

What are they and why should I care?

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Codes and Standards

Why should I care?

- ABET requires this as part of all senior design projects.
- Many industries are highly regulated and rely on your knowledge of standards.



History of Standards



- Bible Book of Genesis:
 - “Make thee an ark of gopher wood; rooms shalt thou make in the ark, and shalt pitch it within and without with pitch.”
 - And this is the fashion which thou shalt make it of: The length of the ark shall be three hundred cubits, the breadth of it fifty cubits, and the height of it thirty cubits.
 - A window shalt thou make to the ark, and in a cubit shalt thou finish it above; and the door of the ark shalt thou set in the side thereof; with lower, second, and third stories shalt thou make it.

History of Standards

- In our preindustrial history, all standards were developed by craftsman and read a lot like Noah's Ark.
- Everything was passed on as "trade knowledge", such as live oak is better than white oak for ship hulls.
- People had no means to measure material strength, chemical composition, or quality of a particular material specimen.

Clocks are Standards

- 14th Century introduced the clock, usually accurate to within 15 minutes, to announce times of worship, special occasions, or meals
- By the Industrial Revolution in the early 1900s, we wanted clocks accurate within seconds.
 - Work shifts
 - Train schedules
 - Worldwide time zones

Engineers Need Standards!

- Codes and standards help prevent accidents
- They encourage competition and let everyone play by the same rules
- They allow companies to get products approved for sale as “safe and effective”
- Standards control measurement, so we know that something measured in one country is the same as something measured in another.

Early American Standards

- American Society of Mechanical Engineers (ASME)
 - Boiler codes
- American Society for Testing and Materials (ASTM)
 - Railroad steel
- American National Standards Institute (ANSI)
 - Unifying national standards from five engineering groups, including above. 1916

International Standards

- International Organization for Standards (ISO) 1947
 - Geneva, Switzerland
 - 158 member nations
 - Thousands of standards:
 - ISO-2 Textiles, twists of yarns, tightness of weave, etc
 - ISO 15189 Medical laboratories, cleanliness, etc.
 - ISO 9000 or 9001 Certified “Quality Management”

European Union

- 27 Member nations
- Have “European Directive” which applies to products sold in Europe
- Must comply with CE Mark standard
 - Safety and efficacy
 - Medical devices
- US equivalent is UL or FDA, etc (that use ISO standards)
- NIST maintains international measures

ABET

- ABET is the Accreditation Board for Engineering and Technology
- Visit every six years (we're next Fall)
- "Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on ... course work and incorporating appropriate engineering standards and multiple realistic constraints."

ABET and Capstone Design

- Required that you incorporate at least one standard into your design and report.
- Library has many ASTM standards, and we have option of downloading for \$10 each.
- “Specifications” for a competition do NOT count as codes and standards!!

Material standards

- Selecting a material based on a standard DOES count, as long as it is discussed in your report. Why this material instead of all others?
- Project team must discuss what the standard specifies for their specific material (such as allowable composition ranges, etc.)

Questions?

- Work with your advisors to determine an appropriate standard to incorporate.
- Clearly and explicitly discuss your standard in your final report and why it is appropriate for your project, how you incorporated it, and what you learned from it.