

## **THE ENGINEERS CODE OF PRACTICE**

Engineering Code of Practice simply refers to practical guidance (basic rules) for engineers to help them comply with legal obligations, safety standards, civil and professional obligations in the practice of engineering. An engineer may lose his license if he/she fails to comply with the code of Practice.

### **Note**

**This lecture note is an excerpt from the document titled “GEC524 - ENGINEERING ETHICS, CODE OF CONDUCTS AND THE RESPONSIBILITIES OF AN ENGINEER” downloaded from <https://prog.lmu.edu.ng/colleges\CMS/document/books/GEC524%20-%20ENGINEERING%20ETHICS,%20CODE%20OF%20CONDUCTS%20AND%20THE%20RESPONSIBILITIES%20OF%20AN%20ENGINEER.pdf>.**

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### **1.1 FUNDAMENTAL CODE OF ETHICS**

The professional engineer has some authority which has to be exercised carefully to avoid being a source of danger to the public. This includes being a leader in engineering projects, practicing engineering and supervising the work of younger engineers. The basic rules that govern the conduct of engineers (Engineering Ethics) are summarized into:

- (i) Hold paramount the safety, health and welfare of the public.
- (ii) Perform services only in areas of their competence.
- (iii) Issue public statements only in an objective and truthful manner.
- (iv) Act for your employers as faithful agents or trustees.
- (v) Avoid deceptive acts.
- (vi) Conduct themselves in such a way as to always enhance the reputation of the profession.

### **1.2 ENGINEERS’ RESPONSIBILITY FOR PUBLIC SAFETY.**

The incessant collapse of buildings at various places in Nigeria (especially Lagos), the environmental degradation experienced by the people of Niger Delta, the pot-holes in most

Nigerian roads, recent incidences in the US such as the Challenger space-ship disaster, the Kansas city Hyatt –Regency hotel walkway collapse and the Exxon Ospill have drawn attention to the Engineers' responsibility for public safety.

Engineers and their managers must keep their obligations to public safety at the forefront when making design and management decisions.

Quality designs and construction practice are imperative in every field of engineering. There is need for ethical and creative engineering designs and corporate practice.

The American Society of Civil Engineering Code of Ethics states that —Engineers must hold the public safety, welfare, and health paramount and use our knowledge and skill for the enhancement of human welfare.

When Engineers take pride in and responsibility for their designs, the entire engineering profession benefits.

Consideration of professional ethics in engineering practice positively affects engineering creativity. If ignored, bad public relations are a possibility for the engineer, the company he works for and the profession in general. Engineers should strictly adhere to their professional codes and standards. They should encourage others to report those who do not. They should do so because:

- i. It will help protect people from being injured by what the engineers do.
- ii. It will assure each engineer of a better working environment and reduce pressures from other people to do otherwise.
- iii. They will be proud of their profession if they adhere to the codes of ethics, especially in Nigeria where the public image of engineers need improvement.
- iv. Adhering to the codes will lead to benefits for all engineers and public confidence in the profession will be increased.

Safety is an essential design consideration. Safety is deemed as the absence of unreasonable danger. Safety is freedom from accident. Sometimes, a factor safety of 2-3 is built into engineering design equations. Despite this, litigations associated with engineering failures are on the increase, and in some countries practicing as a professional has become a risky venture. The Engineers and their professional societies must acquire requisite knowledge about liability issues. The question is often asked,—where does a design engineer and his companies

responsibility end and the contractors manufacturers and consumer's begin? It is pertinent to end this section on Engineers

responsibility for public safety with a quotation from the Ethics case studies published by the Texas A & M department of philosophy and mechanical Engineering: —The public has provided Engineers, through the tax base, with the means of obtaining education, and through legislation, with the means of licensing and regulating themselves. In return, engineers have responsibility for protecting the safety and wellbeing of the public in all of their design efforts. This is part of an implicit social contract all engineers agree to when they accept admission to an engineering college (membership of NSE).

### **1.3 CONFLICTING INTERESTS AND CONFLICT OF INTEREST.**

Engineers should be careful in getting involved in taking —decisions which may be seen as biased or having conflicting interests or conflict of interest. The examples below indicate conflict of interests which can influence the judgment of an engineer.

- (a) An engineer has responsibility to write specifications for a water project but owns a company that manufactures and sells such systems. This constitutes a conflict of interest.
- (b) An Engineer works for a local government agency and at the same time works for a consulting firm that deals with the agency.
- (c) Engineering decisions that are to the advantage of Engineers taking the decision constitute conflicting interests.
- (d) A company pays for engineers to attend a seminar on the use of its products. This is compared to perks and gifts given to physicians by drug companies.
- (e) An Engineer's interests may be at conflict with those of its clients.
- (f) An Engineer leaving public employment and then working in the same area in the private sector is a delicate issue. The engineer has had access to government activities that a private client may desire. Can this be ethical?
- (g) A city engineer selects an engineering firm for a city project based on its technical proposals. However other firms view the selection of the firm as biased.
- (h) A client believes an engineer's design are too costly but the engineer fears that anything less may endanger public safety.
- (i) An Engineer has a conflict between honoring an agreement with a former employer and

reporting a hazard to protect public interest.

(j) An Engineer owns both a contracting firm and a consulting firm and seeks to provide both services for a client.

#### **1.4 ENGINEER'S PROFESSIONAL OBLIGATIONS.**

Engineers shall commit themselves to achieving the highest standards in their work so as to increase the reputation of their profession. To achieve this they shall:

- Act consistently in public interest
- Act In the best interest of their client and employer and consistent with public interest
- Their product meet the highest professional standards possible
- Maintain the integrity of their professional judgment
- Promote an ethical approach to design and development
- Advance the integrity and reputation of the profession consistent with public interest
- Should be fair to and supportive of their colleagues
- Committed to lifelong learning and professional development
- Shall promote an ethical approach to professional practice.

Thus the engineer has various obligations which are further expatiated for emphasis

##### **1.4.1 ENGINEERS' OBLIGATIONS TO THE PUBLIC**

Engineers shall act consistently in public interest by;

1. Accepting full responsibility for their own work.
2. Act as moderators of the interests of the employer, the client and the users in the best interest of the public good.
3. Accept designs and proposals only if they are safe, meet specifications and do not diminish quality of life or harm the environment.
4. Disclose to appropriate bodies, any potential danger to the user, public or the environment that may be associated with a proposal or design.
5. Cooperate in any efforts to address such matters of grave public concern that may arise from his engineering proposal or design.
6. An engineer should avoid deception in all public statements concerning his proposal, methods and tools.

7. Should always volunteer professional skills and contribute to public education in the discipline.

#### **1.4.2 ENGINEERS' OBLIGATIONS TO CLIENTS AND EMPLOYER**

Engineers should always act in a manner that is in the best interest of their employers and clients, consistence with public interest. As appropriate, they should;

1. Provide service only in their area of competence and should be honest in any limitations of their experience and education.
2. Should not knowingly use designs that are obtained illegally or unethically.
3. Should use the property of his client or employer only in authorized manner or with their consent.
4. Maintain confidentiality of any information gained in the professional work where such is in the public interest and consistent with the law.
5. Report to client or employer promptly, if a project is likely to fail, prove too expensive, violate intellectual property law or otherwise be problematic.
6. Accept no outside work detrimental to the work being performed for the primary employer.
7. Inform client or employer or appropriate authority when a higher ethical concern is being compromised.

#### **1.4.3 ENGINEERS' OBLIGATIONS TO MANAGEMENT**

Engineering projects managers and leaders should ensure and promote ethical approach to development and execution of engineering projects and shall as appropriate:

1. Ensure good management and effective procedures for promotion of quality and standards and reduction of associated risks.
2. Ensure that information on standards are available to engineers on a project.
3. Assign responsibility to engineers after considering appropriate contributions of education and experience tempered with potential for further education and experience.
4. Ensure realistic and quantitative bills of quantities, scheduling, and outcomes on the project and provide an uncertainty assessments of the estimates.
5. Provide full and accurate conditions of service to prospective engineers for employment on the project.
6. Offer fair and just remuneration to employees on the project.

7. Provide for due process in hearing charges of violation of an employer's policy or of this code.
8. Should not punish any engineer for expressing ethical concerns on a project.

#### **1.4.4 ENGINEERS OBLIGATIONS TO PROFESSIONAL COLLEAGUES:**

Engineers should be fair and supportive of their professional colleagues. They should as appropriate:

1. Encourage colleagues to strictly adhere to the code.
2. Should be committed to assisting colleagues in their professional development.
3. Always credit fully the work of others and refrain from taking undue credit.
4. Should always give a fair hearing to the opinions, concerns or complains of other colleagues.
5. Engineers in situations outside their area of competence, call on the opinions of other professionals who have competence in that area.

#### **1.4.5 OBLIGATIONS TO SELF:**

Engineers should be committed to lifelong learning promote an ethical approach to the practice of their profession. They shall also endeavour to:

1. Continually improve their knowledge in the analysis, design, specifications, maintenance, development and testing of the systems of interest together with the management of the development process.
2. Improve the quality of the output of the engineering projects they are associated with.
3. Improve their ability to produce accurate and informative documentation of the projects.
4. Improve their knowledge of relevant professional standards and laws governing the contracts.

### **1.5 CONTINUOUS PROFESSIONAL DEVELOPMENT AND COMMITMENT TO EXCELLENCE.**

Today, Engineers can level mountains to the ground and turn rivers from their courses. The skies and the oceans are media for a wide range of engineering activities. Various categories of

modern transportation and communication systems have turned the world into a global village. Electric Energy has catalyzed civilization and environmental development. No matter the area of human challenge, the engineers are the agents of change and innovation through well thought out engineering projects.

In the light of the above, the engineer must be engaged in continuous professional development to maintain competence and advance the existing frontiers of knowledge in their areas of practice. (He who adds not to his learning diminishes it—Talmond Tabloid), the engineer should provide subordinates, the opportunities for professional development. Professionalism is also about commitment to standards of excellence in the performance of tasks in ones field of expertise. The engineer's obligations include commitments to professional development, the determination to always achieve a high standard of excellence and consistently ensuring a sound judgment in decision making.

### **1.5.1 OBLIGATIONS TO THE PROFESSION**

Engineers should always work to advance the integrity and reputation of the profession consistent with public interest. Engineers should as appropriate:

1. Provide public knowledge of the profession and an environment that encourages ethical practice of engineering.
2. Should not promote their own interest at the expense of the profession, client or employer.
3. Ensure professional standards except when inconsistent with public interest
4. Should always avoid false statements and those that could be considered speculative, vacuous, deceptive, misleading or doubtful
5. Engineers should ensure that clients, employers and supervisors know of their commitment to the professional code of ethics and the implications of such commitment.

### **1.5.2 COMMITMENT TO EXCELLENCE**

Engineers shall ensure that their final output meet the highest professional standards possible.

1. Aim to achieve high quality and acceptable cost, irrespective of tradeoffs. Such tradeoffs should be clear to and accepted by the client and employer
- .2. Identify and address ethical, economic, legal and environmental issues related to the projects.

3. Engineers should ensure that they have the requisite qualifications, by appropriate combination of education, training and experience, for the project they accept to execute.
4. Ensure that their output meet the highest professional standards and should not depart from such standards unless when ethically or technically justified.
5. Understand clearly the specifications for projects they undertake.
6. Ensure realistic estimates of cost, scheduling, quality and outcomes on any project and provide uncertainty assessment of their estimates
7. Engineers should ensure adequate documentation, including problems encountered and solutions adopted for any project executed.

### **1.5.3 NEED FOR SOUND JUDGEMENT**

Engineers shall maintain integrity and independence in their professional judgment. They should as appropriate:

1. Only endorse documents prepared under their supervision or within their areas of competence and with which they are in agreement.
2. Maintain professional objectivity with engineering documents they are asked to evaluate.
3. Should not engage in corrupt practices such as bribery, double or inflated billing, or other improper financial practices.
4. Disclose to all parties concerned, those conflicts of interest that cannot be avoided in the project
5. Should refuse to participate in any project in which they, their employers or clients have undisclosed conflicts of interest.

### **1.6 PROFESSIONAL CONDUCT AND MISCONDUCT:**

Engineering ethics is beginning to take its place alongside other well established professional groups such as Medical, Nursing, Business and Legal ethics. These professions have websites on the conduct/ misconduct of their members.

Most establishments have unwritten codes of conduct for their staff whilst others spell out what should be regarded as misconduct. Since —To engineer is human the Nigerian Society of Engineers is beginning to receive complaints on Engineers' misconduct. The University of Lagos



senior staff conditions of service defines misconduct as —General misconduct to the prejudice of the good name of the establishment and/or of discipline and the proper administration of business of the University. This includes corruption, dishonesty, drunkenness in the course of duty, and false claims against the University, insubordination, divided loyalty (conflict of interest) , negligence, falsification and suppression of records (facts, professional information) and conviction for a criminal offence other than traffic offence, absence from duty without leave for two consecutive or more nights without satisfactory reason, disobedience of any instruction issued by a constituted authority, failure to appear or to answer questions satisfactorily in any investigative panels set up by the establishment on matters out of above regulations.

A search on the internet shows that cases of misconduct are not as rampant in engineering discipline as in other professions. Engineers are taught to be familiar with codes and standards for their disciplines and to introduce a reasonable factor of safety in their designs. They are also expected to collaborate with the local standards enforcement agency such as the Standards Organization of Nigeria. However, neglect of professional ethics and inadequate enforcement of codes and standards are the causes of the few engineering failures in Nigeria.

In academics, plagiarism is a serious offence. It is interesting that some complaints on plagiarism have been received by the Nigerian Society of Engineers. All Engineers have responsibility to build a good image for the society and should always be conscious of the impact of their actions on the public image of their professions.

A search for our world's worst engineering failures/disasters would cover collapse of buildings and other structures, natural disasters such as earthquakes and oil spills. Some of the well documented failures include:

- i. Columbia space shuttle/challenger space-ship disaster
- ii. Failure of supersonic aircraft concord
- iii. Bhopal chemical leak which claimed 2000 lives
- iv. Collapse of Bridges from wind damage
- v. Chernobyl Nuclear power plant explosion and fire
- vi. Exxon Valdez oil spill, Alaska 1989, 10million gallons spilled
- vii. Kansas city, Missouri Hyatt Regency Hotel Failure

When failures occur, engineers should provide an analysis report by considering the ethical issues that might have been partly responsible for the failures. This should include information

on what failed, why it failed, possible ways of preventing such failures and who was at fault.

### **2.1.7 ENGINEERING FAILURES**

Although the engineer's efforts at creating and building systems to meet some need are expected to be —fail proof but since to engineer is human, failures do occur. Engineering systems also fail over time as a result of aging, material fatigue or wear and tear. The engineer must design to avoid failure which could result in loss of life and property or damage to the environment. A combination of factors lead to system or equipment failures. These include human factors, design flaws, material fatigues, and extreme conditions of operation and environmental factors. Often, neglect of engineering ethics is a root cause of an engineering failure. An ethical engineer is one who:

- i. Avoids conflict of interest
- ii. Does not attempt to misrepresent his knowledge and experience so as to accept jobs outside his area of expertise.
- iii. Acts in the best interest of society and environment
- iv. Fulfills the terms of their contract in a professional manner
- v. Promotes the education of young engineers within the field.

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When failures occur, engineers should provide an analysis report by considering the ethical issues that might have been partly responsible for the failures. This should include information on what failed, why it failed, possible ways of preventing such failures and who was at fault.

**Further reading**

Read the code of conduct of the various engineering societies such as the Nigeria Society of Engineers, APWEN, etc.