



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Trench Boxes and the Construction Site

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Description

Summary of a case involving safety equipment and professional responsibility on a trench digging site.

Abstract

Trench digging is one of the oldest types of construction work in documented history. Historically, there have been between 100 and 300 people killed in the United States every year because of trench collapse.

The case stresses safety equipment presence on construction sites. The case also addresses the issues of the engineer's moral responsibility versus legal liability, and it is particularly well-suited for upper-level geotechnical, statics, and structures courses.

Body

Instructor's Guide

Introduction To The Case

Trench digging is one of the oldest types of construction work documented in history. Prior to World War II, trenches were dug by hand. As workers dug trenches deeper, the sides of the trench had to be shored, or supported, to keep the walls of the trench from collapsing. Following the war, innovations were made in cable backhoes, and trench digging disappeared as an established profession. By the 1950's, hydraulically-actuated backhoes were developed, making it possible to rapidly dig very deep trenches. As a result of backhoe innovations, and because there were no workers inside the trenches during digging, trench walls were no longer shored.

All trenches have what is known as a stand-up time. The stand-up time is the time that elapses from the time the trench is dug until the trench walls start collapsing. Stand-up time is dependent on many factors, including soil type, water content, trench depth, weather conditions, and whether or not the soil has been previously disturbed. Stand-up times can be as short as zero seconds or as long as several months, and are difficult to predict. Before trenches are dug, someone can take soil samples as a means of estimating stand-up time; however, soil conditions can be dramatically disparate only a few feet from where the soil sample was taken.

After a trench is dug, workers go down into the trench, performing whatever work is necessary, such as laying pipe or telephone lines, welding pipe, or installing valves. If the walls of the trench are not supported, there is the possibility that the walls will collapse and trap the workers in the trench. Historically, there have been between 100 and 300 people killed in the United States every year due to trench collapses. This case stresses the importance of safety equipment on the construction site, deals with issues of engineering social responsibility versus legal liability, and is particularly well-suited to upper-level geotechnical, statics, and structures courses.

Guidelines For Presentation

1. Prior to class discussion, distribute student handout: Trench Boxes and the Construction Site: Social Responsibility Versus Legal Liability. Have students come to the discussion class prepared to address the technical and ethical issues raised in the student handout.
2. At discussion, present students with Overhead 1): View of Trench.
3. End discussion class with Overhead 2), Trench Boxes and the Construction Site: Ethical Issues of the Case. Discuss the ethical issues of the case:

- Where does the responsibility of the engineer end and the construction site contractor begin?
- Should engineers allow construction workers to endanger their lives by not using trench boxes on-site?
- Should construction management be held responsible for ensuring trench boxes are used? What is their responsibility?
- If social responsibility comes before legal liability, what would you do in a similar situation, given that OSHA regulations make the use of trench boxes optional?

Instructors preparing to lead class discussion on this case will find helpful essay #5, "Negligence, Risk, and the Professional Debate over Responsibility for Design" and #4, "Engineering Design Literature on Social Responsibility Versus Legal Liability," both appended at the end of the cases listed in this report. In addition, essays #1 through #3 appended at the end of the case listings in the report will have relevant background information for the instructor preparing to lead classroom discussions. Their titles are, respectively: "Ethics and Professionalism in Engineering; Why the interest in Engineering Ethics?;" "Basic Concepts and Methods in Ethics;" and "Moral Concepts and Theories."

Ethical Issues Of The Case

1. Where does the responsibility of the engineer end and the responsibility of the construction site contractor begin?
2. Should engineers allow construction workers to endanger their lives by not using trench boxes on-site?
3. Should construction management be held responsible for ensuring that trench boxes are used? What is their responsibility?
4. If social responsibility comes before legal liability, what would you do in a similar situation, given that the OSHA regulations make use of trench boxes optional?

Trench Boxes And The Construction Site Social Responsibility Versus Legal Liability

Student Handout

June, 1992

Synopsis

Trench digging is one of the oldest types of construction work documented in history. Prior to World War II, trenches were dug by hand. As workers dug trenches deeper, the sides of the trench had to be shored, or supported, to keep the walls of the trench from collapsing. Following the war, innovations were made in cable backhoes, and trench digging disappeared as an established profession. By the 1950's, hydraulically-actuated backhoes were developed, making it possible to rapidly dig very deep trenches. As a result of backhoe innovations, and because there were no workers inside the trenches during digging, trench walls were no longer shored.

All trenches have what is known as a stand-up time. The stand-up time is the time that elapses from the time the trench is dug until the trench walls start collapsing. Stand-up time is dependent on many factors, including soil type, water content, trench depth, weather conditions, and whether or not the soil has been previously disturbed. Stand-up times can be as short as zero seconds or as long as several months and are difficult to predict. Before trenches are dug, someone can take soil samples as a means of estimating stand-up time; however, soil conditions can be dramatically disparate only a few feet from where the soil sample was taken.

After a trench is dug, workers go down into the trench, performing whatever work is necessary, such as laying pipe or telephone lines, welding pipe, or installing valves. If the walls of the trench are not supported, there is the possibility that the walls will collapse and trap the workers in the trench. Historically, there have been between 100 and 300 people killed in the United States every year due to trench collapses. The state of Texas usually leads the nation in this statistic.

Professional Responsibility And Use Of Trench Boxes

The public has become increasingly aware that industrial progress often has negative side-effects. The place of engineers in protecting the public from these negative effects is a controversial issue. This controversy becomes especially spirited when moral responsibility may appear wider than legal responsibility. The use of trench boxes on construction sites illustrates this debate. A trench box (also called a trench shield) may be placed in the trench to prevent trench failures from

injuring workers. A trench box consists of two large plates, usually made of steel, which are parallel to the walls of the trench, and horizontal cross-members which hold the two plates apart. The lower edge of the box rests on the bottom of the trench, and the top edge extends above the top of the trench. The workers stay between the plates of the trench box, so that if the wall of the trench collapses, the dirt will be stopped by the trench box. As work progresses, the trench box is pulled along the trench with a backhoe.

Due to the added expense of using the trench box, many contractors are reluctant to use them. They know that if a worker is killed or injured in a trench wall collapse, Workman's Compensation will cover all medical expenses and reimburse the families of the deceased workers. Barring gross negligence, the families are not allowed to sue in Texas, where about 10-15% of the annual fatalities occur.

When a construction project requires a large excavation, such as digging the foundation for a tall building, the support structure for the excavated walls is specified in the plans. The main problem involving nonuse of trench boxes occurs in cities, when water or sewer lines are being installed or repaired. The engineer usually does not specify the support structure for the trench on the plans, but leaves that to the contractor. In September 1987, a bill was passed in Texas that required the following: plans for city projects had to include the support structure on the plans, the support structure (or trench box) had to be included in the bid for the project, and the contractor had to install the trench box in the trench. In 1987, before the bill was passed, 18 people died in Texas due to trench wall collapses. In 1988, only two people were killed, and both of these deaths were not the result of a trench box inadequacy.

In January 1990, the law was changed. Plans are now only required to show the Federal Occupational Safety and Health Administration (OSHA) regulation for trench support on the plans, not the actual design of the support system itself. It is up to the contractor to provide a suitable support system for the trench. The OSHA regulation gives the following four ways of providing for proper trench support:

1. Slope the sides of the trench to a specified angle, thus eliminating the need for all support.
2. Look at the soil and determine the type of support required from the tables provided in the OSHA regulation.
3. Hire an engineer to design a suitable support system.

4. Go to a trench wall manufacturer and use their tables for determining the proper support system.

To understand the various problems associated with making social versus legal decisions, read the following section, "Engineering Design: Literature on Social Responsibility versus Legal Liability."

Engineering Design: Literature On Social Responsibility Versus Legal Liability

Introduction

Litigation associated with engineering design has escalated enormously over the last few decades, and has increased the intensity of debates over whether engineers and their companies should give priority to social responsibility or legal liability. Where does a design engineer and his/her company's responsibility end and the responsibility of the subcontractor, manufacturer and consumer begin? Liability is complicated by the fact that law typically lags behind social costs associated with failed design. In other words, legislation is often after-the-fact, so how can an engineering firm justify its actions based on current legal definitions? If a company's design has adverse affects on the public welfare, laws must be enacted to ensure that appropriate safety standards are met. Or, at the very least, legal suits are filed so injured parties can be compensated and culprits penalized. This phenomenon has become particularly critical regarding litigation involving engineering design and product liability.

The public has become increasingly aware that the benefits of industrial progress are often associated with negative side-effects. The responsibility of engineers in protecting the public from these side-effects is the focus of a lively debate. This is intensified by the fact that legal liability and social responsibility may not always coincide.

What should be said about the engineer's and his/her company's social responsibility? Is it not their job to act as society's protector? Should social responsibility not precede any discussion of legal liability? And should a design engineer not take every precaution to ensure his/her company's product is safe before it enters the market? Safety must be an essential design consideration. As Christopher D. Stone notes in his "Where the Law Ends: The Social Control of

Corporate Behavior," Even if we put aside the defects in the impact of the sanctions, there still remains the problem that law is primarily a reactive institution. Lawmakers have to appreciate and respond to problems that corporate engineers, chemists, and financiers were anticipating (or should have anticipated) long before that the drugs their corporations are about to produce can alter consciousness or damage the gene pool of the human race, that they are on the verge of multinational expansion that will endow them with the power to trigger worldwide financial crises in general y unforeseen ways, and so on.

Even if laws could be passed to deal effectively with these dangers, until they are passed a great deal of damage some perhaps irreversible can be done. Thus, there is something grotesque and social y dangerous in encouraging corporate managers to believe that, until the law tel s them otherwise, they have no responsibilities beyond the law and their impulses (whether their impulses spring from the id or from the balance sheet). We do not encourage human beings to suppose so. And the dangers to society seem all the more acute where corporations are concerned.²

Social Responsibility for Public Safety: An Overview

With corporate decision-making structures as the focus, we find that many of the difficult ethical choices corporate managers and design engineers must make involve conflicts regarding who is responsible for a given activity. Managers and engineers alike have different obligations depending on their role within the corporation. Managers often perceive themselves as having a special duty to protect the financial well-being of the company. Engineering codes assign to engineers special duty to protect the public. Whether these roles are appropriate and especially whether this narrow conception of the role of managers is adequate is a matter of debate. As one writer has put it, "Corporate role morality takes as given precisely what classical moral theory wishes to evaluate, the worthiness of the duties assigned by one's role."

If engineers do have a special obligation to the health and safety of the public, an engineer must often place his/her social responsibility over the objectives of his/her employer. "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." Sometimes a cost/benefit analysis is not enough, especially when lives are at stake.

In his "Explaining Wrongdoing," Michael Davis emphasizes the need for professionals to distance themselves from a "microscopic" way of looking at their role within the corporation, to look up from their given tasks to see the larger implications of the work they perform for society. In essence, Davis argues that problems associated with professional ethics center on these fundamental questions of social obligation. Using the famous Challenger disaster as a case study, Davis shows that while no one broke the law in Challenger, there was clearly wrongdoing on the part of Morton Thiokol's managers and engineers. "For an engineer, safety is the paramount consideration. The engineers could not say the launch would be safe. So, Lund should have delayed the launch. Seven people died, in part at least, because he did not do what, as an engineer, he was supposed to do." This is not simply limited to highly publicized disasters. In all fields of engineering, concern over safety, and the engineer's responsibility for ensuring it, is paramount. In his "Safety - An Important Responsibility," Carlton Robinson argues that safety is an especially critical factor for transport engineers and their managers. Given the volume of traffic on roads, safety must come before cost considerations in highway design and construction. Carlton argues that if, at present, increased safety is not the primary goal in engineering design and construction projects, it should be.⁶ Safety is a social, not a legal obligation, and engineers and their managers must always keep their obligations to the public welfare at the fore when making design and management decisions.

Another example on the importance of choosing social responsibility over the law involves the Soldier of Fortune guns-for-hire classified advertising cases. In his article, Don Tomlinson asks whether we are first professionals or first human beings. While placing guns-for-hire advertisements was not illegal, it was immoral, and people died because of the advertisements. Soldier of Fortune acted irresponsibly toward the public, and "Law cannot shield anyone from the most basic duty all human beings owe all other human beings: respect for life. Law and ethics are not one and the same. Further, using law as a justification for conduct which is socially irresponsible is socially irresponsible itself."⁷ The same duties apply to engineering design and management.

Quality engineering is a necessity. This means there is a need for creative engineering and ethical corporate practice. The American Society of Civil Engineering Code of Ethics states that "engineers must hold the public safety, welfare, and health paramount and use our knowledge and skill for the enhancement of human welfare." When engineers, managers, corporate owners,

contractors, subcontractors and inspectors take pride in and responsibility for their designs the entire engineering profession benefits. According to Charlton Moorman, ethical engineering practice positively affects engineering creativity, and the "engineering profession benefits when ethics are followed and creativity is used by the engineer. When not followed, bad public relations are a possibility for the engineer, the company employing the engineer and the profession in general."

Professional engineering societies play a significant role in ensuring that safety standards are maintained, and it is imperative that individual professional engineers adhere to what his/her society mandates. Michael Davis notes that in thinking like an engineer, one must remember the place of a code of ethics in the practice of his/her profession:

Engineers should not only do as their profession's code requires, but should also support it less directly by encouraging others to do as it requires and by criticizing, ostracizing, or otherwise calling to account those who do not. They should support their profession's code in these ways for at least four reasons: First, engineers should support their profession's code because supporting it will help protect them and those they care about from being injured by what other engineers do. Second, supporting the code will also help assure each engineer a working environment in which it will be easier than it would otherwise be to resist pressures to do much that the engineer would rather not do. Third, engineers should support their profession's code because supporting it helps make their profession a practice of which they need not feel morally justified embarrassment, shame, or guilt. And fourth, one has an obligation of fairness to do his part insofar as he claims to be an engineer and other engineers are doing their part in generating these benefits for all engineers.

Sometimes, however, even when engineers meet their design obligations, failures still occur. What is the engineer's responsibility once the design is handed over to a contractor, subcontractor or the consumer? Is the designer liable for aiding others in the use of a product? What criteria can the engineer invoke? In his "Charity and the Duty to Rescue," John Whelan says, "there is not a duty to aid; however, many failures to aid deserve moral criticism; and some of them deserve very serious moral criticism." He notes that one must distinguish between morally objectionable failures to aid and those which are merely failures of consideration. They are distinguishable by knowing what the obligations of the rescuer (or in this case, the engineer) are. "Knowledge (or any reasonable belief)...is relevant to any obligation what matters[; however,] is whether you can do something about it." In determining whether you

are obligated to do something to prevent harm to others, two of his six rules apply directly to engineering design: 1) that there is sufficient professional reason to believe that you can prevent unreasonable danger at little cost to yourself; and 2) that you do not have sufficient reason to believe someone else can prevent harm if you do not. This raises serious questions about the meaning of 'safety' and 'unreasonable danger' as design considerations.

One of the problems is that engineers are often not trained to look at notions of "unreasonably dangerous products." In his work, D. Muster uses the analogy of medical health practitioners to encourage a forensic approach to engineering. "Some engineers tend to ignore design considerations that cannot be quantified easily for analysis or, at least, they consider them to be of less importance than others which lend themselves readily to being modeled and analyzed."¹⁴ For Muster, the real problem engineers face is that they are not properly educated in product liability law and the legal concept of an "unreasonably dangerous product," so they do not fully appreciate when they are ethically obligated to assist others in the product chain.

Strict liability for a defective product falls into three categories, and all three are significant in the chain: design, manufacturing, and marketing. In particular, Muster notes that "A marketing defect is synonymous with the failure of a manufacturer to give adequate warnings and instructions for the proper use of his product."¹⁵ This is also true for the designer. When looking at whether there was an "unreasonable" danger, courts test the product as to whether it was: state-of-the-art, an unavoidably unsafe product, misused by the user, or misused in a way that could have been foreseen.

Like the other authors, Muster argues that safety is an essential design consideration, and, given all the educational programs and literature available to engineers, "no designer can claim the information on which to base a safe design is unavailable." He further notes, like Stone, that most design changes are directly attributable to product liability litigation, and that safe products are part of good business practice. Thus, safety is seen as the absence of unreasonable danger. Anything short of that can be considered morally unacceptable. Yet, morally unacceptable conduct continues apace, and the amount of litigation escalates. So, let us look at the consequences for the engineering profession.

Legal and Social Consequences for the Engineering Profession

As we have already pointed out, claims against design professionals and their companies are on the increase. Even if the professional engineer believes he/she has done everything to avoid "unreasonable" danger, accidents happen, and designers are increasingly held liable for construction and product mishaps. Engineers must, therefore, familiarize themselves with the legal doctrines of informed consent, novel tort remedies and reforms, third-party liability issues, liability insurance and legislative lobbying techniques.

The legal doctrine of informed consent is based on tort law. In *A History and Theory of Informed Consent*, a "tort" is defined as "a civil injury to one's person or property that is intentionally or negligently inflicted by another and that is measured in terms of, and compensated by, money damages." Any failure to obtain informed consent in situations where it is legally required is considered a "tort." While the book deals almost exclusively with medical ethics, the implications for engineering designers is clear.

In recent years, a novel theory of tort remedy, the "Hedonic tort," is becoming more prominent. The "Hedonic tort" remedy considers as its base the theory of individual happiness, and its attributes include "quality of life factors such as environmental standards, quality of education, weather, and the amounts of time spent pursuing vocations."¹⁸ According to Jack Karns, individual happiness is based on three factors: "a. degree of moral virtue, b. degree of good fortune with which the individual is blessed, and c. [and most important for the design engineer's consideration] whether a tragic choice is made based on circumstances beyond someone's control." Hedonic damage suits could conceivably ruin a professional's (and his/her firm's) reputation, never mind financial viability to practice. Thus, this theory of tort remedy could have significant impacts on product design, incorporating additional safety features in order to minimize such damage claims.

One of the problems associated with tort reform, however, is the issue of insurance. Because claims have increased substantially in the last few decades, battles over reform have escalated since the early 1980's. As Dennis Schapker notes, many firms have responded to these increased claims by dropping their insurance coverage's of 1990, 21% of all design firms were uninsured. This percentage of uninsured firms does not bode well for the engineering profession as a whole. Thus, he argues that design professionals must get involved in the debate over tort reform.²⁰ This call to action becomes more urgent as designers are increasingly being held responsible for negligence in their work (including the work of their subcontractor), despite written

contract disclaimers aimed at defending their interests. Civil Engineering notes that "the privity of contract defense is no longer an absolute shield that design professionals may use to protect themselves from liability to third parties." Thus, engineers must know about tort reform and liability insurance in a way that was unnecessary even a few years ago.

While insurance is not an excuse for unprofessional behavior, engineers must know more about it. In his case study of an insurance carrier, Randal Horne notes that, "With the ever-increasing tendency toward litigation, clients have begun to view their design professional's liability insurance as a potential source of full reimbursement for any damages they may incur."

This can be a paralyzing concept for the engineer, to say the very least. Claims against designers not only mean increased insurance expenses, but also loss of the goodwill of clients and a tarnished reputation that can harm future business prospects. "Although it may be difficult to assign a monetary value to these losses, it is not difficult to imagine that they could be career or at least business threatening."

Thus, engineers must get involved, as must their societies. The nature of engineering in the United States means that each state can create unique laws governing the practice of engineering. This has resulted in a liability crisis of the first order. While most recognize the need for engineers to place their social responsibility over issues of legal liability, many petty law suits make practicing as a professional a risky venture. If engineers get involved in the debate over legal liability, perhaps they can spend more time policing themselves, and less time in the court room. Mark Friedlander, a liability attorney, argues that engineers and their societies must acquire the requisite knowledge about liability issues, and then lobby for legislation that will protect them from the ever-increasing litigation crisis.

"Among the most costly and frivolous lawsuits are construction-site-accident claims. Engineers ordinarily have no responsibility for construction-site safety. Nevertheless, obtaining indemnity against these claims from the contractor, or defense under the contractor's general liability policy, is difficult. In my experience, such claims constitute most frivolous malpractice claims filed against design professionals."

If engineers are better educated about the litigation process, perhaps they can better serve society at large. The courts are siding with contractors, which means that the public feels engineers should continue answering for their designs on site.

And maybe they should take a more active role. The only way to know for sure that their design instructions are being adhered to is by getting involved, and knowing what both their social as well as legal responsibilities are. Only then can they determine, and influence society at large about, the benefits from their work.

Ethical Issues Of The Case Points For Discussion

In the light of the essay in the previous section, how would you say the social contract between engineering professionals and the public applies to the use of trench walls?

In "Professional Responsibility for Harmful Actions," Martin Curd and Larry May propose the following simplified account of professional responsibility embodying a rather crude model of negligence:

The Malpractice Model of Professional Responsibility: A professional, S, is negligent and hence responsible for the harm he or she causes, if his or her behavior fits the following pattern:

1. As a member of his or her profession, S has a duty to conform to the standard operating procedures of his or her profession;
2. At time t, action X conforms to the standard operating procedures of S's profession;
3. S omits to perform X at time t;
4. Harm is caused to some person, P, as a result of S's failure to do X; that is, if S had done X, then the harm to P would not have occurred.

Is there a violation of this model when engineers allow construction sites to operate without the safety feature of trench boxes? If not, is the model itself defective? If so, how should it be changed? Assume that a patient in a local hospital with a serious malady has a doctor who believes he is not knowledgeable enough about that malady. He goes to his medical colleagues on the hospital staff and asks their advice. They all refuse to talk to him since the patient is not theirs. They cite possible malpractice liability insurance problems as their reason. They believe existing state-level "good-Samaritan" laws will not protect them in these circumstances. Does this mean the patient has to hire the other expert doctors to

protect himself? What if the patient is not even aware of their refusal to cooperate and is never told about it? Certainly, this analogy pertains to the use of trench boxes. Where does the responsibility of the engineer end and the construction site contractor begin?

Should engineers allow construction workers to endanger their lives by not using trench boxes on-site?

Should construction management be held responsible for ensuring trench boxes are used? What is their responsibility? If social responsibility comes before legal liability, what would you do in a similar situation, given OSHA regulations make the use of trench boxes optional?

Annotated Bibliography

- **Curd, Martin, and May, Larry, "Professional Responsibility for Harmful Actions," *Module Series in Applied Ethics, Center for the Studies of Ethics in the Professions, Illinois Institute of Technology, 1984.***
 - This essay explores the grounds on which professionals should be held responsible for harms caused by their actions. Most of the examples are about engineers, designers, and architects involved in real-life cases from tort law.
- **Davis, Michael, "Thinking Like An Engineer: The Place of a Code of Ethics in the Practice of a Profession," *Philosophy & Public Affairs, Vol. 20, No. 2, Spring 1991, pp. 150-167.* (See also, "Explaining Wrongdoing," *Journal of Social Philosophy, Vol. 20, Numbers 1&2, Spring/Fall 1989, pp. 74-90.*)**
 - In these lucid essays, Davis argues that "a code of professional ethics is central to advising individual engineers how to conduct themselves, to judging their conduct, and ultimately to understanding engineering as a profession." Using the now infamous Challenger disaster as his model, Davis discusses both the evolution of engineering ethics as well as why engineers should obey their professional codes of ethics, from both a pragmatic and ethical point of view. Essential reading for any graduating engineering student.
- **Muster, D., "Safety and Reasonable Danger as Design Criteria for Engineers: Some Effects of Products Liability Law on Engineering Design," *Proceedings of the Institution of Mechanical Engineers, Part***

B, *Journal of Engineering Manufacture*, Vol. 204, No. B3, 1990, pp. 185-190.

- This paper discusses issues of safety and the concept of "unreasonable" danger in engineering design. Using a medical analogy, Muster argues that engineers must aim at forensic engineering, relying on moral considerations as well as technical considerations in design. He further discusses product liability laws and their impact on engineering design.

• **Faden, Ruth R. and Beauchamp, Tom L., *A History and Theory of Informed Consent*, New York: Oxford University Press, 1986.**

- This book defines and discusses the legal doctrine of informed consent, by looking at tort and constitutional law as it applies to medical ethics. Although written for and about medical ethics, the book's message has value for engineering ethics as well.

• **Friedlander, Mark C., "A Legislative Agenda to Curb Liability Lawsuits," *Consulting/Specifying Engineer*, Vol. 7, March 1990, pp. 27-32.**

- Attorney Friedlander argues that professional societies must get involved in lobbying for legislation that protects engineers against frivolous malpractice claims.

• **Horne, Randal M., "Understanding Terra RRG Professional Liability Insurance," *Journal of Professional Issues in Engineering*, Vol. 116, July 1990, pp. 239-249.**

- This article presents a case study of one insurance carrier. Horne shows how important it is for engineers to understand liability insurance, especially given the rise in litigation in the past decades.

• **Karns, Jack P., "Economics, Ethics and Tort Remedies: Emerging Concept of Hedonic Value," *Journal of Business Ethics*, Vol. 9, September 1990, pp. 707-713.**

- This article discusses a novel tort remedy, the Hedonic tort, based on the concept of quality of life and the theory of individual happiness. He argues that this tort remedy will have a significant impact on product design, as a move is made to ensure greater product safety.

• **"Liability of a Design Professional for Impact Costs of a Subcontractor," *Civil Engineering (American Society of Civil Engineers)*, Vol. 59, January 1989, p. 30.**

- This article shows how design engineers are being held responsible for negligence in both their work and the work of their subcontractors.

- **Moorman, Charlton Kent, "Does Ethical Engineering Practice Affect Creativity?", *Civil Engineering (American Society of Civil Engineers)*, Vol. 59, November 1989, pp. 68-69.**
 - This short article stresses the importance of ethical behavior for engineering creativity. Moorman argues that engineers must hold the public safety foremost while designing for the market.
- **Nesteruk, Jeffrey, "The Ethical Significance of Corporate Law," *Journal of Business Ethics*, Vol. 10, No. 9, September 1991, pp. 723-727.**
 - In this article, the focus is on corporate decision-making structures, and conflicts regarding particular role obligations. Nesteruk argues that as laws change, so do the roles of people in the corporate hierarchy, thereby creating problems for the legal aspects of corporate social responsibility.
- **Robinson, Carlton C., "Safety--An Important Responsibility," *ITE Journal (Institute of Transportation Engineers)*, Vol. 61, No. 7, July 1991, pp. 21-24.**
 - This article discusses safety as a critical ingredient for transport engineers and their managers.
- **Schapker, Dennis R., "Tort Reform and Design Professionals," *Journal of Professional Issues in Engineering*, Vol. 116, July 1990, pp. 258-265.**
 - This article discusses the battle over tort reform and how it has affected the engineering profession since 1980. It is a call for engineers to get involved in the debate.
- **Stone, Christopher D., *Where the Law Ends: The Social Control of Corporate Behavior*, New York: Harper & Row, 1975.**
 - This book looks at corporate moral behavior; in particular, how law is a reaction to misdeeds in business behavior. Stone provides a thorough, albeit negative analysis of corporate ethics, and provides recommendations for promoting ethical behavior. Although written in 1975, the book still holds value for the student interested in the issue of social responsibility versus legal liability.
- **Tomlinson, Don E., "Choosing Social Responsibility Over Law: The Soldier of Fortune Classified Advertising Cases," *Business and Professional Ethics*, Vol. 9, Nos. 1&2, Spring-Summer 1990, pp. 79-96.**
 - This article discusses the ethics of the Soldier of Fortune's guns-for-hire advertisements that resulted in several murders across the United States.
- **Whelan, John M. Jr., "Charity and the Duty to Rescue," *Social Theory and Practice*, Vol. 17, Fall 1991, pp. 441-56.**

- This article discusses those classes of action and inaction that can be seen as morally objectionable failures to aid. He argues that one cannot simply weigh the competing interests of the savior and victim, that what matters is whether, as a professional, you are in a position to help.

Notes

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