms of the probabilities of threat occurrence. But the decision making in this category is based on tradeoffs between life and costs. This confrontation with risk requires engineers to go beyond the question, "Can we do it?" to the question, "Should we do it?

The second kind of ethical dilemma is in managing institutions where the engineers work in large institutions that have their own laws of order and there is less inclination of employees to challenge authority, even when authority is known to be wrong in its decisions that affect the public. Tension between self-interest and social interest is reflected in differences between personal ethics and corporate ethics.

The third kind of ethical dilemma is in managing the future. Technological initiatives and choices cast a long shadow ahead; so part of the act of technology selection must deal with the future. Paradoxically, however, we find repeated examples of a failure to look ahead. To be sure, the future is always beset with uncertainty. But engineers can switch on to the imagination with the simple question, "What might happen if?" The question leads to what became known as technology assessment to aid decision making by involving a combination of technical facts and social preferences.

Engineering Practice is not what it used to be; thus a quest is essential to learn and adapt to the new environment we practice. Engineers in Lebanon are not different from their international peers and the problems and decisions they have to make every day are similar to those faced by others any where in the World.

In this work, Engineering Codes of Ethics of various professional societies including those of the Lebanese Order of Engineers and Architects - Beirut are discussed with examples that demonstrate the use of the code. This is followed by steps and rules that can help engineers formulate ethical judgments and decision-making. Practice exercises are compiled to enhance understanding of ethical dilemmas. Local case studies are discussed in the light of the ethical judgment methodology. Recommendations for local adoption are formulated.

II. Codes of Ethics of Engineering Professional Societies

Engineers have attempted to establish rules or standards of conduct in the form of codes of ethics. These codes not only protect the public, but also build and preserve the integrity and reputation of the engineering profession. There is no single code for all engineering societies, but there is considerable agreement among the various ethical codes. The Order of Engineers and Architects in Beirut does not have a code yet. However, this chapter includes relevant sections from the OEA internal bylaws. The fundamental canons of the codes are presented, while the full codes of some societies and their guidelines for using the fundamental canons and rules of practice are presented in Appendix A. Some universities that offer engineering degrees require that their graduates make a pledge or oath to the profession before graduation. The pledge of the engineering graduates of the American University of Beirut is presented in Appendix B as an example.

Professional Societies
"Engineering registration is a privilege and not a right. This privilege demands that engineers responsibly represent themselves before the public in a truthful and objective manner." [5]

Unlike practicing physicians and lawyers, practicing engineers in Lebanon are not all required to pass certification exams [6]. The requirement to be licensed depends upon the position of employment. If you take a job in which services are directly offered to the public, such as a consulting engineer on public projects, registration is generally required. A rule of thumb is that registration is required for engineers who work on static items, such as bridges and highways, but not for dynamic items such as cars, airplanes, and locomotives. Another rule of thumb is that engineers who do not work directly with the public, such as engineers that work for companies producing consumer products, are also exempt from professional licensing. However, any rule of thumb has exceptions, and each engineer should check the laws to determine if professional registration is required for the position held.

In Lebanon with the OEA, professional registration is required from engineers whose work involves signing for engineering designs and engineering projects [6].

American leading professional engineering societies all have codes of ethics, specifically:

National Society of Professional Engineers - NSPE

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

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

Rules of Practice

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

Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
2. Engineers shall at all times strive to serve the public interest.
3. Engineers shall avoid all conduct or practice which deceives the public.
4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
5. Engineers shall not be influenced in their professional duties by conflicting interests.
6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
8. Engineers shall accept personal responsibility for their professional activities; provided, however, that Engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the Engineer's interests cannot otherwise be protected.

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

American Society of Civil Engineers - ASCE

Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. using their knowledge and skill for the enhancement of human welfare and the environment;
2. being honest and impartial and serving with fidelity the public, their employers and clients;
3. striving to increase the competence and prestige of the engineering profession; and
4. supporting the professional and technical societies of their disciplines.

Fundamental Canons

1. 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.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.
7. Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

American Society of Mechanical Engineers - ASME

The Fundamental Principles

Engineers uphold and advance the integrity, honor, and dignity of the Engineering profession by:

I. Using their knowledge and skill for the enhancement of human welfare;
II. Being honest and impartial, and serving with fidelity the public, their employers and clients; and
III. Striving to increase the competence and prestige of the engineering profession.

The Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner.
8. Engineers shall consider environmental impact in the performance of their professional duties.

Institute of Electrical and Electronics Engineers - IEEE

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

1. to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;

10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Association of Computing Machinery - ACM

General Moral Imperatives

As an ACM member I will . . .

1.1 Contribute to society and human well-being
1.2 Avoid harm to others
1.3 Be honest and trustworthy
1.4 Be fair and take action not to discriminate
1.5 Honor property rights including copyrights and patents
1.6 Give proper credit for intellectual property
1.7 Respect the privacy of others
1.8 Honor Confidentiality

More Specific Professional Responsibilities

As an ACM computing professional I will . . .

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work
2.2 Acquire and maintain professional competence
2.3 Know and respect existing laws pertaining to professional work
2.4 Accept and provide appropriate professional review
2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks
2.6 Honor contracts, agreements, and assigned responsibilities
2.7 Improve public understanding of computing and its consequences
2.8 Access computing and communication resources only when authorized to do so.

Organizational Leadership Imperatives

As an ACM member and an organizational leader, I will . . .

3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities
3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life
3.3 Acknowledge and support proper and authorized uses of an organization's computing and communications resources
3.4 Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements. Later the system must be validated to meet requirements
3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system
3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems

Compliance with the Code
As an ACM member I will . . .
4.1 Uphold and promote the principles of this Code
4.2 Treat violations of this code as inconsistent with membership in the ACM

Accreditation Board for Engineering and Technology - ABET

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

The Fundamental Canons
1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

Order of Engineers & Architects in Beirut - OEA

The bylaws of the Order of Engineers & Architects contain relevant sections to the conduct of engineers. The reader should refer to the original Arabic manual for any interpretation of this literal translation [6].

Rights and Obligations of Engineers:
Article 8-1:
The engineer is to abide to the duties and obligations explained in this article and other articles listed below.

The engineer shall adhere to the bylaws and decisions of the OEA and shall abstain from doing any work that conflicts with the laws or approved practices or works that violate the rights of others.

Article 8-2:
The engineer shall register in the OEA all his works in the public and private sector and all the contracts associated with engineering works at all stages of study, supervision or implementation and shall pay all the incurred dues on these works as decided by the Representatives Board of the OEA. The Registration process of contracts and the payment of dues are done according to the system that is approved by the OEA Council.

Article 8-3:
The engineer shall interact with his peers on the basis of trust and mutual respect and shall not criticize in front of others the works of his peers who worked before him on the same job and shall not discredit the technical knowledge of his peers or undermine their expertise.

Article 8-4:
The engineer must respect the OEA authority and give all the information or clarifications required from him by the OEA.

Article 8-5:
The engineer shall treat his clients on the basis of trust, honesty and fidelity and shall perform the work on their behalf in a way that achieves what the clients want within the laws and accepted systems.

Article 8-6:
The engineer shall not give himself titles in the engineering profession beyond the titles given in his engineering degrees and according to his registration in the OEA.

Article 8-7:
The engineer is allowed to put on his door a bulletin that shows his name, specialty, degrees and the name of institution he graduated from. The engineer is allowed to advertise his name and specialty near the projects he is executing or supervising. The engineer may write all personal identification data on all the paper work, drawings and contracts that he processes in his engineering practice.
The engineer shall not, while practicing engineering independently, get contracts or attract clients in an unethical way as using commissions and secret payments. The engineer shall not pay to advertise about himself and his works directly or indirectly in newspapers, magazines and other publications. If the engineer announces about himself in

newspapers or publications, he should only mention his name, address and specialty in brief.

Article 8-8:
The engineer shall be paid on the works that he performs within his practice from the job owner or his representative and shall not receive money from any person or source that has disputes with the job owner.

Article 8-9:
Every member of OEA shall fill and submit a declaration form about his work and shall inform the OEA with any changes that take place in the information submitted in that form. The member must fill in all the required information in the professional declaration form in person and shall sign the form at his responsibility. Any wrong information will lead the member to a halt of all his transactions at the OEA based on a decision from the OEA Council, and he may be also subject to punishments that are stated in the bylaws. The stated address is used in all correspondences which are considered delivered. Any objection to receipt because of wrong address is not legally valid if the address is the same as that in the professional declaration form.

Article 8-10:
The engineer remuneration is determined by a contract for the work according to the guidelines on fees determined by the OEA Council. The engineer shall not accept fees that degrade the value of the profession and the dignity of engineers and should abide by the mentioned fees' guidelines. The engineer shall not compete unethically with his peers for their clients or projects by reducing his fees below the level put by the OEA.

Article 8-11:
If the work owner asked the engineer to do preliminary work prior to their agreement contract, then the engineer shall ask the work owner to sign a formal contract using to the OEA forms. After making all proposed modifications by both parties, the agreement form should include the name of the client and the type of work asked from the engineer and all the needed data, with a consent from the client to accept the judgment of the OEA if any disputes arise later from performing the tasks of the contract according to article 8-15.

Article 8-12:
The engineer shall put all his experience and technical knowledge in the preparation of designs and forms indicated in the fees guidelines and manage and supervise all the works assigned to him. He shall do his best to cater for the interests of his clients. The engineer can delegate his employees to follow up on tasks or make measurements,

but this should be under his direct supervision and he is held accountable for their work.

Article 8-13:
If the client asks the engineer to make changes in the design and these changes result in an increase of the cost, then the engineer will have to tell the client in writing about the additional costs before starting to implement the changes.

Article 8-14:
The engineer, before starting to study or execute the work or even sign the contract, shall insure in writing that his client has not asked another engineer already to do the same work. If another engineer has already been involved in the work, then the engineer shall inform him in writing to make sure that he had all his dues paid. If an engineer is asked to take the job after other engineers left the work unfinished due to contract cancellation or voluntary withdrawal from the work, then the engineer shall protect the integrity of the withdrawing engineer or engineers and maintain their lawful rights and shall make sure that the owner of the work is honoring previous commitments. The new engineer shall not start his new work except after getting a written statement from the withdrawing engineer that he has received all his rights or he does not mind the takeover. If the written statement is not possible to obtain due to disputes between the previous engineer and the work owner, then the new engineer should seek permission from the OEA to start the work. The OEA Council, once has given permission for work to the new engineer, shall seek resolution of the dispute between the previous engineer and the work owner. It is up to the OEA to evaluate if permission should be given, or not and under what conditions or dues based on the type of the dispute and the results of the efforts done for resolving the dispute.

Article 8-15:
All engineers members of OEA, in their agreements with their clients, shall try to have a condition that require referring to the OEA in case technical or financial disputes arise during the execution of the contract according to the bylaws of the OEA. Referring back to the OEA does not stop the right of each part from going to the Lebanese Courts for other legal timely or emergency precautions

Article 8-16:
In case of no condition for dispute evaluation by the OEA, then the disputes are directly referred to the Law. But the engineer or the work owner has the right to ask the OEA Council to resolve the dispute.

Article 8-17:
The engineer shall not file a law suit against any other engineer no matter what is the case unless he gets permission from the OEA President. The engineer shall, in case of a dispute with a peer, present the dispute to the OEA President while requesting the permission for suing. The OEA President will do his best to resolve the dispute. The OEA President must give the permission within 30 days from the date of registering the permission at the OEA if the dispute is not resolved. If a period of 30 days passes without considering the permission, then the permission is automatically given.

Article 8-18:
Engineers have the right to establish companies for engineering practice according to article 57 of the engineering practice law.

Section 9: OEA Disciplinary Council
Only the relevant article of the disciplinary act of OEA (section 9) is translated in this manual from the OEA internal bylaws [6]:

Article 9-1:
Every engineer who fails to fulfill the duties of his profession as described in the law of practice, the OEA internal bylaws, or any other guideline issued by OEA, or presents during the engineering practice or outside the practice an action that discredits the profession or an action that is not compliant with integrity of the profession or the integrity of his/her peers, their dignity or competency, or discredits with his/her actions the integrity of the OEA, will subject himself/herself to the disciplinary actions stated in articles 60 and 61 stated in the law of engineering practice of OEA.

Applications of Codes of Ethics
The following cases are selected from the text of Wright [7], to clarify the use of the professional codes.

Case 1 PLANS SIGNED BY OUTSIDE ENGINEER A small steel fabricator having engineering graduates on its payroll prepared the plans for the roof truss of a local building. The government inspector refused to accept the plans because they were not signed by a registered engineer. The steel company carried the plans to a local consulting engineer and asked that he certifies and places his seal and signature on the plans. The engineer, after satisfying himself that the design and plans were adequate and economical, agreed to certify the plans but insisted on receiving the fee as if he had prepared the plans.
Was such a procedure ethical? Was the engineer unreasonable in demanding such a fee? Should the building owner be expected to pay the additional cost involved or should the steel fabricator be expected to pay the engineer for his services?

Discussion
From the standpoint of the engineer, this procedure was ethical. There is an ethical question with respect to the fabricator, who would have willingly passed off an uncertified set of plans for a truss had he not been prevented from doing so by an alert government inspector.
It would have been unethical for the engineer to seal the design without checking the adequacy and economics of the truss design. Therefore, the engineer was not unreasonable in requiring the same fee he would have received had he been completely responsible for the design of the truss.

Case 2: FAILURE TO GIVE CREDIT TO OTHERS: Two researchers, X and Y are working independently on a problem. After a great deal of laboratory work, Researcher X writes a report explaining his results. In his report, however, he is unable to correlate his data into a simple pattern.
Researcher Y approaches the problem from a more theoretical viewpoint and discovers that X's data can be described by a well-known classical formula. Y reports the findings to X in an informal discussion with him.
A few months later, X publishes a paper explaining all of his data through the use of the formula suggested by Y, but he fails to acknowledge the contribution. Should he have done so? Was he right in his position that since it was only a well-established formula that was suggested, no acknowledgment was needed?

Discussion
ABET's suggested guidelines state: "Engineers shall give proper credit for engineering work to those to whom credit is due, and recognize the proprietary interests of others. Whenever possible, they shall name the person or persons who may be responsible for designs, inventions, writings, and other accomplishments". In failing to recognize the contribution of Y, it appears that Researcher X violated this guideline.
Giving credit to a predecessor or one who makes a contribution never hurts and is advisable. Doing so does not take anything away from the report, and it is a credit to the person reporting. Professional engineers should be careful not to injure the professional reputation, prospects, practice, or employment of another engineer and should treat other engineers with honor and respect.

Case 3: ACKNOWLEDGING MISTAKES: (RECTIFICATION OF AN ERROR)
Ziad, a professional structural engineer, was asked to investigate an existing structure, now supporting two identical condensers, to determine the advisability of adding a third condenser to the structure. The structure had been designed two years earlier by a group of engineers under Ziad's supervision. Ziad did not review the original design, but he was responsible for the group under his supervision. In checking the design, Ziad discovers that the original placement of reinforcing steel did not provide adequately for earthquake loading. The inadequacy, although real, is probably not too significant. The structure has been in service for two years without incident, but there has not been an earthquake in that period. Ziad must choose from three courses:

- Should he say nothing about the inadequacy and simply report that the structure is not capable of carrying the proposed new load?

- Should he work out a system of reinforcement for the structure that would both rectify the original inadequacy and provide for support of the new load in a single package?
- Should he admit to the original error and suggest to the owner that repairs be made against the possibility of damage if an earthquake should occur?

Discussion:
In this case, the engineer should disclose the original error to his client. Ziad did not perform his responsibility of reviewing and approving the original design, although he was paid to do so. Ethically, therefore, the responsibility is still his, since it had never been discharged. Ziad must now bring the whole matter into the open for consideration of the owner and take appropriate action to correct the problem. He should not proceed independently and secretly on any of the proposals mentioned.

Case 4: STICKING TO A GRADUATE'S COMMITMENT
Three months before graduation, electrical engineering student Laura accepts an offer of employment from one firm and subsequently is invited in by another firm for an interview. The travel distance to the second firm is considerable, and it has offered to pay the expenses incident to the trip. What action should be taken by the student?

Discussion
In this case, Laura has accepted a job and with it has accepted certain obligations. She cannot ethically accept employment with the second firm unless she is released by the first firm. She may visit the second firm and accept its expense money provided she informs the second firm that she is committed to the first firm and cannot accept employment there unless the first firm consents. If the second firm is willing to interview her and to pay her expenses under these conditions, she may take the trip. A more dignified procedure unquestionably is to decline the invitation to a second firm or to inform the first firm that she would like to visit the second firm and to see what they have to offer, although she acknowledges that her primary obligation is to the first firm.

III. Ethical Dilemmas in Professional Practice

Engineers have diverse and sometimes conflicting responsibilities. Moreover, engineers have professional rights. In this chapter, we discuss engineering ethical judgment and techniques to assist in solving ethical problems.

Professional Responsibilities:

Confidentiality and Propriety Information: All information received from the client, or developed for the client should be treated in the strictest confidence. Information will be released to others only with permission of the client. All client reports and data are confidential until publicly released by the client. Proprietary data should not be used in any subsequent assignments without specific approval of the client for which the data was developed. It is normal for local news media to find interest in capital improvement projects, both in the public and private sector. It is also not unusual for reporters to misunderstand and thereby misrepresent some portion of a project, to the detriment of the client.

Credit and Intellectual Property in Engineering Practice[8]: This is part of the engineer's responsibilities to other engineers. Intellectual property of engineers in private practice: From the code of ethics of NSPE, the following is outlined as professional obligations: "Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the Engineer for others without express permission. Engineers, before undertaking work for others in connection with which the Engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. Employer should indemnify the Engineer for use of the information for any purpose other than the original purpose."

In benchmarking and reverse engineering, it is perfectly legal to disassemble, examine and even destroy the item. The serious legal issue of patent infringement arises if we choose to adopt protected information or process as our own. If reverse engineering is to be appropriate, the engineer should obtain the item in an open manner, either through outright purchase on the open market or with the knowledge and permission of the owner.

Individual credit and the ownership of innovation in a design may be reflected by naming the device to an individual or to a group or organization. Engineers shall give credit for engineering work when

credit is due, and will recognize the proprietary interests of others (Code of NSPE – Appendix A). Does the present system of intellectual property ownership and social control ensure that members of the profession serve the public interest?

Responsibility to the Public – The engineer is to maintain a paramount concern for the health, safety and welfare of the public. Engineer's responsibility for safety is long standing and is clearly stated in the professional codes of ethics. Managers have to factor in such things as schedules, budgets and contract requirements. But engineers are to place safety considerations above all others. Engineers need more training in balancing risk versus benefit, so they can better communicate their legitimate concerns about public safety. Engineers have a responsibility for protecting the safety and well-being of the public in all of their design effort and decision-making process. Engineers do not work in vacuum and have to assess and manage risk in the light of obligation to the public, employer, and engineering profession as a whole.

Responsibility to the Client – The engineer shall serve the client with integrity and objectivity to ensure that our counsel is based on the impartial consideration of all pertinent facts and responsible opinions.

Responsibility to Employer [8]– A sound relationship between the professional employee and the employer is expected, based on mutual loyalty, cooperation, fair treatment, ethical practices and respect while recognizing the responsibility to safe guard the public health and safety. Employee loyalty and creativity is expected in support of the employer's objectives. It is not unusual in technical organizations for there to be hard fought battles regarding purely technical decisions that do not necessarily have any ethical implications--but do have impacts on the probabilities of success of products. The assumption here is that the engineer's objective is to prevent some serious harm, while minimizing career damage. Many ethics related disputes are caused by attempts to satisfy irreconcilable constraints.

Responsibility to the Environment – Most of the engineering problems for which engineering solutions have been sought involve threats to human health and safety. This directly follows from the engineer's responsibility for public health and safety. The engineer should monitor activities, which might have an environmental impact, make all reasonable efforts to minimize these effects, and should promote sustainable development. (Global warming – flooding – pollution of soil, water, and air)

Conflict of Interests – To be in a conflict of interests position, a person must be in a position of trust, which requires him or her to exercise judgment on behalf of others, and have interests that might interfere with the exercise of sound judgment in the position of trust. The engineer shall be alert to possible conflicts of interests. The client will be promptly informed of any business association, interest or circumstance, which could, or might be perceived to influence the engineer's judgment of quality of service.

Ethics in Research:

Responsibility for research integrity [8]: ensuring the integrity of research results, dealing fairly with others, especially by appropriately acknowledging their contributions, responsibility for lab safety and protecting the welfare of research subjects. Research misconduct is a significant misbehavior that fails to respect the intellectual property of others, that intentionally impedes the progress of research, or that risks corrupting the scientific record or compromising the integrity of scientific practices. Research misconduct can be identified by the following:

1. Fabrication-making up data or experiments in proposing, conducting and reporting research results.
2. Falsification- changing or misrepresenting data or experiments or other significant information.
3. Plagiarism- representing the work or ideas of another person as one's own.
4. Retaliation of any kind against a person who reported or provided information about suspected or alleged misconduct and who has not acted in bad faith.

Fair Credit in Research and Publication [9]:

The first significant consideration about authorship is who warrants inclusion of an author in an article. The second is the order in which authors are listed. In some fields and journals, authors are listed in alphabetical order. In other journals, the order of authors represents the importance of contribution that each one has made to a paper. Thus the lead author is listed first. In medical fields, the practice is to place the name of the head of the laboratory last. Interdisciplinary investigation has become common. Co-authors often understand little of their collaborators' work or even the problems others address which complicates the assignment of credit and evaluating the relative importance of each contribution.

Ethical Obligations of Authors [8]

Discussing credit before submitting the work for publication is prudent as well as ethically responsible. Along with proper inclusion of authors and acknowledgment of research contributions, proper citation of

sources is crucial to the fair assignment of credit. The ethical guidelines of professional societies state clearly that authors are obligated to perform a literature search to find and then cite the original publications that describe closely related work. The co-authors of a paper should be all those persons who have made significant contributions to the work reported and share responsibility and accountability for the results. Other contributions should be indicated in an acknowledgement section. An author should recognize that journal space is a precious resource created at considerable cost. An author therefore has an obligation to use it wisely and economically. Senior scientists are expected to give junior researchers including graduate students credit where credit is warranted.

Gratuities - Giving and Receiving – Engineers shall not accept any gift, gratuity, loan or other item of value that could influence their decisions. This does not preclude the giving or receiving of holiday cards, calendars or favors of limited value such as an occasional meal.

Computer Ethics: The use of an unlicensed copy of a software package is not only unethical, it can be illegal. It can amount to theft and in any event should be neither practiced nor tolerated. Computer ethics involve also privacy issues, where certain information is private and cannot be distributed without consent. Computers make privacy more difficult to protect as data are centrally stored and increasing number of people can access it [11]. Privacy is the basic right of an individual to control access to and use of information about himself [3]. Any unauthorized use of information is theft. Computers can also be objects of an unethical act, referred to as "hacking". Implanting false information in a database or disseminating viruses over the internet is ethically troubling.

Professional Rights [10]

There are rights that individuals have regardless of professional status, including the right to privacy, the right to participate in activities of one's own choosing outside of work, the right to reasonably object to company policies without fear of retaliation, and the right for due process. The engineer should get the opportunity for professional growth, based on his initiation and employer's support. The most fundamental right of an engineer is the right of professional conscience. This involves the right to exercise professional judgment in performing one's duties in an ethical manner. This right is not always easy for an employer to understand. One aspect of the right of professional conscience is referred to as the "Right of Conscientious Refusal". No employer can ask or pressure an employee into doing something unethical. An engineer ought to be allowed to refuse environmentally hazardous work if his conscience says that such work is immoral.

Whistle-Blowing [10]

When competent engineers know that their activities involve undue risks to innocent bystanders, they may be inhibited by conditions of employment from whistle-blowing or even internally challenging their employers. There is evidence in both industry and government of retaliation, intimidation, and punishment for those engineers, as employees, who do not "go along." Here we find tension between self-interest and social interest reflected in differences between personal ethics and corporate ethics.

Whistle-blowing presents a painfully difficult moral choice. Commonly the options boil down to "should I say something to stop these abuses and risk severe retaliation, or should I remain silent and stay out of trouble? Remaining silent while severe abuses continue does not stop the injustice and eats continually at the conscience. But, whistle blowers sometimes show little of team spirit that many employers value, instead coming across as complainers or fanatic [8]. Few general rules exist to promote or discourage whistle blowing, and most situations are handled on case-by-case basis.

Internal whistleblowing occurs when an employee goes over the head of an immediate supervisor to report a problem to the upper management or to the company president. External whisleblowing occurs when the engineer goes outside the company and reports the wrongdoing to the newspapers or law authority. Both actions can be perceived as disloyalty, with internal whistleblowing is seen as less serious than going outside the company. Whistleblowing can lead to distrust, disharmony, and inability of employees to work together. This is why whistle blowing should only be attempted if the following four conditions are met [11]:

1. Need: There must be a clear and important harm that can be avoided by blowing the whistle.
2. Proximity: The whistle blower must have enough expertise in the area to make realistic assessment of the situation.
3. Capability: The whistle blower must have a reasonable chance of success in stopping the harmful activity.
4. Last resort: Whistle blowing should be attempted only if there is no one else more capable to do it and if you feel that all other lines of action have been explored and shutoff.

It is acceptable to blow the whistle to protect public interest, but not to revenge from fellow employees, supervisors, or your company.

Engineering Ethical Judgement

To understand the engineering ethical judgment it is important to define what ethics in general is about along with the terminology that is commonly used in

ethical reasoning. The following definitions are taken from the website of Josephson Institute which can be accessed for more details [12]:

Values and Principles
When we speak of values we are referring to broad, general beliefs or attitudes about something we prize or desire. These beliefs, however, guide and motivate ethical conduct only when they are translated into principles. Ethical principles are the rules of conduct that are derived from ethical values. For example, "honesty" is a value that becomes operative in the form of a series of principles, such as: tell the truth, don't deceive, be candid, don't cheat. In this way, values give rise to many principles in the form of specific "dos" and "don'ts."

Ethical Values
Ethical values directly relate to beliefs concerning what is right and proper (as opposed to what is correct, effective or desirable).

Nonethical Values
Wealth, status, happiness, fulfillment, pleasure, personal freedom, being liked and being respected fall into this category. We call them nonethical (not unethical) values, for they are ethically neutral. The pursuit of nonethical objectives is normal and appropriate so long as ethical values are not sacrificed in the process.

Conflicting Values
Our values often conflict. In particular situations, our commitment to be honest and truthful may clash with the desire for wealth, status, a job or even the desire to be kind to others. When values conflict, choices must be made by ranking our values. The values we consistently rank higher than others are our core values, which define character and personality.

Contradictory Values
Sometimes we hold values that are internally inconsistent. One could accept the aphorism "a penny saved is a penny earned" and find oneself occasionally acting on the belief "you can't take it with you" or "here today, gone tomorrow."

Personal Moral Values
Most people have convictions about what is right and wrong based on religious beliefs, cultural roots, family background, personal experiences, laws, organizational values, professional norms and political habits. In contrast to consensual ethical principles — trustworthiness, respect, responsibility, fairness, caring, citizenship — personal and professional beliefs vary substantially over time, among cultures and even among members of the same society. They are a

source of continuous historical disagreement. This is an area where, as much as possible, the universal ethical value of respect for others dictates tolerance and respect for the dignity and autonomy of each person and cautions against self-righteousness in areas of legitimate controversy.

A Structured way to approach ethical problems is suggested by the Murdough Center for Engineering Professionalism in Texas Tech University [13].

" The days when an engineer's only ethical commitment was loyalty to his or her employer have long passed. The expansiveness of technology is such that now, more than ever, society is holding engineering professions accountable for decisions that affect a full range of daily life activities. Engineers now are responsible for saying: "Can we do it, should we do it, if we do it, can we control it, and are we willing to he accountable for it?"

Handling ethical dilemmas and making ethical decisions are very important elements of being a professional.
Although some moral demands on professionals are adequately expressible in rules of conduct specifying what acts are permissible, obligatory or prohibited, there is more to acting responsibly. A good consulting engineer not only avoids taking bribes, checks plans before signing off on them, and the like, but also exercises judgment and discretion and takes care to provide a design or product that is safe and of high quality. Judgment and discretion are necessary to provide such designs and products. Moral agents in general and professional in particular must decide how best to achieve good outcomes in matters entrusted to their care. Dilemmas force hard moral choices. They cause us to deal with values. If we are going to deal with dilemmas in an organized manner that allows us to explain and defend our decisions and not start " from ground zero" with each new problem, we need to:

- think about what we mean by such terms as good, bad, right, wrong, and necessary.
- consider, at the most general level, what kinds of actions are morally permissible.
- bring the general and theoretical to specifics which relate to the here and now of the real world.

This process allows us to get in our minds clear ideas about what is right and wrong and helps us to decide what to do in other cases. Then we have to make important distinctions. We have to distinguish between:

1. Conventional and Reflective Morality - Is what we have always done what we ought to
2. Morality and Law - Just because it is legal, is it right?
3. Morality and Prudence - Can we morally do it, just because it is in our best interest?
4. Morality and Economics - is the most economic decision the most moral decision? Morality and Obedience to Authority - Is following orders that are not proper a legal or a moral defense?
5. Morality and Mere Opinion - Are you obligated to search further for a reason to justify actions than mere opinion?

This takes you back to the start of the list and the considerations of what morality really means. Follow the above system when you analyze ethical dilemmas and you will be able to completely encircle the problem and approach its solution from many directions. But remember: You usually have to give up something of value to get something of value, and with ethics, there is frequently no absolute right answer, just a personal best answer, and it all comes down to you." [13]

Engineering Design and Ethics Analogy

Engineering design problems are problems to make things and processes to satisfy wants and needs. The analogy with ethical problem holds for a variety of design problems. Design problems in engineering are typically highly constrained, as are challenging ethical problems [8]. The design process, especially in the ways in which it differs from merely analyzing the design of others, highlights the very aspects of one's response to ethical problems where one must typically take account of a variety of considerations. The characteristics of a design problem that make it analogous to ethical problems are summarized in the following points [10]:

For interesting or substantive engineering design problems, there is rarely, if ever, a uniquely correct solution or response, or indeed, any predetermined number of correct responses.
Although no unique correct solution may exist, some possible responses are clearly unacceptable - there are wrong answers even if there is not a unique right answer - and some solutions are better than others.
Although for interesting or substantive engineering design problems there is rarely, if ever, a unique correct solution, two solutions may each have advantages of different sorts, so it is not necessarily true that, for any two candidate solutions, one must be incontrovertibly better than other.

Moral lessons to be learned from design problems to form strategies to ethical problems include [10]:

Consideration at the beginning of the unknowns and uncertainties in the situation.

Separation of the development of possible solutions from the definition of the problem. This may require more information. (Ethical problems are open-ended, require brainstorming)
Acting under time pressure. It is often important to begin by pursuing several possible solutions simultaneously, so that one will not be at a loss if one meets unexpected obstacles, but still avoid spreading one's energies too broadly.
The dynamic character of problem situations has further implications. Both the problem situation and one's understanding of it are likely to change and develop over the course of time.

Noticing the ethical issues and being committed to act ethically is not always enough. In complex situations, reasoning and problem-solving skills, just like those required for engineering design, are also necessary. These skills are defined as [12]:

Evaluation — the ability to collect and evaluate relevant facts and to know when to stop and how to make prudent decisions based on incomplete and ambiguous information.
Creativity — the capacity to develop alternative means of accomplishing goals in ways that avoid or minimize ethical problems.
Prediction — the ability to foresee potential consequences of conduct and assess the likelihood or risk that people will be helped or harmed by an act.

Guidelines for Facilitating Solutions [14]

Step 1:	Determine the facts in the situation - obtain all of the unbiased facts possible
Step 2:	Define the Stakeholders – those with a vested interest in the outcome
Step 3:	Assess the motivations of the Stakeholders - using effective communication techniques and personality assessment
Step 4:	Formulate alternative solutions - based on most complete information available, using basic ethical core values as guide
Step 5:	Evaluate proposed alternatives - short-list ethical solutions only; may be a potential choice between/among two or more totally ethical solutions
Step 6:	Seek additional assistance, as appropriate - engineering codes of ethics, previous cases, peers, reliance on personal experience, prayer
Step 7:	Select the best course of action - that which satisfies the highest core ethical values
Step 8:	Implement the selected solution - take action as warranted
Step 9:	Monitor and assess the outcome - note how to improve the next time

Exercises

Exercise 1: Employee right versus employer perspective [15]:

Exercise	Discussion
1. EMPLOYEE You have just come off a six-week field project. You worked an average of 50 hours a week and thought you did a great job. In daily discussions with your project manager, he/she always seemed satisfied with what you were doing and rarely had any input. You are currently burnt out and would like to take three days off, with pay, as comp-time for your hard work. When you propose this to your project manager, he/she got visibly angry and said, "no". You pleaded your case to no avail and now you are to meet with the project manager and the department manager to work it out.	The employee sees nothing wrong with his or her performance on the project. However, even with just this short summary of the situation, you should recognize two things the employee should have done: 1. Communicate to the supervisor early in the project their intention to take time off at the end, and 2. actively seek out constructive criticism on their performance.
2. PROJECT MANAGER The employee has been on a field job for six weeks. He/she did not seem to work efficiently, so, in your view, too many hours were charged for the end product. The employee spoke to you daily, during which times you said a few words about hurrying to finish the job, but not much else because you didn't want them dawdling on the phone. Now the employee wants three days comp-time, which you denied. He/she pressed the issue to the point that you called the department manager to back you up.	It may be hard to fault the project manager for his or her reluctance to allow the time off. However, the project manager should have provided the employee with a timely assessment of his or her performance.
3. DEPARTMENT MANAGER The employee is well-liked but inefficient. The project manager is uncommunicative. You are to find out the situation and work out a compromise. You are also to get the project manager and employee to agree on ways to prevent this sort of disagreement from happening in the future.	The neutral role of the department manager may be a new one to many of us. We should recognize that in spite of this role, the department manager also bears some responsibility for the problem at hand. He or she should have been proactive in addressing the employee's inefficiency (through the proper chain-of-command, of course) and in addressing the project manager's poor communication skills.

Exercise 2: Discussing Values [16]
It is important to establish exactly what values are held by individual engineers. Express your viewpoints about the following issues. Does your opinion agree with the code of ethics of your engineering professional society?

1. Your boss tells you that you have to sack a worker who is regularly arriving nearly an hour late three mornings every week. You know that the worker's lateness is caused by a difficult situation at home, what would you do?

2. You find a confidential report at work that shows your organization is seriously polluting the local environment. There is even suggestions that it is endangering the health of local residents. What do you do?

3. You are absolutely fed up with the job you have. It is giving you no pleasure, you have to drag yourself out of bed to go to work and you spend a lot of time telling your friends about the incompetence of every one around you. You would like to leave, but you know it is going to be difficult to find another job. What would you do?

Exercise 3: Gratuits [5]
Your company buys large quantities of parts from various suppliers in a very competitive market sector. As a professional engineer you often get to make critical decisions on which supplier should be selected from which parts are purchased. A new supplier is very eager to get your company's business. Not only that, but you find they are very eager to provide you personally with many benefits--free meals at high-class restaurants and free vacation weekends for supposed business meetings and demonstrations, and other more confidential things such as expensive gifts that arrive through the mail, club memberships and so on. What should you do?

a) Do not accept any of the gifts that go beyond legitimate business entertaining, even if your company would allow you to accept such gifts.
b) Report all gifts, etc., to your company, and let them decide whether or not you should accept them.
c) Accept the gifts without telling your company, because you know that your professional judgment about the supplier will not be biased by the gifts.
d) Tell other potential suppliers about the gifts, and ask them to provide you personally with similar benefits so you won't be biased in favor of any particular supplier.

Choice (a) is the right answer.

Exercise 4. Understanding the Professional Code of Conduct [5]:
With respect to the Moral Rules of Professional Conduct for engineers:

a) The rules are a bad thing because they encourage engineers to spy on and betray their colleagues.

b) The rules are a useful legal defense in court, when engineers can demonstrate that they obeyed the rules.
c) The rules enhance the image of the profession and hence its economic benefits to its members.
d) The rules are important in providing a summary of what the public has a right to expect from responsible engineers.

Choice (d) is the right answer.

Exercise 5: Charging Excessive Fees [5].
The model rules of professional conduct require registered engineers to conform to all but one of the following rules. Which rule is not required?

a) Do not charge excessive fees.
b) Do not compete unfairly with others.
c) Perform services only in the areas of personal competence.
d) Avoid conflicts of interest.

Choice (a) is the correct answer, because fees are a matter of negotiation between engineers and clients.

EXERCISE 6: Responsibility to the Environment
The depletion of the Ozone layer

The use of Chlorofluorocarbons (CFCs) as refrigerants in refrigerators and AC systems, glass cleaning detergents, etc.

1. Discuss the risks of continued practice (environmental and health) risks.
2. Discuss decision-making process for installation of a large AC system plant for a customer using such refrigerant (system is available and is cheap). Discuss what are the risks and what advice should you give.
3. Cross reference discussion with OEA internal bylaws governing rights and responsibilities of engineers (Section 2 of this manual)

Exercise 7: Discuss the following dilemmas

	Scenarios for Discussion
7.1	You are the design engineer of a construction project. You were asked by the client to "grease" the process of getting necessary licenses faster with money!
7.2	You are the IT engineer at a private service company. The employer asked you to install the latest operating system software version purchased and licensed only for one PC over the network of 10 PCs.
7.3	You are an industrial engineer. The company owner is trying to compete with lower cost foreign production. You were asked by your manager to skip some declared testing (quality assurance steps) for saving time and rejects.
7.4	You are a mechanical engineer working in a processing plant. The owner would like you to shut down the exhaust filter during nights to save operating cost, and run the process more efficiently since similar legalized exhaust is being generated daily by hundreds of diesel taxis.

IV. Case Studies

This chapter includes some case studies from the Lebanese engineering applications. We will list factual popular cases related to the construction industry and follow with short discussions. The cases are reported as quotations from the corresponding references. The discussion presented in this chapter is not about technical issues involved, rather it addresses the professional ethics issues raised by these cases. We would like to stress the open-ended nature of discussions that does not suggest a unique approach in any case.

Biekout Buildings Collapse
In early **June 1999** local news papers reported that unusual construction problems were developing in some residential buildings located in Biekout village at the North East of Beirut (around 8 Km). Following this information, the Order of Engineers & Architects –Beirut (OEA) took the initiative to assign one of its engineers to carry out a preliminary investigation regarding the cracking and any potential risk of collapse.

On **June 11, 1999** the OEA investigating Engineer visited the site located at the top edge of Nahr El Maout valley in front of the quarries. The project included two rows of buildings separated by a large road. Some of these buildings were under construction, which allowed the Engineer to perform a visual inspection of some construction details classified by the Engineer as "outrageous".

Observations as reported by the OEA investigating engineer [17]:
Some columns between the ground and the 1st floor were "out of plumb," with under-designed sections for the loads applied to these columns (six floors). In some areas, concrete did not cover the reinforcement. The transversal reinforcement was also absent in some cases.

Some roof slabs were damped and the exposed reinforcement steel was rusty.

Ground slabs were cracked showing some gaps with width of over 10 cm, which usually indicates, the absence of tie beams at the foundation level.

Level difference on the roof occurred between two of its slabs caused by partial settlement.

Cracking of the concrete supporting corners was apparent which is usually an indication of bad quality concrete mixture.

Inside some occupied apartments, visible cracks appeared everywhere (walls, roofs, kitchens, bed rooms, etc).

The inspection of the neighboring soil showed that a part of the project was built on a "silty soil" expandable when exposed to water.

Conclusions recommended by the OEA investigating engineer [17]
From the architectural positioning point of view, the project should have been located in a safer area, far away from the top edge of Nahr El Maout valley.

The bore holes carried out for the soil investigation covered only some areas of the project.

There was obvious evidence of bad execution of the construction works by incompetent workforce, and without any technical supervision.

Unfair profits, realized from the apartments' sale, drove the shortcuts taken in construction.

The repair of the cracking is not useful in some blocks, as it was costly, the cracks were developing, and the next rain season might be catastrophic.

It was necessary to hire specialized consulting firm to carry out an in depth study for reinforcing the buildings.

On **June 18, 1999,** the OEA transmitted the above preliminary report to the Ministry of Public Works (MPW) for information and necessary action [18].

On **July 1, 1999,** the MPW replied to the OEA confirming the receipt of OEA preliminary report, and the transfer of this report to the internal concerned department to undertake the necessary action [19].

By the **end of 1999**, and following many complaints from the tenants of the apartments, a technical committee from the Council of Development and Reconstruction (CDR) conducted an investigation.

During the second half of **Feb 2000,** two buildings collapsed in Biekout, causing considerable financial losses to the tenants of the apartments, but fortunately without any victims [20].

The Head of the CDR committee declared that the investigation undertaken by the CDR avoided a major catastrophe which could certainly have caused a number of victims [21].

Following this tragic event, the OEA called the Responsible Project Engineer for investigation. He submitted the shop drawings of the buildings, a soil investigation report established after the completion of the buildings, and an agreement between the Responsible Engineer and the Project Developer which stated that the project developer shall undertake the supervision of the construction works and shall be consequently responsible for any damage which might occur to the buildings.

On **March 10, 2000** a technical committee from the OEA visited the site and the surrounding Nahr El Maout area located immediately under the buildings site. The committee concluded that [22, 23]:

> A soil movement existed. This movement covered a much larger area for which the CDR was currently establishing topographical drawings showing exactly the areas where such soil movement might happen.
>
> The soil movement might be attributed to the rock cracking caused by the quarries (extraction of the rock by the use of explosives), or to the accumulated water in the soil due to the heavy rain during this period of the year.
>
> The building were located very close to the retaining wall supporting the road which was displaced in the direction of the valley due to the accumulated rain water, and which in turn pushed horizontally the buildings columns in the same direction. Therefore the failure of the retaining wall should be considered as the main reason for the catastrophe.
>
> The shop drawings of the retaining wall as well as its construction, and the used filling soil material were questionable.

Discussion

This case remains in the Lebanese courts on the date of publication of this manual.

1. The design engineer did not perform an a-priori soil investigation test of the building site. The OEA practice rules do not require submitting a soil test in the designed buildings that are lower than 40 meters in height (this law has changed after the catastrophe by the OEA. Soil tests are now required for buildings that are more than 3 floors high or that have an area of more than 1000m^2). The design engineer action was legal. Should he have checked the site of the project and learned about the cliff and pervious works of quarries in that area? For a civil engineer, this should have triggered safety responsibility before

proceeding with the building permit. The same judgment can be passed about the responsibility of the municipality engineer, who should have not signed the approval for the permit or at least warned the design engineer about the abnormality of the project site soil. These actions are in violation of articles 8-1 and 8-12 of the Lebanese OEA internal bylaws [section 2 of this manual]

2. According to the investigating committee, the columns sections were under-designed for the load. This problem may be a design issue, rather than an actual construction issue. The engineer supervising the construction work, if any was in charge, has broken articles 8-12 and 8-1 of the OEA bylaws by sacrificing technical specification for financial benefits of the client.

3. The project developer, once obtained the building permit, ended his contract with the design engineer. There is no mechanism of insuring that another engineer would be supervising the construction work. This would have been reported to the OEA, according to Article 8-14 of the OEA bylaws, by either the design engineer or the supervising engineer.

4. Other items can be highlighted, knowing that the professional conduct analysis is not unique.

Mrad and Ghaddar, January 2002

Biekout Building Site
Photo taken from: REVUE TRIMESTRIELLE PUBLIEE PAR L'ORDRE
DES ARCHITECTES DE BEYROUTH. NR 12. HIVER

Nehme Building Collapse
On Friday night (around 22:00 Hrs) of **Nov 10, 2000,** buildings in the Nehme region felt vibrations, and heard explosion.

The Municipal Authority was alerted immediately. The Engineer of the Nehme Municipality carried out immed survey that showed an important cracking in the colum buildings. They requested the habitants to evacuate t immediately.

Sponsored by USAID-Amideast and LibanCell

To hire a Consulting Engineer to carry out: a soil investigation, a review of the design drawings submitted with the construction permit and the execution drawings, an investigation regarding the execution of the construction works. In addition, a concrete test should be done to check the resistance of the columns, foundations, and other structural elements compliance with the values indicated in the design drawings.

On **Nov. 13, 2000,** the Consulting Engineer (CE) visited the site based on request from the Council of Development and Reconstruction (CDR).

On **Dec. 20, 2000** the CDR-CE issued his report with the following conclusions regarding neighboring buildings of the same complex [26]:

Existence of important cracking in the various structural elements (columns, beams, etc).
The test results of the concrete samples showed:
Low cement ratio,
High rate of sulfate,
Low compression strength of the columns (below half required),
Presence of honeycombing,
Presence of silt in the concrete mix,
Low density
The test results of the steel reinforcement samples showed the developing rust in the steel.
There was evidence of bad execution of the concrete works and not in accordance with the technical normal practice.
The visual inspection of the foundations soil showed that there was a possibility of differential settlement. In case it existed, it may have affected the stability of this building.

Following these events, the OEA investigated with the Responsible Project Engineer who signed the design drawings submitted with the construction permit and all the Specialist Engineers (Mechanical and Electrical) who participated in the design, or the execution of the collapsed buildings. The following represent conclusions taken from the minutes:

The signature of the Engineer on the design drawings was a false signature. This person was living in Europe since the mid eighties and did not give any power of attorney to any person to sign on his behalf.

Another engineer signed the design drawings in contradiction with the law and the rules of OEA. He was also responsible for the construction of the entire Nehme residential complex, and was legally pursued.

Discussion:
This case remains in the Lebanese courts on the date of publication of this manual.

1. The committee report indicated that the columns of the buildings were too weak to carry the load. Were the design technical specifications executed in the actual constructed building? The technical design engineer may have saved in the cost to increase the client profit! This is in violation of OEA Articles 8-1 & 8-12 [Section 2 of this manual].
2. The engineer, who forged the signature of another engineer on the complex drawings that were submitted to OEA, violated practice rules of the profession stated by Articles 8-1, 8-3 and 8-4 [Section 2 of this manual].
3. The supervision and construction works were both insufficient. The engineer in charge sacrificed safety for money saving on behalf of the client (the developer). This is in violation to OEA Articles 8-1 and 8-5 [Section 2 of this manual].
4. Other items can be highlighted, knowing that the conduct analysis is not unique.

Mrad and Ghaddar, January 2002

Collapsed Building in Nehme

Photo taken from: REVUE TRIMESTRIELLE PUBLIEE PAR L'ORDRE DE
DES ARCHITECTES DE BEYROUTH. NR 12. HIVER 2

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V. Recommendations

The most important aspect of the profession is to win public confidence and to show:

- that engineers have the breadth to deal with risk on society's own term,
- that engineers can exercise integrity regardless of potential sloppy ethics of their employers,
- and that engineers become public advocates on matters of safety.

Most of all, engineering education must foster, besides technical training, critical thinking, conflict management, meaning of the social contract, civic competence, and the role of values that underline all of the choices ahead.

The bylaws of the Lebanese Order of Engineers & Architects (OEA) stress engineers' honesty and integrity values and emphasize the engineer and the client rights. However, the subject bylaws do not define clearly the responsibility of engineers towards public welfare, health and safety. The commitment of OEA members to the professional conduct and responsibilities of the profession will encourage the society as a whole to respect and promote the engineering practice.

Proposed Action Plan:

- To work with the proper OEA committees and relevant public legislation bodies to lead a National formal effort towards establishing the correct framework of an Engineering Code of Ethics.
- To benchmark existing engineering professional societies codes. The code of the National Society of Professional Engineers in the USA [NSPE, Appendix A] is recommended as one valid basis. Another valid model of World Federation of Engineering Organization (WFEO) is being considered by the OEA. The Six Fundamental Canons of NSPE code are compared to the OEA bylaws (see section 2). The first three canons are not explicitly stated in the OEA internal bylaws [6], specifically:

  "Engineers, in the fulfillment of their professional duties, shall:
  1. Hold paramount the safety, health and welfare of the public.
  2. Perform services only in areas of their competence.
  3. Issue public statements only in an objective and truthful manner."

  The other three NSPE Fundamental Canons can be found in the OEA bylaws (section 2) and are stated here:
  - NSPE Canon 4: "Act for each employer or client as faithful agents or trustees."

  (Equivalent to Articles 8-5, 8-7 & 8-12 of OEA Bylaws)
  - NSPE Canon 5: "Avoid deceptive acts."

  (Equivalent to Articles 8-1, 8-3 of OEA Bylaws)

  - NSPE Canon 6: "Conduct themselves honorably, responsibly, ethically and lawfully so as to enhance the honor, reputation and usefulness of the profession."

  (Equivalent to Articles 8-1, 8-10, 8-13 and 9-1 of OEA Bylaws)

  The other American professional societies like the American Society of Civil Engineers (ASCE, Appendix A), American Society of Mechanical Engineers (ASME, section 2), and Institute of Electrical and Electronic Engineers (IEEE, section 2), have an additional fundamental canon related to professional development. Specifically:

  ASCE: Fundamental Canon 7 (Appendix A)

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

  The OEA bylaws do not have an explicit similar article. But some articles stress the professional relationships between peers rather than the responsibility for professional development.

- To launch an awareness campaign by the OEA regarding unethical practices encountered in Lebanon and their impact on the safety, health, and welfare of the community, and the economy.
- To promote the integration of professional ethics into the engineering educational programs.
- To integrate the developed Code of Ethics of the OEA with the introductory training of joining members.
- To ask OEA engineers to be committed to the proper application of the developed Code of Ethics in their daily work.
- To follow up the legal amendments needed for clarifying the responsibilities of the engineers in performing their work. Engineering processes should remain under the control and supervision of competent engineers during the project life cycle form design to realization, commissioning, maintenance, and de-commissioning.
- To enforce through the OEA Disciplinary Council all the legal measures indicated in the OEA internal rules against any Engineer who may violate the future Code of Ethics or the OEA regulations.
- To update existing rules governing OEA disciplinary actions by taking into consideration the developed OEA Code of Ethics, and renaming the existing Disciplinary Council as the Professional Control Council (PCC) guided by the developed Code of Ethics.
- To organize periodic training on professional ethics for registered engineers.
- To work towards eliminating potential conflicts of interests embedded in the existing contractual agreements between engineers and clients.

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14. http://www.engr.washington.edu/~uw-epp/Pepl/Ethics/ethics5.html
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23. "Continuation of the Special report: Collapse of building in area 224 Biekout," filed by the Order of Engineers and Architects - Beirut, June 26, 2001.
24. "9 dead, more than 27 injured in the collapse of two buildings in Nehme, evacuating the remaining of the buildings in the Mezher Housing Project and precautions to evacuate Hotel Bardawil," Al-Nahar Newspaper, November 13, 2000
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Other Resources on the Web:

- Web Clearinghouse for Engineering and Computing Ethics North Carolina State University
- Online Ethics Center for Engineering and Science Case Western Reserve University
- Ethics in Computing North Carolina State University
- National Institute for Engineering Ethics Texas Tech University
- Engineering Ethics Program Texas A & M University
- Institute for Business and Professional Ethics DePaul University
- UNESCO World Commission on the Ethics of Scientific Knowledge and Technology

Appendix A:
Codes of Ethics Guidelines

NSPE- National Society of Professional Engineers:
http://www.nspe.org/eh-home.htm

ASCE- American Society of Civil Engineers:
http://www.asce.org/membership/ethics.htm

ASME - American Society of Mechanical Engineers
http://www.asme.org/policies/p15-7.html

IEEE - Institute of Electrical and Electronics Engineers
http://www4.ncsu.edu/unity/users/j/jherkert/ethics.html

ACM - Association for Computing Machinery
http://www.acm.org/constitution/code.html

National Society of Professional Engineers (NSPE):
Code of Ethics for Engineers:
http://www.onlineethics.org/codes/NSPEcode.html

I. Fundamental Canons

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

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

II. Rules of Practice

1. Engineers shall hold paramount the safety, health and welfare of the public.

a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.
b. Engineers shall approve only those engineering documents which are in conformity with applicable standards.
c. Engineers shall not reveal facts, data or information without the prior consent of the client or employer except as authorized or required by law or this Code.
d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm which they believe are engaged in fraudulent or dishonest enterprise.
e. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

2. Engineers shall perform services only in the areas of their competence.

a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack

competence, nor to any plan or document not prepared under their direction and control.

c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

3. Engineers shall issue public statements only in an objective and truthful manner.

a. Engineers shall be objective and truthful in professional reports, statements or testimony. They shall include all relevant and pertinent information in such reports, statements or testimony, which should bear the date indicating when it was current.

b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.

c. Engineers shall issue no statements, criticisms or arguments on technical matters which are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.

4. Engineers shall act for each employer or client as faithful agents or trustees.

a. Engineers shall disclose all known or potential conflicts of interest which could influence or appear to influence their judgment or the quality of their services.

b. 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 and agreed to by all interested parties.

c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.

d. Engineers in public service as members, advisors or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.

e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

5. Engineers shall avoid deceptive acts.

a. Engineers shall not falsify their qualifications or permit misrepresentation of their, or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers or past accomplishments.

b. Engineers shall not offer, give, solicit or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect of intent to influencing the awarding of a contract. They shall not offer any gift, or other valuable consideration in order to secure work. They shall not pay a commission, percentage or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.

a. Engineers shall acknowledge their errors and shall not distort or alter the facts.

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

c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment they will notify their employers.

d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.

e. Engineers shall not actively participate in strikes, picket lines, or other collective coercive action.

f. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.

a. Engineers shall seek opportunities to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health and well-being of their community.

b. Engineers shall not complete, sign or seal plans and/or specifications that are not in conformity with applicable 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.
c. Engineers shall endeavor to extend public knowledge and appreciation of engineering and its achievements.

3. Engineers shall avoid all conduct or practice which deceives the public.
a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
b. Consistent with the foregoing, Engineers may advertise for recruitment of personnel.
c. Consistent with the foregoing, Engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.

4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the Engineer has gained particular and specialized knowledge.
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.

5. Engineers shall not be influenced in their professional duties by conflicting interests.
a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.
b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the Engineer in connection with work for which the Engineer is responsible.

6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.

a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
b. Engineers in governmental, industrial or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.

8. Engineers shall accept personal responsibility for their professional activities; provided, however, that Engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the Engineer's interests cannot otherwise be protected.
a. Engineers shall conform with state registration laws in the practice of engineering.
b. Engineers shall not use association with a non-engineer, a corporation, or partnership as a "cloak" for unethical acts.

9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.
a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be

duplicated by the Engineer for others without express permission.

c. Engineers, before undertaking work for others in connection with which the Engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. Employer should indemnify the Engineer for use of the information for any purpose other than the original purpose.

As Revised July 1996
"By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients; accordingly, nothing contained in the NSPE Code of Ethics, policy statements, opinions, rulings or other guidelines prohibits the submission of price quotations or competitive bids for engineering services at any time or in any amount."
Statement by NSPE Executive Committee
In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: "The Sherman Act does not require competitive bidding."
It is further noted that as made clear in the Supreme Court decision:

1. Engineers and firms may individually refuse to bid for engineering services.
2. Clients are not required to seek bids for engineering services.
3. Federal, state, and local laws governing procedures to procure engineering services are not affected, and remain in full force and effect.
4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.

5. State registration board rules of professional conduct, including rules prohibiting competitive bidding for engineering services, are not affected and remain in full force and effect. State registration boards with authority to adopt rules of professional conduct may adopt rules governing procedures to obtain engineering services.
6. As noted by the Supreme Court, "nothing in the judgment prevents NSPE and its members from attempting to influence governmental action . . ."

American Society of Civil Engineers (ASCE) Code of Ethics: http://www.asce.org/about/codeofethics.cfm

ASCE Code of Ethics

Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. using their knowledge and skill for the enhancement of human welfare and the environment;

2. being honest and impartial and serving with fidelity the public, their employers and clients;

3. striving to increase the competence and prestige of the engineering profession; and

4. supporting the professional and technical societies of their disciplines.

Fundamental Canons

1. 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.

2. Engineers shall perform services only in areas of their competence.

3. Engineers shall issue public statements only in an objective and truthful manner.

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

5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.

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

Guidelines to Practice Under the Fundamental Canons of Ethics

CANON 1.
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.

a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgments, decisions and practices incorporated into structures, machines, products, processes and devices.

b. Engineers shall approve or seal only those design documents, reviewed or prepared by them, which are determined to be safe for public health and welfare in conformity with accepted engineering standards.

c. Engineers whose professional judgment is overruled under circumstances where the safety, health and welfare of the public are endangered, or the principles of sustainable development ignored, shall inform their clients or employers of the possible consequences.

d. Engineers who have knowledge or reason to believe that another person or firm may be in violation of any of the provisions of Canon 1 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.

e. Engineers should seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health and well-being of their communities, and the protection of the environment through the practice of sustainable development.

f. Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public.

Engineers shall perform services only in areas of their competence.

a. Engineers shall undertake to perform engineering assignments only when qualified by education or experience in the technical field of engineering involved.

b. Engineers may accept an assignment requiring education or experience outside of their own fields of competence, provided their services are restricted to those phases of the project in which they are qualified. All other phases of such project shall be performed by qualified associates, consultants, or employees.

c. Engineers shall not affix their signatures or seals to any engineering plan or document dealing with subject matter in which they lack competence by virtue of education or experience or to any such plan or document not reviewed or prepared under their supervisory control.

CANON 3.
Engineers shall issue public statements only in an objective and truthful manner.

a. Engineers should endeavor to extend the public knowledge of engineering and sustainable development, and shall not participate in the dissemination of untrue, unfair or exaggerated statements regarding engineering.

b. Engineers shall be objective and truthful in 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 witnesses, shall express an engineering opinion only when it is founded upon adequate knowledge of the facts, upon a background of technical competence, and upon honest conviction.

d. Engineers shall issue no statements, criticisms, or arguments on engineering matters which are inspired or paid for by interested parties, unless they indicate on whose behalf the statements are made.

e. Engineers shall be dignified and modest in explaining their work and merit, and will avoid any act tending to promote their own interests at the expense of the integrity, honor and dignity of the profession.

CANON 4.
Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

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

b. Engineers shall not accept compensation 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.

c. Engineers shall not solicit or accept gratuities, directly or indirectly, from contractors, their agents, or other parties dealing with their clients or employers in connection with work for which they are responsible.

d. Engineers in public service as members, advisors, or employees of a governmental body or department shall not participate in considerations or actions with respect to services solicited or provided by them or their organization in private or public engineering practice.

e. Engineers shall advise their employers or clients when, as a result of their studies, they believe a project will not be successful.

f. Engineers shall not use confidential information coming to them in the course of their assignments as a means of making personal profit if such action is adverse to the interests of their clients, employers or the public.

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

CANON 5.
Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

a. Engineers shall not give, solicit or receive either directly or indirectly, any political contribution, gratuity, or unlawful consideration in order to secure work, exclusive of securing salaried positions through employment agencies.

b. Engineers should negotiate contracts for professional services fairly and on the basis of demonstrated competence and qualifications for the type of professional service required.

c. Engineers may request, propose or accept professional commissions on a contingent basis only under circumstances in which their professional judgments would not be compromised.

d. Engineers shall not falsify or permit misrepresentation of their academic or professional qualifications or experience.

e. Engineers shall give proper credit for engineering work to those to whom credit is due, and shall recognize the proprietary interests of others. Whenever possible, they shall name the person or persons who may be responsible for designs, inventions, writings or other accomplishments.

f. Engineers may advertise professional services in a way that does not contain misleading language or is in any other manner derogatory to the dignity of the profession.

g. Engineers shall not maliciously or falsely, directly or indirectly, injure the professional reputation, prospects, practice or employment of another engineer or indiscriminately criticize another's work.

h. Engineers shall not use equipment, supplies, laboratory or office facilities of their employers to carry on outside private practice without the consent of their employers.

CANON 6.
Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.

a. Engineers shall not knowingly act in a manner which will be derogatory to the honor, integrity, or dignity of the engineering profession or knowingly engage in business or professional practices of a fraudulent, dishonest or unethical nature.

CANON 7.
Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

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.

b. Engineers should encourage their engineering employees to become registered at the earliest possible date.

c. Engineers should encourage engineering employees to attend and present papers at professional and technical society meetings.

d. Engineers shall uphold the principle of mutually satisfying relationships between employers and employees with respect to terms of employment including professional grade descriptions, salary ranges, and fringe benefits.

Association of Computer Machinery Code of Conduct
http://www.onlineethics.org/codes/ACMcode.html

This code was created recently by a task force with a strong representation of philosophers and sociologists who teach computer ethics. More explanation of the moral principles can be obtained from the ACM website.

I. General Moral Imperatives.

As an ACM member I will . . .

1.1 Contribute to society and human well-being
1.2 Avoid harm to others
1.3 Be honest and trustworthy
1.4 Be fair and take action not to discriminate
1.5 Honor property rights including copyrights and patents
1.6 Give proper credit for intellectual property
1.7 Respect the privacy of others
1.8 Honor Confidentiality

II. More Specific Professional Responsibilities.

As an ACM computing professional I will . . .

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
Excellence is perhaps the most important obligation of a professional. The computing professional must strive to achieve quality and to be cognizant of the serious negative consequences that may result from poor quality in a system.

2.2 Acquire and maintain professional competence.
Excellence depends on individuals who take responsibility for acquiring and maintaining professional competence. A professional must participate in setting standards for appropriate levels of competence and strive to achieve those standards. Upgrading technical knowledge and competence can be achieved in several ways: doing independent study; attending seminars, conferences, or courses; and being involved in professional organizations.

2.3 Know and respect existing laws pertaining to professional work.
ACM members must obey existing local, state, province, national, and international laws unless there is a compelling ethical basis not to do so. Policies and procedures of the organization in which one participates must also be obeyed.

But compliance must be balanced with the recognition that sometimes existing laws and rules may be immoral or inappropriate and, therefore, must be challenged.
Violation of a law or regulation may be ethical when that law or rule has inadequate moral basis or when it conflicts with another law judged to be more important. If one decides to violate law or rule because it is viewed as unethical, or for any other reason, one must fully accept responsibility for one's actions and for the consequences.

2.4 Accept and provide appropriate professional review.
Quality professional work, especially in the computing profession, depends on professional reviewing and critiquing. Whenever appropriate, individual members should seek and utilize peer review as well as provide critical review of the work of others.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.
Computer professionals must strive to be perceptive, thorough, and objective when evaluating, recommending, and presenting system descriptions and alternatives.
Computer professionals are in a position of special trust and therefore have a special responsibility to provide object, credible evaluations to employers, clients, users, and the public. When providing evaluations, the professional must also identify any relevant conflicts of interest, as stated in imperative 1.3.
As noted in the discussion of principle 1.2 on avoiding harm, any signs of danger from systems must be reported to those who have opportunity and/or responsibility to resolve them.
See the guidelines for imperative 1.2 for more details concerning harm, including the reporting of professional violations.

2.6 Honor contracts, agreements, and assigned responsibilities.
Honoring one's commitments is a matter of integrity and honesty. For the computer professional this includes ensuring that system elements perform as intended. Also, when one contracts for work with another party, one has an obligation to keep that party properly informed about progress toward completing that work.
A computing professional has a responsibility to request a change in any assignment that he or she feels cannot be completed as defined. Only after serious consideration and with full disclosure of risks and concerns to the employer or client, should one accept the assignment. The major underlying principle here is the obligation to accept personal

accountability for professional work. On some occasions other ethical principles may take the greater priority.
A judgment that a specific assignment should not be performed may not be accepted. Having clearly identified one's concerns and reasons for that judgment but failing to procure a change in that assignment, one may yet be obligated, by contract or by law, to proceed as directed. The computing professional's ethical judgment should be the final guide in deciding whether or not to proceed. Regardless of the decision, one must accept the responsibility for the consequences. However, performing assignments "against one's own judgment" does not relieve the professional of responsibility for any negative consequences.

2.7 Improve public understanding of computing and its consequences.

Computing professionals have a responsibility to share technical knowledge with the public by encouraging understanding of computing, includng the impacts of computer systems and their limitations. This imperative implies an obligation to counter any false views related to computing.

2.8 Access computing and communication resources only when authorized to do so.

Theft or destruction of tangible and electronic property is prohibited by imperative 1.2 -- "Avoid harm to others."
Trespassing includes accessing communication networks and computer systems, or accounts and/or files associated with those systems, without explicit authorization to do so. Individuals and organizations have the right to restrict access to their systems so long as they do not violate the discrimination principle (see 1.4).
No one should enter or use another's computing system, software, or data files without permission. One must always have appropriate approval before using system resources, including: communication ports, file space, other system peripherals, and computer time.

III. Organizational Leadership Imperatives.

As an ACM member and an organizational leader, I will . . .

3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities

3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life

3.3 Acknowledge and support proper and authorized uses of an organization's computing and communications resources

3.4 Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements. Later the system must be validated to meet requirements

3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system

3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems

IV. Compliance with the Code

As an ACM member I will . . .

4.1 Uphold and promote the principles of this Code

4.2 Treat violations of this code as inconsistent with membership in the ACM

Appendix B

The Graduate Engineer's Oath
American University of Beirut

Using the heritage left by my professional forebears, I dedicate myself to the pursuit of knowledge and the search for truth in the extension and benefits of my profession to humanity. I will strive always to disseminate what professional knowledge I acquire. And I will fully accept my responsibility for the instruction of younger members of the profession.

Zealous of high repute of my calling, I will strive to protect the interests and the good name of any member of my profession.

To all, I pledge integrity and fair dealing, tolerance and respect, and devotion to the obligation to use my special knowledge and express to serve humanity with complete sincerity.

I will strive faithfully to fulfill the solemn obligations of my profession and to govern my life and practice by its Canons of Ethics.

LibanCell

Dears Engineers,

We're living today in a challenging environment. Worldwide, Information Technology and the Internet revolution have transformed not only the way we do business but almost every aspect of our lives, the nature of our daily transactions: how we shop, how we get information, how we communicate, ...And cellular technology has even driven this transformation further by adding two basic ingredients of change: mobility and convenience. Mobility as the freedom dimension, the anywhere, any time feature. And convenience as the ease of use, practical dimension.

So how does that translate for us in Lebanon? How are we exploiting the opportunity offered to us by the Internet, to occupy a position of leader on the Internet geographical map, in this new World Economy? What are we providing as alternatives to our young talents, our key asset in order for them to select Lebanon as a home and a working place?

This responsibility has to be shared by both the Government and the private sector. The Government has a major say through regulation. It has to draft and promulgate laws to open up, to allow the provision of services, to think of "growing the sector". And we, as a private sector, have to invest and build infrastructure enabling the development and proliferation of services.

To be the Reference" is LibanCell's Vision. And we are deeply committed to be the Reference, not only in our dealings with our people, shareholders, customers, partners and the community, but also in keeping up with the social role we believe in and supporting consistently the values and noble causes we promote. We have and will continue in developing LibanCell Education Support program. We are a main contributor to multiple cultural activities and festivals held in Lebanon. We partnered with the Ministry of Interior for a campaign on safe driving and with Baalbeck festival committee to engrave a part of our cultural heritage on CD.

We are committed to be Your Enterprise, Your Choice and we are well aware of our social responsibility towards the community. Our support in this program is just another example.

Hussein Rifaï
Chairman – General Manager

Our Vision : To be The Reference.
Our Mission : We are Committed to the Enterprise of Choice in Lebanon and Beyond and to Sustain Leadership in the Provision of Communication Services and Solutions.