

## *Ethical Problem Solving in Engineering*

**Directions:** Read the scenario and the suggested solutions that follow it. Then choose the course of action that you think best solves the problem raised. Or, if you find none of the solutions proposed adequate, design your own solution.

1. An industrial engineering student from a small town has started working in his first job as a member of a research and development team charged with designing a new generation of printers for a market leader in this area. The company he works for wants to maintain its leadership in this area. They also want to respond to the emerging environmental problem caused by the disposal of the inkjet cartridges used in their current model. These inkjet cartridges are made in his hometown. If the new generation of printers does not use disposable cartridges, then the plant in his hometown will close, putting friends and family out of work. His company is a leader in empowering its employees. But what should he do with this newly found power?
  - a. Resign from the research and development team because he has a conflict of interest.
  - b. Use his position and influence on the committee to argue that the company does not need to develop a new generation of printers; the current model will do just fine. In this way he will ensure that his hometown friends will keep their jobs.
  - c. Sit back and see what the senior members of the team want to do. Then when he finds out, enthusiastically embrace whatever they recommend.
  - d. Advocate designing a recyclable cartridge that could be manufactured in the hometown plant.
  
2. You work for a construction company that is bidding for a lucrative contract. You are responsible for submitting the bid. Your supervisor tells you to prepare a bid below the actual cost of the project. When you ask how the company plans to recover its costs, your supervisor tells you to introduce mistakes into the constructions drawings. In this way, the company can recover costs by means of costly change orders. When you express discomfort with this, your supervisor dismisses your concerns. "Everybody does it. If we don't, we will lose the bid and we need this contract." What should you do
  - a. Do exactly as your supervisor asks. After all, you are new to the company and don't want to make waves.
  - b. Tell your supervisor that under no circumstances will you do what he has asked. Furthermore, if he persists, tell him that you will make a formal complaint to the government's ethics ombudsman.
  - c. Tell your supervisor that you will do what he asks only if he puts his order in writing and explicitly relieves you of all responsibility for it. If things go wrong, you want to be able to prove that you were merely following orders.

- d. Quit your job and look for work in a sector that doesn't encourage such practices.
  - e. Suggest to your supervisor that you contact the potential client and express your suspicions that other companies are deliberately inserting errors into their bids to generate expensive change orders.
3. A University of Puerto Rico coop student notices that workers who use catalyst A in a manufacturing process habitually violate safety protocols. She finds this disturbing since she knows that A causes cancer. During a meeting of her work group, she expresses her concerns and recommends that they switch to catalyst B which is non-carcinogenic. The leader of the group, a senior engineer, tells her to drop the issue. He argues that because the workers are violating safety procedures, they are responsible for whatever harm may occur, not the company. Furthermore, he has already looked into catalyst B, and it is much more expensive to use than A. What should the Co-Op student do?
- a. Do nothing. As the team leader has pointed out, this is not really her concern.
  - b. Point out that as an engineer she is committed to uphold the code of ethics which states that public safety is of paramount concern. If they continue to use catalyst A, they must inform the workers of its carcinogenic properties and of the availability of safer alternatives such as catalyst B. To do anything less is to violate a fundamental professional moral imperative.
  - c. Discuss the issue with her faculty advisor at UPRM and ask for advice.
  - d. Since this is clearly a public safety issue (worker safety), and since public safety is paramount, the student should go to the nearest television station and blow the whistle on her employer.
  - e. Investigate the issue further on her own time. Document the danger of catalyst A and carefully examine if catalyst B is really more expensive all things considered.
  - f. Discuss the issue with human resources department or with the supervisor of the manufacturing process to see if there is any way to enforce better the safety procedures.
4. An engineer has been hired by a lawyer to serve as an expert witness for his client, an accident victim. The engineer's responsibility is to prepare a formal, technical report that includes (1) a statement of the available facts, (2) the methodology used by the engineer in her investigation, (3) the technical results of that investigation, and (4) the "expert witness opinion" which is based on the results of the scientific investigation. She will offer her services for a flat fee.
- She has been hired by a lawyer who is representing the injury victim in court. The lawyer tells her to provide a minimal, incomplete report that leaves out information that will likely be essential to the trial. When it becomes necessary to

provide further information, the lawyer will bill the client for the additional work done by the engineer. The lawyer puts it this way: "My client has all kinds of money, so we can milk him for additional fees. Then you and I can split the money. Don't worry, everybody does it."

She is uncomfortable with this arrangement, but the attorney is well known, established, and in a position to throw a great deal of work her way. She needs all the work she can get. And the client is loaded. So what should she do?

- a. Go along with the attorney: leave out essential information and charge for additions to the report. Then split the money with him.
  - b. Quit on the spot. No matter how much you need the money, you are not going to get it by deceiving the client. This is a clear violation of canon 4 issues.
  - c. Pretend to go along with the lawyer, but write a complete report anyway. After all, he's not an engineer himself and is in no position to judge whether you have written a complete report or not.
  - d. Go directly to the client and inform him of the lawyer's intention to cheat him out of additional money.
  - e. Go along with the lawyer this time, but tell him that in the future you will charge a flat fee that will include all aspects of the report.
5. An engineer notices a fine white powder that covers everything in a room that has a laminating press. When she finds out that the press operator has been working in this room for over 10 years, she becomes concerned about the risks the white powder could present to his health. What should she do?
- a. Do nothing. Notifying the worker of the risk could raise legal problems. And should you notify your supervisor (or the worker's supervisor) you raise the probability that they would shoot the messenger rather than respond to the message.
  - b. Go to the nearest television station and talk with a reporter about this deplorable situation.
  - c. Check into OSHA regulations concerning the powder. Should the regulations warrant it, notify OSHA of the problem. Then, through appropriate company channels notify the operator and make sure that he receives a thorough medical examination to determine if any harm has occurred. Then check to make sure that the appropriate follow-up examinations are carried out.
  - d. Take a confrontational stance. Threaten to blow the whistle publicly on this situation unless supervisors take immediate action.
6. A worker under your supervision has recently been fired for incompetence and repeated violations of confidentiality. Several weeks later the worker returns to you

asking for a letter of recommendation. He says you owe it to him; you fired him, and he has not been able to find any work and has a family to support. What should you do?

- a. Write the letter praising him in the highest terms. Otherwise you would be responsible for any harm that would come to his family.
  - b. Write the letter but only after making it clear to him that your letter would have to raise and discuss frankly his being fired
  - c. Decline to write the letter. Explain to him that you have a legal duty to be forthright in any such letter to possible, future employers; any deception or omission would render you legally liable. This would render it impossible for you to recommend him in a favorable light.
  - d. Try to delegate the problem to someone else.
7. Your company has decided to accept your recommendation to purchase a UV curing oven to increase productivity. When the oven has been delivered and readied for use, your supervisor asks you to begin using it even though the appropriate Environmental Quality Board permits have not yet been issued. He states that such permission is pro forma anyway so why wait and lose valuable production time. What should you do?
- a. Do what your supervisor asks. The permits should arrive in a couple of weeks. In the meantime, nobody cares if you use the oven temporarily without the permits.
  - b. Refuse to do it. Running the oven without a permit is illegal, and you are under no obligation to do anything illegal for your employer. Threaten to blow the whistle on him.
  - c. First try to reason with him. Explain that even though you will probably not get caught, the severity of the fine and the loss of the company's good reputation with the EQB are not worth the risk. Add that as an engineer, you have a special obligation to safeguard the environment which includes strictly conforming to government environmental regulations.
  - d. Resign from the company or ask to be assigned to a new division with a different supervisor.
8. A civil engineer working for the a local water company drives past an urbanization and notices that a storage tank full of chlorine gas is located dangerously close to a crowded urbanization. Upon further inquiry, he finds that the tank belongs to a local, privately owned industry. When he discusses this problem with local government authorities, they tell him that there is nothing they can do. They wonder why he is so concerned with something that is not a part of his job. What should he do?
- a. Nothing. He is a civil engineer, and this is outside his area of expertise.

- b. He should drive to the local radio station and demand that they broadcast a warning to the residents of the urbanization. Then they can take collective action against the private company.
  - c. He could continue working through government channels. After further documenting his concerns, he could bring these to the attention of the EQB, EPA, or OSHA.
  - d. Go the owners of the tank and try to persuade them to relocate it. If they refuse, he could threaten to blow the whistle on them to the government or the local press.
9. Your company has recently entered into a cooperative venture with a Japanese firm. A team of engineers from this firm has come to your plant to teach your engineers a new manufacturing process. However, a member of this team, a Japanese engineer with very traditional cultural views, refuses to work with your team because one of the members is a woman. He persists even though you tell him that she is a highly qualified engineer. What should you do?
- a. Reassign the woman engineer. Explain to her that it is in the best interests of the company that they not offend the cultural sensitivities of the Japanese team.
  - b. Tell the Japanese engineer that he must work with all the members of your team or go back home.
  - c. Try to reason with the Japanese engineer by telling that in your culture women are highly qualified and work side by side with men. If this doesn't work, discuss the issue with another member of the Japanese team asking him to convince the Japanese engineer that it would be a good idea to work with the whole team including the woman.
  - d. Contact the supervisors of the engineers back in Japan and have them send a different team that is better prepared to deal with matters specific to Puerto Rican culture.
10. A student takes a computer systems class in which she learns how to deal with computer viruses. Using what she has learned, she creates her own virus and contemplates releasing it into the University system. Her plan is well intentioned enough: she wants to test the University's virus detection system. If the system picks up the virus, then this proves that it is sound. If not, then the virus will enter the system but since it is fairly harmless—or so she believes—it will eventually be detected without doing any harm, dramatizing to the University that its virus detection system has some weaknesses. Either way, she believes, she will do some good. You are her friend, and she tells you of her intentions. What should you do?
- a. Tell her to go ahead. She'll be doing the University a favor.
  - b. Go immediately to the instructor of the computer systems class and tell him of your friend's intention.

- c. Try to talk her out of introducing the virus. Point out that it violates University regulations, that she could be severely punished, and that others with similarly benign intentions have wreaked havoc on computer systems.
- d. Anonymously inform the system administrator that someone (don't specify who) plans on introducing a virus into the system. Maybe they can stop your friend, and, because you don't reveal her identity, they will be unable to punish her.