Agenda

Engineering Ethics and Liability

What are Ethics

Industry Code

Case Studies
The basic concepts and fundamental principles of decent human conduct. It includes study of universal values such as the essential equality of all men and women, human or natural rights, obedience to the law of land, concern for health and safety and, increasingly, also for the natural environment.
Codes of ethics are not law.
Ethical behavior is not always protected by the law.
Companies realize that ethical behavior is essential to their long term prosperity.

Ethically aware companies provide
- help to employees facing ethical conflicts
- allow employees to raise ethical concerns
- explicitly prevent forms of retaliation for reporting unethical behavior
QUESTION 1: For Our Big Picture

In how many states do you have a P.E. license?

- 1?
- 2?
- 3?
- 4?
- 5+?
QUESTION 2: For Our Big Picture

How frequently does your continuing education requirement include Ethics?
- Never?
- One PDH credit every 2 years?
- One PDH credit every year?
- More?
- Don’t know?
The National Society of Professional Engineers dedicated to the non-technical concerns of licensed professional engineers across all disciplines

David B. Steinman, P.E.
- Chief Engineer of the Mackinac Bridge
- Founder of the National Society of Professional Engineers
The Engineering Code of Ethics has three components:

- **The Fundamental Canons:** which articulate the basic components of ethical engineering.

- **The Rules of Practice:** which clarify and specify in detail the fundamental canons of ethics in engineering.

- **Professional Obligations:** which elaborate the obligations that engineers have.
Fundamental Canons

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.
RULES OF PRACTICE
Fundamental Canons

Hold Safety, Health & Welfare of the Public Paramount

• If professional judgment is overruled where public is endangered you shall inform your client

• Do not engage or lend your name to fraudulent or dishonest persons or firms

• Strive with principles of sustainable development

• Sign and seal only documents you have done or reviewed
Perform services only in areas of their competence.

- Undertake assignments only when qualified by education or experience
- Do not affix your signature to plans or documents where you lack competence

"Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No., Expiration Date: ."

- You may seal the entire project as long as technical engineers signed their segments
SIGNING & SEALING

- In 2014 a five story residence was constructed directly over DC Waters North East Boundary Trunk Sewer Line.
- Only about 2 feet of soil between the bottom of the basement and the top of the 22 foot diameter masonry sewer.
- Building caused cracks.
- Did not notify DC Water of the building till complete.
- All engineering done by Structural Eng.

- Repair $$$$$
- Building????
Issue public statements only in an objective and truthful manner
  • Avoid material misrepresentation or omission of fact
  • Do not take credit for work performed by others
  • Be objective and truthful in reports, statements or testimony
Engineer B wrote an article for a publication where a substantial portion of text came from a prior article written and published by Engineer A. Engineer A contacted Engineer B on the identical word-by-word text and Engineer B stated he had submitted him (Engineer A) as a reference but the Editor had omitted it.

Did Engineer B act ethically?

- Yes?
- No?
- Maybe?
Act for each employer or client as faithful agent or trustee

- Disclose all known or potential conflicts of interest to influence judgement
- Do not receive compensation from more than one party for services on the same project unless fully disclosed
- Engineers in public service shall not participate in decisions with respect to services provided by them or their firm
- Do not solicit from or contract with a governmental body on which you serve as principal or officer of their organization
Avoid deceptive acts

- Do not falsify qualifications or misrepresent you or your associates qualifications.
  - Includes brochures or presentations
- Do not offer, give, solicit, receive directly or indirectly any contribution to influence award of a contract.
Fundamental Canons
Fundamental Canons

NSPE™ NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
Champion | Guide | Advance | Unite
QUESTION 4: Is this Ethical?

Does this activity happen today with Engineering Firms paying to obtain Government Contracts?

- Yes?
- No?
- Don’t know?
Fundamental Canons – Rules of Practice

Continue Professional Development

- Keep current in your field of specialty
- Encourage employees to become registered, attend meetings and present papers.
8th Fundamental Canon - July 2017

Engineers shall,

✓ in all matters related to their profession,
✓ treat all persons fairly and encourage equitable participation
✓ without regard to gender or gender identity, race, national origin, ethnicity, religion, age, sexual orientation, disability, political affiliation, or family, marital, or economic status
Ethics

Our Decisions as Engineers have Consequences

- If you have affixed your seal to a Drawing or Specification you are legally responsible for that drawing or specification.
- If any product or material shown on a plan sealed by you experiences a failure you will most likely be required to defend your decision and determine why the failure occurred.
PROFESSIONAL OBLIGATIONS
Honesty & Integrity

- Engineers shall be guided in all relations by highest standards of honesty & integrity
  - Advise clients if believe a project will not be successful
  - Do not do outside jobs to detriment of employment
  - Do not attract an engineer from other employer by falsification

Serve Public Interest

- Engineers shall strive to serve the public interest
  - Shall not sign/seal projects not within standards
  - Participate in civic affairs and community
  - Adhere to sustainable development

Avoid Public Deception

- Engineers shall avoid all conduct or practice that deceives the public
  - Avoid material misrepresentation of fact or omission of fact
  - You may prepare articles but not imply credit for work performed by another
Engineers shall not disclose confidential information without consent
- Specialized project knowledge promotion shall have written consent of all parties
- Shall not share disclose business affairs of former clients or employers

Engineers shall not be influenced in professional duties by conflicting interests
- Engineers shall not accept fees or free engineering from a material or equipment supplier for specifying their product

Engineers shall not obtain employment or advancement by untruthful criticizing others or improper methods
- Salaried engineers shall accept part-time work only consistent with employers policies
- Do not untruthfully criticize others to gain work
**Professional Obligations**

- **Engineers shall not harm professional reputation of others**
  - Engineers in private practice will not review another engineer's work except if disclosed or work was terminated.
  - Engineers in government, industrial, or education employ can review others' work when required by their duties.

- **Engineers shall accept personal responsibility for their professional activities**
  - Engineers accept personal responsibility.
  - Do not use others as a "cloak".

- **Engineers shall give credit to those to whom credit is due**
  - Recognize proprietary interests of others.
  - Engineers' design, data, records, & notes are the employer's property.
  - Designs for a client should not be duplicated without permission.
CASE STUDIES
LIABILITY

An obligation that one is bound in law or justice to perform

Condition of being actually or potentially subject to an obligation

Condition of being responsible for a possible or actual loss, penalty, expense or burden
Liability &
Case Study

35 W Bridge Collapse, Minnesota
Collapsed August 1\textsuperscript{st} 2007 killing 13 people injuring 145!
Original Design and Construction in 1964
Liability & Case Study

35 W Bridge Collapse, Minnesota

What went wrong?
35 W Bridge Collapse, Minnesota

Forensic Investigators reviewed the wreckage to determine the cause.
Liability & Case Study

35 W Bridge Collapse, Minnesota

The gusset plates failed
The original design of the gusset plates was called into question...
Original Design (1964) Engineer: Jacobs Engineering
Inspection Consultant hired 2003 to perform Fatigue Analysis: URS
URS neglected to analyze the gusset plates and relied on the original design.
Maintenance Contractor stored equipment on another deck
Who is Financially Responsible for the Failure?
(select all that apply)

- Design Engineer
- Original Construction Contractor
- Fatigue Analysis Engineer
- Repair Contractor
Liability & Case Study

35 W Bridge Collapse, Minnesota

Final Outcome:
Jacobs paid $8.9 million in settlement - WITHOUT ADMIITTING TO ANY WRONGDOING
URS paid $52.4 MILLION to resolve the issue– WITH NO ADMISSION OF LIABILITY OR FAULT
Jasper, TX Fish Hatchery – Design & Install Drainage

Project Valuation: $27 Million
Project Start: July 2008
Quantity of Pipe: 11,000 ft of HDPE (30”, 48” & 60” Dia.)
Jasper, TX Fish Hatchery – Design & Install Drainage

Design / Installation / Failure / Liability

Collapses Discovered: April 2009

HDPE Deflections: 30”, 48” and 60” Dia.

Project Completion: 30%
Liability & Case Study

Jasper, TX Fish Hatchery – Design & Install Drainage

Design / Installation / Failure / Liability

Flexible Pipe Sizes: 30” – 48” – 60”

Overall Project 30% Complete at Discovery of Fail

Forensic Investigation Ordered

Cause of Failures: EXCESSIVE DEFLECTION
Fish Hatchery Design Failures

- Incorrectly using a design chart for the design that did not include the effect of groundwater
- Not providing adequate construction phase services such as site visits and reviews of field compaction efforts and records
- Not using available geotechnical reports that provided critical information of the in-situ soil conditions necessary for a proper pipe design, and
- Specifying improper backfill and compaction for the project
Fish Hatchery Installation Failures

- Inadequate Compaction
- Utilizing a Trench Box that was too narrow to obtain Compaction
- Disturbing Compacted backfill by dragging the trench box
- Not dewatering beneath the pipe trench
- Inability to use RFI Process to resolve identified discrepancies related to soils / compaction
Liability & Case Study

Jasper, TX Fish Hatchery
– Design & Install Drainage

Inspection Criteria

Wall Crushing

Figure 3.14 Wall crushing at the 3 and 9 o'clock positions.

Localized Buckling

Figure 3.15 Localized wall buckling.

Reverse Deflection

Figure 3.17 Reversal of curvature due to over-deflection.

Over Deflection

Figure 3.16 Ring deflection in a flexible pipe.
Jasper, TX Fish Hatchery – Design & Install Drainage

Wall Crushing

Reverse Deflection

Localized Buckling

Over Deflection

Liability & Case Study
Case Study: Liability & Risk

The projected cost of the hatchery when construction finally got underway during July 2008 was around $27 million.

However, Boruff said the figure could rise exponentially, possibly by several million dollars, before the problem with the failed drainage pipe is ironed out. ANOTHER UNKNOWN IS WHO IS GOING TO FOOT THE BILL TO PAY FOR THE GLITCH.

“We are still going through a lot of engineering analysis and testing at this point to determine exactly what caused the problem,” said Phil Durocher, TPWD director of inland fisheries. “If it turns out to be as bad as it looks initially, it is certainly not going to be cheap to fix.

BOTH THE CONSTRUCTION COMPANY THAT INSTALLED THE PIPE AND THE ENGINEERING COMPANY THAT DESIGNED THE PROJECT ARE SAYING THEY DID EVERYTHING RIGHT, BUT IT IS REAL OBVIOUS SOMETHING WENT BAD WRONG HERE. It could be that multiple parties have some culpability here. We’ll just have to wait and see.”

Matt Williams,
Who is Responsible? (select all that apply)

- Manufacturer
- Design Engineer
- Contractor
- Public Agency (Owner)
Back on track: Design firm bears brunt of repair bill on fish hatchery

Just call it a mountain of a mistake.

After months of evaluation, legal wrangling and dirty work, more than two miles of faulty underground drainage pipe has been exhumed and replaced at the new John D. Parker East Texas Fish Hatchery.

he cost? A healthy $3.3 million.

The state-of-the-art facility is currently under construction below the Sam Rayburn Reservoir dam near Jasper. The projected completion date is early Spring 2011.

The drainage system in question is linked to a dozens of production ponds that will be used for rearing about 5 million Florida bass, blue catfish and bluegill annually. Water will flow through the pipe to the hatchery outfall, Beef Creek, then into the Angelina River about a mile downstream.
Jasper, TX Fish Hatchery – Design & Install Drainage

Concrete Pipe

Engineer
Manufacture per ASTM C76
Install per ASTM C1479

Manufacturer
C76 - OKAY

Installer
C1479 - OKAY

Flexible Pipe

Engineer
“as per manufacturer’s recommendations”

Manufacturer
“As per ASTM D2321”

ASTM D2321
Engineer referenced 29 times
Something fishy with failures?

High-density polyethylene pipe and reinforced concrete pipe are not interchangeable.

As installed above, concrete was used to back fill the plastic pipe. While the pipe was thought to be as strong or stronger than the concrete pipe, it was not. A year later, due to stresses at the pipe and concrete interface, the concrete cracked at the pipe and failed. The concrete pipe would have been able to handle the load. As an aside, the concrete used was not standard for pipe, it was a mass concrete. The mass concrete was not designed to handle the loads placed on it, which led to the eventual failure.

In another case, the pipe was buried under earth, then water was added. Over time, the pipe was not properly pressure tested and eventually the plastic pipe burst, a result of the water pressure causing the plastic to weaken. The concrete pipe would have been able to handle the same amount of pressure.

Pipe that is not properly installed can fail, and it is the designer and installer’s responsibility to make sure it is installed properly. If in doubt about the installation, ask, and get a written assurance of performance. If in doubt about the design, ask, and get a written assurance of performance. If in doubt about the manufacturer’s warranty, ask, and get a written assurance of performance. If in doubt about the actual limitations of the pipe, ask, and get a written assurance of performance. If in doubt about the working conditions, ask, and get a written assurance of performance.

Designers and engineers need to research and analyze a number of factors and conditions for the intended application before specifying the type of pipe to be used.
Engineering Ethics: The Decision is Yours!
It’s Your License, It’s Your Responsibility

American Concrete Pipe Association

Engineering Ethics and Liability
Presented by Aimee Connerton - Rinker Materials
aimeej.connerton@rinkerpipe.com (301) 357-0324
and Liza Kirk, P.E. – Forterra liza.kirk@forterrabp.com (281) 705-7077
ACPA 2020 Pipe School & Pipe Show
Embassy Suites in San Marcos, Texas
January 6-9, 2020
Save the Date!!

ACPA 2020 Webinar Series

Post Installation Inspection
by Doug Holdener, Sarah Matin, and Angel De Jesus
February 20, 2020