Ethical Responsibility of Engineers for Alumnus Whistleblowing

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Introduction

Since the Watergate cover-up of the mid-1970s the US culture has begun to support the idea of whistleblowing and the belief that persons with knowledge should be encouraged to expose government and private mismanagement, wrongdoing, illegal conduct or conduct dangerous to the health and safety of others. Congress established the Office of Inspector General[1] (OIG) in 1978. The OIG maintains a 24-hour hotline[2] for people to report government mismanagement, wrongdoing, illegal conduct, or conduct dangerous to the health and safety of others. The General Accounting Office (GAO)[3] was established by Congress to improve the efficiency of the U.S. government financial audits and reviews. Another example, which shows the support for whistleblowing, is the appearance in employment law of the public policy exception to the employment-at-will doctrine. Historically the employment-at-will doctrine held that an employer may terminate an employee for any reason or no reason. Over time the law has restricted this right of employers and some employers may not terminate persons based on race, creed, sex, national origin and to some extent disability.[4]

Whistleblowing does need to strike a balance with competing values. The Government Accounting Office describes the need to strike a "balance between the objective of encouraging legitimate disclosure of waste, mismanagement and abuse of authority and that of retaining management authority and accountability."

Parker[5] defines whistleblowing as "the release of organizational information to the public which superiors or colleagues would prefer to be kept secret." Two types of whistleblowers exist:

- *Alumnus* whistleblowers: who are persons who reveal information about his/her previous organization either on or after departing from it.
- *Pure* whistleblowers: which are persons who reveal information about their organization while remaining there.

A strong commitment to highly ethical behavior is important to filling engineering's role in society. Does this extend to whistleblowing? Engineering is a profession with specialized

knowledge that directly affects the safety and well-being of millions of people. Encouraging ethical behavior of engineers increases the health and well-being of a society. However, the health and well-being of society are not the only interests that impact a engineering projects. For example, in a construction project the owner, contractor and engineer all have interests that are important to protect also.

Engineering, as all other professions, operates under multiple sets of legal, behavioral and ethical standards. For example, Cannon 1 of the ASCE Code of Ethics[6] ("hold paramount the safety, health and welfare of the public") is one standard or value. In his criticism of the profession Eugene Ferguson[7] described the values of the engineering profession as practiced to be:

1. Strive for efficiency;
2. Design labor-saving systems;
3. Design control into the system;
4. Favor the very large, the very powerful or - in electronics - the very small
5. Tendency to treat engineering as an end in itself rather than as a means to satisfying human need.

The above listed values do not necessarily keep safety, health and welfare paramount. If these two sets of standards come into increasing or major conflict, it may be necessary for the profession or the law (through legislators and/or judges) to step in and draft compromise standards. Whistleblowing is an alternative method of reconciling these two value systems.

This paper discusses the ethical obligations of individual professional engineers as illustrated by the collapse of the Texas Bonfire in 1999. A hypothetical situation is introduced and then analyzed for its ethical implications.

The Problem

Consider the following hypothetical based on the collapse of the Bonfire at Texas A&M University on November 18, 1999 and modeled on "Joe the Engineer" from the Texas Board of Professional Engineer's ethics exam. Joe graduated from the engineering program at Texas A&M in 1992. While earning his degree Joe participated in several of the many traditions that make school spirit an important part of the Texas A&M culture. As an engineering student he was very interested and active in the annual Bonfire that was built and burnt in preparation for the football game with the University of Texas. Even though he had no previous construction experience Joe volunteered to cut and load the logs during the fall of his freshman year. During the subsequent three years Joe became increasingly involved in building the Bonfire, including tying the logs into bundles and climbing the stack to install the bundles. In his final two years as a student at Texas A&M Joe participated in "crush", the annual round-the-clock effort to complete the Bonfire in time for its ignition before thousands of Texas A&M fans, including students, alumni and members of the local community. Over the years Joe also moved up the

hierarchy of the Bonfire organization and learned how the building of the Bonfire was organized and managed.

The Bonfire was enormous. The Bonfire has been a tradition for almost 100 years and in that time it grew from a small pile of wood and trash to an 80 foot tall tower of logs potentially heavier than two 747 jumbo jets and topped with an outhouse (Special Commission 2000)[8]. By the 1990s the Bonfire design had evolved into six-tiers of vertical logs in a "wedding cake" shape and held in place around a spliced center pole by steel wires. The design of each year's Bonfire was based on the design from the previous year and passed down to the next year's student leaders. The same "inheritance" process was used to pass on harvesting and construction procedures. Alumni donated the vast majority of the physical resources for Bonfire, including the trees, cranes for erection, wire, and jet fuel for the spectacular ignition. Labor was volunteered by Texas A&M students and supervised by student leaders with experience from prior years. In recent years Bonfire volunteers were given brief safety training but were not otherwise trained. Professionals, such as crane operators, who donated their time, completed the few jobs considered to require special skills.

Although the University sanctioned the Bonfire, it was almost completely organized, managed, and operated by Texas A&M students. The special commission on the 1999 collapse would later say that despite its size the "…design and construction have remained almost the exclusive purview of students. Involvement by the University in the Bonfire design has historically been very limited." (SC, p.11).[9] Over the years the University and Bonfire Committee had responded to specific concerns such as volunteer safety and the environmental impact of the harvesting of the logs with adjustments to operations. But the management and operations remained student-led and student-run. The Bonfire was primarily considered a spirit-building activity that incidentally involved construction activities.

Returning to Joe, since graduation his engineering career had developed steadily and successfully, with regular increases in responsibility. By 1999 he had worked as an assistant project manager on a few large projects and was managing his firm's participation in several small projects. Joe had learned the roles of professional engineers and other participants on construction projects. He learned how drawings, specifications, contracts and many required and optional but standard practices interacted to keep projects safe and quality high. Through these experiences Joe developed pride and integrity about the roles and responsibilities of professional engineers. He joined the American Society of Civil Engineers, passed the Principles and Practices of Engineering examination, and was registered as a professional engineer in the State of Texas. He became a member of the National Society of Professional Engineers.

Joe remained an active Texas A&M alumnus, attending football games and going to the annual burning of the Bonfire with thousands of others. Like many people, Joe was shocked and upset by the tragic collapse of the Bonfire in 1999 that killed twelve students just days before its planned completion. The tragedy caused Joe to reflect on his own participation in Bonfire as an undergraduate. In retrospect, some aspects of the Bonfire seemed similar to the projects he was currently managing for his firm. Both the Bonfire and the projects Joe managed as a professional engineer required the organization and management of material, equipment, and labor to construct a large physical product. After the collapse the Texas Board of Professional Engineers would confirm Joe's suspicions by ruling that the 1999 Bonfire was a construction project in

violation of the Texas Engineering Practice Act (1937) that regulates the design and construction of structures (Lee, 2000). Joe began to see the Bonfire as a construction project instead of merely a student activity designed to raise school spirit for the football team and the University. Slowly Joe began to realize that the same requirements he grappled with at work to perform his project management duties in a professional manner also applied to the Bonfire. As Joe recalled how Bonfire had been managed and run when he was a student it became clear that the construction project standards that were required and regularly practiced by professional engineers, including himself, had not been used with Bonfire. Joe became troubled by the thought that he had participated in a construction project that he now knew was sub-standard and that the lack of professional standards might have contributed to the Bonfire failure.

This paper is concerned with the following issue: Was Joe ethically obligated to notify appropriate professional bodies or public agencies (i.e. to whistleblow) of the unsafe construction practices used on the Bonfire project when he became a professional engineer? This issue will be addressed by first comparing the specific practices used on the Bonfire in 1999 with standard practices of professional construction projects to assess the nature and degree of deviations and severity of ethical concerns. Professional engineering codes of ethics are then used to evaluate Joe's responsibilities with regard to the Bonfire.

A Comparison of Construction Standards and Bonfire Practices

Innumerable practices are required or are standard on construction projects as large as the Bonfire. Many of these practices are not relevant to this study. Six relevant construction practices that deviated on the Bonfire project from industry requirements and standards, and common practice have been identified:

1. Establish clear lines of responsibility and authority: Written contracts are used to define the roles, authority and responsibilities of the primary parties in construction projects. The process of coming to legally binding agreements about the roles and responsibilities of the participants in a construction project leads to accountability and higher quality work. The purposes of this practice include: 1) to be sure someone is responsible for each part of the project, 2) to link responsible parties to portions for which each is responsible and 3) to provide those with responsibility WITH the required authority to fulfill their obligations.

In contrast to the standard industry practice of establishing clear lines of responsibility and authority, the roles, and responsibilities for several critical aspects of the Bonfire were never made clear. The responsibility of the University, the student groups and other organizations and volunteers was never established. A problem caused by failing to assign responsibility is that participants, and certainly observers, can easily assume that someone else is responsible, but not themselves. In fact, no one took responsibility for many important parts of the Bonfire project.

To a student such as Joe, it is likely that the easy-going flexibility of the Bonfire project was attractive and he would not see it for the problem it was. The student's goal in the project is to have fun and build community within the ranks of Texas A&M students. Responsibility was secondary and as long as everything got done, it was not really important who did it and who was responsible. Certainly some students were in charge of certain tasks, but responsibility tended to be transferred around and no clear records were kept. Only in his final years as a

student, when he was in a position of some authority, might Joe have reasonably investigated, understood, and questioned the lines of authority and responsibility. However the Bonfire's relatively strict adherence to traditional processes and hierarchical organization such as the Corp of Cadets could easily discourage him from doing so.

2. Management of risks: Construction practitioners recognize that the inherent uncertainty of construction requires the management of risks. Standard and common practices include using financial and schedule contingencies as buffers to accommodate changes and unexpected events. Some risks are reduced, such as creating safer job sites through rigorous house keeping routines. Other risks that cannot be minimized are shifted to others through contracting, insurance, and bonding. Public and private insurance plans cover design errors and omissions and worker safety (primarily through workman's compensation). Surety bonds protect owners and general contractors against the risk of business failure of firms they hire.

In contrast, Bonfire participants engaged in little, if any, risk management. Students such as Joe may well have not recognized the dangers of the practices used in the Bonfire, including:

1. An informal design change process
2. Inadequately trained workers
3. Permitting the consumption of alcohol on the job
4. Planned around-the-clock operation as the fixed deadline approached. This left little flexibility in schedules, which is necessary to adjust for weather or other conditions that could impact productivity or working conditions.
5. Lack of insurance or planning to protect against unforeseen events.

Beyond the failure to recognize these direct dangers, Bonfire managers did not recognize and accept that they lacked the expertise needed to manage the risks of the Bonfire project. Joe learned basic risk management before or as his career developed through promotions and increased responsibility on the job, first as an assistant project manager on some large projects, and then as a manager on smaller projects.

3. Use a facility design prepared by professional engineers: The purpose of this practice is to assure that, if constructed as designed, facilities will perform as intended. This standard requires that only persons trained and experienced in the design of specific types of facilities (e.g. structures) prepare the plans and specifications for the project. This practice is implemented in most states by requiring the engineering portions of projects to be designed by a registered professional engineer. Industry practice and state laws (including those in Texas) require designs prepared by professional engineers as a means of insuring minimum quality for construction projects.

In contrast the design for the Bonfire was the responsibility of student leaders who were untrained or incompletely trained in the design of structures and had not demonstrated adequate ability to design tall, heavy structures. The design was informal in that it had been altered during the passing of the design from one set of student leaders to the next without review by anyone knowledgeable in the affects of design changes on structural integrity. This failure proved critical. Design changes did not adequately account for increased outward pressures on the steel wires caused by the upper tiers of logs collapsing into the lower tiers. The failure of the steel wires precipitated the collapse that caused the deaths and injuries (Special Commission 2000).

4. Comply with safety regulations: The Occupational Safety and Health Act of 1970 sets standards for safe construction operations that are used throughout the industry, regardless of whether laws require compliance or not. These regulations require practices such as the wearing of hardhats and steel-toed boots, and the securing of ladders to reduce the chance of movement during use. The use of specific people and practices are precluded. For example, inadequately trained persons are not to be used. Alcohol, which impairs participants' abilities to behave and perform in a safe manner, is prohibited.

In contrast volunteers for the construction of the Bonfire performed activities such as the harvesting and transfer of very large logs typically without hardhats and steel-toed boots. The likelihood of injury was increased by this failure. Alcohol use was allowed and persons under the influence of alcohol were permitted to participate in inherently dangerous activities.

Although common sense suggests the use of OSHA practices, as a student and Bonfire worker Joe was not legally obligated to comply (OSHA requires employers, not employees to do specific things). Developing an understanding of OSHA requirements is, however, a typical part of a construction project manager's career. Therefore Joe would have likely become aware of and sensitive to these needs by the time he became a professional engineer.

5. Supervise construction operations with trained and experienced persons: Project superintendents and foremen should be trained and experienced. They should have knowledge and experience of construction tools and practices. They should be able to foresee and anticipate circumstances and practices that could lead to injury to workers and failures of physical facilities. These persons have the responsibility for the safety of those working under their supervision.

In contrast, supervision of the Bonfire construction was by student leaders, for which there was no requirement of training or experience in proper construction operations. Like the design, construction practices passed informally and were not based on knowledge of proper construction methods. Student leaders without engineering training or experience had the authority to make decisions concerning the design of the Bonfire and how it was to be built.

6. Construction by persons trained to perform the tasks undertaken: By OSHA regulation and for efficiency of operations, construction workers are trained in how to perform specific crafts or operations (e.g. crane operation, concrete, etc.). Industry standards vary widely in how construction workers are trained, but construction work is typically performed by those that have previously proven themselves capable or by apprentices who are controlled by persons with training.

Depending on the focus of his career, Joe may have developed professional engineering skills in construction supervision (item 5. above) and training (item 6. above). Regardless, Joe's previously described appreciation of the tools, methods and practices needed and used in the construction industry would alter him to their variance from those used in the Bonfire.

In contrast, Bonfire volunteers were untrained in construction operations. Those harvesting trees received brief safety training, and professional construction workers such as the crane operator are assumed to have adequate training. However the vast majority of the construction of the Bonfire was by persons with inadequate skills to perform the tasks undertaken.

In conclusion concerning the comparison of industry construction standards and Bonfire practices, the differences between required and standard construction practices and those used at the Texas A&M Bonfire in 1999 are great. This comparison indicates that the Bonfire was not managed or operated in conformance with good or even minimal construction practice standards. Therefore the Bonfire circumstances can facilitate the investigation of the ethical issues faced by individual professional engineers.

Ethical Issue – Was Joe (the Alumnus) Ethically Obligated to Blow the Whistle?

The evaluation of Joe's ethical responsibilities with regard to the Bonfire is based on the Texas Engineering Practice Act, Professional Conduct And Ethics[10], the Code of Ethics of the National Society of Professional Engineers[11] and also American Society of Civil Engineers[12]. Other engineering organizations such as the American Society of Mechanical Engineers[13] have similar codes. Note that because the Texas Engineering Practice Act is a *law* it would not normally be considered only an *ethical* standard (despite its name), however it is used here as such for comparison.

The applicable Texas Engineering Practice Act, Professional Conduct and Ethics sections are:

> (b) **Engineers shall be entrusted to protect the health, safety, property, and welfare of the public in the practice of their profession.** The public as used in this section and other rules is defined as any individual(s), client(s), business or public entities, or any member of the general population whose normal course of life might reasonably include an interaction of any sort with the engineering work of the license holder.
>
> (c) **Engineers shall notify involved parties or the board of any engineering decisions or practices that might endanger the health, safety, property or welfare of the public.** When, in an engineer's judgment, any risk to the public remains unresolved, that engineer shall report any fraud, gross negligence, incompetence, misconduct, unethical or illegal conduct to the board or to proper civil or criminal authorities.[14]

The analysis initially investigates only Joe's obligations according to several engineering Codes and does not address his potential obligations on moral or other grounds. Using the above standard, Joe is *not* required to report the problems he realizes in 1999 are likely to still exist

with the Bonfire construction practices. This is because under this code, Joe is only required to report unsafe practices relating to *Joe's* engineering projects – not all projects. The Bonfire project is not one of Joe's projects. For example, if Joe is walking down the street on vacation and sees an unsafe engineering practice, he is not obligated by the Code to report it to someone.

The above result is supported by combining both sections Section (c) Section (b). Section (c) states "Engineers shall notify involved parties or the board of any engineering decisions or practices that might endanger the health, safety, property or welfare of the public." However, section (b) above has defined the 'public' as "any individual…whose normal course of life might reasonably include an interaction of any sort with the *engineering work of the license holder*." Emphasis added. As used in the Code, the word 'public' does not mean what most people might think the word 'public' does. It only means people who come into contact with Joe's projects – not all people.

Using the applicable NSPE ethical standards, Joe *would* have a duty to report. The NSPE standards are so broad that if read literally they require engineers to report just about any problem to appropriate authorities. The applicable standards are:

Preamble[15]

> Engineering is an important and learned profession … Engineers must perform under a standard of professional behavior which requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons (Also Rules of Practice #1).

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health and welfare of the public.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.

> e. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

The Fundamental Canons and Rules of Practice above place upon engineers the requirement that they "Hold paramount the safety, health and welfare of the public." It is certainly a jump from this statement to the requirement that Joe report unsafe practices on projects he has worked that at some later date he realizes are unsafe. However subsection (e) under the above statement requires reporting violations of the Code to appropriate professional bodies. This section is not clear, but it seems to require Joe to report any *engineer* who he sees that is not "holding paramount the safety, health, and welfare of the public". Since one of the

major problems on the Bonfire site was the *lack* of engineers, it does *not* appear Joe has any duty to report anything to anyone.

However, the Preamble to the Code of Ethics is so broad as to virtually mean everything. The preamble requires engineers to adhere to "the highest principles of ethical conduct". What does this mean? Certainly if Joe had reported the problems with the construction practices this tragedy might have been avoided. Particularly when coupled with the cost to Joe of attempting some type of intervention and reporting – virtually none – it could be argued that he did not act within the highest principles of ethical conduct.

The American Society of Civil Engineers (ASCE) Code of Ethics[16] is very similar to the NSPE except that it requires the engineer to report *any persons* (not just engineers) who are not holding paramount the "safety, health and welfare of the public in the performance of their professorial duties." The ASCE Guidelines to Practice Under the Fundamental Canons of Ethics"[17] Canon 1 reads:

> **CANON 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.
>
> d. Engineers who have knowledge or reason to believe that another *person* (emphasis added) or firm may be in violation of any of the provisions of Canon I 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.

Therefore, under this ethical standard, Joe would be required to report that he had reason to believe that the people conducting the construction of the Bonfire were not holding "paramount the safety, health and welfare of the public in the performance of their professional duties." In this example, the Bonfire, Joe the engineer should "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" and that improper engineering judgment, decisions and practices are taking place.

It is unclear whether this standard would require Joe to report, say for example a police officer who was not "holding paramount the safety, health and welfare of the public in the performance of their professional duties" but that is a subject beyond the scope of this paper.

Discussion of Result of NSPE and ASCE Code Application to this Problem

The result reached by applying the NSPE and the ASCE codes to this scenario illustrates some of the problems with codes of ethics that are very broadly written. Lichtenburg[18] (1996) in

her article, "What are Codes of Ethics For" reviews many of the puzzling and difficult aspects of formal codes of ethics. She lists three types of codes:

1. Codes that are completely obvious – in which case, they invite ridicule.

2. Codes that are not at all obvious – In which case they cause suspicion.

3. Codes that are completely vague – In which case they are useless unless interpreted.

A fourth type of code seems to exist. That is a code, such as NSPE and ASCE, that requires *total* and complete performance of some particular conduct without taking any extenuating factors into consideration. This problem is ameliorated however because the code of ethics is either (a) a model of perfect behavior or (b) in proceedings before boards of inquiry extenuating circumstances are taken into account.

Ethics as a Model of Perfect Behavior

No law exists saying professions cannot set out codes of ethics that model perfect behavior or are vague. These traits are a trade off to the alternative: a detailed outline of acceptable and possible behavior taking into account numerable extenuating circumstances. However, this could be a definition of the law! Why have a code that duplicates the law? The code of ethics has value for the very reason it differs from the law – it is simple. It may not be perfect, but it works in enough circumstances. The pay off for having the code exceeds the costs for not having one. If codes didn't would anyone even have them? According to economists people seldom engage in complex activities that do not provide them some benefit – or at least they don't for very long!

The ability to describe a model of perfect behavior is one thing that codes of ethics can do, and the law cannot! The law however (at least in the U.S.) contains a basic maxim or legal principle that the law does not require that which is impossible. However, having a perfect standard of behavior is certainly helpful as a goal.

Codes of Ethics and Extenuating Circumstances

In actual practice, boards of inquiry take extenuating factors into consideration. One might argue that the codes of ethics should perhaps be more detailed and outline the extenuating circumstances so that people will know what is expected of them. The codes then run the risk of becoming extremely complicated, and would resemble the law (which routinely takes extenuating circumstances into consideration). Why is complexity necessarily advantageous? Complexity can be necessary and can complex systems can often accomplish things that more simple systems cannot. This does not mean however that complex systems are always necessary and/or can always accomplish things that simple systems cannot. A primary value of a code of ethics is its simplicity.

The Value of Codes of Ethics

Simple codes of ethics are valuable. Simple codes of ethics, as compared to the complexity of law, are by their very nature much shorter and much easier to understand than the law. For this reason they are more likely to actually be *used* than the law. Sure, in any given situation someone might research the legality of any particular action (or more likely hire an attorney to do so since experts are needed to interpret the law) but if the cost of having this detailed information outweighs the risk of not having it, it is extremely unlikely someone will pay for the detailed information. The question also arises: do we even want such inefficiency? Codes of ethics offer a simplified standard of behavior that can be referred to more easily than attempting to discover exactly what the law says about any particular situation.

Codes of ethics provide at least *some* information to the consuming public about the type of service to expect from those who have agreed to be bound by the code. Certainly consumers would like more information – they would like to know *exactly* how any particular engineer will perform. They would like guarantees and warranties – but they cannot always get them. Some information, even incomplete information, is certainly better than no information. And certainly Codes of ethics are not the only information consumers seek and probably not even the primary – they seek recommendations. Again, just because there are other sources of information for the consuming public does not mean that this particular sources is irrelevant. It is just further down on the list.

Codes also provide *some* guidance to the people who agree to be bound by the code. A code that was as detailed as the law (or even close in detail) would certainly provide so much information to the professional as to be totally worthless.

Another value to codes of ethics is their affect upon the ongoing debate about acceptable actions by professional persons. Just the fact that professionals and academics write about and discuss specific behaviors has some affect. If, for example, alumnus whistleblowing is discussed enough and debated enough, its value (or lack thereof) will be recognized.

Conclusion

The National Society of Professional Engineers Code of Ethics for Engineers and the American Society of Civil Engineers Code of Ethics (Guidelines to Practice) require alumnus reporting of unsafe practices to appropriate authorities. That is, these codes require that an engineer who discovers that unsafe practices are likely being engaged in on some particular engineering project (even projects the engineer is not involved in) must report those unsafe practices to appropriate authorities.

This is a standard of *perfect* behavior. As a standard of perfect behavior it is impossible to reach by all people in all situations. However, as an ethical goal it has value.

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