Engineering Ethics

Living an Undivided Life

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Signs of a Divided Life

We make our living at jobs that violate our basic values, even when survival does not absolutely demand it

Signs of a Divided Life

We hide our beliefs from those who
disagree with us to avoid conflict,
challenge and change

Main Entry: in·teg·ri·ty

1 : firm adherence to a code of especially moral or artistic values : incorruptibility
2 : an unimpaired condition : soundness

3: the quality or state of being complete or undivided : completeness

synonyms see honesty

Merriam-Webster Online Dictionary

Learning Objectives

1. Types of Ethics
2. Define Professionalism
3. Understand the Role Fear Plays in Ethical Behavior
4. What Codes govern Professional Ethics
5. What is an Engineer's/Organization's Responsibility in Working Ethically
6. What are the Impediments to Acting Responsibly
7. How Do We Live an Undivided Life

Three Types of Ethics or Morality

1. **Common Morality** – a set of moral beliefs shared by almost everyone

2. **Personal Morality** – a set of moral beliefs that a person holds

3. **Professional Ethics** – the set of standards adopted by professionals
   1) Usually stated in a formal code, unlike common morality or personal morality
   2) Focuses on the issues that are important in that profession
   3) Within a professional relationship, professional ethics should take precedence over personal morality
   4) Differs from personal morality in its degree of restriction of personal conduct
   5) Has both a negative and positive dimension
   6) An example of role morality – moral obligations based on special roles and relationships

What is Professionalism

"A profession is a number of individuals in the same occupation voluntarily organized to earn a living by openly serving a moral ideal in a morally permissible way beyond what law, market, morality, and public opinion would otherwise require."

Michael Davis,
"Is There a Profession of Engineering?"
Science and Engineering Ethics, 3, no. 4, 1997, p. 417.

According to Davis, a profession…

1. Cannot be composed of only one person
2. Involves a public element
3. A way people earn a living and is usually something that occupies them during their working hours
4. Something that people enter into voluntarily and that they can leave voluntarily
5. Must serve some morally praiseworthy goal, although this goal may not be unique to a given profession.
6. Is characterized by a set of ethical standards, which should obligate professionals to act in some way that goes beyond what law, market, morality, and public opinion would otherwise require.

2002

FEAR

Understanding Fear

- Responses to fear are hardwired and automatic.
- We have to learn what to be afraid of, but not how to act afraid.
- We can also "unlearn" what frightens us.

Hardwired for Fear Before Thought

Brain is hard wired to first recognize FEAR and thereafter, REASON

22ms delay

Architecture and chemistry of brain forces fear, before thought

Source: The Emotional Brain, Joseph LeDoux, Simon & Shuster, 1996
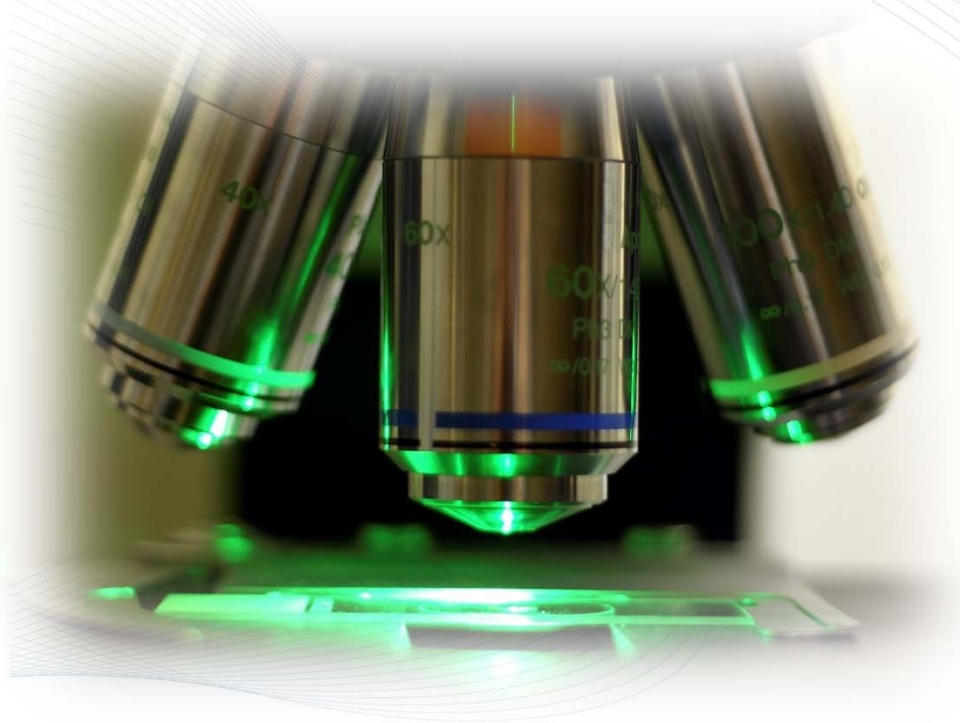
Source: www. Express.co.uk

Contextualization of Fear

Regulation of fear on the basis of our assessment of the situation we are in…

A shark in the wild elicits fear, whereas the same shark in a aquarium fascinates

Source: www. Express.co.uk

Re-Framing (Shape-Shifting)

A different way of looking at the same reality.

Professional Codes as a Framing Tool

American Society of Safety Engineers (ASSE)
Code of Professional Conduct
"…Protect people, property and the environment through the application of state-of-the-art knowledge…"

Board of Certified Safety Professionals (BCSP)
Code of Ethics and Professional Conduct
"…Hold paramount the safety and health of people, the protection of the environment and protection of property …"

National Society of Professional Engineers (NSPE)
Code of Ethics
"…Hold paramount the safety, health, and welfare of the public…"

Safety / Engineering Responsibility

Safety / Engineering Responsibility

Multi-faceted…

1. Accountability as an individual and/or member of a team

2. Legal liability

3. Moral accountability

American Society of Safety Professionals Code of Professional Conduct

- *Serve the public, employees, employers, clients, the Society, and the profession with fidelity, honesty and impartiality.*

- *Inform all appropriate parties when professional judgment indicates that there is an unacceptable level of risk of injury, illness, property damage or environmental harm.*

National Society of Professional Engineers Engineering Code of Ethics

(Refer to Preamble, NSPE Code of Ethics)

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.

Board of Certified Safety Professionals
Code of Ethics

- **HOLD** *paramount the safety and health of people, the protection of the environment and protection of property in the performance of professional duties, and exercise their obligation to advise employers, clients, employees, the public, and appropriate authorities of danger and unacceptable risks to people, the environment, or property.*

- **CONDUCT** *their professional relations by the highest standards of integrity and avoid compromise of their professional judgment by conflicts of interest.*

www.bcsp.org

Our Knowledge is Power

[The professional] had better be virtuous. Few may be in a position to discredit him. The knowledge explosion is also an ignorance explosion; if knowledge is power, then ignorance is powerlessness.
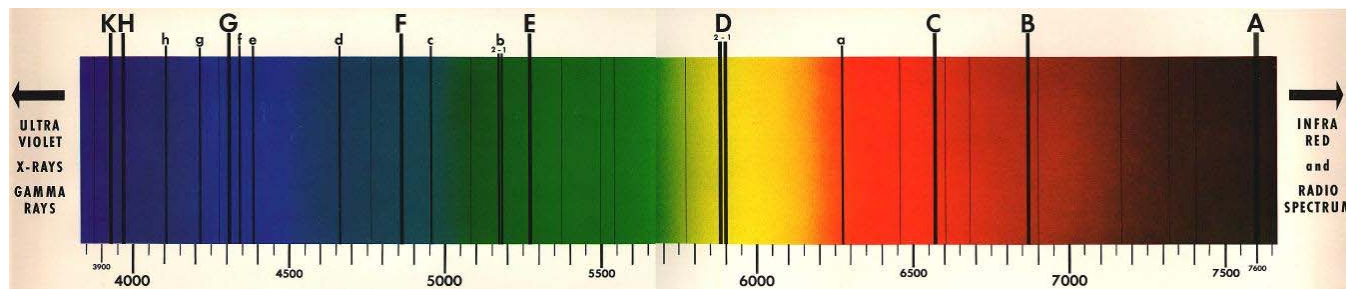
William F. May, "Professional Virtue and Self-Regulation," in *Ethical Issues in Professional Life* (Oxford: Oxford University Press, 1988), p. 408.

Who are the "innocents"?

Think about your company, your industry…

Two Ends of the Responsibility Spectrum

Minimalist Approach
As little as required to stay out of trouble, keep one's job, etc.

Above and beyond the call of duty

Engineering Standards of Performance

NSPE Code requires that the work of engineers conform with "applicable engineering standards."

ASSE Code requires that the safety engineer make informed decisions in the performance of professional duties that adhere to all relevant laws, regulations and recognized standards of practice.

Regulatory standards and Standards of Competence
…typically leave significant room for professional discretion in engineering design and its implementation: *Engineering Judgment*

Obligation vs. Blame Responsibility

- **Obligation Responsibility**

    ...a generally "positive" and forward-looking conception of responsibility
    ... sometimes refers to a person who occupies a position or role of supervision – a person in "responsible charge"

- **Blame Responsibility**

    ... a generally "negative" and backward-looking conception of responsibility
    ... sometimes refers to the person "responsible" for an accident
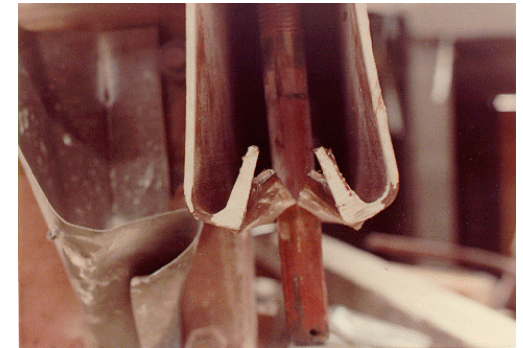
Standard of Care

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 engineer's 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."

Joshua B. Kardon, "The Structural Engineer's Standard of Care," paper presented at the OEC International Conference on Ethics in Engineering and Computer Science, March 1999

Two Engineering Case Studies

Engineering Negligence:
Kansas City Hyatt Regency walkway collapse, 1981

Non-Negligent:
Citicorp Center "near miss"
1977 Downtown Manhattan
William LeMessurier

Columbia Accident Investigation Board
3. "Causes:" Physical, Organizational & Human

Are Corporations morally responsible agents?

Corporations, like people, …

1. Have a decision-making mechanism

2. Have policies that guide their decision making.

3. Can be said to have "interests" that are not necessarily the same as those of the executives, employees, and others.

Question

- When engineers and safety professionals are working within a company, to what extent are they responsible to the company versus responsible to the public?

Liability

Standard of Care in Tort Law

-- concerned with wrongful injury
-- not restricted to regulatory standards
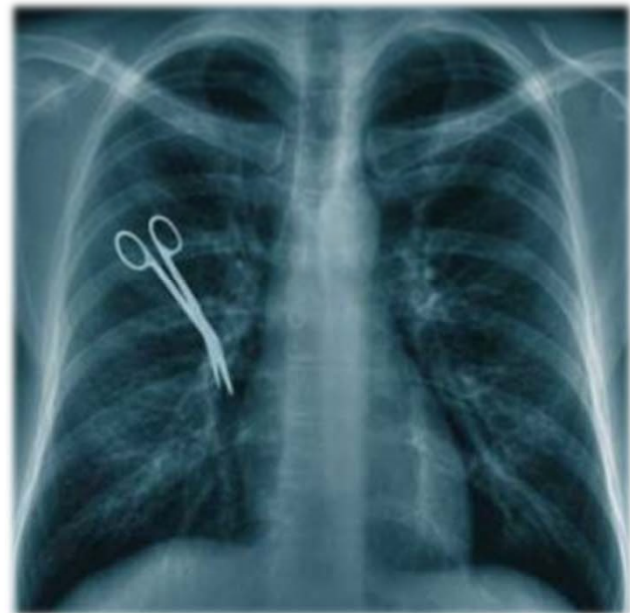
Levels of Liability

1. INTENTIONALLY causing harm; knowingly and deliberately causing harm
2. RECKLESSLY causing harm; being aware that harm is likely to result with no action taken
3. NEGLIGENTLY causing harm; potential harm is overlooked or lack of awareness that harm potential exists.

Professional Negligence

Defined by four elements:

1. A legal (moral) 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

Ford Pinto

Design Standards

Ford Explorer
Firestone Tires

"The Problem of Many Hands"

Principle of Responsibility for Inaction in Groups

The degree of responsibility of each member of the group depends on the extent to which the member could reasonably be expected to have tried to prevent the action.

Principle of Responsibility for Action in Groups

The degree of responsibility of each member of the group depends on the extent to which the member caused the action by some action reasonably avoidable on his part.

Impediments to Responsible Action

1. Fear
2. Self-Interest
3. Self-Deception
4. Ignorance
5. Egocentric Tendencies
6. Microscopic Vision
7. Uncritical Acceptance of Authority
8. Groupthink

Fear

Self-Interest

Good thing: We all have personal and professional hopes and ambitions

Bad thing: When concern for our own interests leads to actions contrary to the interest of others -- contrary to what others expect of us as professionals

- At the extreme, can be a form of *egoism* -- an exclusive concern to satisfy one's own interests, even at the possible expense of others

Example:
Morton Thiokol's (ATK) role in the *Challenger* disaster
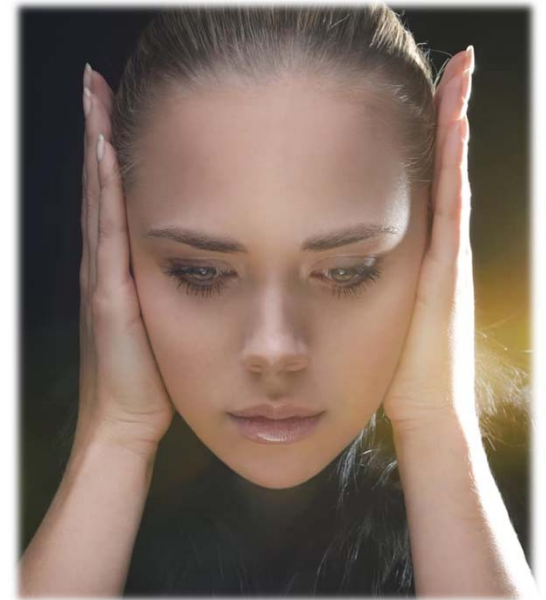Robert Lund / Jerald Mason

Self Deception

Self Deception: an intentional avoidance of truths we would find it painful to confront self-consciously

"**Normalizing Deviance**" -- a practice in which the boundaries of acceptable risk are expanded without a sound engineering basis.

> *"With each successful landing, it appears that NASA engineers and managers increasingly regarded the foam-shredding as inevitable, and as either unlikely to jeopardize safety or simply an acceptable risk."*
> *Columbia* Accident Investigation Board
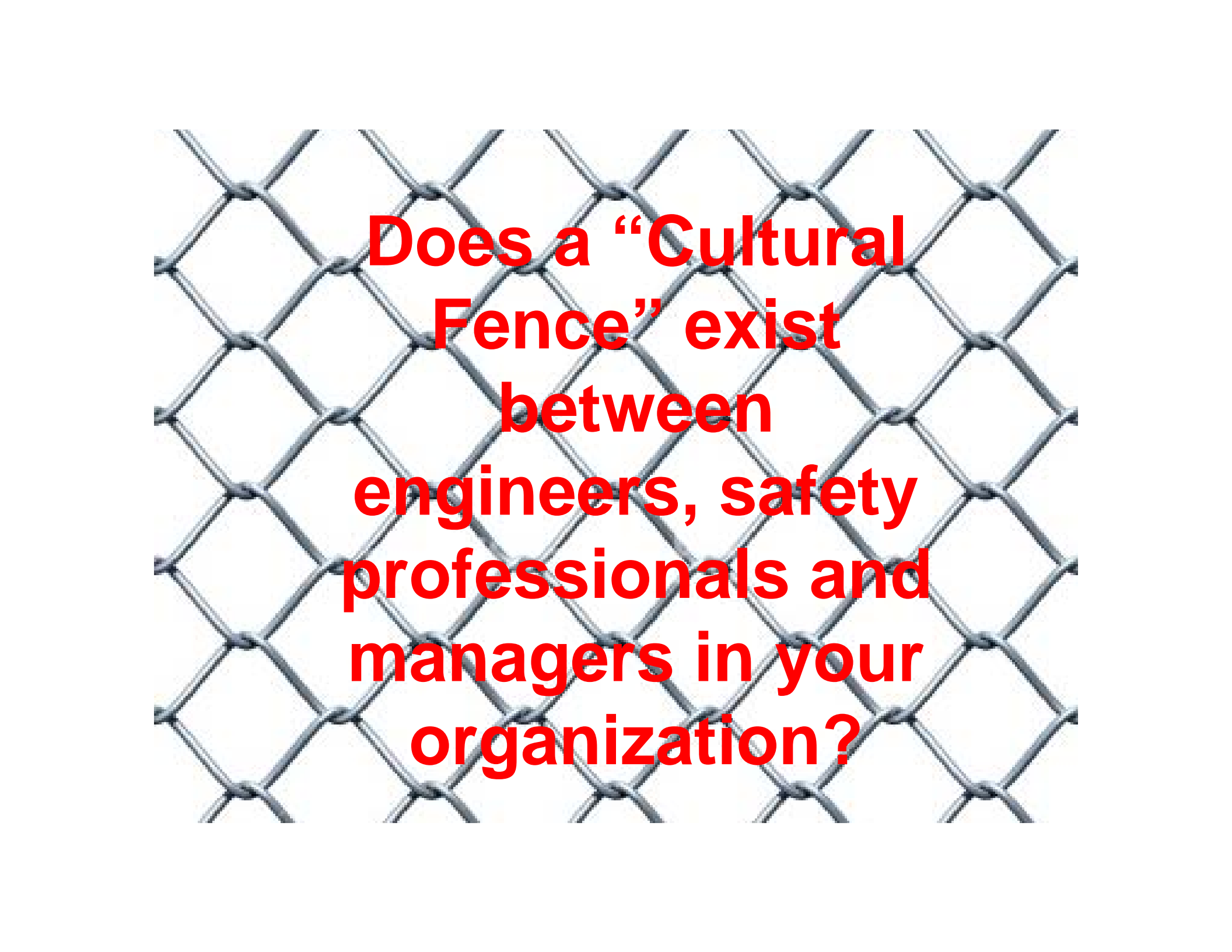
Ignorance

Obviously!!

Ignorance of vital information is a barrier to responsible action

Sometimes, willful avoidance occurs – a turning away from information in order to avoid having to deal with the challenges it may pose

a.k.a. Selective Listening, Progressive Filtering

Does a "Cultural Fence" exist between engineers, safety professionals and managers in your organization?

Egocentric Tendencies

A special form of ignorance…

Withholding bad news from others, with the best of intentions.

Why? Because we wouldn't want to hear bad news!

Example:
NASA managers who made decisions from an exclusively management perspective, prioritizing schedule, political ramifications and cost, at the expense of safety. Such decisions were not necessarily self-interested. Rather, the well-being of the organization was the goal.

Microscopic Vision

Uncritical Acceptance of Authority

Milgram's Famous "Obedience" [Experiments](#)
(1960's)

"Ordinary people simply doing their jobs and without any particular hostility on their part can become agents in a terrible, destructive process. Moreover, even when the destructive effects of their work become patently clear and they are asked to carry out actions incompatible with fundamental standards of morality, relatively few people the resources needed to resist authority."

Stanley Milgram, *Obedience to Authority* (New York: Harper & Row, 1974)

Groupthink

Groupthink – situations in which groups come to agreement
at the expense of critical thinking

8 Symptoms of Groupthink:
1. An *illusion of invulnerability*
2. A strong "we-feeling"
3. *Rationalizations*
4. An *illusion of morality*
5. *Self Censorship*
6. An *illusion of unanimity*
7. An application of *direct pressure*
8. *Mindguarding*

Irving Janis, Groupthink, 2nd ed. (Boston:
   Houghton Mifflin, 1982)

Chicken Little Syndrome

"I'm not going to be Chicken Little about this."

One NASA employee commenting on management's decision not to seek clearer images of the leading edge of the left wing of the shuttle in order to determine whether the foam strike had caused damage.

Columbia Accident Investigation Board

Our Workplace Reality!

- Market stresses arise

- Budget cuts

- Sometimes necessary to make decisions under pressure with:
  - incomplete data
  - insufficient time
  - insufficient information.

- Where do you stand on this **ethical slippery slope?????**
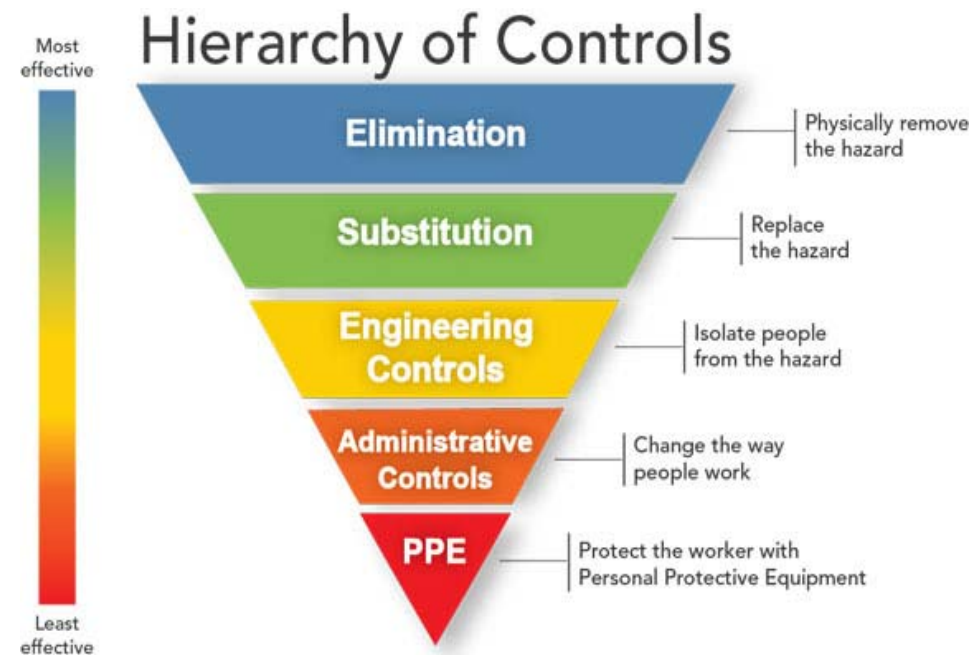
What is the Solution?

Change and Uncertainty

"For interesting or substantive engineering design problems, there is rarely, if ever, a uniquely correct solution or response, or indeed, any predetermined number of correct responses."

Caroline Whitbeck,1998

Find a *Creative Middle Way*

- A creative middle way resolution is one in which all of the conflicting demands are at least partially met.

- Our judgement of what is better or worse may not be accurate when we don't know what is best.

- In fact, a uniquely "best design" may not exist!

- Ethical dilemmas may arise when ALARP is applied!

Hierarchy of Controls

Most effective

Least effective

Elimination — Physically remove the hazard

Substitution — Replace the hazard

Engineering Controls — Isolate people from the hazard

Administrative Controls — Change the way people work

PPE — Protect the worker with Personal Protective Equipment
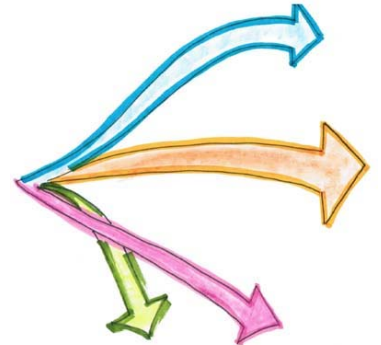
Creative Middle Ways

- **Convergence**:
  - Utilitarian approach – Creates that best or greatest good for the greatest number of people, situation, etc.
  - Respect for persons standards-
    - Golden rule / Self Defeating / Rights Approach

- **Divergence:**
  - these standards lead to conflicting conclusions, which may lead to difficult choices

Cadaver Crash Testing for Enhanced Vehicle Safety

- Extremely controversial, particularly with use of child cadavers

Center for Auto Safety's "Middle Way" Criteria:

In order to use cadavers for crash testing, must obtain:

1. Assurance that the data sought by the tests cannot be gained from using dummies

2. Prior consent by the deceased person, and

3. Informed consent of the family

Organizational Culture - Ethics

- An atmosphere of trust between the employer and the employee

- An empowering environment where employees feel secure in raising and seeking the resolution of sensitive issues

- An absence of fear of employer retribution against employees for raising and seeking resolution of sensitive issues

Source: NSPE, Final Report of the NSPE Ethics in Employment Task Force, 2019

Ethics in the Workplace

- NSPE believes employees should raise and seek resolution of issues in a professional manner, and that employers should respond in a way that permits timely and effective resolution of those issues without damaging the reputation of the employee or the employer.

Source: NSPE, Final Report of the NSPE Ethics in Employment Task Force, 2019

The Path to Resolution of an Ethical Dilemma In Employment

- Creative Middle Way

- Company Ethics Policy

- Advice From a Person in the Company that the Employee Trusts
  Any member of supervisory management
  Legal Department
  Corporate Compliance Administrator Personnel
  Corporate Security
  Ethics Hot Line (1-800-888-XXXX) if available

Source: NSPE, Final Report of the
NSPE Ethics in Employment Task
Force, 2019

The Path to Resolution of an Ethical Dilemma In Employment

- No Corporate Ethics Policy?

- No Trusted Individual to Consult?

  - For Licensed Engineers - NSPE Board of Ethics Review

  - Private Attorney

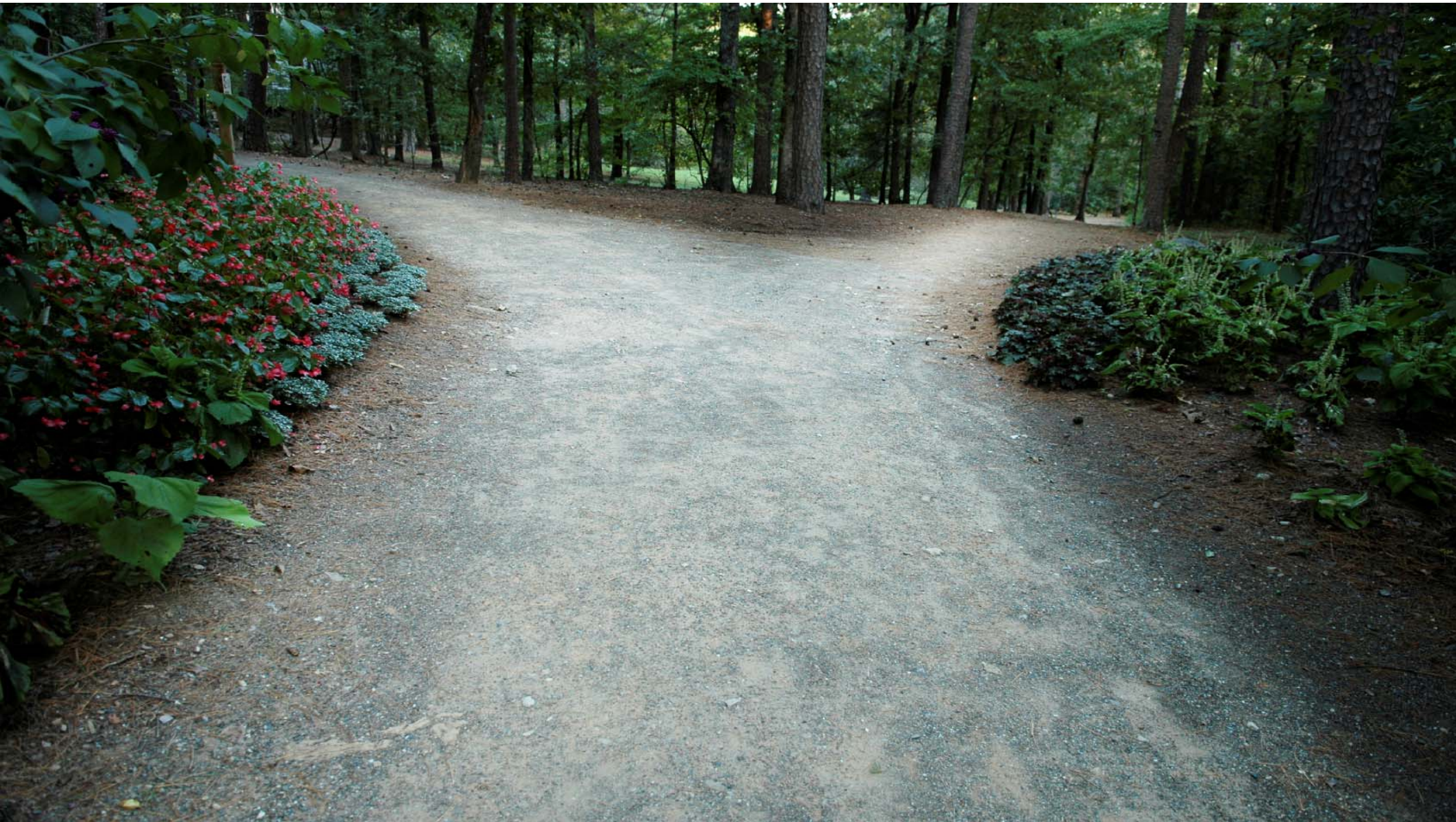# Questions to Consider Before Taking Action

1. Is my action in compliance with all applicable local, national, and international laws?
2. Is my action in keeping with the values of the company I am employed by?
3. Is my action honest and fair in every respect?
4. Will my action be viewed positively if it becomes known to my supervisor, coworkers, friends, or subordinates?
5. Will my action reflect positively on my company and me if it is disclosed in the newspaper or other media?
6. Is my action in compliance with company policy, procedures, or principles?

- Answer - "YES" - Employee is acting ethically
- Answer – "NO" - Employee should seek further advice

Ethical Decisions –Conflict Resolution

- Guidance to help resolve ethical problems is available in the form of :

1. Codes of Ethics

2. Actual case studies from professional and technical engineering societies and engineering licensing boards.

3. Legal Action

   www.nspe.org/resources/ethics/board-ethical-review

I learned that courage was not the absence of fear, but the triumph over it. The brave man is not he who does not feel afraid, but he who conquers that fear.

— Nelson Mandela

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