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ENGINEERING CODES OF ETHICS: ANALYSIS AND APPLICATIONS

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The Public knows that doctors and lawyers are bound to abide by certain recognized rules of conduct. Not finding the same character of obligations imposed upon engineers, people have failed to recognize them as members of a profession.--A.G. Christie (1922), engineer

With respect to each separate profession we must begin by analyzing the functions it performs in society. A code of ethics must contain a sense of mission, some feeling for the peculiar role of the profession it seeks to regulate.--Lon Fuller (1955), lawyer

I. Introduction: The Challenger Disaster

On the night of January 27, 1986, Robert Lund, vice-president for engineering at Morton Thiokol, had a problem. The Space Center was counting down for a shuttle launch the next morning. Lund had earlier presided at a meeting of engineers that unanimously recommended against the launch. He had concurred and informed his boss, Jerald Mason. Mason informed the Space Center. Lund had expected the flight to be postponed. The Space Center had a good safety record. It had gotten it by not allowing a launch unless the technical people approved.

Lund had not approved because the temperature at the launch site would be close to freezing at lift-off. The Space Center was worried about the ice already forming here and there on the boosters, but Lund's worry was the "O-rings" that sealed the boosters' segments. They had been a great idea, permitting Thiokol to build the huge rocket in Utah and ship it in pieces to the Space Center two thousand miles away. Building in Utah was so much more efficient than building on-site that Thiokol had been able to underbid the competition. The shuttle contract had earned Thiokol a $150 million in profits.[1] But the O-rings were not perfect. If one failed in flight, the shuttle could explode. Data from previous flights indicated that the rings tended to erode in flight, with the worst erosion occurring on the coldest preceding lift-off. Experimental evidence was sketchy but ominous. Erosion seemed to increase as the rings lost their resiliency and resiliency decreased with temperature. Unfortunately, almost no testing had been done below 40F. The engineers had had to extrapolate. But, with the lives of seven astronauts at stake, the decision seemed clear enough: Safety first.

Well, it had seemed clear earlier that day. Now Lund was not sure. The Space Center

had been "surprised" and "appalled" by the evidence on which the no-launch recommendation had been based. They wanted to launch. But they would not launch without Thiokol's approval. They urged Mason to reconsider. He had re-examined the evidence and decided the rings should hold at the expected temperature. Joseph Kilminster, Thiokol's vice president for shuttle programs, was ready to sign a launch approval, but only if Lund approved. Lund's first response was to repeat his objections. But then Mason had said something that made him think again. Mason had asked him to think like a manager rather than an engineer. Lund did and changed his mind. The next morning the shuttle exploded during lift-off, killing all aboard. An O-ring had failed.[2]

Should Lund have reversed himself and approved the launch? In retrospect, of course, it seems obvious that he should not have. But most problems concerning what we should do would hardly be problems at all if we could foresee all the consequences of what we do. Fairness to Lund requires us to ask whether he should have approved the launch given only the information actually available. Since Lund seems to have reversed himself and approved the launch because he began to think like a manager rather than an engineer, we need to consider whether Lund, an engineer, should have thought like a manager rather than an engineer. But, before we can consider that, we need to know what the difference is between thinking like a manager and thinking like an engineer.

One explanation of the difference would stress technical knowledge. Managers are trained to handle people. Engineers are trained to handle things. To think like a manager rather than an engineer is to focus on people rather than on things. According to this explanation, Lund was asked to concern himself primarily with how best to handle his boss, the Space Center, and his own engineers. He was to draw upon his knowledge of engineering only as he might his knowledge of a foreign language, for example, to help him understand what his engineers were saying. He was to act much as he would have had he never earned a degree in engineering.

If that explanation of what Mason was asking of Lund seems implausible, what is the alternative? If Mason did not mean that Lund should make his knowledge of engineering peripheral (as it seems Mason, also an engineer, did not when he earlier re-examined the evidence himself), what was he asking Lund to do? What is it to think like an engineer if not

simply to use one's technical knowledge of engineering? Interestingly, that is a question engineers have been asking for almost a century. Answers have often been expressed as a code of ethics. So, it seems, one way to begin to answer our question is to learn something about those codes.

II. History of Engineering Codes

The first civilian engineering organization in the United States, the Boston Society of Civil Engineers, was founded in 1848. The American Society of Civil Engineers (ASCE) was founded four years later. Though the early leaders of these organizations often referred to the "high character and integrity" engineers needed to serve the interests others committed to them, the history of codes of ethics really begins a half century later. In 1906, the American Institute of Electrical Engineers (AIEE) voted to embody in a code the ideas expressed in an address by its president, Schuyler S. Wheeler. After much debate and many revisions, the AIEE Board of Directors adopted a code in March, 1912. The AIEE Code was adopted (with minor amendments) by the American Society of Mechanical Engineers (ASME) in 1914. Meanwhile, the American Institute of Consulting Engineering, the American Institute of Chemical Engineers (AIChE), and ASCE each adopted a code of its own. By 1915, every major engineering organization in the United States had a code of ethics.[3]

These first codes were criticized almost as soon as they were adopted. They were (it was said) too concerned with duties to employers and fellow engineers. An engineer's duty to the public was merely to educate. For example, the AIEE Code (see Appendix A) required the engineer to "consider the protection of a client's or employer's interest his first professional obligations, and [to]...avoid every act contrary to this duty (sec. B.3)." An engineer's duties to the public were "to assist the public to a fair and correct general understanding of engineering matters, to extend generally knowledge of engineering,...to discourage the appearance of untrue, unfair or exaggerated statements on engineering subjects," and otherwise to be careful what one said in public (sec. D.16-19). Though they often speak of "employers" as well as of "clients," the early codes seemed designed primarily for the engineer who contracts with many clients and

is not dependent on any one of them. "Bench engineers," already numerous, seemed almost forgotten. But perhaps most serious, some codes permitted conduct others forbad. For example, the ASCE Code (Appendix B) forbad an engineer to "accept any remuneration other than his stated charges for services rendered his client" (sec. 1), while the AIEE Code (sec. B.4) permitted payments to the engineer from suppliers or other third parties if the client consented.[4]

Attempts to respond to such criticism began almost immediately. Among the first was the code (Appendix C) of the American Association of Engineers (AAE), itself an organization intended to include all engineers. None of the early attempts achieved much. But, on the eve of World War II, the American Engineering Council (AEC) began a process that almost achieved agreement among engineers on a single code of ethics. The AEC organized a committee to develop a code for all engineers. Each major engineering society was represented. When the AEC dissolved, the Engineers Council for Professional Development (ECPD) took over sponsorship. The resulting code was a conscious effort to synthesize the major provisions of earlier codes.

The ECPD Code was enormously successful at creating at least the appearance of unity among engineers. All eight major engineering organizations either "adopted or assented" to it in 1947. By 1955, it was accepted, at least in large part, by 82 national, state, or local engineering organizations. That was, as one commentator put it, "probably the greatest progress to be made ever before or since toward the realization of a single set of ethical standards for all engineers."[5]

But the ECPD Code was not as successful as at first it seemed. Some organizations, while "assenting" to the code, retained their own as well to preserve certain detailed provisions that seemed to suit their circumstances better than the corresponding provisions of the ECPD Code. As time went on, these organizations tended to rely more and more on their own code. The ECPD Code slowly lost influence.

The ECPD revised its code in 1963, 1974, and 1977 in an attempt to reverse this trend. Though many of the revisions were substantive, perhaps the most important were structural. Four "fundamental principles" replaced the "Foreword." The 28 "canons" and a long list of "guidelines" was added. These structural changes were intended to allow an organization to adopt the principles, but without the guidelines, if it did not want to accept the whole package.

Though the guidelines are supposed to be read in the light of the principles and canons, they are in fact an independent code. (See Appendices D and E.)

The Accreditation Board for Engineering Technology (ABET) replaced the ECPD soon after these revisions were made. The revisions nevertheless gave the ECPD Code new life (though under the new name). The revised code (that is, the fundamental principles and canons) has been adopted, at least in part, by most major engineering organizations in place of their own code. There are, however, two important exceptions.

The National Society of Professional Engineers (NSPE) initially adopted the 1947 version of the ECPD Code but substituted its own code in 1964 and has since revised it several times. Though still having much in common with the original ECPD Code, the NSPE's Code differs somewhat both in structure and content. (See Appendix G.) The NSPE Code is important for two reasons.

First, the NSPE has a "Board of Ethical Review" (BER) which answers ethics questions members of the society submit. While some other engineering societies also have such an advisory committee, the NSPE is alone in publishing the advice. BER "opinions" are printed several times a year in the NSPE's magazine, Professional Engineer. About 200 opinions have been collected and published in four volumes, the last covering the period 1971-75. These opinions constitute a valuable resource on many questions of engineering ethics.

Second, because professional engineers are licensed by states, the NSPE--through its state societies--has a role in the regulation of professional engineers much like that state medical societies have in the regulation of doctors. The NSPE Code is at least potentially enforceable (though only against registered engineers) in a way other codes of engineering ethics are not.

The other independent code, that of the Institute of Electrical and Electronic Engineers (IEEE), is important for different reason. The IEEE, with over 300,000 members, is the largest engineering organization in the United States. Its code, adopted in 1979, represents an alternative to the others. It is much briefer than the NSPE's (though significantly longer than the ABET Code without the Guidelines). It applies only to "members" of IEEE. Some of its provisions are unusual as well. For example, "Article II" enjoins engineers "to treat fairly all colleagues and co-workers regardless of race, religion, sex, age, or national origin", while

"Article III" expressly limits what engineers owe employer and client to what is consistent with "other parts of this Code." (See Appendix F.)

These three codes (four, counting the ABET Guidelines as separate from the ABET Code) today serve as ethical benchmarks for engineers. Several others, including an umbrella code proposed by the American Association of Engineering Societies (AAES) and a "Uniform Code" proposed by the IEEE, are being debated. No doubt, others will follow. (For the AAES Code, see Appendix H.)

III. Codes of Ethics Today

Most professions regularly amend their codes of ethics. Many have undertaken drastic revisions more than once. But engineering seems to be unique in the number of competing codes proposed and adopted over the years. Why has the history of codes been different for engineering? Is engineering, or engineering ethics, itself unique?

Chief among the explanations often advanced for the number of codes is that engineering is simply too diverse for one code of ethics to apply to all. Some engineers are independent practitioners. Some are employees of large organizations. Some are managers. Many are closely supervised. Some, whether in large organizations or on their own, are more or less their own boss. Engineers (it is said) just do too many different things for the same standards to apply to all. In sum, engineering is not a single profession but a family of historically related professions.

Though much rings true in this explanation of the number of codes of ethics, something rings false as well. If the divisions in engineering were like that, say, between medicine and dentistry, why would engineers establish "umbrella" organizations and devote so much time to trying to achieve one code for all engineers? Doctors and dentists have not made similar efforts to write a single code of ethics for their two professions. The three-quarters of a century engineers have tried to write a code for all engineers is—like the existence of schools of engineering—evidence that engineers all belong to one profession, however divided and diverse its membership. Indeed, we might think of the effort to write a single code as an attempt to

preserve the unity of the profession. On this view, the number of codes proposed and adopted is an instance of the "NIH" (Not Invented Here) phenomenon. The number of independent professional organizations, not the existence of several engineering professions, explains the number of competing codes.[6]

The NIH phenomenon is likely to be strongest when each side has good reasons for its view. Perhaps this is such a case. One side is certainly right to point out that a short code, like the Ten Commandments, is easy to remember or consult. It can be conspicuously posted to remind engineers of their obligations. A short code is also easier to get approved because its necessary generality automatically obscures disagreement over details of conduct. But the other side can also point out that a long code can provide much more information. It can take into account special circumstances, make exceptions explicit, and otherwise provide more guidance, at least for those willing to take the time to read it through. It can make it less likely that engineers who think they agree on standards will suddenly discover that they do not at a moment when the discovery is costly. Some professionals, for example, lawyers and accountants, long ago opted for a long code like the NSPE's or ABET's Guidelines. Others, for example, doctors and social workers, have opted for a short code like the IEEE's or ABET's fundamental principles and canons. Though the various codes differ in more than length, the other differences also seem to be founded on more than pride of authorship. The NIH phenomenon thus only partly explains why engineers have not been able to agree on a single code.

Whatever the explanation of the number of codes, there is no doubt that their variety could make it hard for an engineer to know what to do. An engineer who belongs to several organizations might be subject to several codes. Which should she consult? If the codes differ on some point, which (if any) should she consider binding. What should other engineers think of her if she chooses to do what one code allows even though another forbids it? What should <u>they</u> do?

These difficulties are not as serious as they may seem. In general, the various codes are not enforced by the organizations adopting them. Though the language often resembles that of statute, codes of ethics are in fact more like guides to conscience or public judgment, that is to say, moral rules. An engineer who violates the code of one of the organizations to which she

belongs is not likely to be expelled (or even formally censured). She is even less likely to have her "license to practice" revoked (since most engineers are not licensed at all). Apart from pangs of conscience, the only repercussion she is likely to suffer is the bad opinion of those who know her well enough to know what she has done. Her primary concern should be one of justifying her conduct to those concerned, herself included.

But thinking of codes of ethics as moral rules rather than legal rules seems to suggest new difficulties. If codes of ethics are merely moral rules, why worry about them at all? Why should each engineer not let his private conscience be his guide? Why should he have to consider what some organization of engineers has to say about what he should do? What expertise can engineering societies have in morals? Aren't the experts in morals philosophers or clergy rather than engineers? To answer these questions, we shall have to consider the relationship between professions and codes of ethics.

IV. Codes and Professions

A code of ethics generally appears when an occupation organizes itself into a profession. Why this connection between codes of ethics and organized professions? We may distinguish three common explanations.

One, what we might call "definition by paradigm," has would-be professions imitating the forms of widely recognized professions. To be a profession is to be like the most respected professions, the paradigms. Since the paradigms--especially law and medicine--require long training, special skills, licensing, and so on, so should any other group that wants to be considered a profession. Since both law and medicine have a code of ethics, engineering would naturally suppose it needed one as well to be a profession.

Much may be said for this first explanation of why engineering has a code of ethics. For example, the American Bar Association (ABA) adopted its first code of ethics in 1908, that is, four years before the first American engineering society did. Engineers certainly did not ignore the ABA's action. (Note, for example, the quotation from A.G. Christie at the beginning of this module.)

Though much may be said for this explanation, it seems inadequate for our purposes. The emphasis on imitation does not explain why engineers copied the ABA's adoption of a code of ethics but not the ABA's enforcement or licensing requirement. The emphasis on imitation also makes it hard to understand why engineers think what the code says important. After all, if a profession only needs a code so it can be like other professions, why should it matter much what the code says? Is it only because the paradigm profession thinks what its code says is important? But perhaps most significant, the emphasis on other professions does not explain why the early American codes were modeled on the code of the British Institute of Civil Engineers rather than on some American paradigm like the ABA's.[8]

One attempt to make up for these inadequacies yields (what we may call) "the contract with society" approach to understanding the relation between professions and codes of ethics. According to this approach, a code of ethics is one of those things a group must have before society will recognize it as a profession. The contents of the code are settled by considering what society would accept in exchange for such benefits of professionalism as high income and high prestige. A code is a way to win the advantages society grants only to those imposing certain restraints on themselves. A profession has no other interest in having a code of ethics.

While this second explanation may seem a significant advance over the first, it is still far from adequate. In particular, it gives us little help in answering such questions as the following: Why should engineers be so concerned about the details of their code when, it seems, society recognizes engineering as a profession and does not much care which of the various codes engineers adopt? Why did the original engineering codes take so much space laying down rules about how engineers should treat one another when it seems society is likely not to care about such things or (as in the prohibition of supplanting another engineer) to be positively adverse? The inability of the second explanation to help us answer such questions suggests that we should look for a better one.

A third explanation of the relation of profession and codes of ethics seems better than the other two. This explanation views a code as primarily a "contract between professionals." According to this explanation, a profession is a group of persons wanting to cooperate in serving the same ideal better than they could if they did not cooperate. Engineers, for example, might be

thought to serve the ideal of efficient design, construction, and maintenance of safe and useful objects.[9] A code of ethics would then prescribe how professionals are to pursue their common ideal so that each may do the best he can at minimum cost to himself (and to the public--if looking after the public is part of the ideal). The code is to protect each from certain pressures (for example, the pressure to cut corners to save money) by making it reasonably likely that most other members of the profession will not take advantage of his good conduct. A code protects members of a profession from certain consequences of competition.

According to this explanation, an occupation does not need society's recognition to be a profession. It needs only a practice among its members of cooperating to serve a certain ideal. Once an occupation has become a profession, society has a reason to give it special privileges (for example, the sole right to do certain kinds of work) if society wants to support serving the ideal in question in the way the profession has chosen to serve it. Otherwise, it may leave the profession unrecognized. So, according to this third explanation, what is wrong with the first two is that they confuse the trappings of profession with the thing itself.[10]

If we understand a code of ethics as the way a profession defines relations between those who want to serve a common ideal, we may construe the number of different codes of ethics as showing that engineers are not yet fully agreed to how they want to pursue their common ideal. Engineering would, in this respect, still be a profession-in-the-making. Thinking of engineering in this way is, under the circumstances, nonetheless consistent with thinking of engineering as a profession. The substantive differences between codes is not great. The differences in structure and language are more obvious than important in the choice of conduct. Engineers seem to have agreed on all essential terms of their "contract."[11]

Understanding a code of ethics as a contract between professionals, we can explain why engineers should not depend on mere private conscience when choosing how to practice their profession, why they should take into account what an organization of engineers has to say about what engineers should do. What others expect of us is part of what we should take into account in choosing what to do, especially if the expectation is reasonable. A code provides a guide to what engineers may reasonably expect of one another, what (more or less) "the rules of the game" are. Just as we must know the rules of baseball to know what to do with the ball, so we

must know engineering ethics to know, for example, whether, as engineers, we should merely weigh safety against the wishes of our employer or instead give safety preference over those wishes. A code of ethics should also provide a guide to what we may expect other members of our profession to help us do. If, for example, part of being an engineer is putting safety first, then Lund's engineers had a right to expect his support. When Lund's boss asked him to think like a manager rather than an engineer, he should, as an engineer, have responded, "Sorry, if you wanted a vice president who would think like a manager rather than and engineer, you should not have hired an engineer."

If Lund had so responded, he would have responded as the "rules of the engineering game" require. But would he have done the right thing, not simply according to those rules but really? This is not an empty question. Even games can be irrational or immoral. (Think, for example, of a game in which you score points by cutting off your fingers or by shooting people who happen to pass in the street below.) People are not merely members of this or that profession. They are also persons with responsibilities beyond their profession, persons who cannot escape pangs of conscience, criticism, blame, or punishment just by showing that they did what they did because their profession told them to. While we have now explained why an engineer should, as engineer, take account of her profession's code of ethics, we have not explained why anyone should be an engineer in the relevant sense.

We may put this point more dramatically. Suppose Lund's boss had responded in this way to what we just imagined Lund to have said to him: "Yes, we hired an engineer, but--we supposed--an engineer with common sense, one who understood just how much weight a rational person gives a code of ethics in decisions of this kind. Be reasonable. Your job and mine are on the line. The future of Thiokol is also on the line. Safety counts a lot. But other things do too. If we block this launch, the Space Center will start looking for someone more agreeable to supply boosters." If doing as one's professional code says is really justified, we should be able to explain to Lund (and his boss) why, as a rational person, Lund should support his profession's code as a guide for all engineers and why, under the circumstances, he could not rationally expect others to treat him as an exception.

V. Why Obey Your Profession's Code?

We might begin our answer by dismissing two alternatives some people find plausible. One is that Lund should do as his profession requires because he "promised," for example, by joining an engineering society having a code of ethics. We must dismiss this answer because it is at least possible that Lund never did anything we could plausibly characterize as promising to follow a code. Lund could, for example, have refused to join any professional association having a code. Yet, it seems such a refusal would not excuse him from conducting himself as an engineer should. The obligations of an engineer do not seem to rest on anything so contingent as a promise, oath, or vow. The "contract" between professionals of which we spoke cannot literally be a contract. It seems more like a "contract implied in law," that is, an obligation resting on what it is fair to require of someone given that she has benefitted in a certain way by some action of hers (for example, by claiming to be an engineer).

Another plausible answer we may quickly dismiss is that Lund should do as his profession requires because "society" says he should. We may dismiss this answer in part because it is not clear that society does say that. One way society has of saying things is through law. No law binds all engineers to abide by their profession's code of ethics (as the law does bind all lawyers). Of course, society has other ways of saying things than by law, for example, by public opinion. But it seems doubtful that the public knows enough about engineering ethics to have an opinion on the questions we are considering. More important, it is not clear why public opinion or law should decide what it is rational or moral to do. Certainly there have been both irrational laws (for example, those requiring use of outmoded techniques) and immoral laws (for example, those recognizing slavery). The public opinion supporting those laws could not have been less irrational or immoral than the laws themselves.

The two answers we have now dismissed share one notable feature. Either would, if defensible, provide a reason to do as one's profession says that is independent of what in particular the profession happens to say. The answers do not take account of the contents of the code of ethics. They are "formal." The answer we shall now give is not formal. We shall show that it is rational to support a code of ethics having a certain content by showing that it is rational

to support codes having a content of that sort.

Consider the ABET Code (Appendix D). The Code is divided into "fundamental principles" and "fundamental canons." The fundamental principles simply describe in general terms an ideal of service. 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 so on]." What rational person could object to other people with her skills trying to achieve that ideal? (Or at least, what rational person could object so long as their doing so did not interfere with what she was doing?) Surely every engineer, indeed, every member of society, is likely to be better off overall if engineers uphold and advance the integrity, honor, and dignity of engineering in this way.

The fundamental canons lay down general duties. For example, engineers are required to "hold paramount the safety, health and welfare of the public," to "issue public statements only in an objective and truthful manner," to "act in professional matters for each employer or client as faithful agents and trustees," and to "avoid all conflicts of interest." Each engineer stands to benefit from these requirements both as ordinary person and as engineer. As ordinary person, an engineer is likely to be safer, healthier, and otherwise better off if engineers only make truthful public statements, and so on. Explaining how engineers stand to benefit as engineers requires a thought experiment.

Imagine what engineering would be like if engineers did not generally act as the canons require. If, for example, engineers did not generally hold paramount the safety, health, and welfare of the public, what would it be like to be an engineer? The day-to-day work would, of course, be much the same. But every now and then an engineer might be asked to do something which, though profitable to her employer or client, would put other people at risk, some perhaps about whom she cared a great deal. Without a professional code, an engineer could not object as an engineer. An engineer could, of course, still object "personally" and refuse to do the job. But, if she did, she would risk being replaced by an engineer who would not object. An employer or client might rightly treat an engineer's personal qualms as a disability much like a tendency to make errors. The engineer would be under tremendous pressure to keep her

"personal opinions" to herself and get on with the job. Her interests as an engineer would conflict with her interests as a person; her conscience, with her self-interest.

The only way--apart from law--to prevent such conflicts is to make it part of being an engineer that the public safety, health, and welfare come first. Preventing such conflicts is, it seems, sufficient reason for any engineer, including Lund, to want engineers generally to adhere to (something like) the ABET Code. But why should an engineer adhere to it himself when, as in Lund's case, it seems he stands to benefit by departing from it? The answer should be obvious. Lund would have to justify his departure from the Code by appeal to such considerations as the welfare of Thiokol and his own self-interest. Appeal to such considerations is just what Lund could not incorporate into a code of ethics for engineers or generally allow other engineers in defense of what they did. Lund could not let such an exception be incorporated into the code because its incorporation would defeat the purpose of the code. A code is necessary in large part because, without it, the self-interest of individual engineers would lead them to do what would harm everyone overall. Lund could not allow other engineers to defend what they did by appeal to their own interests or that of their employer for much the same reason. To allow such appeals would be to contribute to the breakdown of a practice Lund has good reason to support.

We are, of course, assuming that engineers do in fact generally act in accordance with the ABET Code (whether or not they know it exists). If that assumption were mistaken, Lund would have no professional reason to do as the Code says. The Code would be a dead letter, not a living practice. It would have much the same status as a "model statute" no government ever adopted, or the rules of a cooperative game no one was playing. Lund would have to rely on private judgment. But relying on private judgment is not necessary here. Lund's engineers seem to have recommended as they did because they thought the safety of the public, including the astronauts, paramount. They did what (according to the ABET Code) engineers are supposed to do. Their recommendation is itself evidence that the Code corresponds to a living practice.

So, when Lund's boss asked him to think like a manager rather than an engineer, what he was in effect asking Lund to do is to think in a way that Lund must consider unjustified for engineers generally and for which Lund can provide no rationally defensible principle making

himself an exception. When Lund did as his boss asked (supposing he did), he in effect let down all those engineers who helped to build the practice that today allows engineers to say "no" in such circumstances with reasonable hope that their client or employer will defer to "professional judgment" and that other members of their profession will aid them if the client or employer does not defer.

Lund could, of course, explain how his action served his own interests and those of Thiokol (or, rather, how they seemed to at the time). He could also thumb his nose at all talk of engineering ethics (though that may lead to the government barring him from work on any project it funds, to fellow engineers refusing to have anything to do with him, and to his employer coming to view him as an embarrassment). What he cannot do is show that what he did was right, all things considered.

VI. Using a Code of Ethics

So far, we have assumed that Lund did as his boss asked, that is, that he thought like a manager rather than an engineer. Assuming that allowed us to provide a relatively clear explanation of what was wrong with what Lund did. What was wrong was that Lund acted like a manager when he was an engineer and should have acted like one.

We must, however, now put that assumption aside and consider whether engineering ethics actually forbids Lund to do what it seems he did, that is, weigh his own interests, his employers, and his clients against the safety of the seven astronauts. Ordinary morality seems to allow such weighing. For example, no one would think you did something morally wrong if you drove your child to school, rather than letting him take the bus, even though your being on the road increases somewhat the risk that someone will be killed in a traffic accident. Morality allows us to give special weight to the interests of those close to us. If engineering ethics allows it too, then--whatever Lund may have thought he was doing--he would not actually have acted unprofessionally. Let us imagine Lund reading in turn our three (or four) "benchmark" codes. What would they tell him? What could he infer?

Of the seven fundamental canons of the current ABET Code, only two seem relevant: 1)

"[holding] paramount the safety, health and welfare of the public" and 4) "[acting] in professional matters for each employer or client as faithful agents or trustees." What do these provisions tell Lund to do? The answer is not obvious. Does "public" include the seven astronauts? They are, after all, employees of Thiokol's client, the Space Center, not part of the public as, say, those ordinary citizens are who watch launches from the beach opposite the Space Center. And what is it to be a "faithful agent or trustee" of one's client or employer? Is it to do as instructed or to do what is in the client's or employer's interests? And how exactly is one to determine those interests? After all, the actual result of Lund's decision was a disaster for both employer and client--but a disaster Lund, his employer, and his client thought themselves justified in risking. And what is Lund to do if the public welfare requires what no faithful agent could do? What is it to "hold paramount" the public welfare?

The IEEE Code, for all its innovations, is not likely to help Lund much (even assuming Lund to be a member of the IEEE). Article III.1 more or less repeats the faithful-agent requirement of ABET canon 4. Article IV.1 more or less repeats the requirement of the ABET canon 1 (though without declaring the public interest "paramount"). Members of the IEEE are supposed to "protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest." The duties of a faithful agent are, however, limited by other provisions of the code while the duty to protect the public is not. The public welfare takes precedence <u>whenever</u> it conflicts with the duties of a faithful agent. The IEEE Code thus provides a plausible interpretation of "hold paramount." This would be helpful if we knew what was included in the public safety, health, and welfare. Unfortunately, the IEEE Code (like ABET's) tells us nothing about that.

Though the NSPE Code is much more detailed than the other two, its details are only somewhat more helpful here. The first "rule of practice" simply repeats the language of ABET canon 1, while the fourth rule does the same for canon 4. Rule 1a follows the IEEE Code in giving priority to the public safety, health, and welfare over all other considerations but gives more content to how one should "speak out." If overruling Lund's judgment were to endanger the public "safety, health, property, or welfare," then, according to Rule 1a, Lund would have a positive duty to bring the matter to the attention of "the appropriate authority." The appropriate

authority might be someone other than the client or employer. Rule 1b partially defines "safe for public health, property, and welfare" in terms of conformity to "accepted standards." That would be helpful if the problem that concerned Lund were conventional enough for certain standards to have won acceptance. Unfortunately, the use of O-rings in question here was so new that there was no manual of "safety specs" to which an engineer could turn. That was part of Lund's problem.

The NSPE Code illustrates the advantage of detailed provisions. The more detailed a code, the more guidance it is likely to provide on just the question an engineer is worried about. The current NSPE code could, for example, have contained a provision like canon 11 of the NSPE Code of 1954: "[The engineer} will guard against conditions that are dangerous or threatening to life, limb or property on work for which he is responsible..." That would have made Lund's duty clear. Unfortunately, it does not contain such a provision. Why? One possibility is that the drafters of the current code thought the provision redundant given the duty to hold the public safety paramount. Another possibility is that the NSPE Code--and ABET Guidelines--now require engineers to be concerned only for the public safety, health, and welfare rather than, as canon 11 seems to do, everyone's. Perhaps, after due consideration, the drafters of the various codes decided it was too much to ask engineers to worry about the safety of their client's or employer's employees as well as the safety of the public. How is an engineer to understand a code of ethics if (as often happens) it does not clearly address a problem?

That question will be surprisingly easy to answer if we keep in mind the connection between professions and codes of ethics. The language of any document must be interpreted in light of what it is reasonable to suppose its authors to intend. For example, if "bachelor" appears undefined in a marriage statute, we interpret it as referring to single males, but if the same word appears undefined in directions for a college's graduation ceremony, we instead interpret it as referring to all students getting their baccalaureate, whether male or female, single or married. That is the reasonable interpretation because we know that marriages usually involve single males (as well as single females) rather than people with baccalaureates while just the reverse is true of graduation ceremonies. So, once we figure out what it is reasonable to suppose engineers to intend by declaring the "public" safety, health, and welfare "paramount," we should be able to

decide whether interpreting "public" so that it includes "employees" is what they intend (or, at least, what, as rational persons, they should intend).

The "authors" of a code of engineering ethics (both those who originally drafted or approved it and those who now give it their support) are all more or less rational agents. They differ from most other rational agents only in knowing what engineers must know to be engineers and in performing duties they could not perform (or could not perform as well) but for that knowledge. It is therefore reasonable to suppose that their code of ethics would not require engineers to risk their own safety, health, or welfare, or that of anyone for whom they care, except for some substantial good (for example, high pay, easy application of the code, or service to some ideal to which they are committed). It also seems reasonable to suppose no code they "authored" would include anything people generally consider immoral. Whatever a rational engineer might do in private, she could not expect an immoral provision to win much public support from other engineers.

We already have a pretty good idea why a code of engineering ethics would make public safety an engineer's paramount duty (that is, a duty taking precedence over all others). Rational engineers would want to avoid situations in which only their private qualms stood between them and a use of professional knowledge they considered wrong or otherwise undesirable. Each would (as we saw) want to be reasonably sure the others' knowledge would serve the public even when the interests of the public conflicted with those of employer or client. Given this purpose, what must "public" mean?

We might interpret "public" as equivalent to "everyone" (in the society, locale, or whatever). On this interpretation, the "public safety" would mean the safety of everyone more or less equally. A danger that struck only children, or only those with bad lungs, or the like, would not endanger "the public." This interpretation must be rejected. Since few dangers are likely to fall upon everyone more or less equally, interpreting "public" to mean "everyone" would yield a duty to the public too weak to protect most engineers from having to do things which would make life for them (and those for whom they care) worse than it would otherwise be.

We might also interpret "public" as referring to "anyone" (in the society, locale, or whatever). On this interpretation, the "public safety" would be equivalent to the safety of some

or all. Holding the public safety paramount would mean never putting anyone in danger. If our first interpretation of "public" made provisions protecting the public too weak, this second would make such provisions too strong. For example, it is hard to imagine how we could have airplanes, mountain tunnels, or chemical plants without some risk to someone. No rational engineer could endorse a code of ethics that virtually made engineering impossible.

We seem, then, to need an interpretation of "public" invoking some relevant feature of people (rather than, as we have so far, just their number). We might, for example, think that what makes people a public is their relative "innocence," "helplessness," or "passivity." On this interpretation, "public" would refer to those persons whose lack of information, technical knowledge, or time for deliberation renders them more or less vulnerable to the powers an engineer wields on behalf of his client or employer. An engineer should hold paramount the public safety, health, and welfare to assure that engineers will not be forced to give less regard to the welfare of these "innocents" than simple decency requires.

On this interpretation, someone might be part of the public in one respect but not in another. For example, the astronauts would be part of the public in respect of the O-rings because, not knowing of the danger, they were in no position to abort the launch because of the danger. The astronauts would, in contrast, <u>not</u> be part of the public in respect of the ice forming on the boosters because, having been fully informed of that danger, they were in a position to abort the launch if they were unwilling to take that risk. On this third interpretation, "public" does not seem to create the difficulties it did on the two preceding interpretations. We now seem to have a sense of "holding the public safety paramount" we may reasonably suppose rational engineers to endorse.

On this interpretation, all three codes of ethics would require Lund either to refuse to authorize the launch or to insist instead that the astronauts be briefed to get their informed consent to the risk. Refusing authorization would protect the "public" by holding the safety of the astronauts paramount. Insisting that the astronauts be briefed and decide for themselves would hold the safety of the "public" paramount by transferring the astronauts from the category of member of the public to that of informed participant in the decision. Either way, Lund would not, under the circumstances, have had to treat his own interests, those of his employer Thiokol,

or those of his client the Space Center, as comparable to those of the public.

Is this the right answer? It is if we have taken every relevant consideration into account. Have we? How are we to know we have? We can, of course, go through a check list. But how are we to know that the check is complete? Past experience is an indication, but now and then something unprecedented occurs. So, what are we to do? In engineering ethics, as in the rest of engineering, it is often easier to demonstrate the fault of alternatives than to demonstrate that this or that answer must be right. This is such a case. While we cannot demonstrate that our third interpretation is the right one, we can demonstrate that the only obvious alternative remaining is wrong.

That alternative is that "public" refers to all "innocents" except employees of the client or employer in question. Employees are to be excluded because (it might be said) they are paid to take the risks associated with their line of work. On this interpretation, Lund would not have to hold the safety of the astronauts paramount. They would not be part of the public.

What is wrong with this fourth alternative? Consider how we understood "innocents." These are persons whose lack of information, training, or time for deliberations renders them vulnerable to the powers an engineer wields on behalf of his client or employer. An employee who takes a job knowing the risks (and being able to avoid them) might be able to insist on being paid enough to compensate for them. She could certainly be said to be paid to take those risks. But she would, on our third interpretation, also not be part of the public to which an engineer owed a paramount duty. She would have given informed consent to the risk in question. On the other hand, if the employee lacked information to evaluate the risk, she would be in no position to insist on compensation. She would, in other words, be as innocent of, as vulnerable to, and as unpaid for, the risks in question as anyone in the public. Nothing prevents an engineer, or someone for whom an engineer cares, from being the employee unknowingly at risk. So, rational engineers have as much reason to want to protect such employees as to protect the public in general. "Public" should be interpreted accordingly.

VII. Some Rules of Thumb

If we look back at what we did to decide whether Lund's conduct was unprofessional, we

can identify five steps in our deliberation. Characterizing these steps should provide rules of thumb for approaching other problems of engineering ethics.

1. Identify Ethical Issues. Not all engineering decisions have an ethical dimension. But a surprising number do. How is one to know? One useful test is to ask whether anyone but the engineer in question would suffer or be put at risk by the conduct in question. Another is to ask whether the engineer would like a world in which most engineers conducted themselves as the engineer is contemplating (and whether that world would differ from this one). A third test is to ask whether the engineer would want what he is doing to be widely known. The first test tends to pick out problems of human welfare; the second, problems of fairness; and the third, problems of honesty.

These tests must, of course, be applied using all relevant information available and only information available. We should not ignore inconvenient facts or treat mere possibilities as if they were more than that. Information is relevant if it might affect a rational person's decision. It is available if the decision-maker has it or can easily get it in time to decide.

2. Distinguish Issues of Professional Ethics. Should any of the above tests give a positive result, the next step is to consider what kind of ethical problem has been identified. Not all ethical problems are professional problems. For example, committing adultery with a fellow engineer after hours in a motel raises ethical issues without raising any professional ones. How is one to know? One indication that professional ethics is involved is that the conduct is expressly discussed in a code of engineering ethics. (Notice that adultery is not.) But, as we have seen, not all matters of professional ethics are expressly discussed in ethics codes. Much is left to interpretation. So, we need another test. Our discussion of Lund suggests it. We knew that Lund's conduct raised a question of engineering ethics because it involved using knowledge of engineering or using some power he had (in part) because he was an engineer.

3. Formulate Options. Formulating some options is implicit in steps 1 and 2. (You do not have an ethical problem until you have some options.) Often, however, the initial list of options will be incomplete in an important way. (Perhaps, for example, had Lund suggested it, Lund's boss would have been only too happy to brief the astronauts on the O-ring risk and let them decide whether to postpone lift-off.) Not all ethical issues are as hard as they seem at first

(though many are as hard or harder). So, it is worth asking whether any serious options have been omitted. One source of options is a code of ethics, especially if it is as detailed as the NSPE's (or ABET's Guidelines). Other sources are biographies of engineers, case studies of particular engineering problems, and imaginative fiction about engineers in ethical dilemmas. These can, of course, only be used if there is time to refer to them--or if one has read them in advance.

4. Evaluate Options. There are two possibilities. Sometimes the relevant code of ethics, especially a detailed one like the NSPE's will contain a provision which expressly states that one (or more) of the options available is professionally required. When the relevant code is "on point", the professionally proper decision is clear. More often, provisions will have to be interpreted to determine what the code requires. Interpretation requires a) identifying all potentially relevant provisions of the code, b) trying to make them fit together so that they give directions a rational engineer would want every other engineer to follow even if that means having to follow them too, and c) determining what those directions require in the case in question.

What if this process leads you to conclude that the relevant code requires something morally wrong? This is a hard question but, fortunately, one not likely to arise. No actual code today includes a provision immoral on its face (and, given the origin of engineering codes, it is unlikely that any would). Any immoral conclusion would have to rest on an interpretation of the code. In general, however, it is unreasonable to suppose engineers would require members of their profession to do anything immoral. So, any time you conclude that you are professionally required to do something morally wrong, you have almost certainly made a mistake.

Almost certainly, but not certainly. Truly hard cases, that is, cases where no available option is morally right, cannot be absolutely ruled out. What then is an engineer to do when she confronts a truly hard case? The answer seems obvious. Morally bad actions are seldom all equal. Some may be less harmful, less unfair, or less dishonest, than others. In circumstances allowing no morally right action, an engineer could still hold the public interest paramount, maintain the integrity of her profession, and the like by doing the least harm possible, by being as fair as possible, and by otherwise keeping wrongdoing to a minimum. That certainly seems to

be how each rational engineer would want others to conduct themselves. Any code of ethics should be interpreted accordingly.

Deciding what to do in this way should always yield conduct rational engineers would support as a general practice, since each engineer stands to benefit if other engineers generally decide on conduct in this way. Just as important perhaps, deciding in this way should also yield conduct of which the public would approve, since it stands to benefit from the useful products of engineering without sacrifice of its safety, health, or welfare. So, an engineer who chooses professional conduct in this way should be able to convince any rational person concerned, to endorse his principles and his reasoning. He should, in other words, be fully able to justify his conduct.

5. Review. Having thus reached a tentative answer, you ought to review your reasoning. One way to do that is to imagine yourself on a "board of ethical review" (or a Senate committee investigating your decision after things did not go as you expected). Would your reasoning still convince you if you did not think of it as yours? No justification of conduct is professionally defensible if its appeal to you is largely dependent on interests you do not share with engineers generally or with the public. Putting yourself in the place of your profession or the public is a good way to make yourself think impartially.

Another way to catch errors is to put your problem to engineers not involved in it, especially those with experience and a reputation for good judgement. If such persons generally agree with your reasoning (and choice of option), you are probably right. You must, however, be careful not to reveal confidential information when seeking advice (and, of course, you must have time to make such inquiries--as often you will not).

VIII. Sample Application of Rules of Thumb

The following case and comment are intended to provide a model for application of our rules of thumb to the cases for discussion in Section IX.

Jade Glitz is serving a term on her engineering society's national executive board.

During an evening reception after one of the board's semi-annual meetings, she chats with the society's president, Harold Takumm. Between drinks, Takumm causally mentions that firms in his state commonly provide local government officials with "walking-around money" to influence the award of contracts. When Glitz, not used to such practice in her own state, expresses surprise, Takumm, who runs an engineering consulting firm, admits that he can see nothing wrong with the practice and has even engaged in it himself in order to stay in business. Mistaking her surprised silence for interest, he becomes more specific. He tells her how he got his start by paying off a state official and how he has been paying off one or another ever since (though he does not name anyone). Finally, he tells why he thinks he has done nothing wrong: With a little digging, a trained investigator could, he says, uncover proof enough to implicate most engineering consultants in the state, himself included. But no one has cared enough to make the investigation, not even the press.

Increasingly uncomfortable hearing these revelations, Glitz finally breaks off the conversation and returns to her hotel room. There, over a glass of Maalox, she wonders whether what she has heard is true, whether it could be proved, and whether she has any responsibility to do anything with what she has heard. Though she likes Takumm personally, she no longer feels comfortable with him in her professional society or, indeed, in her profession.

Ethical Issues? Because Takumm's activities are illegal, he certainly would not want them made public. Revelation might ruin him. Glitz, too, has reasons not to want Takumm's payments made public. Though she has lost respect for him, she still likes him enough not to want him harmed. She should also be concerned for her professional society. What would such revelations do to its reputation? On the other hand, Glitz should not want it known that she knew what Takumm was doing and did nothing. That would turn what might have seemed local corruption into a national scandal. Clearly, Glitz's problem is ethical.

Professional Issues? If Glitz were now to refer to ABET's Code of Ethics, she would find (beside canon l's familiar injunction to hold the public safety, health, and welfare paramount) only canon 6 at all relevant to her situation: "Engineers shall act in such manner as to uphold and enhance the honor, integrity and dignity of the profession." What could she conclude from

this provision? Takumm's regular bribing of public officials in his state does not seem consistent with upholding the honor, integrity, and dignity of engineering. But should Glitz do anything about it? Would she be upholding and enhancing the honor of her profession by accusing Takumm publicly? By accusing him in secret? Or by keeping silent? Would reporting Takumm do anything for the public safety, health, or welfare?

If Glitz were now to consult the ABET Guidelines, she might be surprised to find specific guidance. According to ld, engineers "with knowledge or reason to believe that another person or firm may be in violation of any provision of these Guidelines...[are to] present such information to the proper authority in writing..." While Glitz does not have "knowledge", she certainly has "reason to believe" Takumm has been engaged in bribery. So, <u>if</u> Takumm's bribing is in violation of some provision
of the Guidelines, Glitz has a professional duty to report her conversation to "the proper authority."

If Glitz continued her examination of the Guidelines, she would eventually find section 5a: "Engineers shall not pay or offer to pay, either directly or indirectly, any commission, political contribution, or gift, or other consideration in order to secure work, exclusive of securing salaried positions through employment agencies." Takumm said he had directly made gifts to secure work (and the politicians involved presumably do not qualify as "employment agencies"). So, if what he said was true, he has violated a provision of the Guidelines and, under the Guidelines, Glitz has no choice but to report her conversation to the proper authority.

<u>Options</u>? Glitz seems to have four professionally recognized options: (1) report her information about Takumm to the proper authority, (2) protect the public interest in some way and speak out, (3) not report or speak out but do something else to protect the public and the honor, integrity, and dignity of her profession (for example, cease to associate with Takumm as the pre-1977 ABET Code required), or (4) do nothing if that is consistent with holding the public safety, health, and welfare paramount and upholding the honor of her profession. To these four options must be added one all the codes agree is <u>un</u>professional: (5) do nothing even if doing nothing is against the public interest and the profession's. These five options seem to be more or less exhaustive. So, what should Glitz do?

Evaluating Options. If Glitz's professional society has adopted the current ABET Guidelines, she should (as one of its officers) have little trouble deciding what to do (though she might still be tempted not to do it). The Guidelines would require her to report what she had been told to her society's ethics committee, if it has one, for investigation, and to the appropriate prosecutor's office in Takumm's state (presumably, one with which Takumm is unlikely to have done business).

Is there anything morally objectionable about either act of reporting? Does Glitz owe Takumm some duty of confidentiality? It seems not. As an officer of Glitz's professional society, Takumm seems to have voluntarily given up any right inconsistent with the society's Code of Ethics. So, assuming Glitz's professional society adopted the ABET Guidelines, her duty is clear.

If, however, her professional society had only adopted the current ABET, NSPE, or IEEE code, evaluating her options would be more difficult. She would have to decide whether reporting Takumm's conversation would help protect the public safety, health, and welfare or enhance the honor, integrity, or dignity of her profession. To decide that, she would have to answer such questions as these: Does bribery's being illegal mean it threatens the public safety, health, or welfare? Does bribery's being prohibited under her profession's code mean it threatens the public safety, health, or welfare? If, as seems unlikely, she were to answer all these questions no, she would have to consider the effect of reporting on her profession. Otherwise, holding the public welfare paramount would exclude considering the honor, integrity, or dignity of her profession.

Glitz could not, it seems, conclude that an activity necessarily threatens the public safety, health, or welfare just because it is against the law or her profession's code. Both the law and her profession's code could include rules having some purpose other than (though consistent with) the public safety, health, and welfare. Indeed, it is easy to imagine laws or professional rules inconsistent with the public safety, health, and welfare (though it is hard to imagine people like us adopting them--except by mistake). So, it seems, Glitz should determine directly whether bribery threatens the public safety, health, or welfare. How is she to do that?

One way to do that is to engage in a thought experiment. She might ask herself what life

would be like in a society much like this one except that bribing public officials to get engineering contracts was both legal and professionally proper. The result of the experiment does not seem in doubt. Contracts would not be as likely to go to the most qualified engineer as in a society, like this one, in which the factors determining who gets a job are less likely to include how much money an engineer offers the appropriate public official. Since an engineer's professional qualifications are a better indication than his ability to bribe, of how likely he is to serve the public safety, health, and welfare better, choosing engineers in part on the basis of professional qualifications seems likely to increase the risk to the public safety, health, and welfare. This conclusion both explains why all three "benchmark" codes prohibit bribing officials to get contracts and why we should not interpret the failure of the NSPE Code explicitly to require "whistleblowing" as equivalent to its having nothing to say about "whistleblowing" in a case like Takumm's.

Glitz is, however, left free under both the NSPE and the IEEE codes to determine how best to protect the public interest (except for the IEEE's speaking-out requirement). If she could protect the public interest merely by telling Takumm to quit giving bribes if he does not want her to make their conversation public, she may do that. If she can best serve the public interest by forcing Takumm out of office or resigning herself, she may do that. If she can only serve the public interest by reporting her information to appropriate law-enforcement agencies, she should do that. But, when deciding how best to protect the public (how best to hold their interests "paramount"), she cannot, as an engineer, consider how her doing so will serve (or harm) her profession's interests, much less her own or Takumm's. She may take these other considerations into account, if at all, only when she must choose between options all of which would protect the public interest equally well and better than any other alternative.

A minute's thought should, it seems, convince Glitz that she should do exactly what the ABET Guidelines require. She cannot protect the public safety, health, and welfare in Takumm's state unless she uses what she knows to do more than stop Takumm from offering bribes. Takumm's own bribing is a small part of the problem. The only way for her to do more than stop Takumm is for her to report her information to the appropriate law-enforcement officials in

Takumm's state, that information including Takumm's name. Only government has the resources to root out the corruption Takumm described.[12]

Another minute's thought is likely to leave Glitz unsure what else the public interest requires. Speaking out (as the IEEE Code requires) seems unnecessary if Glitz can get a thorough investigation without publicly disclosing her charges. The same seems true about having nothing further to do with Takumm. What Glitz heard may, upon investigation, turn out be no more than the ravings of a drunk, or of a story teller with a passion for shocking listeners, or of a friend on the edge of a nervous breakdown. That leaves her to consider what her profession's interest requires.

Our three benchmark codes agree that Glitz must put her profession's honor, integrity, and dignity before her own interests or those of Takumm. But it seems that she may sufficiently protect her profession by alerting the appropriate officers of the society so that they get Takumm out of office as soon as the evidence justifies it. Since it is hard to see how the public safety, health, or welfare or her profession's honor, integrity, and dignity would be served by doing more, it seems that Glitz has no professional duty personally to disassociate herself from Takumm or to speak out against him (unless her professional society has adopted the IEEE Code). Any decision personally to disassociate herself from him or to speak out would have to rest on ordinary moral considerations (none of which seems relevant here) or upon some personal preference, for example, for open debate.

Review. We leave the review of this reasoning to our readers.

IX. More Problems for Discussion

All the problems in this section have an ethical dimension. But, like most practical problems, they have other dimensions as well. Considerations of personal loyalty, law, business competitiveness, and the like may also be relevant in determining what should be done. Many of the problems presented here are based on inquires submitted to the NSPE's Board of Ethical Review (BER) . They represent a sample of problems that practicing engineers have found perplexing enough to justify seeking outside advice and that the BER found important enough to

deserve formal answer.

You may find the NSPE's current Code of Ethics, ABET's Code and Guidelines, and the IEEE's Code helpful in identifying relevant considerations. (See Appendices D through G.) But you should not consider your work done until you have found an argument for your resolution that could convince any rational person. (That this or that code, or the BER, says such-and-such is, of course, not itself such an argument.)

Your preparation of arguments may benefit from reading the relevant opinions of the BER. These are often thought-provoking and always attuned to the practicalities of engineering. For that reason, all problems drawn from BER opinions include the BER citation. (The number to the left of the hyphen is the year the inquiry was answered--for example, "86" for "1986"--while the number to the right indicates the place that answer had in the sequence of answers issued as formal opinions in that year.) You are, however, cautioned to remember that we have changed the facts of some problems for editorial reasons. The changes may affect how the problem should be resolved. You are also reminded that some of the opinions were written under a substantially different code and that the concepts of engineering ethics are not yet so settled that the reasoning of the BER of even a few years ago necessarily corresponds to what the BER would (or should) say today.

One common criticism of problems like these is that they fail to provide enough information to make a reasoned decision possible. The criticism is often unfair. The BER, for example, has had no trouble making reasoned decisions concerning the problems drawn from their opinions. Of course, that is in part because BER members bring to examination of a particular problem the common knowledge of their profession (much as we did when analyzing Glitz's problem). You should feel free to do the same, provided in doing so you do not make the problem trivial. You could, for example, have "solved" Glitz's problem by assuming that Takumm was a well-known liar. But such a "solution" would do nothing to sharpen your professional judgment.

CASE 1: Saving Fish. You work as a chemical engineer at a refinery releasing toxic wastes into Lake Pachmach. The wastes are within legal limits but--by calculations you have

just done using confidential data other corporations along the lake recently provided your employer--you have learned that the combined waste of all users substantially exceeds the limit which standard ecological works regard as safe for aquatic life. You can find no authoritative standard that would allow you to say whether that level of toxin in the water would make eating fish living there dangerous. That worries you because Lake Pachmach, while too murky for swimming, is still fished in now and then. What should you do?

CASE 2: Tricks of the Trade (BER 78-6). Engineers Agronymous and Borshette, though both engaged in the same specialized field of engineering, work for different firms and, recently, contended against one another for a major contract. Following submission of their respective qualifications, the client chose Borshette and, after several weeks of negotiation, entered into a contract. Agronymous thereupon complained to the ethics committee of the state engineering society that Borshette had obtained the contract by improper means. Borshette's submission included the claim that Engineer Profundi would be assigned primary responsibility for carrying out the contract, a responsibility for which Profundi's qualifications were excellent. Agronymous charged that, though the claim that Profundi was on Borshette's staff was probably decisive in Borshette's winning the contract, Profundi was not in fact on Borshette's staff.

The state society's ethics committee conducted a preliminary inquiry, determining a) that at the time Borshette submitted the statement of qualifications, Profundi had orally accepted Borshette's offer of employment but had not yet begun to work, b) that Profundi changed his mind and so informed Borshette before Borshette was actually chosen for the project, and c) that Borshette did not inform the client either before being chosen for the project or even during the negotiations preceding signing the contract. As a member of the state society's ethics committee, you are to decide whether Borshette was unethical, for example, in failing promptly to advise the client of the change in staffing indicated in the original submission.

CASE 3: Free Samples (BER 81-1). The village board of Clunk City invited "proposals" for a contemplated water project. The project, estimated to cost $400,000 was to be financed in part with money from a federal-aid program. Three engineering firms submitted proposals, one

of which (that of Richard Love Associates) included a pre-application study for submission to the federal agency, with a feasibility study, a general system layout, and a cost estimate. The other firms submitted proposals containing little more than information relating the project to their background, experience, and qualifications. Love's proposal was accepted, but on condition that Love accept a letter of intent for the work making payment of any fee contingent on the village securing federal financing. Love agreed. Love thus seems either to have done a good deal of engineering work free or to have entered into a contract making payment contingent on something other than doing the work. Did Love do anything unethical?

CASE 4: Professional Societies (BER 82-7). You have worked as an electrical engineer for Gargantua Enterprises for 20 years. During most of that time, your supervisors encouraged you to participate in the activities of the IEEE. You have held several board and committee positions over the years. All important appointments were cleared with your supervisor in advance. You now hold an important committee office.

Gargantua has recently undergone reorganization because of hard times. Last week your new supervisor, Belle Hammer, also an electrical engineer, told you that she opposes further participation in the IEEE except during periods of unpaid leave. You pointed out that Gargantua's policy still allows you to attend professional meetings on company time provided your supervisor permits. Hammer agreed but reminded you that the permission you need is hers. She will not, she explained, give permission hereafter because your participation in IEEE does not benefit Gargantua. She will give permission only when attendance constitutes "employee training". You asked permission to take your request to "higher authority". Hammer flatly refused.

A few days later, you were called to the section chief's office on another matter. While there, you asked his opinion of attendance and participation in professional society meetings by engineers. You did not tell him what Hammer said. He reaffirmed the organization's policy with considerable enthusiasm.

Today you prepared a travel request for the upcoming IEEE meeting and handed it to Hammer who would ordinarily submit it to the section chief with favorable or unfavorable

recommendation. Hammer looked at the request and then, looking at you again, said, "This request dies here. You work for me. I'm the one who has to answer to the section chief for the efficiency of the office. Don't step out of line again."

Was it ethical for you to discuss participation in professional societies with the section chief without first notifying Hammer? Was it ethical for Hammer to block your efforts to obtain excused leave to attend professional meetings? Was there anything professionally improper in your conduct or Hammer's?

CASE 5: When Research Becomes Something Else (BER 75-11). Some years ago you published a paper in an engineering magazine on the relative safety of certain time-delay steam boiler gauges. The paper was based on your original research. Recently, engineer Hydra published an article on the same subject in another engineering magazine. Much of the article is yours word-for-word. You wrote Hydra for an explanation. He responded that he had submitted his article with a list of six references, one of which was your article, but the editor inadvertently omitted the list ---for which error he (Hydra) is, he said, profoundly sorry. Did Hydra do anything unprofessional? If he did, what should you do?

CASE 6: Patent Ownership (BER 74-11). You are an expert in food processing machinery. A patent attorney has retained you (by verbal agreement) to serve as expert witness for her client, a manufacturing company suing another such company for patent infringement. Your assignment is a) to study the machines in question, b) to determine whether, in your opinion, the patent has been infringed, and c) to testify accordingly should you find an infringement.

When studying the machine, you get an idea you believe to be patentable. That is, you conceive of a machine which, in your opinion, would constitute an advance in the design of the particular food processing machinery involved in the pending lawsuit. You submit the idea to the patent attorney and the manufacturer. You wait three months. You hear nothing. So, you request the patent attorney and the manufacturer to advise within a reasonable time whether they have any interest in the improvement. They apparently take this request as an attempt to

pressure them into paying you more than originally agreed for your work in the lawsuit. The patent attorney writes you demanding that you immediately sign over to the manufacturer all the rights to your idea. She pointedly gives no assurance of compensation for your idea beyond what you have already been paid for your study and testimony. Indeed, she suggests that your conduct has been improper. Has it? What should you do now?

CASE 7: Participating in a Strike (BER 74-3). The law in your state permits state employees to organize unions, to engage in collective bargaining for the purpose of seeking improvements in wages, hours, and working conditions, and to strike if consistent with maintaining "vital services." You are an engineer in the state highway department which the law does not regard as providing a vital service.

Some time ago the nonprofessional employees in your department, acting according to law, sought an election for recognition of the department as a collective bargaining unit. The engineers filed for a separate vote, but their petition was disallowed by the state employee relations board because the law did not authorize separate units (or separate votes) for professional employees. A majority of all state highway employees eligible for collective bargaining eventually approved recognition and chose the largest of the state employee unions to represent the unit in collective bargaining. There being no separate vote for the professional employees, no one knows how they voted. You voted against unionization.

The union soon signed an agreement with the department management. The agreement included an "agency shop". No one had to join the union, but all employees in the bargaining unit had to pay either union dues or a "service fee" for the benefits of representation. The "service fee" differs from union dues only in not conferring the rights (or duties) of membership in the union.

Near expiration of the first agreement, the union began negotiating a new agreement. Among the union's demands was a 60 percent pay increase. The state offered much less. Negotiations were long but futile. When the first agreement expired, the union voted to strike.

You wonder whether it would be professionally proper for you, an engineer, to participate in the strike actively (for example, by serving on the picket line) or even passively

(that is, by simply not appearing for work). You hesitate not to participate at all in part because you think the nonprofessional workers are justified in striking, in part because you have never liked crossing a union picket line, and in part because you don't like thinking of yourself as a "scab". But you also hesitate because you are worried about what your relations with the union would be after the strike if you continued to work. What should you do?

CASE 8: Professional Society in Politics (BER 73-9). The state highway department proposed routing a new highway through a part of your city commonly known as Pinktown. Residents organized to block the project and employed you to study the proposed route. You concluded the highway could be built more cheaply, more safely, and probably more quickly if, instead, it were routed through the former neighborhood of the state highway department's chief engineer. You so reported.

The report so outraged one of your partners that she went before the local chapter of the state engineering society of which she, you, and the highway department's chief engineer are members, explained the project, and answered all questions asked of her, and then asked the chapter to endorse publicly the alternate route you proposed. Was it ethical for your partner to request the local chapter to endorse a project in which her firm was directly involved? Would it be ethical for the chapter to take a public position on a controversial question in which members of the chapter are directly involved?

CASE 9: Political Contributions (BER 73-6). Engineers A, B and C made legal political contributions in the sums of $150, $1000 and $5000, respectively, to a candidate for governor of the state in which they practice. The candidate won. Over the next three years, the firms in which A, B and C are principals received state contracts for engineering services with total fees ranging from $75,000 (for A) to $4 million (for C). A local newspaper having uncovered these facts, has charged that the engineers acted unethically. Was the political contribution of A, B and C unethical? Did either A, B or C act unethically in taking a state contract after making the contribution in question?

CASE 10: Restrictive Employment Agreement (BER 72-5). Cranberry Associates, an engineering consulting firm, requires all its employees to sign the following agreement as a condition for employment:

The undersigned hereby agrees, on the date and place mentioned above for the sum of One Dollar ($1.00) and other considerations, that Two Years (2) after leaving the employ of Cranberry Associates he/she will not become engaged in, directly, or indirectly, as an Owner, Partner, Proprietor, or Principal, in any business, trade, or occupation providing Architectural, Engineering, or Planning services within a One Hundred Mile (100) radius of any office operated by Cranberry Associates at the time of his/her termination.

Is it ethical for the engineers running Cranberry to require engineers they employ to sign such an agreement? Is it ethical for an engineer to sign it?

CASE 11: Indigent Clients (BER 67-8). Harlan Snooky, having lost a thumb in a metal press he was operating, filed a claim with the state worker's compensation board. His claim rests on what turns out to be a technical detail relating to proper operation of the press. Snooky has asked you to appear before the board as an expert witness. Though you would like to help Snooky and are certainly qualified to give the testimony, you wonder whether you should. Snooky cannot afford to pay your usual fee. You would either have to make payment contingent on winning his claim or give your services free. What should you do?

CASE 12: Disclosing Previous Work (BER 65-2). You worked for almost ten years as an engineer for a federal agency during which you studied computer programming methods to determine whether any might help make extraction of certain metals from ore more economical. Your study included a very extensive search of the literature and several months of experimentation. The resulting report contained detailed recommendations on a large number of methods. Your superiors thought the report valuable enough to publish. It is now available as a department report for $42.50 to anyone who might find it useful.

Soon after you completed the report, Congress cut your department's funding in half and you were let go. You then started a private consulting firm. You have not done badly during the first year, though it is certainly too soon to say you are a success. Still, you have gotten some good jobs and have prospects of better. For example, you have just been contacted by an important commercial mining company with a problem similar in scope and content to one you solved as part of the study you did while working for the government. Your first thought is that it is a good thing that they don't know about your report since, if they did, they probably could solve the problem for little more than $42.50. But your second thought is that it might be improper for you not to tell the company of the report during negotiations. You have, after all, already been paid for that work once. What should you do?

CASE 13: Secrets. Jamile Mobile, a chemical engineer, quit one huge feed company, Porcine Products, where she seemed to have been a victim of discrimination for a similar job at a bigger feed company, Cornborn Feed, with a better reputation for treatment of women. Her new boss, also a woman, made it clear at their initial meeting that she had been hired for her skills, not for what she knew about Porcine. Yet, it was hardly a month before a problem she had been assigned caused her to wonder whether skills can be so easily separated from knowledge. Though the problem initially looked unrelated to what she did for Porcine, it turned out that the best way to solve it was to use a process she had developed there, one she suspects Porcine considers a trade secret. Mobile thinks of just calling up Porcine and asking. But she can't do that. Her question might give Porcine information about Cornborn's product plans. For similar reasons, she cannot tell her boss much about what is bothering her. There must, of course, be other solutions to the problem. But it will take her a while to find one and it might not be as good. What should you do?

CASE 14: Working the Data Over. Winslow Fendrucker is a junior engineer at Grimco. His job is analyzing test data. One day his supervisor calls him into her office, closes the door, and quietly, very quietly, tells him that she would like his analysis of the latest tests of a certain juicing device "improved". Perhaps reading the surprise on his face, she makes it clear that she

is not asking him to falsify data or anything like that. But, she points out, though both she and he think the device in question has great long-term potential, the likely effect of Fendrucker's analysis is, as it stands, that work on the device will be stopped before it has a chance to prove itself. All she is asking Fendrucker to do is to "work the data over" until it properly reflects their high hopes for the device. Is that so unreasonable?

CASE 15: Two Sides. Flabia Maccadamia is an engineer at Deep Hole, a mining company. She lives in Ravenous Canyon and has been an inactive member of its local environmental society for some years. The society was originally organized to prevent the Canyon from becoming a water reservoir for Denver. But now it has a new concern. The Canyon abuts federal land on three sides, land the government proposes to open for mining. The society opposes all mining on land close to the Canyon but has not been able to win support for its position from people outside the Canyon. The society has therefore come to Flabia to ask for help. They think that if she could draft an environmental impact statement showing that mining near the Canyon would be dangerous, both to its natural beauty and its habitability, they might be able to win over more important environmental groups. They have come to Flabia because they do not have the money to hire an outside consultant. They are asking her to contribute her time "for the cause". She is, she believes, competent to do the statement. She could, with some help from others she knows, do a competent statement in her spare time. And she would like to do something more for the society than just sent it a $25 check once a year. Still, she is not sure. The grapevine at work has been humming with stories that Deep Hole is planning a big mine near Denver. One story placed the mine within a few miles of Ravenous Canyon. Can Flabia Maccadamia ethically do the environmental impact statement.

NOTES

1. Sanger (1986, p. 8).

2. The exact words seem to have been "take off your engineering hat and put on your management hat." Roger's Commission (1986). v. I, p. 94). The preceding narrative is based on testimony contained in that volume (esp. pp. 82-103).

3. Wisely (1977, p. 55-56).

4. See, for example, Christie (1922, pp. 99-100).

5. Wisely (1983, p. 83).

6. Oldenquist and Slowter (1979, pp. 8-11).

7. See, for example, Cooke (1922, p. 70).

8. Compare this with the famous definition offered by the British Institution of Civil Engineers in 1818: "[The] profession of civil engineer [is] the art of directing the great sources of power in nature for the use and convenience of man." Cited in Christie (1922, p. 98).

9. For a more extensive defense of this explanation, see Davis (1986).

10. Some evidence for this claim will be presented in sections VI and VIII in the course of applying the various codes to particular cases.

11. Should Glitz check the facts before reporting what she knows to proper authority? Let us first assume that Glitz is sure that she was told pretty much what she remembers being told. The question then is whether she should check the truth of Takumm's story. The answer seems to be that she need not unless (as seems unlikely) she may do so easily. To ask her to go out of her way to confirm Takumm's story seems unreasonable. She is an engineer, not a journalist or public prosecutory. If, however, we assume instead that next morning Glitz is not sure she has Takumm's story pretty much right, then it seems that she should at least ask Takumm whether he said what she remembers him saying (asking in a way not likely to put him on his guard). She should exercise reasonable care in going to the authorities. Resolving any doubt about essential facts is certainly part of exercising reasonable care.

BIBLIOGRAPHY (to be included later)

Appendix A

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Adopted March 8, 1912:

CODE OF PRINCIPLES OF PROFESSIONAL CONDUCT

While the following principles express, generally, the engineer's relations to client, employer, the public, and the engineering fraternity, it is not presumed that they define all of the engineer's duties and obligations.

ENGINEERING

A. General Principles

1. In all of his relations the engineer should be guided by the highest principles of honor.

2. It is the duty of the engineer to satisfy himself to the best of his ability that the enterprises with which he becomes identified are of legitimate character. If after becoming associated with an enterprise he finds it to be of questionable character, he should sever his connections with it as soon as practicable.

B. The Engineer's Relations to Client or Employer

3. The engineer should consider the protection of a client's or employer's interests his first professional obligation, and therefore should avoid every act contrary to this duty. If any other considerations, such as professional obligations or restrictions, interfere with his meeting the legitimate expectation of a client or employer, the engineer should inform him of the situation.

4. An engineer can not honorably accept compensation, financial or otherwise, from more than one interested party, without the consent of all parties. The engineer, whether consulting, designing, installing or operating, must not accept commissions, directly or indirectly, from parties dealing with his client or employer.

5. An engineer called upon to decide on the use of inventions, apparatus, or anything in which he has a financial interest, should make his status in the matter clearly understood before engagement.

6. An engineer in independent practice may be employed by more than one party, when

the interests of the several parties do not conflict; and it should be understood that he is not expected to devote his entire time to the work of one, but is free to carry out other engagements. A consulting engineer permanently retained by a party, should notify others of this affiliation before entering into relations with them, if in his opinion, the interests might conflict.

7. An engineer should consider it his duty to make every effort to remedy dangerous defects in apparatus or structures or dangerous conditions of operation, and should bring these to the attention of his client or employer.

C. Ownership of Engineering Records and Data

8. It is desirable that an engineer undertaking for others work in connection with which he may make improvements, inventions, plans, designs or other records should enter into an agreement regarding their ownership.

9. If an engineer uses information which is not common knowledge or public property, but which he obtains from a client or employer, the results in the form of plans, designs, or other records should not be regarded as his property, but the property of his client or employer.

10. If an engineer uses only his own knowledge, or information which by prior publication, or otherwise, is public property and obtains no engineering data from a client or employer, except performance specifications or routine information; then in the absence of an agreement to the contrary the results in the form of inventions, plans, designs, or other records, should be regarded as the property of the engineer, and the client or employer should be entitled to their use only in the case for which the engineer was retained.

11. All work and results accomplished by the engineer in the form of inventions, plans, designs, or other records, that are outside of the field of engineering for which a client or employer has retained him, should be regarded as the engineer's property unless there is an agreement to the contrary.

12. When an engineer or manufacturer builds apparatus from designs supplied to him by a customer, the designs remain the property of the customer and should not be duplicated by the engineer or manufacturer for others without express permission. When the engineer or manufacturer and a customer jointly work out designs and plans or develop inventions a clear understanding should be reached before the beginning of the work regarding the respective rights

of ownership in any inventions, designs, or matters of similar character, that may result.

13. Any engineering data or information which an engineer obtains from his client or employer, or which he creates as a result of such information, may be considered confidential by the engineer; and while he is justified in using such data or information in his own practice as forming part of his professional experience, its publication without express permission is improper.

14. Designs, data, records and notes made by an employee and referring exclusively to his employer's work, should be regarded as his employer's property.

15. A customer, in buying apparatus, does not acquire any right in its design but only the use of the apparatus purchased. A client does not acquire any right to the plans made by a consulting engineer except for the specific case for which they were made.

D. The Engineer's Relations to the Public

16. The engineer should endeavor to assist the public to a fair and correct general understanding of engineering matters, to extend the general knowledge of engineering, and to discourage the appearance of untrue, unfair or exaggerated statements on engineering subjects in the press or elsewhere, especially if these statements may lead to, or are made for the purpose of, inducing the public to participate in unworthy enterprises.

17. Technical discussions and criticisms of engineering subjects should not be conducted in the public press, but before engineering societies, or in the technical press.

18. It is desirable that first publication concerning inventions or other engineering advances should not be made through the public press, but before engineering societies or through technical publications.

19. It is unprofessional to give an opinion on a subject without being fully informed as to all the facts relating thereto and as to the purposes for which the information is asked. The opinion should contain a full statement of the conditions under which it applies.

E. The Engineer's Relations to the Engineering Fraternity

20. The engineer should take an interest in and assist his fellow engineers by exchange

of general information and experience, by instruction and similar aid, through the engineering societies or by other means. He should endeavor to protect all reputable engineers from misrepresentation.

21. The engineer should take care that credit for engineering work is attributed to those who, so far as his knowledge of the matter goes, are the real authors of such work.

22. An engineer in responsible charge of work should not permit non-technical persons to overrule his engineering judgments on purely engineering grounds.

[Heermance (1924), pp. 166-169]

APPENDIX B

CODE OF ETHICS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

Adopted, September 2, 1914

It shall be considered unprofessional and inconsistent with honorable and dignified bearing for any member of the American Society of Civil Engineers:

1. To act for his clients in professional matters otherwise than as a faithful agent or trustee, or to accept any remuneration other than his stated charges for services rendered his clients.

2. To attempt to injure falsely or maliciously, directly or indirectly, the professional reputation, prospects, or business, of another-Engineer.

3. To attempt to supplant another Engineer after definite steps have been taken toward his employment.

4. To compete with another Engineer for employment on the basis of professional charges, by reducing his usual charges and in this manner attempting to underbid after being informed of the charges named by another.

5. To review the work of another Engineer for the same client, except with the knowledge or consent of such Engineer, or unless the connection of such Engineer with the work has been terminated.

6. To advertise in self-laudatory language, or in any other manner derogatory to the dignity of the Profession.

[Annals of American Academy (1922), pp. 273-374]

APPENDIX C
AMERICAN ASSOCIATION OF ENGINEERS

Specific Principles of Good Professional Conduct[1]

The compilation consists of four parts as follows:

Part I. Relations of the Engineer to the Public.

Part II. Relations of the Engineer to the Clients and Employers.

Part III. Relations of the Engineer to Employees.

Part IV. Relations of the Engineer to other Engineers.

Part I

Relations of the Engineer to the Public

1. The Engineer should regard his duty to the public welfare as paramount to all other obligations.

2. He should not use his professional standing as a means of sponsoring or promoting commercial or other undertakings of a speculative character.

3. He should scrupulously avoid connection, by act or omission, with any illegal or questionable undertaking or participation in any enterprise inimical to the public welfare.

4. He should not advertise in self-laudatory language or in any other manner derogatory to the dignity of the profession.

5. He should avoid any publicity giving the impression that technical matters can be dispensed with; or that technical proficiency along any line is easy of acquisition; or that exaggerated returns may be expected from any limited course of technical instruction.

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[1] **Specific Principles of Good Professional Conduct was compiled by the Practice Committee of the American Association of Engineers, under the chairmanship of E. E. Carpenter (1923), codified by Dr. D. B. Steinman (Chairman, 1924-25), and adopted by the Board of Directors in 1924.**

6. He should avoid any questionable statements or any statements couched in language that would convey a false impression, in any of his reports, advertisements, or articles.

7. He should avoid contingent fees as tending to prejudice the quality of the service which he renders; when retained to report on a property or project he should scrupulously careful to make no business arrangement for compensation or otherwise that might tend to bias his report.

8. The Engineer should strive to give a full measure of service for the best interests of his client and of the public, and should charge fair and adequate fees for such service. He should maintain the professional attitude in negotiations for his services; and he should avoid all practices which have a tendency to affect adversely the amount, quality or disinterested nature of professional services, such as charging inadequate fees, competing on a price basis where (as in almost invariably the case) the service to be rendered or the character of its proper performance cannot be precisely defined, spending large amounts of money securing business, or consenting to furnish monetary guarantees of cost estimates.

9. The Engineer should use every care to make his estimates accurate and reliable, and in particular should guard against allowing self-interest to lead him into making an inadequate estimate.

10. He should refrain from using any improper or questionable methods of soliciting professional work.

11. He should participate in clean politics and should strive to be a force to assist in the cleansing of the politics.

12. He should take an active interest in the public welfare in behalf of which he should ever stand ready to volunteer his special knowledge, skill and training for the use and benefit of mankind.

Part II

Relations of the Engineers to Clients and Employers

1. The Engineer should pursue his professional work in a spirit of strict fidelity and full loyalty to his clients and employers.

2. He should inform a client or employer of any business connections, interests or affiliations which might tend to influence his judgement or impair the disinterested quality of his services.

3. He should accept compensation for his services in connection with any work from one source only, except with the full knowledge and consent of all the interested parties.

4. He should hold as confidential such information relating to the business or technical affairs of a client or employer as the latter regards or may be presumed to regard as personal or proprietary.

5. He should not engage in any outside work without the full knowledge and consent of his employer.

6. When connected with any work, he should not accept commissions, outside employment, promise of employment or any other consideration from a contractor engaged upon that work.

7. He should not have no business dealings or connections with any client of his employer without the full knowledge and approval of his employer.

8. He should not entertain no offers of employment or other considerations from a third party, when such may in any way influence his actions or decisions with respect to the relations which may exist between such third party and the Engineer's employer or client.

9. He should not accept commissions or other considerations for specifying or recommending supplies, equipment or services.

10. He should not pay commissions to others for recommending his services to prospective clients.

11. He should have no interest direct or indirect in any materials, supplies or equipment used in the construction work of his client or in any firms receiving contracts for his client's work without informing his client in advance of the nature of such interest and obtaining sanction.

12. He should not engage in the independent practice of engineering without the knowledge and sanction of his employer, and under no circumstances should he compete with his employer on the basis of lower fees.

Part III

Relations of the Engineer to Employees

1. The Engineer should treat his employees or subordinates in a spirit of fairness, with due regard and consideration for their personal welfare and professional advancement.
2. There should be a professional bond between employer and employee when both are engineers, which will dictate and impel reciprocal interest and mutual consideration.
3. The Engineer should pay adequate salaries commensurate with the importance and responsibility involved in the service.
4. He should encourage the professional pride of his employees or subordinates in their work and should offer them every means of protecting their reputations and the quality of the work entrusted to them by not interfering with the proper performance of the duties for which they are responsible.
5. He should recognize the freedom of his employees to change employment and should in no way hinder employees or subordinates on bettering their condition.
6. He should not discharge am employee, nor withhold employment from him, nor discriminate against him in any way on account of his affiliations or activities in any professional, political, or religious organization.
7. He should respect his employee's right of freedom of thought, speech, and outside activity as long as the same does not impair the efficiency and value of the employee's service.
8. He should see that his employee is adequately covered by insurance against risk of casualty arising from his work.
9. In advertising or offering employment, he should refrain from any misrepresentation as to the conditions and permanency of such employment.
10. If in public employ, he should assume the responsibility of consistently protecting the interests of his subordinates.
11. He should make every effort to provide steady employment for his employees and when

forced to discharge an employee he should give the most generous notice possible and exert every reasonable effort to assist the employee in finding another position.

Part IV

The Engineer's Relations to Other Engineers

1. The Engineer should not by word, act or omission, injure falsely or maliciously, directly or indirectly, the professional reputation, prospects or business of another Engineer.
2. He should not attempt to supplant another Engineer after definite steps have been taken toward his employment.
3. If employed in conjunction with another Engineer, and by the same client, he should not review and comment conclusively upon the work of the other Engineer except with the full knowledge and consent or unless the connection of such other Engineer to the work has been previously terminated.
4. He should not use unfair means to effect his professional advancement or to injure the chances of another Engineer to secure and hold employment.
5. He should not attempt to inject his services into a project at the expense of another Engineer who has been active in developing it.
6. He should not interpose between other Engineers and their clients when unsolicited. When solicited, he should avoid any possibility of doing a brother Engineer an injustice.
7. He should not seek or solicit a position occupied by another Engineer.
8. He should not attempt to secure work on the basis of lower salaries or fees.
9. He should be courteous, fair, considerate in his dealing with other Engineers.
10. He should conduct any necessary comment on or criticism of the work of other Engineer with careful regard for the good name and dignity of the engineering profession, and he should scrupulously refrain from criticism to personal advantage, as in negotiating for an engagement.
11. He should not commercialize his affiliations with, or official position in, any technical organization.

12. He should not use his professional affiliations to secure the confidence of other Engineers in speculative commercial enterprises.

13. As a member of any professional organization, he should avoid any act tending to promote his own interest at the expense of the dignity and standing of the organization.

14. As an officer of a professional organization, he should sedulously avoid any appearance of using his position for personal advertising.

15. He should cooperate in upbuilding the engineering profession by exchanging professional information and experience with his fellow engineers and students of engineering, and by contributing to the work of engineering societies, schools of applied science, and the technical press.

16. He should regard himself as a debtor to his profession and should dedicate himself to its advancement.

[Annals of American Academy of Political Science (1955), pp. 53-56]

APPENDIX D

ACCREDITATION BOARD FOR ENGINEERING AND TECHNOLOGY*

Code of Ethics of Engineering

The Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering professional 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;

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

IV. 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 through their careers and shall provide opportunities for the professional development of those engineers under their supervision.

*****Formerly Engineers' Council for Professional Development. (Approved by the ECPD Board of Directors, October 5, 1977)

APPENDIX E

ACCREDITATION BOARD FOR ENGINEERING AND TECHNOLOGY

Suggested

Guidelines for Use with the Fundamental Canons of Ethics

1. Engineers shall hold paramount the safety, health and welfare of the public 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 not approve nor seal plans and/or specifications that are not of a design safe to the public health and welfare and in conformity with accepted engineering standards.

c. Should the Engineers' professional judgment be overruled under circumstances where the safety, health, and welfare of the public are endangered, the Engineers shall inform their clients of employers of the possible consequences and notify other proper authority of the situation, as may be appropriate.

(c.1) Engineers shall do whatever possible to provide published standards, test codes and quality control procedures that will enable the public to understand the degrees of safety or life expectancy associated with the use of the design, products and systems for which they are responsible.

(c.2) Engineers will conduct reviews of the safety and reliability of the design, products or systems for which they are responsible before giving their approval to the plans for the design.

(c.3) Should Engineers observe conditions which they believe will endanger public safety or health, they shall inform the proper authority of the situation.

d. Should Engineers have knowledge or reason to believe that another person or firm may be in violation of any of the provisions of these Guidelines, they 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.

(d.1) They shall advise proper authority if an adequate review of the safety and reliability of the products or systems has not been made or when the design imposes hazards to the public through its use.

(d.2) They shall withhold approval or products or systems when changes or modifications are made which would affect adversely its performance insofar as safety and reliability are concerned.

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.

f. Engineers should be committed to improving the environment to enhance the quality of life.

2. 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 specific technical field of engineering involved.

b. Engineers may accept an assignment requiring education or experience outside of their own fields of competence, but only to the extent that 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 and/or seals to any engineering plan or document dealing with subject matter in which they lack competence by virtue of education or experience, nor to any such plan or document not prepared under their direct supervisory control.

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

a. Engineers shall endeavor to extend public knowledge, and to prevent misunderstandings of the achievements of engineering.

b. Engineers shall be completely objective and truthful in all professional reports, statements, or testimony.

c. Engineers, when serving as expert or technical witnesses before any court commission, or other tribunal, shall express an engineering opinion only when it is founded upon adequate knowledge of the facts in issue, upon a background of technical competence in the

subject matter, and upon honest conviction of the accuracy and proprietary of their testimony.

d. Engineers shall issue no statements, criticisms, nor arguments on engineering matters which are inspired or paid for by an interested party, or parties, unless they have prefaced their comments by explicitly identifying themselves, by disclosing the identities of the party or parties on whose behalf they are speaking, and by revealing the existence of any pecuniary interest they may have in the instant matters.

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.

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 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 knowingly undertake any assignments which would knowingly create a potential conflict of interest between themselves and their clients or their employers.

c. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, nor for services pertaining to the same project, unless the circumstances are fully disclosed to, and agreed to, by all interested parties.

d. Engineers shall not solicit nor accept financial or other valuable considerations, including free engineering designs, from material or equipment suppliers for specifying their products.

e. Engineers shall not solicit nor 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.

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

g. Engineers shall not solicit nor accept an engineering contract from a governmental body on which a principal, officer or employee of their organization serves as a member.

h. When, as a result of their studies, Engineers believe a project will not be successful, they shall so advise their employer or client.

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

(i.1) They will not disclose confidential information nor findings of any commission or board of which they are members.

(i.2) When they use designs supplied to them by clients, these designs shall not be duplicated by the Engineers for others without express permission.

(i.4) While in the employ of others, Engineers will not enter promotional efforts or negotiations for work or make arrangements for other employment as principals or to practice in connection with specific projects for which they have gained particular and specialized knowledge without the consent of all interested parties.

j. The Engineer shall act with fairness and justice to all parties when administering a construction (or other contract.

k. Before undertaking work for others in which Engineers may make improvements, plans, designs, inventions, or other records which may justify copyrights or patents, they shall enter into a positive agreement regarding ownership.

l. Engineers shall admit and accept their own errors when proven wrong and refrain from distorting or altering the facts to justify their decisions.

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

n. Engineers shall not attempt to attract an employee from another employer by false or misleading representations.

o. Engineers shall not review the work of other Engineers except with the knowledge of such Engineers, or unless the assignments/or contractual agreements for the work

have been terminated.

(o.1) Engineers in governmental, industrial or educational employment are entitled to review and evaluate the work of other engineers when so required by their duties.

(o.2) Engineers in sales or industrial employment are entitled to make engineering comparisons of their products with products of other suppliers.

(o.3) Engineers in sales employment shall not offer nor give engineering consultation or designs or advice other than specifically applying to equipment, materials or systems being sold or offered for sale by them.

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

a. Engineers shall not pay nor offer to pay, either directly or indirectly, any commission, political contribution, or a gift, or other consideration in order to secure work, exclusive of securing salaried positions through employment agencies.

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

c. Engineer should negotiate a method and rate of compensation commensurate with the agreed upon scope of services. A meeting of the minds of the parties to the contract is essential to mutual confidence. The public interest requires that the cost of engineering services be fair and reasonable, but not the controlling consideration in selection of individuals or firms to provide these services.

(c.1) These principles shall be applied by Engineers in obtaining the services of other professionals.

d. Engineers shall not attempt to supplant other Engineers in a particular employment after becoming aware that definite steps have been taken toward the others' employment or after they have been employed.

(d.1) They shall not solicit employment from clients who already have Engineers under contract for the same work.

(d.2) They shall not accept employment from clients who already have

Engineers for the same work not yet completed or not yet paid for unless the performance or payment requirements in the contract are being litigated or the contracted Engineers' services have been terminated in writing by either party.

(d.3) In case of termination of litigation, the prospective Engineers before accepting the assignment shall advise the Engineers begin terminated or involved in litigation.

e. Engineering shall not request, propose nor accept professional commissions on a contingent basis under circumstances under which their professional judgments may be compromised, or when a contingency provision is used as a device for promoting or securing a professional commission.

f. Engineers shall not falsify nor permit misrepresentation of their, or their associates', academic or professional qualifications. They shall not misrepresent nor exaggerate their degree of 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 ventures, or their past accomplishments with the intent and purpose of enhancing their qualifications and work.

g. Engineers may advertise professional services only as a means of identification and limited to the following:

(g.1) Professional cards and listings in recognized and dignified publications, provided they are consistent in size and are in a section of the publication regularly devoted to such professional cards and listings. The information displayed must be restricted to firm name, address, telephone number, appropriate symbol, names of principal participants and the fields of practice in which the firm is qualified.

(g.2) Signs on equipment, offices and at the site of projects for which they render services, limited to firm name, address, telephone number and type of services, as appropriate.

(g.3) Brochures, business cards, letterheads and other factual representations of experience, facilities, personnel and capacity to render service, providing the same are not misleading relative to the extent of participation in the projects cited and are not indiscriminately

distributed.

(g.4) Listings in the classified section of telephone directories, limited to name, address, telephone number and specialties in which the firm is qualified without resorting to special or bold type.

h. Engineers may use display advertising in recognized dignified business and professional publications, providing it is factual, and related only to engineering, is free from ostentation, contains no laudatory expressions or implication, is not misleading with respect tot he Engineers' extent of participation in the services or projects described.

I. Engineers may prepare articles for the lay or technical press which are factual, dignified and free from ostentation or laudatory implications. Such articles shall not imply other than their direct participation in the work described unless credit is given to others for their share of the work.

J. Engineers may extend permission for their names to be used in commercial advertisements, such as may be published by manufacturers, contractors, materials suppliers, etc., only by means of a modest dignified notation acknowledging their participation and the scope thereof in the project or produce described. Such permission shall not include public endorsement of proprietary products.

k. Engineers may advertise for recruitment of personnel in appropriate publications or by special distribution. The information presented must be displayed in a dignified manner, restricted to firm name, address, telephone number, appropriate symbol, names of the firm is qualified and factual descriptions of positions available, qualifications required and benefits available.

l. Engineers shall not enter competitions for designs for the purpose of obtaining commissions for specific projects, unless provision is made for reasonable compensation for all designs submitted.

m. Engineers shall not maliciously or falsely, directly or indirectly, injure the professional reputation, prospects, practice or employment of another engineer, nor shall they indiscriminately criticize another's work.

n. Engineers shall not undertake nor agree to perform any engineering service on a

free basis, except professional services which are advisory in nature for civic, charitable, religious or non-profit organizations. When serving as members of such organizations, engineers are entitled to utilize their personal engineering knowledge in the service of these organizations.

o. Engineers shall not use equipment, supplies, laboratory nor office facilities of their employers to carry on outside private practice without consent.

p. In case of tax-free or tax-aided facilities, engineers should not use student services at less than rates of other employees of comparable competence, including fringe benefits.

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

a. Engineers shall not knowingly associate with nor permit the use of their named nor firm names in business ventures by any person or firm which they know, or have reason to believe, are engaging in business or professional practices of a fraudulent or dishonest nature.

b. Engineers shall not use association with non-engineers, corporations, nor partnerships as 'cloaks for unethical acts.

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

s. Engineers shall encourage their engineering employees to further their education.

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 should support the professional and technical societies of their disciplines.

e. 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 persons or persons who may be responsible for designs, inventions, writings or other

accomplishments.

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

g. Engineers shall uphold the principle of appropriate and adequate compensation for those engaged in engineering work.

h. Engineers should assign professional engineers duties of a nature which will utilize their full training and experience insofar as possible, and delegate lesser functions to subprofessionals or to technicians.

i. Engineers shall provide prospective engineering employees with complete information on working conditions and their proposed status of employment, and after employment shall keep them informed of any changes.

Accreditation Board for Engineering and Technology
345 East 47th Street
New York, NY 10017

APPENDIX E

IEEE Code of Ethics (1979-1990)

Preamble *Engineers, scientists and technologists affect the quality of life for all people in our complex technological society. In the pursuit of their profession, therefore, it is vital that IEEE members conduct their work in an ethical manner so that they merit the confidence of colleagues, employers, clients and the public. The IEEE Code of Ethics represents such a standard of professional conduct for IEEE members in the discharge of their responsibilities to employers, to clients, to the community and to their colleagues in this Institute and other professional societies.*

Article I *Members shall maintain high standards of diligence, creativity and productivity, and shall:*

1. Accept responsibility for their actions;
2. Be honest and realistic in stating claims or estimates from available date;
3. Undertake technological tasks and accept responsibility only if qualified by training or experience, or after full disclosure to their employers or clients of pertinent qualifications;
4. Maintain their professional skills at the level of the state of the art, and recognize the importance of current events in their work;
5. Advance the integrity and prestige of the profession by practicing in a dignified manner and for adequate compensation.

Article II *Members shall, in their work:*

1. Treat fairly all colleagues and co-workers, regardless of race, religion, sex, age or national origin;
2. Report, publish and disseminate freely information to others, subject to legal and proprietary restraints;
3. Encourage colleagues and co-workers to act in accord with this Code and support them when they do so;
4. Seek, accept and offer honest criticism of work, and properly credit the contributions of others;
5. Support and participate in the activities of their professional societies;

6. Assist colleagues and co-workers in their professional development.

Article III *Members shall, in their relations with employers and clients:*

1. Act as faithful agents or trustees for their employers or clients in professional and business matters, provided such actions conform with other parts of this Code;

2. Keep information on the business affairs or technical processes of an employer or client in confidence while employed, and later, until such information is properly released, provided such actions conform with other parts of this Code;

3. Inform their employers, clients, professional societies or public agencies or private agencies of which they are members or to which they may make presentations, of any circumstance that could lead to a conflict of interest;

4. Neither give nor accept, directly or indirectly, any gift, payment or service of more than nominal value to or from those having business relationships with their employers or clients;

5. Assist and advise their employers or clients in anticipating the possible consequences, direct and indirect, immediate or remote, of the projects, work or plans of which they have knowledge.

Article IV *Members shall, in fulfilling their responsibilities to the community:*

1. Protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest;

2. Contribute professional advice, as appropriate, to civic, charitable or other nonprofit organizations;

3. Seek to extend public knowledge and appreciation of the profession and its achievements.

Approved February 18, 1979, by the Board of Directors of the
Institute of Electrical and Electronics Engineers, Inc.

APPENDIX F

NATIONAL SOCIETY FOR PROFESSIONAL ENGINEERS

CODES OF ETHICS

For Engineers

Preamble

Engineering is an important and learned profession. The members of the profession recognize that their work has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness and equity, and must be dedicated to the protection of the public health, safety and welfare. In the practice of their profession, engineers must perform under a standard of professional behavior which requires adherence to the highest principles of ethical conduct on behalf of the public, clients, employers and the profession.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties shall:

1. Hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act in professional matters for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts in the solicitation of professional employment.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.

   a. Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property and welfare of the public. If their professional judgment is

overruled under circumstances where the safety, health, property or welfare of the public are endangered, 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 safe for public health, property and welfare in conformity with accepted standards.

c. Engineers shall not reveal facts, data or information obtained in a professional capacity 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 firm name nor associate in business ventures with any person or firm which they have reason to believe is engaging in fraudulent or dishonest business or professional practices.

e. Engineers having knowledge of any alleged violation of this Code shall 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, subjects only when that opinion is founded upon adequate knowledge of the facts and competence in the subject matter.

b. Engineers may express publicly a professional opinion on technical subjects only when the opinion is founded upon adequate 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 engineer may have in the matters.

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

a. Engineers shall disclose all known or potential conflicts of interest to their employers or clients by promptly informing them of any business association, interest, or other circumstances 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 to, and agreed to by, all interested parties.

c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from contractors, their agents, or other parties in connection with work for employers or clients 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 decisions with respect to professional services solicited or provided by them or their organizations in private or public engineering practice.

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

5. Engineers shall avoid deceptive acts in the solicitation of professional employment.

a. Engineers shall not falsely or permit misrepresentation of their, or their

associates', academic or professional qualifications. They shall not misrepresent or exaggerate their degree of responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment, associates, joint venturers or past accomplishments with the intent and purpose of enhancing their qualifications and their work.

b. Engineers shall not offer, give, solicit or receive, either directly or indirectly, any political contribution in an amount intended to influence the award of a contract by public authority, or which may be reasonably construed by the public of having the effect or intent to influence the award 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 professional relations by the highest standards of integrity.

a. Engineers shall admit and accept their own errors when proven wrong and refrain from distorting or altering the facts in an attempt to justify their decisions.

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 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 avoid any act tending to 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 be of constructive service in civic affairs 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 of a design safe to the public health and welfare and in conformity with accepted 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 and to protect the engineering profession from misrepresentation and misunderstanding.

3. Engineers shall avoid all conduct or practice which is likely to discredit the profession or deceive the public.

a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact necessary to keep statements from being misleading or intended or likely to create an unjustified expectation; statements containing prediction of future success; statements containing an opinion as the quality of the Engineers' services; or statements intended or likely to attract clients by the use of showmanship, puffery, or self-laudation, including the use of slogans, jingles, or sensational language or format.

b. Consistent with the foregoing, Engineers may advertise for recruitment of personnel.

c. Consistent with the foregoing, Engineering 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 confidential information concerning the business affairs or technical processes of any present or former client or employer without his consent.

a. Engineers in the employ of others shall not without the consent of all interested parties enter promotional efforts or negotiations for work or make arrangements for other employment as a principal or to 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 and 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. Engineering 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 uphold the principle of appropriate and adequate compensation for those engaged in engineering work.

a. Engineers shall not accept remuneration from either an employee or employment agency for giving employment.

b. Engineers, when employing other engineers, shall offer a salary according to professional qualifications.

7. 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 professional commission on a contingent basis under circumstances in which their professional 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 consideration.

c. Engineers shall not use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice without consent.

8. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice or employment of other engineers, nor

untruthfully criticize other engineers' work. 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.

9. Engineers shall accept responsibility for their professional activities; provided, however, that Engineers may seek indemnification for professional 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 nonengineer, a corporation, or partnership, as a "cloak" for unethical acts, but must accept personal responsibility for all professional acts.

10. 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 which may justify copyrights or patents, should enter into a positive agreement regarding ownership.

11. Engineers shall cooperate in extending the effectiveness of the profession by

interchanging information and experience with other engineers and students, and will endeavor to provide opportunity for the professional development and advancement of engineers under their supervision.

a. Engineers shall encourage engineering employees' efforts to improve their education.

b. Engineers shall encourage engineering employees to attend and present papers at professional and technical society meetings.

c. Engineers shall urge engineering employees to become registered at the earliest possible date.

d. Engineers shall assign a professional engineer duties of a nature to utilize full training and experience, insofar as possible, and delegate lesser functions to subprofessionals or to technicians.

e. Engineers shall provide a prospective engineering employee with complete information on working conditions and proposed status of employment, and after employment will keep employees informed of any changes.

"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 of 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..."

Note:

In regard to the question of application of the Code to corporations vis-a-=vis real persons, business form or type should not negate nor influence conformance of individuals to the Code. The Code deals with professional services, which services must be performed by real persons. Real persons in turn establish and implements policies within business structures. The Code is clearly written to apply to the Engineer and it is incumbent on a member of NSPE to endeavor to live up to its provisions. This applies to all pertinent sections of the Code.

NSPE Publication No. 1102 as revised January 1987

APPENDIX G

MODEL GUIDE FOR PROFESSIONAL CONDUCT

AMERICAN ASSOCIATION OF ENGINEERING SOCIETIES

Preamble

Engineers recognize that the practice of engineering has a direct and vital influence on the quality of life for all people. Therefore, engineers should exhibit high standards of competency, honesty and impartiality; be fair and equitable; and accept a personal responsibility for adherence to applicable laws, the protection of the public health, and maintenance of safety in their professional actions and behavior. These principles govern professional conduct in serving the interests of the public, clients, employers, colleagues and the profession.

The Fundamental Principle

The engineer as a professional is dedicated to improving competence, service, fairness and the exercise of well-founded judgment in the practice of engineering for the public employers and clients with fundamental concern for the public health and safety in the pursuit of this practice.

Canons of Professional Conduct

Engineers offer services in the areas of their competence and experience, affording full disclosure of their qualifications.

Engineers consider the consequences of their work and societal issues pertinent to it and seek to extend public understanding of those relationships.

Engineers are honest, truthful and fair in presenting information and in making public statements reflecting on professional matters and their professional role.

Engineers engage in professional relationships without bias because of race, religion, sex, age, national origin or handicap.

Engineers act in professional matters for each employer or client as faithful agents or trustees, disclosing nothing of a proprietary nature concerning the business affairs or technical processes of any present or former client or employer without specific consent.

Engineers disclose to affected parties known or potential conflicts of interest or other circumstances which might influence--or appear to influence--judgment or impair the fairness or quality of their performance.

Engineers are responsible for enhancing their professional competence throughout their careers and for encouraging similar actions by their colleagues.

Engineers accept responsibility for their actions; seek and acknowledge criticism of their work; offer honest criticism of the work of others; properly credit the contributions of others; and do not accept credit for work not theirs.

Engineers perceiving a consequence of their professional duties to adversely affect the present or future public health and safety shall formally advise their employers or clients and, if warranted, consider further disclosure.

Engineers act in accordance with all applicable laws and the _____[1] rules of conduct, and lend support to others who strive to do likewise.

[1]AAES Member Societies are urged to make reference here to the appropriate code of conduct to which their members will be bound. Approved by AAES Board of Governors 12/13/84

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