Definition of Needs and Requirements

The objective of this project is to identify opportunities across the campus that uses aluminum and our purpose is to find a system to increase the efficiency and sustainability of products and product systems. There are many uses of aluminum on the University Park campus of the Pennsylvania State University, which include electronics, construction, lockers, bookshelves, Chik-fil-A sandwich packaging, door handles, laboratory materials, baseball bats, Beaver Stadium bleachers, and pop/soda cans.

Possibly one of the most common use of aluminum here at State College, PA happens on football Saturdays at Beaver Stadium. Hundreds of thousands of fans fill the stadium and sit/stand on the aluminum bleachers. Aluminum is a viable option when trying to seat 106,000+ fans; it is cost-effective, yet durable.

In order to produce aluminum, bauxite is mined and then purified using the Bayer process. Purified aluminum oxide is then mixed with cryolite to melt the metal and then through electrolysis, aluminum ions are reduced to form aluminum metal. The aluminum can then be mixed with other metals to form an alloy that has certain properties, such as strength and cost. The alloy is then pressed into sheets and bent into its desired shape and cut to desired dimensions. The bleachers are then shipped to location where the supports and bleacher top are assembled and anchored into the foundation. The product is then used for as long as it can handle thousands of jumping and screaming fans. Once the bleachers have reached the end of their life, they are disassembled and sent to a foundry to be shredded and melted down so they can be reused.
Problems associated with the bleachers at Beaver Stadium:

1. **Navy game**: One set of bleachers in the student section broke and students passed it up through the crowd.
2. **Almost every game** you can feel the benches rocking back and forth as people jump around and dance during games.
3. **Possible rusting and weathering due to natural environment.**
4. **Can become weakened by cracks continuing to grow from constant cycle of getting wet, freezing and expanding.**
5. **Get cold and wet making it miserable to sit on.**