Legal Issues in Engineering Design

Laws, Regulations, and Standards
Warning!

• The lecture introduces you to legal aspects of engineering practice but is not intended as legal advice.

“A little learning is a dang’rous thing.”

Alexander Pope
(1688-1744)
Typical ‘Legal’ Situations

• Preparing a contract to secure the services of a specialized software company
• Reviewing a contract to determine if a contractor who built the clean room should be paid
• Managing a design project against potential product liability suits
• Testing equipment for compliance with Federal Communications Commission (FCC) regulations
• Implementing an ISO 9000 quality control standard
What is ISO?

- ISO is a nickname - not an acronym - for the International Organization for Standardization which facilitates the creation and voluntary adoption of world wide industrial and manufacturing standards.
- This international body developed the ISO 9000 Standards to ensure that products and services of member countries secure global acceptance.
What is ISO 9000 Standard?

- ISO 9000 is a written set of standards which describe and define the basic elements of the quality system needed to ensure that an organization's products and services meet or exceed customer needs and expectations.
Law vs. Ethics

- Both reflect the values of a society, are interrelated, but are still distinct.

- Ex #1: A defective product despite all due diligent care

- Ex #2: Hiring engineers away from a competing firm
The Origin of Laws-I

1758 B.C.: Hammurabi’s Building Code

“If a builder has built a house for a man and has not made his work sound, and the house which he has built has fallen down, and so caused the death of the householder, that builder shall be put to death.”

(quoted from Martin and Schinzinger, 1989)
The Origin of Laws-II

A.D. 1852: The U.S. Steamship Code

During 1816-1848, 233 boiler explosions contributed to a total of 2563 persons killed and 2097 injured. One explosion alone, on the Moselle in 1838, claimed 151 lives.

(data from Martin and Schinzinger, 1989)
American Law: Current Situation

- **Case Law**: based on previous court cases 
  (e.g.: contracts; product liability)
- **Statutory Law**: statutes created by legislative bodies (e.g.: Clean Air Act)
- **Administrative Law**: rulings and regulations of government agencies, (e.g., Environmental Protection Agency (EPA), FCC)
Liability

Liability = Obligation to pay damages

How does one incur a liability?

1. Breach of contract
2. Committing a tort (e.g., fraud, negligence)
Contracts

Contract = offer + acceptance + consideration

Example: If Supersoft and Dilbert enter into a contract in which Supersoft promises to pay Dilbert $5000 for modifying a CAD software package, both the money and the service are considerations.
Typical Situations for Contracts

- Sale or purchase of property and services
- Employment contract (intellectual property rights)
- Confidentiality agreements
Breach of Contract

- A breach of contract occurs when one party fails to perform his/her part of the contract.
- Extreme difficulty/greater cost in executing the contract does not relieve a party of the responsibility to deliver as promised.
- (Legally) injured party can sue for damages.
ABC electric agreed by fax on Monday to buy 100 fractional-horsepower motors for $3000 from XYZ electric. On Wednesday, the purchasing agent from ABC calls and says he is canceling the order. XYZ says the motors have already been shipped and they want their money.
Tort = Civil Wrong

- **Fraud**
  - *Ex.:* Double billing, false certification

- **Professional Negligence:**
  - Good intentions are not enough.
  - Even corporate employees can be sued.

- **Product liability:** refers to the liability of any or all parties along the chain of manufacture of any product for damage caused by that product.
Negligence: A Case Study

Tom Swift, P. E., was hired by MicroCom Corp. to recommend the equipment needed to convert a certain product line (PDA) from metal to plastic parts without affecting the production rate. After $10M of new equipment was installed, it was found that the new production line would operate at only 70% of the old production rate because Mr. Swift did not take into account the longer cycle time for plastic curing in his design.
From 1995 to 1996, personal injury product liability civil lawsuits in federal courts increased 116%. *(quoted from Dieter, 2000)*

**Strict Product Liability**: A manufacturing or design defect is sufficient to create a liability even though no professional negligence was involved or even when the injured party acted carelessly.
Design Aspects of Product Liability

- Strict adherence to standards
- Thorough testing
- Quality control measures
- Process documentation
- Warning labels and instruction manuals
- Formal design review before production
- Liability insurance
Laws > Regulations > Standards

- Lawmakers cannot be expected to keep up with each new technological innovation.
- What is needed are regulatory agencies (such as FDA and EPA) and commissions (such as FCC), which employ experts to set up precise regulations (= administrative law).
  - FDA: Food and Drug Administration
  - EPA: Environmental Protection Agency
- Govt. agencies may develop or adopt (mandatory) standards as parts of their regulations.
The Clean Air Act is the comprehensive Federal law that regulates air emissions from various sources. This law authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.
More on Standards-I

• Voluntary standards may be developed by professional groups for industry wide use.

• Some Standards-setting Organizations:
  - ISO: International Organization for Standardization
  - ANSI: American National Standards Institute
  - IEEE: Institute of Electrical and Electronics Engineers
    - Non-profit, technical professional association in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace and consumer electronics, among others.
More on Standards-II

Functions of Standards:
- Uniformity of size/function (floppy disks)
- Safety/reliability (National Electric Code)
- Quality assurance (ISO 9000)
- Reproducible data (Measurement standards)
- Mitigate interference (Frequency bands)
Developing standards is a:
- Quasi-legal
- Voluntary
- Consensus process
IEEE Standard Principles

• Imperative Principles of the Standards Process:
  – Due process: follow procedure
  – Openness: Everyone has access to the process.
  – Balance: representation from all materially interested and affected parties.
  – Right of Appeal: The right to take steps to has a case heard.
Due Process

• IEEE is a ANSI Accredited Standards Development Organization
  – ANSI approves operating procedures
  – ANSI reviews and provides for public comment of IEEE standards
  – ANSI audits IEEE process.
Openness

- Make information and actions publicly available for examination
- Include all materially interested and affected parties
- Avoid antitrust situations/appearance of collusion.
Consensus

- Agreement among the majority
- Not unanimity
- Defined in the IEEE balloting rules as at least 75% of the ballots must be returned and of those at least 75% must approve to become a standard.