Abigail Smith

1. List two to four **Desired Needs** of your project that led to your final design objectives.
- It was significant that our device enable biaxial compression by (1) conducting compression in horizontal plane and (2) mounting to device that compression in vertical plane
- (3) Device needs to maintain a constant load when the spinal cage expands or retracts
2. List the major **Constraints** on your design/project
    a. Safety/Regulatory Affairs: (1) Could not fabricate the frame ourselves due to lack of certifications for heavy machinery, (2) could not install power source until last minute because it is unsafe if exposed
    b. Risks: (1) linear actuator exerts hundreds of pounds–need to be careful to not get a finger stuck, (2) touching parts of the circuit while active could result in death
    c. Global Impact: N/A, few people would operate device (but it will make device testing more robust)
    d. Manufacturability: N/A, only needed to be produced once
    e. Quality Control/Marketability: N/A, not feasible to enter the market
3. List the major **Engineering Standards** on your design/project
    a. standards that could be developed from your project:
        i. Load bearing spinal devices could be required to withstand physiologically relevant loads from biaxial compression
        ii. Spinal devices that can expands or retract must be able to withstand constant and increasing compression
4. Explain **Ethical, Environmental, and Societal concerns** for practical applications of your project. Please address each of these areas.
    a. Ethical: Our device is easy to use but should not be used in place of the more robust and reliable Instron machine
    b. Environmental: There is a notable labor and material cost to each fabrication of this device. If this one were break it would cost a lot of time and material to repair
    c. Societal: Injury from linear actuator during operation
5. Describe **Active Teamwork** and **Leadership** in your design group
    a. **collaboration** and inclusion of diverse opinions: Sharing praise/concern for everyone's ideas, working independently before collecting ideas
    b. **delegation** of leadership on subprojects: Someone always volunteered to work on something, everyone else helped however they could until they took charge
    c. establishing and reaching **goals and deadlines:** we usually got things done ahead of time and communicated if things would be done closer to deadline
    d. received or given **constructive feedback**: we would clearly explain if there was an issue or pitfall and then clearly explain a better solution
6. What were the most significant motivating factors that led you to
    a. acquire **new knowledge:** Total unfamiliarity with multiple components of our circuit and spinal fusion surgery, vague familiarity with CAD/Arduino
    b. be **self-initiating:** I had teammates that relied on my work
    c. **persist** against challenges and setbacks: Our project had no end date. We had to work until it was complete. The sooner it got done and worked out the better