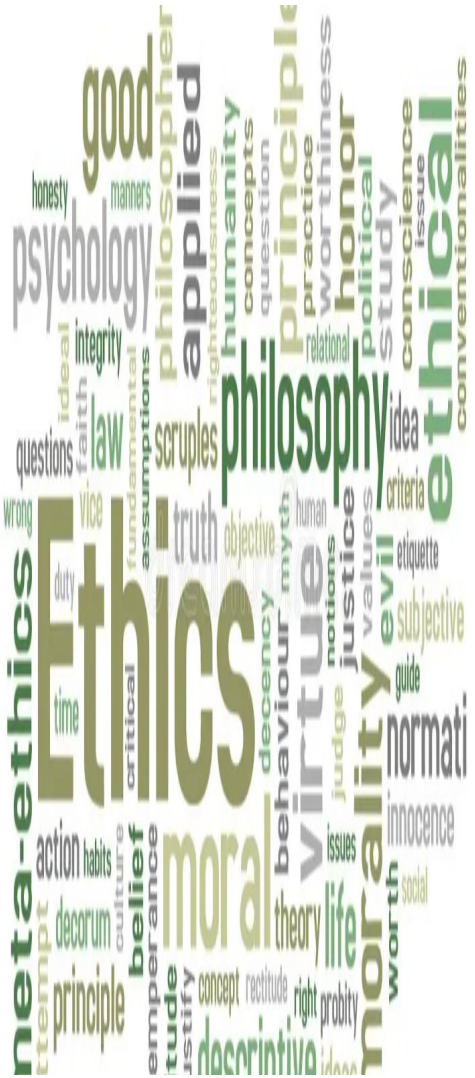
PRESENTED BY GROUP LAST RIDE

ACKNOWLEDGING ERRORS IN DESIGN

COURSE: ENGINEERING ETHICS

Section: I

Course Faculty: **BISHWAJIT BANIK PATHIK**



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OVERVIEW OF A CASE STUDY

Case Study Title: Safety vs. Simplicity - The Ethical Dilemma of Engineer T

Engineer T, a senior structural engineer at XYZ Consulting Engineers, was responsible for designing major modifications to an existing building. **To simplify construction, T chose a design approach that placed structural connections in a tightly constrained upper-floor space. These constraints were clearly documented, but the location made it physically difficult for workers to perform the installation safely.** During construction, a serious and permanent injury occurred when a worker attempted to make one of the difficult connections. After the accident, Engineer T reflected and realized that alternative, safer design options could have been explored earlier—though they would have been more costly and complex. **Engineer T felt personally responsible and discussed the matter with the firm's Chief Engineer, Engineer B.** They concluded no design error had occurred since the constraints were noted and no safety expertise was expected from the design engineer. A lawsuit was later filed regarding the incident, and during deposition, Engineer T responded with transparency but did not acknowledge fault, as advised by legal counsel. This case raises a critical ethical question: **Did the design prioritize safety or did it prioritize convenience and cost at the expense of public welfare?**

[Source: https://www.nspe.org/career-resources/ethics/acknowledging-errors-design]

Key Information of the Case

- Engineer T, senior structural engineer at XYZ Consulting Engineers
- Designed major modifications to an existing building
- Structural connections placed in a tightly constrained upper-floor space
- Constraints were clearly documented
- Location made installation physically difficult and unsafe
- A serious and permanent injury occurred during construction
- Safer design alternatives were possible but more costly and complex
- Engineer T felt personally responsible and reported to Engineer B
- Firm concluded no design error as constraints were disclosed
- No safety expertise expected from the design engineer
- Engineer T was transparent in deposition but didn’t admit fault (legal advice)

INTRODUCTION

Code: NSPE Code I.1 – *"Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health, and welfare of the public."*

Meaning:

- This code emphasizes that ***public safety must come first*** — before time, cost, or convenience.
- Engineers have a ***moral obligation*** to ensure their work does not endanger others, even indirectly.
- Ethical decision-making should be ***proactive***, especially in areas that affect people's lives and well-being.

Consequences of violating the code:

- **Immediate Impacts:**
  - •Risk of injury or death to workers or the public
  - •Personal moral distress for engineers involved
- **Long-Term Consequences:**
  - •Legal claims and financial losses
  - •Reputational damage to engineering firms
  - •Erosion of public trust in the profession
  - •Missed opportunity to improve future designs and safety standards

Implications of the Code (NSPE Code I.1) in the Professional Field:

- **Structural & Civil Engineering:** *Design must account for not just strength and materials, but also for how safely a structure can be constructed and maintained.*
- **Construction Planning:** *Engineers must foresee whether a design will pose challenges or risks for workers and contractors on-site.*
- **Interdisciplinary Communication:** *Engineers must collaborate with safety experts and anticipate how their decisions impact those outside their domain.*
- **Ethical Culture:** *Organizations should encourage engineers to speak up when safety might be compromised — even if not legally required.*

Example:

- ***Millau Viaduct** – France (Tallest bridge in the world)*

- **During its design phase, engineers collaborated with construction safety experts**
- **Modular segments were built off-site to minimize high-altitude labor**
- **Innovative equipment allowed safer on-site installation with reduced human risk**

OVERVIEW OF THE CASE STUDY

Violation of selected Ethical Code:

- Although the design was technically correct, it failed to fully prioritize the safety of construction workers.
- A simpler and cheaper design approach was chosen without evaluating safer alternatives.
- This decision indirectly led to an unsafe working condition and a serious injury.
- Ethical engineering requires anticipating safety issues — not just complying with requirements.

Four Steps for Resolving Ethical Dilemma

01

Moral Clarity

02

Know the Facts

03

Consider Options

04

Make a Reasonable Decision

Four Steps for Resolving Ethical Dilemma

Step 1: Moral Clarity

Ethical Issue: A worker was injured due to a design that did not prioritize ease and safety of construction.

Dilemma: Should safety have been given more weight than simplicity and cost, even if the design met technical standards?

Four Steps for Resolving Ethical Dilemma

Step 2: Know the Facts

- The design placed structural connections in a constrained area with limited access.
- The injury occurred during installation due to these constraints.
- Alternative designs were possible but were not explored early.
- The contractor did not raise safety concerns, and Engineer T had no formal safety training.
- A lawsuit was filed; Engineer T disclosed facts transparently but did not admit to a design error.

Four Steps for Resolving Ethical Dilemma

Step 3: Consider Options

Option 1: Proactively Accept Ethical Responsibility and Advocate Safety-First Reforms

- **Pros**: Demonstrates moral integrity; sets a precedent for ethical engineering.
- **Cons**: May open the firm to legal exposure; may cause internal conflict if others don't support it.

Option 2: Publicly Follow Legal Advice, Privately Push for Change

- **Pros**: Maintains legal protection while enabling internal reforms for safer future designs.
- **Cons**: Lacks public accountability; may be viewed as avoiding responsibility.

Four Steps for Resolving Ethical Dilemma

Step 3: Consider Options

Option 3: Engage Interdisciplinary Teams for Future Projects

- **Pros**: Encourages collaboration with safety experts, preventing similar issues in future; builds a safety culture.
- **Cons**: No immediate redress for current incident; benefits are long-term.

Option 4: Prioritize Safety Over Simplicity and Cost from the Start

Pros: Ensures worker safety; aligns with ethical responsibility ; prevents harm and long-term liability..

- **Cons**: Potentially higher costs and longer design timelines; may be seen as compromising efficiency and simplicity.

Four Steps for Resolving Ethical Dilemma

Step 4: Make a Reasonable Decision

Make a Reasonable Decision:

- **Best Ethical Response:** Engineer T should have prioritized worker safety and explored alternative, safer designs from the beginning.
- After the incident, the firm should initiate internal reforms to ensure safety considerations are built into every project.
- Future designs should involve interdisciplinary review to proactively minimize construction risk.

"**Ethics isn't just about compliance — it's about protecting lives**"

Conclusion

Future Implications

- Engineers must not only follow technical standards but also anticipate real-world safety implications of their designs.
- Public safety should always be prioritized — even when it adds complexity or cost to a project.
- Ethical reflections should be encouraged, not silenced, even when legal concerns are involved.
- Engineering education should include awareness of construction safety and interdisciplinary risk analysis.

Conclusion

Safety Measures:

- Include construction feasibility and safety reviews in the early design phase
- Encourage collaboration between engineers, contractors, and safety professionals
- Use simulation tools to assess worker access, posture, and risk zones

Corporate Social Responsibility (CSR):

- Firms must implement ethical design practices that go beyond the minimum
- Promote internal policies that reward safety-first thinking
- Provide training that raises ethical and safety awareness
- Establish systems where engineers can speak up about risks without fear.

Conclusion

Final Thoughts

- Ethics in engineering is not only about preventing failure — it's about protecting lives
- Safety is not optional. It's a moral obligation tied to every design choice.
- One overlooked detail can change someone's life forever — ethically sound design protects against that.
- A culture of ethical accountability builds long-term trust in the engineering profession.

Closing Message

Always ask :

“Is this design safe for everyone involved — from drawing board to real-world execution?”

REFERENCE

https://www.nspe.org/career-resources/ethics/acknowledging-errors-design

THANK YOU VERY MUCH!