

**Final Report of the
NSPE Task Force on Overruling Engineering Judgment
to the NSPE Board of Directors
June 30, 2006**

Dilemma

Engineers face an ethical dilemma when their engineering judgment on issues affecting public health or safety is being overruled by a supervisor or regulator who has no engineering credentials. Though engineers are obligated to speak up and vigorously defend public health and safety in such situations, they are painfully aware of the risk of retaliation from those challenged by their ethical stand. The consequences could include employment termination or even the ruination of their professional careers and reputations. The consequences on an engineering employer/company must also be considered.

Many contemporary engineering projects and programs are now directed by non-engineers. During the latter half of the 20th century, many government agencies and corporations have focused on the non-technical aspects of technical programs in determining the qualifications of managers. Furthermore, many regulatory agencies exercise powerful control over the details of projects and programs owned or operated by others. Today, engineers sometimes report to political scientists, public administrators, and MBAs at the head of their organizations. Sometimes this structure works well, relieving the engineers of the non-technical problem areas but deferring to the engineer's judgment on all technical issues. However, a risk that is frequently ignored is that, unless a trust relationship develops between the engineer and the non-engineer supervisor or regulator, the technical program or project can be misdirected into unstable and even dangerous ground that may become unduly influenced by political factors, public relations issues, financial considerations, and unreasonable completion schedules.

It is important to realize that disasters caused by engineering failures, such as the Challenger and Columbia disasters, damage the careers of thousands of employees in the public and private sectors. It takes years to recover. Had the engineers been clearer, more assertive, and more persuasive in communicating life-threatening concerns to non-engineer managers in the Challenger and Columbia disasters; and, conversely, had the non-engineer and engineer managers understood the risks being taken by their failure to listen to the subordinate engineers, perhaps their decisions would have been different.

The failure of the levees in New Orleans during Katrina is turning into a similar story. The Chief of Engineers, Lt. Gen. Carl Strock, took responsibility for the failed levees this month. The Corps 6000 page interagency report concluded that the levees were “built in a disjointed fashion using outdated data.” Strock acknowledged that “words alone will not restore trust in the Corps.” An independent investigation led by civil engineering professors from the University of California, Berkeley, also found that “the levee system protecting New Orleans was defective as a result of dysfunctional organizations” at all levels. Echoing a central issue in both Space Shuttle disasters, Professor Raymond Seed said, “A culture of safety was replaced with a culture of efficiency.” Professor Bob Bea said **“They took the engineering out of the Corps of Engineers.** Most of this was a result of mandates by the White House, Congress and the state to be better, faster and cheaper, but you can’t have all three at once without lowering the quality and reliability of the flood defense system.”

Engineering Ethics

The Code of Ethics for NSPE members, and codes of ethics of other engineering societies, states that the obligation to protect public health and safety is “paramount.” This obligation takes precedence over all other considerations, including obligations to keep confidential knowledge about the employer or client. In America, this obligation rises above the societal importance placed on teamwork. Painfully, it even takes precedence over the natural desire to keep one’s job. Engineers are well aware that engineering decisions can mean the difference between life and death, not only for one person but for entire communities. This is the ultimate meaning of public health and safety, and reinforces the principle that, to a member of the engineering profession, some things are more important than one’s own economic well-being.

Both employed engineers and engineering employers must consider the consequences of decisions to be made involving the practice of engineering. First, guidelines for the engineer who is faced with the overruling judgment situation and second the procedures the engineering employer should have in place to address the overruling judgment situation—which can result in the employer/company long-term costs/benefits (financial, reputation, credibility, public relations, less need for governmental regulation)

The underlying principle of state licensure for engineers, engineering firms, and other professionals is the state’s police powers to protect the public. The practice of engineering is generally defined in most state engineering licensure laws, and is summarized as follows:

“[A]ny services or creative work, the adequate performance of which requires engineering education, training, and experience in the application of special knowledge of the mathematical, physical, and engineering sciences to such services or creative work...insofar as they involve safeguarding life, health, or property....”

Each state has determined that the practice of engineering affects public health and safety to such a degree that no one should be allowed to practice engineering in that state until one has demonstrated to the state the competence to do so. It follows that every engineer licensed by the state is obliged to protect the public. All engineers have this obligation, but state-licensed engineers, professional engineers, have it reinforced by their state license.

Recommendations

To respond to this situation, the Task Force believes that NSPE should provide guidance both to individual engineers and to engineering employers. An excellent source of guidance for engineers who face the ethical dilemma of seeing danger to life arising from nonengineer manager's decisions to overrule or bypass their engineering judgment can be found in the recent NSPE Ethics in Employment Task Force Report (www.nspe.org/ethics/eh1-report.asp). The life-threatening case is the most extreme example of an ethical conflict facing an engineering employee. This report sets forth an approach and a procedure that can work. It needs wide dissemination and publicity within the engineering community. It includes conditions where employers have appropriate procedures in place, such as an ethics hotline, and conditions where procedures are not available.

The NSPE Ethics in Employment Task Force report describes a company or agency environment that is prepared to respond to ethical problems of an engineer employee. NSPE needs to promote discussion and cooperation between engineers and their employers that seeks common ground to address these ethical dilemmas and their consequences.

The issues raised by disasters, such as the NASA shuttles and the New Orleans levees, strongly suggest reconsideration of the qualifications needed for technical program managers. No one argues that an engineering degree by itself makes a competent manager, but the presence of engineering credentials at the management level must be seen as enhancing the level of public safety. NSPE needs to show the public that only a professional engineering perspective at the management level ensures that those who exercise decision-making authority over engineering systems and processes will fully understand the public health and safety implications of their decisions. This is why the state license program exists for professional engineers.

Whether the engineer turns out to be "on top" or "on tap" in a life-threatening crisis, **communication skills become vitally important**. NSPE must emphasize the need for engineers to develop and enhance their abilities to explain life-threatening situations in simple, understandable, lay terms, easily understood by nonengineers (managers or regulators) and the public. In attempting to fulfill an ethical obligation, the engineer's success may require an appreciation of, even empathy with, contrary values that are pushing the decision in the wrong direction. Without authority to make the final decision, the engineer must clearly and persuasively warn the non-engineer manager of the risk of failure on public health or safety, and the potential disaster for the whole program.

The current effort by the American Society of Civil Engineers to define better the “body of knowledge” needed for professional practice, and to upgrade accordingly the minimum requirements in engineering education, may be one opportunity to shine a spotlight on communications.

Finally, NSPE should study and, if deemed feasible, fund, develop and publicize avenues of support for engineers who, because they have fulfilled their ethical obligation to the public, find themselves in a legal struggle to defend their work, their judgments, their jobs, and their reputations. An NSPE Ethics Hotline, now under consideration, could be a strong first step in this direction. Professional Engineers who are trying to behave ethically deserve more support from their professional society than has been available in the past.

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