Ethics Issues in the Engineering Profession

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ABSTRACT

Engineers uphold and advance the integrity, honor, and dignity of the profession by using their knowledge and skills for the enhancement of human welfare, by being honest and impartial, by serving with fidelity to public, their employers and clients, by striving to increase the competence and prestige of the engineering profession, and by supporting the professional and technical societies of their disciplines. Engineers should hold paramount the safety, health and welfare of the public in the performance of their professional duties. Engineers actually carry on their shoulders the responsibility of ratifying the principles of sustainable growth in a safe and healthy environment. Sustainable developments deal with meeting the existing needs from naturally accessible reserves, while preserving and enhancing the environmental quality. This paper focuses on multiple topics of ethics issues in the engineering profession in detail. It includes why maintaining a high ethical standard is so important in the engineering profession; engineers' rights and obligations in dealing with safety, health and welfare of the public for a sustainable growth; misconception about ethics issues in the engineering profession; performing services only in areas of competence; ethical professional competition; avoiding conflicts of interest; pitfalls in the engineering profession dealing with ethics issues, and practical cases involving the ethical issues of engineering profession.

INTRODUCTION

Engineering plays an important role in sustainable development with respect to economic, social and environmental aspects. In the current complex work environment, there are multiple ethics issues of engineering profession. Technically speaking, the Engineering profession is a public service and the Engineering Codes of Ethics are an extensive guideline to professional demeanor. Understanding the engineering ethics guidelines are no more a choice for engineers but it is imperative for engineers to understand and execute them throughout their professional career. The three key points that are to be considered while serving the public are: Safety, Welfare and Health. Engineering is an important, learned and respected profession. The services provided by engineers require honesty, impartiality, fairness, and equity, and must be performed to the protection of the public health, safety, and welfare. In order to establish and maintain a high standard of integrity, skills and practice in the engineering profession and safeguard life, health, property and welfare of the public; ethics guidelines are recommended and or enforced by various agencies for their employees and members. It is important to note that engineers at all times recognize his/her primary obligation to protect the safety, health and welfare of the public in performance of his/her professional duties. Under any circumstances, where the safety and or health and or welfare of the public are compromised, the engineer should take necessary action by informing the concerned authority of the possible consequences. In the last few years, various state licensing authorities are making ethics training mandatory for their license holding members and taking stringent actions against those license holding members who fail to follow the ethical guidelines. It is evident that for the past decades, the developments in the United States in creating the engineering code of ethics by different organizations have been actually led by court actions. The engineering judgements are so critical that the community wellbeing, safety, and a sustainable development are entirely dependent on those judgements. Codes of ethics are developed by organizations with at most care to guide the conduct of their members in their respective societies and professional associations by keeping the sustainable development as their guiding principle.

NECESSITY OF "ETHICS ISSUES OF ENGINEERING PROFESSION" TOPIC:

Engineering plays a critical role in human life with respect to economic, social, and cultural development [1]. In the current complex work environment, there are multiple ethics issues of engineering profession due to several external

factors associated with their decision-making judgements. Engineering is the application of mathematical and scientific principles for real-life development purposes by keeping the external constraints invoked by economic, environmental and sociological factors [1]. . Code of ethics are the broad guidelines to the professional conduct expected to be performed by an engineer throghout his/her professional career. Community well being and developments are fully dependent on engineer's judgement it is extremely important to ensure that the judgements are being made within the code of ethics to protect the interests of the current and the future generations. Codes are just one of the methods that an engineer can use while making professional judgements [2]. If a professional is performing his/her duties following the motto of safety, health and welfare of the public, then he/she will automatically be following the ethical guidelines of his/her profession. This paper is written with the intent of promoting ethical behaviors in organizations and within engineering profession for a sustainable

ETHICS DEFINITIONS:

Ethics is an extremely important part of the engineering profession. There can be multiple ethical issues of engineering profession, if an engineer fails to follow the basic norms of ethical guidelines. There are multiple definitions of Ethics. Its definition modifies according to the field and/or the context in which it is being used of or related to moral action, conduct, motive or character; as, ethical emotion; also, treating of moral feelings, duties or conduct; containing precepts of morality; moral.[3] Professionally right or befitting; conforming to professional standards of conduct (Kraushaar v. La Vin,181 Misc. 508, 42 N.Y.S.2d 857, 859). Proper ethical behavior is highly recommended for engineers in performance of duties while providing services to the public. The three basic points that are to be considered while serving the public are Safety, Welfare and Health [3]. Ethics is a study of standards of right and wrong by keeping the human welfare as the top prioriyty the top. According to Michael Josephson, among the universal ethical values are honesty, integrity, promise-keeping, fidelity, fairness, respect for others, responsible citizenship, pursuit of excellence and accountability. Ethics is also the philosophy of dealing with moral conduct, duty and judgment when dealing with humanity and the associated systems.

ETHICS AND MORALS

In practical life, people don't normally differentiate between Ethics and Morals. It relates to "right" and "wrong" conduct. Ethics refer to rules provided by an external source, e.g., Professional ethics standard set up by licensing board, codes of conduct in workplaces or principles in religions. In contrast, Morals refers to an individual's own principles regarding right and wrong. It can vary from person to person. The same act can be morally right for one person but can be morally wrong for others e.g. speaking the truth irrespective of consequences can be act of a person of high morality, but the same is not true for a person of low morality.[4]

ENGINEERING ETHICS & ITS RELEVANCE:

Engineering ethics is related to professional ethics, which is different than personal morality. It determines professional practice standard and is normally learnt through lessons of professional practice. Ethics is an essential part of an engineering professional education because it guides students in dealing with complexity of engineering professional practices. It is recommended to discuss the engineering ethics into engineering education with reference to four questions: What is engineering ethics? Why should it be emphasized in engineering education? How should it be taught? and When should it appear in the professional education? These topics/questions are discussed in detail in subsequent sections. [5]

MODEL RULES OF PROFESSIONAL CONDUCT REGULATED BY NCEES (NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING)

Several organizations such as NCEES have developed models and rules of professional conduct to guide its members in proper execution of their professional duties [6]. To safeguard life, health, and property, to promote the public welfare, and to maintain a high standard of integrity and practice, Rules of Professional Conduct has been developed by respective licensing boards. This is basically divided into three sections. These sections correspond to Licensee's Obligation to Society; Licensee's Obligation to Employer and Clients and; Licensee's Obligation to Other Licensees. [6]

CONTINUING EDUCATION INCLUDING ETHICS (RECENT GUIDELINES) REQUIREMENT OF NEW-YORK STATE ENGINEERING PROFESSIONALS

In the past there was only recommendations for engineering and other discipline professionals to have continuing education in their field of expertise. By passage of time, it was noted by the licensing board that many engineering and other discipline professionals are not following these recommendations. Keeping this situation in view, effective

January 1, 2004 licensed professional engineers and land surveyors renewing registration of a license on or after January 1, 2005 are required to complete continuing education requirements. If registration is due for renewal in recent time (after January 1, 2007), professional engineers will be required to complete 36 contact hours of continuing education and land surveyors will be required to complete 24 contact hours of continuing education, in each three-year registration period. Acceptable continuing education includes courses and educational activities. For courses, a minimum of 18 hours of continuing education must be completed in courses for professional engineers and a minimum of 16 hours of continuing education must be completed in courses for land surveyors. All 36 hours for professional engineers or 24 hours for land surveyors may be completed through acceptable courses. For educational activities, a maximum of 18 hours may be in educational activities for professional engineers. and a maximum of 8 hours may be in educational activities for land surveyors.[7]

In the current complex work environment, there was only recommendations from licensing boards for engineering and other discipline professionals to have ethics education in the past. By passage of time, it was noted by the licensing board that many engineering and other discipline professionals are not following general ethics recommendations suggested by the board. Keeping this situation in view, beginning August 1, 2011 and after (as a special requirement), at least an hour of professional ethics education must be taken as either a course or educational activity during every registration period. This requirement becomes effective for registration periods beginning August 1, 2011 and after.

CODE OF ETHICS OF PROFESSIONAL ENGINEERS WITH REFERENCE TO NSPE (NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS)

Engineering is a reputed, learned and a public profession. Engineering has a direct and significant impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and should be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that corresponds to the highest principles of ethical conduct. The Fundamental Canons of NSPE for Engineers, in the fulfillment of their professional duties, should: Hold paramount the safety, health, and welfare of the public; Perform services only in areas of their expertise/competence; Issue public statements only in an objective and truthful manner (not exaggerating for marketing purposes) ; Act for each employer or client as faithful agents or trustees; Avoid deceptive acts; and Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the engineering and other professions [8].

According to NSPE Rules of Practice, Engineers should hold paramount the safety, health, and welfare of the public. They should perform services only in the areas of their competence. According to NSPE guidelines of Professional Obligations, Engineers should be: Guided in all their relations by the highest standards of honesty and integrity; At all times strive to serve the public interest; Avoid all conduct or practice that deceives the public ; 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; and give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others. [8]

Apart from the above, NCEES board suggests that Engineers should not: Disclose confidential information without consent concerning the business affairs or technical processes of any present or former client or employer, or public body on which they served earlier or currently serving; be influenced in their professional duties by conflicting interests; should not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods; and 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 should present such information to the proper authority for action. [8]

The NSPE Code of Ethics also encourage engineers to follow the principles of sustainable development. The code defines sustainable development as the “challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development”. The main objective is to design projects in a manner that reduces their environmental impact during construction activities as well as during the life cycle of the project. [9]

GENERAL ETHICS ISSUES OF ENGINEERING PROFESSION

The topic of 'Engineering Ethics' is no longer an innovative topic. There are a growing number of engineering ethics guidelines introduced by well-known engineering societies such as: ASCE, AREMA, IEEE, SWE, ASME, AIChE and licensing boards across the world for guiding their professionals to act primarily at the public interest. The specific interest that many of the codes highlight is that of safety & welfare of public coupled with the avoidance of damage to the environment. A detailed analysis of legal obligations owed by individual engineers shows that the codes adopt or require duties beyond those which are possibly to be directly enforceable against the individual engineer, whether by the immediate employer or clients. This kind of setting gives rise to a number of fundamental questions including: how a duty involving the public interest to be enforced; and what steps are open to engineers when looking to comply with codes of conduct? [10]. Each scenario needs to be evaluated thoroughly on a case by case basis to determine how the individual engineer needs to react under specific situations.

CONCEPT OF MINOR NEGLIGENCE AND GROSS NEGLIGENCE

Minor Negligence is the mistake made by a licensee due to unaware of rules and regulation [10]. There could be a possibility that governing licensing board may excuse the licensee's first minor negligence. Gross negligence is a serious negligence made by a licensee professional [11]. Under gross negligence, the licensee professional knowingly execute this crime without considering the consequences or by ignoring the impact his action might cause on the public, the environment or on the property. The governing licensing board normally takes serious disciplinary action against the individuals responsible for gross negligence.

PITFALLS IN THE ENGINEERING PROFESSION DEALING WITH ETHICS ISSUES AND PRACTICAL CASES INVOLVING ETHICS ISSUES OF ENGINEERING PROFESSION

If an engineering professional is hired by a client. His/her professional decisions should be based on his/her professional knowledge and experience. [10] There are occasions, where the engineering professional hired by a client may have to deliver his/her professional opinion against the interest of client. This type of scenarios could happen a lot in real life. Conflict of interest is a major issue while dealing with ethical issues. Many organizations have developed their own unique ethical standards for their engineers and those guidelines include but are not limited to: safeguarding the interests of the public, demonstrating professional competence, sustainable development, preserving confidentiality, attending to conflict of interest and maintaining the social and environmental responsibility [2]. If the engineer encounter a situation where a warning needs to be raised to get the attention of the concerned stakeholders, it is critical for the engineer to deal with questions such as : whether to warn or not, when to warn, who to warn or how to warn. The handlings of warnings are extremely significant because warnings could prevent disasters that impact the public, environment or the nation's economy itself.

CONCLUSION:

The recent development of the world has been dominated by Science, Technology, Engineering and Mathematics and the role of the engineers are directly connected to the needs of the public. Engineering plays an important role in sustainable development with respect to economic, social and environmental aspects. Hence, the relevancy of Ethics Issues of Engineering Profession is extremely significant and the uniquely defined Code of Ethics are seen as an extensive guideline to professional conduct while executing their duties. Engineers should uphold and advance the integrity, honor, and dignity of their profession by using their knowledge and skill for the enhancement of human welfare [12]. Engineers are increasingly essential to play a leadership role in sustainable development, overcoming global challenges, such as Engineers actually carry on their shoulders the responsibility of ratifying the principles of sustainable growth in a safe and healthy environment weakening of resources, environmental pollution, damage to ecosystems and rapid population growth [1]. Engineers are expected to give high priority for the safety, health and welfare of the public in the performance of their professional duties apart from being truthful to the facts [12]. Engineers are public servants and they agree to this as part of their professional ethics and duty. This paper has described various practical ethical situations that engineers could follow as a guiding principles during their professional career. The paper also focused on multiple topics of ethics issues within the engineering profession in detail which includes but not limited to: why maintaining high ethical standard is so important in the engineering profession towards sustainable development; Engineers' rights and obligations in dealing with safety, health and welfare of the public; Misconception about ethics issues in the Engineering profession; Performing services only in areas of competence; Ethical professional competition; Avoiding conflicts of interest; Pitfalls in the engineering profession dealing with ethics issues and Practical cases involving ethics issues of engineering profession.

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