1.10 Engineering Design Process
Part 4 – Reflect: Testing and Redesign

Summary
Students will observe the role of testing in the engineering design process. They will generate their own testing criteria based on their Design Requirements and Constraints and make a testing plan. Student groups will present their prototypes to the class.

Learning Objectives
After this class, students will be able to:

• Describe the types of testing that engineers might perform on prototypes.
• Describe the types of standards to which products must adhere.
• Describe why quality assurance testing would be done on a prototype.

Materials
Continue to make the following available for students to prototype their design.

• Playdoh
• Pipe cleaners
• File folders
• Tape
• Markers
• Cardboard
• Card stock
• String
• Scissors
• Straws
• Popsicle sticks

Time
80 minutes

Procedure/Pacing

Testing
1. Review with students that testing takes on different characteristics during different phases of prototyping. Early prototypes will be tested
to see if they will work as designed, if they are user friendly, and if they have the necessary features. Later, more refined prototypes will be tested to see if they meet mandatory safety standards and voluntary standards. Prototypes (and final products) will be tested for quality, to make sure they will withstand both expected and unlikely use. This type of testing is called quality assurance testing.

2. Discuss with students that there are standards that may be set by governmental regulating agencies or independent safety and standards organizations that will likely affect any design. Standards may be required by law or may be voluntary. Often voluntary standards are usually those agreed upon by an industry so that all designs will work with one another. For example, the standardization of screw thread sizes. Ask students to describe what it might be like if screws did not have a standard thread size.

3. Ask students to consider what kinds of quality assurance tests a product might go through. You may use the videos in the resources section to spur discussions.

4. In their groups, look back at their Design Requirements. Have students discuss how they will need to test their prototype to make sure the requirements have been met. Also, have students discuss the usual use of their and other conditions their design might experience. Students should report how they might test their design to make sure it will withstand satisfactorily. (Assignment 1.10i)

5. Help students understand that based on testing results, engineers may redesign all or part of their prototype. The cycle of the Engineering Design Process may be repeated many times before a final solution is reached.

6. Allow students to finish prototyping their designs.

In-Class Assignment
Assignment 1.10i: Testing Plan

Resources
Standards:
Underwriters’ Laboratory (UL) http://ul.com/aboutul/
American National Standards Institute http://www.ansi.org/

Quality Assurance Testing Videos:
A380 Airbus toilet testing facility https://www.youtube.com/watch?v=0Oxtc4o0Q1I
Redwing Shoe testing  https://www.youtube.com/watch?v=Urt1PYj kf84
Packing Container Testing  https://www.youtube.com/watch?v=WxKwF06U3Rw

**Homework**
None for today