1. Drinking in the Workplace (EE: CC, page 302)

Branch, Inc. has been losing ground to its competitors in recent years. Concerned that substance abuse may be responsible for much of Branch's decline, the company has just adopted a policy that imposes sanctions on those employees found to be working under the influence of alcohol or illegal drugs.

John Crane and Andy Pullman have worked together in one of the engineering divisions of Branch for several years. Frequently John has detected alcohol on Andy's breath when they were beginning work in the morning and after work breaks during the day. But, until the new policy was announced it never occurred to John that he should say anything to Andy about it, let alone tell anyone else about it. Andy's work always has always been first rate, and John is not the kind of person who feels comfortable discussing such matters with others.

Two days before the announcement of the new alcohol and drug policy, Andy tells John that he is being considered for the position of head of quality control. Although pleased at the prospect of Andy's promotion, John wonders if Andy's drinking will get in the way of meeting his responsibilities. John worries that, with additional job pressures, Andy's drinking problem will worsen. What should John do?

2. Working Overtime (EE: CC, 353)

Ryan Redgrave was young, inexperienced in industry and naive about industry methods of operating. He did, however, possess superb qualifications in statistics and in computer programming and applications. He was hired by XYZ to improve quality control in plastic parts.

Ryan began implementing elements of statistical process control, and steady improvement in the quality of plastic parts was observed. Ryan noted that one vendor, IMP, a small company, produced a high-quality raw material that gave a superior part except that frequently, when color was involved, their batch-to-batch color consistency was not good. He called this to the attention of IMP's sales representative, Mark, a personable young man about Ryan's age. Mark asked for Ryan's help in solving the inconsistency problem, and over dinner one evening Ryan outlined a series of experiments to get to the root cause of the color consistency.

Mark agreed that IMP would supply the necessary material samples, and Ryan worked late several nights to conduct the experiments he had devised. As a result of these experiments, Ryan was able to suggest some formulation changes to Mark to improve the color consistency of their raw material. To show his gratitude, Mark took Ryan and his wife to an expensive restaurant for dinner. "This will make up for some of the late hours you worked trying to solve our mutual quality problem," Mark exclaimed.

The formulation changes Ryan suggested did work and the color consistency of the IMP material improved markedly. Mark continued to check its performance on frequent sales calls at XYZ. The friendship between Mark and Ryan grew, with Mark frequently taking Ryan to lunch. On several of these occasions, Mark urged Ryan to recommend that XYZ buy more of its plastic from IMP.

Ryan did recommend to his Procurement Department that, because of the improved quality of the material, XYZ buy more from IMP. A small increase was put into effect, although Procurement told Ryan that IMP's price was the highest of any of the plastics vendors with which XYZ dealt.

Identify and discuss any ethical issues this case raises. Has Ryan done anything wrong? Mark? Since Ryan worked extra hours, without pay, to improve IMP's color consistency is this an instance of "good works" on his part?

3. Trees (EE: CC, 311)

Kevin Clearing is the engineering manager for the Verdant County Road Commission (VCRC). VCRC has primary responsibility for maintaining the safety of county roads. Verdant County's population has increased by 30% in the past 10 years. This has resulted in increased traffic flow on many secondary roads in the area. Forest Drive, still a two lane road, has more than doubled its traffic flow during this period. It is now one of the main arteries leading into Verdant City, an industrial and commercial center of more than 60,000 people.

For each of the past 7 years at least one person has suffered a fatal automobile accident by crashing into trees closely aligned along a 3 mile stretch of Forest Drive. Many other accidents have also occurred, causing serious injuries, wrecked cars, and damaged trees. Some of the trees are quite close to the pavement. Two law suits have been filed against the road commission for not maintaining sufficient road safety along this 3 three mile stretch. Both were dismissed because the drivers were going well in excess of the 45 mph speed limit.

Other members of VCRC have been pressing Kevin Clearing to come up with a solution to the traffic problem on Forest Drive. They are concerned about safety, as well as law suits that may some day go against VCRC. Clearing now has a plan -- widen the road. Unfortunately, this will require cutting down about 30 healthy, longstanding trees along the road.

Clearing's plan is accepted by VCRC and announced to the public. Immediately a citizen environmental group forms and registers a protest. Tom Richards, spokesperson for the group, complains, "These accidents are the fault of careless drivers. Cutting down trees to protect drivers from their own carelessness symbolizes the destruction of our natural environment for the sake of human 'progress.' It's time to turn things around. Sue the drivers if they don't drive sensibly. Let's preserve the natural beauty and ecological integrity around us while we can."

Many letters on both sides of the issue appear in the Verdant Press, the issue is heatedly discussed on local TV, and Tom Richards presents VCRC with a petition to save the trees signed by 150 local citizens.

Discuss how Kevin Clearing should proceed at this point.

4. Fire Detectors (EE: CC, 311)

Residential fires cause many deaths each year. Several companies manufacture fire detectors in a highly competitive market. Jim is a senior engineer at one of these companies. He has been invited to discuss with management the directions his company should take in manufacturing and marketing fire detectors.

Jim knows that there are two basic types of fire detectors. Type A is very good for certain types of fires, but for smoldering fires the detector will delay the alarm too long or fail to detect the fire at all, sometimes resulting in the loss of life. Most companies still manufacture type A because it is cheap to build and generally performs well. Type a sells for $6 to $15.

Type B detectors combine Type A fire detecting abilities with a device for detecting smoldering fires, which constitute about 5 percent of all fires. Type B detectors sell for $15-30, but they could be sold for almost the price of type a detectors if they were manufactured in large quantities. In order to bring this about (short of government intervention prohibiting the sale of Type A detectors), many companies would have to decide that, in the interest of greater public safety, they will sell only Type B fire detectors.

There is little evidence that this is going to happen. As things stand, most companies either manufacture only Type A detectors, or at lest depend on Type A detectors for the vast majority of their profit. Relatively few Type B detectors will sell under present market conditions. However, we do not know for sure what

the actual effect of a company's example of selling only type B detectors would be. It might stimulate other firms to follow the example, or it might cause the government to outlaw Type A detectors.

Jim's company could still stay in business if it manufactured only Type B detectors, because there is some market for them and fire detectors are only one of the products manufactured by Jim's company. Jim takes seriously the engineer's responsibility to hold paramount the safety and welfare of the public. He wonders what this obligation implies in this situation. As he sees it, he faces two options:

Option 1

He can make no attempt to change his firm's policy, which is to manufacture mostly type a detectors and sell a few Type B detectors (3 percent of the firm's fire detector sales). Type A detectors, of course, are safety devices with a known deficiency, one of which can be corrected in Type B detectors. However, Type A detectors do work well 95 percent of the time. Also, far more people will buy Type A detectors than B under present market conditions.

Option 2

He can urge his company to go out of the business of making type A detectors and make only type b detectors, arguing that this is the only ethically responsible thing to do. In the long run, if other companies did the same thing, more lives would be saved and people would not be exposed to a danger of which they are generally not aware. (People generally do not know of the differences between Type A and Type B detectors.)

Which of these two options do you think is preferable? Can you think of any other options that Jim should consider?

5. Microwaves (EE: CC, 324)

After graduating from State University after 7 years of grueling undergraduate engineering classes, you go to work for XYZ Industries. XYZ Industries manufactures microwave ovens and other kitchen gadgets. You are hired into a low-level engineering position and as your first task you are asked to test a series of microwave ovens to test their defrosting capability. You proceed to your lab where you find a few dozen microwave ovens in their boxes waiting for you to start your test. You notice that every brand of microwave oven is here, including all of XYZ's competitors' brands.

You unpack all of the microwave ovens and begin your tests. It is kind of boring testing microwave ovens (you have to wait up to five minutes to defrost some of the test items), so you begin to dig through the cabinets in your lab to see what is there. You quickly find out that this is used to be the lab where they tested the microwave oven doors for radiation permeability (the amount of radiation that could escape through the glass door of the microwave ovens). You find a neat little piece of hand-held equipment which apparently was used to measure radiation levels. Being an engineer, you can't resist trying it out. You switch on the meter and point it around the room and out the window, etc. You notice that when you point it at some of the microwave ovens it goes off the scale. You quickly turn off all of the other microwaves, and discover that the reading is not some fluke. The microwave ovens you are standing in front of are emitting higher-than-average levels of radiation. You look and discover that one of the ovens is from XYZ and the other is from ABC, XYZ's arch-rival. These microwave ovens are currently the best-selling ovens on the market, because they are the cheapest ones available. It appears that these bargain ovens may not be as safe as they seem.

Seeing something fishy, you decide to look around a little more. You find the test report that discusses the radiation emissions from all of XYZ's models of microwave ovens. You learn that only the top of the line

and the mid-level microwaves were tested. The bargain oven's results had been extrapolated from the test results from the other ovens. What should you do?

6. Town Z Case (UPRM Ethics Case)

You are a recent graduate from UPRM and are trying to start up your own business in the construction industry. Town Z opens the bidding on a lucrative construction project. When you mention to a friend that you are thinking of submitting a bid, he tells you that it will not be successful unless you make a hefty campaign contribution to the mayor's reelection bid. He suggests that you inflate your bid to include the campaign contribution and hide this by padding other budget items. What should you do?

7. Inkjet Cartridge Case (UPRM Ethics Case)

In the early 1990's there were two basic printing technologies: dot matrix and laser. The development of inkjet cartridges revolutionized printing technology by offering laser-like quality at dot matrix prices.

Inkjet printers are affordable, in part, by the use of the disposable ink cartridge. The inkjet printers represent a very lucrative sector of the computer industry. Disposable cartridges have generated more than 30,000 jobs throughout the world. In your own hometown there is a large manufacturing plant of disposable cartridges for one of the most popular inkjet printers in the market. It is estimated that 45% of the families in your hometown depend directly or indirectly on the economic activity generated by this manufacturing plant.

Although the components of the disposable cartridges can last from five to seven years, it is more lucrative for the company to make them disposable rather than refillable. The razor-thin profit margin on the printer itself complicates matters further; in fact, most of the profit is generated by the sale of the disposable cartridges.

The continuous disposal of used cartridges is becoming a serious solid waste management problem for society. Some countries are considering regulating them, or even penalizing their use through special taxes. These factors need to be taken into account when designing the next generation of printers.

The company that has a manufacturing plant in your own hometown has just hired you to work in their research and development facilities in New York. You will be on a team charged with designing the next generation of printers. The aim is to restore market share since new competitors in the inkjet printer sector have been eating away at your company's profits for some time now. The next generation of printers may not use disposable cartridges. But this might require shutting down or downsizing the plant in your hometown.

8. Inserting Change Orders (UPRM Ethics Case)

A construction company bidding for a lucrative contract decides to present a quote lower than the actual cost of the project. Since they have no intention of losing money, they deliberately include mistakes in the construction drawings that would later require changing the contract at an additional cost to the client. Thus the construction company can risk bidding lower than cost to win the bid and later recoup costs through the costly change orders required to correct deliberately inserted mistakes.

This is a common practice in the Puerto Rican construction industry. Both the developers and the construction companies are aware of it. While developers are not thrilled with it, they reluctantly accept it because they want to start construction as soon as possible.

The practice of bidding for government contracts started in the 1930's when federal government agencies found it necessary to look for ways to reduce corruption. There are, however, alternatives to the practice described above. In Germany, for example, the contract is awarded to the firm with the quote closest to the

average. Another bidding system is based on the idea of best value bidding. This process has two parts: a preliminary selection process that assesses each bidder's ability to complete the project successfully; with the contract being awarded to the lowest bidder of those found competent in the first stage.

9. Pacemaker Case (UPRM Ethics Case)

A pacemaker manufacturing company (PACE Inc.) located in a small town in Puerto Rico provides jobs to about 80% of the town's workforce. Profit margins are thin in this competitive field which includes larger U.S. companies. You are on an R&D team for PACE that has studied two options for the circuitry: BULK CMOS and SOI. The team favors BULK CMOS because the manufacturing process is simpler and cheaper. But the chips will be larger and consume more energy; this means more surgery for the patients to replace the batteries. Overall, the use of BULK CMOS would reduce patient life expectancy by 15%. Given this knowledge, what should you do?

10. Japanese Engineer Case (UPRM Ethics Case)

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?

11. Participation in Protest Action as Part of a Political Campaign (NSPE BER 84-6)

Facts:
Engineer A is a candidate for the state legislature from a district in which there is a substantial percentage of unskilled workers who are represented by a union. In a particular plant where many of these employees work, the third worker in a year was killed recently in an industrial accident. After many discussions between workers and management, the workers set up a picket line to protest what they claim are unsafe working conditions and alleged management indifference to employee safety. During the political campaign Engineer A visits the picket site and participates without having visited the plant to investigate the specific conditions of the previous accident. With TV cameras focused on him, Engineer A holds up a placard which accuses the company of callous disregard for the workers and then joins the protesting employees in the picket line.

Question:
Was it unethical for Engineer A to accuse the company of callous disregard for the workers at the plant?

12. Objectivity of Engineer Retained as Expert (NSPE BER, 85-4)

Facts:
Engineer A is a forensic engineer. H e is hired as a consultant by Attorney Z to provide an engineering and safety analysis report and courtroom testimony in support of a plaintiff in a personal injury case. Following Engineer A's review and analysis, Engineer A determines that he cannot provide an engineering and safety analysis report favorable to the plaintiff because the results of the report would have to suggest that the plaintiff and not the defendant was at fault in the case. Engineer A's services are terminated and his fee is paid in full. Thereafter, Attorney X, representing the defendant in the case, learns of the circumstances relating to Engineer A's unwillingness to provide a report in support of Attorney Z's case and seeks to retain Engineer A to provide an independent and separate engineering and safety analysis report. Engineer A agrees to provide the report.

Question:
Was it ethical for Engineer A to agree to provide a separate engineering and safety analysis report?

13. Signing of Drawings by Engineer in Industry (NSPE BER, 88-5)

Facts:
Engineer A is employed by a computer manufacturing company. She was responsible for the design of certain computer equipment several years ago. She signed off on the drawings for the equipment at that time. Although Engineer A's design was properly prepared, the equipment manufacturing process was faulty and, as a result, the equipment became too costly and suffered mechanical breakdown. The manufacturing division made a number of recommended modifications to her design that it believed would help reduce costs in the manufacturing process. Engineer A's analysis of the manufacturing division's recommendations revealed that they would reduce the reliability of the product and greatly increase the downstream costs to the company through warranty claims. Engineer A's supervisor, who is not an engineer, asks Engineer A to sign off on the changes for the new computer equipment. There is nothing to suggest that the equipment would pose a danger to the public health and safety. Engineer A raises her concerns to her supervisor but nevertheless agrees to sign off on the changes without further protest.

Question:
Did Engineer A fulfill her ethical obligation by signing off on the changes without further action?

14. Public Welfare—Hazardous Waste (NSPE BER, 92-6)

FACTS:
Technician A is a field technician employed by an consulting environmental engineering firm. At the direction of his supervisor Engineer B, Technician A samples the contents of drums located on the property of a client. Based on Technician A's past experience, it is his opinion that analysis of the sample would most likely determine that the drum contents would be classified as hazardous waste. If the material is hazardous waste, Technician A knows that certain steps would legally have to be taken to transport and properly dispose of the drum including notifying the proper federal and state authorities.

Technician A asks his supervisor Engineer B what to do with the samples. Engineer B tells Technician A only to document the existence of the samples. Technician A is then told by Engineer B that since the client does other business with the firm, Engineer B will tell the client where the drums are located but do nothing else. Thereafter, Engineer B informs the client of the presence of drums containing "questionable material" and suggests that they be removed. The client contacts another firm and has the material removed.

QUESTIONS:

1. Was it ethical for Engineer B to merely inform the client of the presence of the drums and suggest that they be removed?

2. Did Engineer B have an ethical obligation to take further action?

15. PEER REVIEW -- CONFIDENTIALITY AGREEMENTS (NSPE BER Case 96-8)

FACTS:

Engineer A serves as a peer reviewer as part of an organized peer review program developed to assist engineers in improving their professional practice. When originally selected as a peer reviewer, Engineer A is asked to sign a confidentiality agreement; whereby Engineer A agrees not to disclose confidential information involving peer-reviewed firms.

As part of a peer review visit, Engineer A visits Engineer B's firm. Following a review of the technical documentation in connection with a series of recent design projects involving Engineer B's firm, Engineer A discovers that Engineer B's work may be in violation of state and local safety code requirements and could endanger public health, safety, and welfare.

QUESTION:

What are Engineer A's ethical responsibilities under the circumstances?

Engineering Ethics: Cases for Ethics Bowl

Procedure:

1. Students will be divided into groups of five
2. Each student will be assigned three cases
3. Students will carry out the following with regard to each case
    - Provide a short, paragraph summary of the case in Spanish
    - Identify five possible solutions to solve the scenario or five corrective actions should scenario describe actions already taken.
    - Prepare a stakeholder matrix that evaluates these solutions according to the following tests: reversibility, harm, publicity, and feasibility.
    - Choose a solution to the problem presented by the case
    - Construct an argument combining ethical and technical considerations that the solution chosen is the best available alternative.
4. Each group will include these case summaries in their final project report.