

**Desired Needs:**

- a. This device has to produce reliable/consistent results (maintaining appropriate forces on the specimen) as data collected from it will be used in FDA 510k submissions
- b. This device must withstand up to 2000N of force without structural yielding or incorrect measurement reading

**Constraints:**

- a. Must not shatter/fracture/break under stress to prevent projectile hazards
- b. Power supply does not deliver appropriate voltage and results in improper measurements or broken electrical components
- c. Must have high precision but be generalized to work with multiple spinal implant types
- d. Has to be manufactured cheaply when compared with the price of similar testing devices
- e. The device is used for testing by others, meaning it must be easy to understand/use

**Engineering Standards:**

- a. ASTM F1717: Standard Test Methods for Spinal Implant Constructs in a Vertebrectomy Model
- b. ISO 12189: Implants for surgery
- c. Standards could be developed surrounding test methods for expandable spinal implants

**Ethical, Environmental, and Societal Concerns:**

- a. Faulty data acquisition could eventually lead to improperly tested spinal implants being purchased by customers
- b. Requires manufacturing done by companies that likely utilize dirty energy
- c. Most companies will not have access to this device and will not be collecting data that could improve the health of patients

**Active Teamwork and Leadership:**

- a. Everyone would bring their own ideas together and then we would collaborate to identify how all of our perspectives could be implemented
- b. The two main components of the design: manufacturing and electronics, were split into two separate groups that came together to make a finished product
- c. We made sure we had clear communication between group members and everyone understood what they had to do
- d. With everyone working on their own sections, feedback came in the form of improving overall final design, rather than small specific changes

**Motivating Factors:**

- a. Knowing practically nothing about spinal surgery before this project, learning about procedures that help change people's lives daily was very exciting
- b. Tasked with the circuit design system, I had to learn how all the different parts would work together effectively or the device would not work
- c. Wanting to be able to present a finished product alongside a poster was big motivation

**Innovation:** This testing setup is much cheaper than any other testing machines you typically find on the market for structural testing.