

Responsibility in Engineering

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Lesson Outline

- Responsibility has to do with accountability, both for present and past.
- The obligation-responsibilities of engineers require, not only adhering to regulatory norms and standard practices of engineering but also satisfying the standard of reasonable care.
- Engineers can expect to be held accountable, if not legally liable, for intentionally, negligently, and recklessly caused harms.
- Responsible engineering practice requires good judgement, not simply following algorithms.
- *“What does an engineer do when no one is looking?”* an important question.



Responsibility

It can be applied at different **levels:**

- individual engineers
- teams of engineers
- divisions or units within organizations
- even organizations themselves.

Again it may focus primarily on:

- legal liabilities
- job-defined roles
- moral accountability (Main focus in this chapter)



Introduction: An example of code of ethics

The preamble of the code of ethics of the National Society for Professional Engineers (NSPE)

*Engineering is an **important** and **learned** profession. As members of this profession, engineers are expected to exhibit the **highest standards of honesty and integrity**. Engineering 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**. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.*



Good Engineer: Two extreme points

- **Minimalist approach** of doing **as little as** one can get away with and still stay out of trouble.
- Above and beyond the call of duty. **Ready to handle everything.**



Good Engineer: Two extreme points (Cont.)

Good Engineers: Ideal Case

- Actual status should be **in between** of these two.
- General people expect **integrity, honesty, civic-mindedness**, and a willingness to make some **self-sacrifice**.
- ▶ ● Exhibit **imagination and perseverance**.
- ▶ ● **Communicate** clearly and informatively.
- ▶ ● To be **committed to objectivity**.
- ▶ ● To be **open** to acknowledging and correcting **mistakes**.
- ▶ ● To **work** well **with others**.
- ▶ ● To be committed to **quality**.
- ▶ ● To be able to see the **big picture** as well as more minute details.



ENGINEERING STANDARDS

- Engineers can try to **gain the trust** of those they serve and with whom they work is to **commit themselves to a code of ethics that endorses high standards of performance.**
- Engineering standard is a **combination** of **technical requirements** and requirement that certain procedures be undertaken to ascertain that specific, **measurable objective.**
- The NSPE code of ethics is the product of the collective reflection of members of one particular professional society of engineers. **It is a culmination of long-time experience.**
- But the rationality of each code or standard **should be supportable by reasons.**



THE STANDARD OF CARE

- Engineers have a professional obligation to conform to the standard **operating procedures** and **regulations**.
- Sometimes, however, **it is not enough** to follow standard operating procedures and regulations.
- **Unexpected problems** can arise that standard operating procedures and current regulations are **not well equipped to handle**.
- Hence, engineers are expected to **satisfy a more demanding norm** called **standard of care**.



THE STANDARD OF CARE (Cont.)

Joshua B. Kardon's Definition

*An engineer is **not liable**, or responsible, for damages **for every error**. Society has decided, through case law, that **when you hire an engineer, you buy the engineers normal errors**. However, if the error is shown to have been **worse than a certain level of error**, the engineer is **liable**. That level, the **line between non-negligent and negligent error**, is the *standard of care*.*



How is **this line determined** in particular cases?

- 1 It is **not up to engineers alone** to determine this, but they do **play a crucial role** in assisting judges and juries in their deliberations.
- 2 It should be an **accepted practice** in engineering that is well understood **by competent engineers** in the areas of engineering under question.

Kardon notes:

*A good working definition of the **standard of care** of a professional is: that level or quality of service ordinarily provided by other normally competent practitioners of good standing in that field, contemporaneously providing similar services in the same locality and under the same circumstances. **Multiple solutions are possible as standard of care.***



BLAME-RESPONSIBILITY AND CAUSATION

- What is the underlying cause?
- The causes can be:
 - Physical cause
 - Organizational cause
 - Individual cause
- Higher priority in Physical Cause makes it less priority in Organizational or Individual cause, and vice-versa.



Organizational Causes

- Can they also be morally responsible agents, much as humans can be?
- There are two opposite opinions: Yes and No.



Organisation can not be morally responsible

- Some theorists believe it makes no sense to say that organizations (such as General Motors or NASA or Google) can be morally responsible agents.
- An organisation is **not, after all, a human person** in the ordinary sense.
- Unlike human persons, corporations **do not have a body, cannot be sent to jail, and have an indefinite life.**



Organisation can be morally responsible

- On the other hand, corporations are described as **artificial persons** in the law.
- According to Blacks Law Dictionary: **the law treats the corporation itself as a person which can sue and be sued. The corporation is distinct from the individuals who comprise it (shareholders).**
- Corporations, like persons, can also come into being and pass away and can also be fined.



Organisation can be morally responsible (Cont.)

Philosopher Peter French defines **3 properties** of a corporation that make it similar to human.

- 1 Corporations, like people, **have a decision-making mechanism.** Boards of directors and executives make decisions for the corporation.
- 2 Corporations, like people, **have policies that guide their decision making.** People have moral rules and other considerations that guide their conduct. Similarly, corporations have corporate policies, including, in many cases, **a corporate code of ethics** and **corporate culture.**
- 3 Third, corporations, like people, can be said to have **interests.** Corporate interests include **making a profit, maintaining a good public image, and staying out of legal trouble.**



LIABILITY

- Engineers are expected to abide by Code of Ethics , Standard of Care.
- But mistakes can be addressed from legal perspective (i.e. can be brought to the court).
- There are **moral responsibility** and **legal liability**.
- Legal liability in many ways parallels moral responsibility, although there are **important differences**.
- Harms can be done **i) intentionally ii) recklessly and iii) negligently**.



LIABILITY (Cont.)

- First, a person can **intentionally** or knowingly and deliberately cause harm. If I stab you in the back in order to take your money, I am both morally responsible and legally liable for your death.
- Second, a person can **recklessly** cause harm by not aiming to cause harm but by being aware that harm is likely to result. If I recklessly cause you harm, the causal factor is present, so I am responsible for your harm. In reckless behavior, although there is not an intent to harm, there is an intent to engage in behavior that is known to place others at risk of harm.
- Third, a still weaker kind of legal liability and moral responsibility is usually associated with **negligently** causing harm. Unlike recklessness, where an element of deliberateness or intent is involved (such as a decision to drive fast), in negligent behavior the person may simply overlook something or not even be aware of the factors that could cause harm.



LIABILITY (Cont.2)

In law, a successful charge of negligence must meet four conditions:

- 1 A legal obligation to conform to certain standards of conduct is present.
- 2 The person accused of negligence fails to conform to the standards.
- 3 There is a reasonably close causal connection between the conduct and the resulting harm.
- 4 Actual loss or damage to the interests of another results.



DESIGN STANDARDS

- Engineers are expected to hold considerations of public safety paramount.
- However, there is likely **more than one way to satisfy safety standards**, especially when stated broadly.
- How are designers to proceed?



Ford Case Study

For example, in the late 1960s, operating under the constraints of developing an appealing automobile that weighed less than 2000 pounds and that would cost consumers no more than \$2000, Ford engineers decided to make more trunk space by putting the Pintos gas tank in an unusual place. **This raised a safety question regarding rear-end collisions. Ford claimed that the vehicle passed the current standards. However, some Ford engineers urged that a protective buffer should be inserted between the gas tank and protruding bolts. This, they contended, would enable the Pinto to pass a more demanding standard that it was known would soon be imposed on newer vehicles.** They warned that without the buffer, the Pinto would fail to satisfy the new standard, a standard that they believed would come much closer to meeting the standard of care enforced in tort law.



Ford Case Study (Cont.)

Ford decided not to put in the buffer. It might have been thought that satisfying the current safety standard ensured that courts and their juries would agree that reasonable care was exercised. However, this turned out to be a mistaken view. As noted previously, the courts can determine that existing technical standards are not adequate, and engineers are sometimes called upon to testify to that effect.



Ford Case Study (Cont.2)

Given the **bad publicity** Ford received regarding the Pinto and its history of subsequent litigation, Ford might regret not having heeded the advice of those engineers who argued for the protective buffer. This could have been included in the original design, or perhaps there were other feasible alternatives during the early design phases. However, even after the car was put on the market, a change could have been made. This would have involved an expensive recall, but this would not have been an unprecedented move in the automotive industry.



Summary:

- There are accepted standards of engineering practice.
- There is a specific engineering design.
- There may exist gap between them.
- That gap may turn to be the most probable reason for greater damage.

