Pedestrian Bridge
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**Opportunity**: To design a new aluminum-based product to be used on campus or modify an existing product used on campus by incorporating aluminum or replacing another metal with aluminum such that the university will benefit and Alcoa will profit.

**Background**
Alcoa was founded by Charles Martin Hall and Alfred Hunt. Its headquarters are in New York City and its operational base is in Pittsburgh, PA. It is currently the world’s third largest Aluminum producer.

Most aluminum comes from bauxite. A major expense in the production of aluminum is extraction and transportation of bauxite, as there are few substantial deposits in the United States. Bauxite is a mixture of iron and aluminum compounds and is strip-mined (overlying material is removed), then processed first into alumina then into aluminum by electrolysis. Industrial benefits of aluminum over other metals include its relatively low cost and density, its resistance to corrosion and oxidation, its light weight and its high malleability. It is more expensive than steel but less expensive than many other commercially-used metals. Additionally, aluminum is extremely recyclable, thus making it a more environmentally-friendly choice than many other metals. According to Earth 911, two-thirds of aluminum ever produced is still in use today. It is recycled by melting disposed aluminum down into ingots, or small blocks of aluminum. It is 95% more energy efficient to recycle aluminum than to produce new aluminum.

Places where aluminum is used around campus include light poles, fences, benches, handrails, manhole covers, bike racks, information stations, decorative fences, university owned vehicles, trash cans, wheel alloys, packaging at commons, outdoor furniture and dumpsters. It is also used in a variety of structural components of buildings.

**Specifications/Customer Needs**
- Benefit Penn State
  - Save money
  - Make university more sustainable
  - Make university operation more efficient
  - Make student/faculty lives more efficient
- Benefit Alcoa
  - Make profit
- Environmentally friendly
  - Recyclability of aluminum
- Practical
  - Able to be implemented at Penn State
- Cost effective

**Brainstorming**
1. Pedestrian Bridge at Curtin/University intersection
2. Replace outdoor steel products (telephone poles, handrails, etc.) with aluminum
3. Replace roofing/siding with aluminum

**Pairwise Comparison**

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A- Practical  
B- Cost Effective (for PSU)  
C- Beneficial to PSU  
D- Beneficial to community

**Evaluation of Ideas**

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**Graphics of Design**
Figure 1: Intersection of University Drive and Curtin Road

Figure 2: CAD model of bridge; aluminum grating, handrails, and sheets to wrap steel beams

Discussion
After being given the assignment guidelines, we determined that we would either choose to modify existing campus products with aluminum or create a new product that uses aluminum. We toured campus and saw where aluminum was used and where other metals were used that could potentially be replaced with aluminum. We determined we would either modify outdoor products such as light poles, handrails, dumpsters, etc. with aluminum or replace the shale roofing of many campus buildings with aluminum if we chose to take the route of modifying an existing product. We also recognized the need of Penn State to make the University Drive-Curtin Road intersection more efficient for both pedestrians and cars, as it is typically very busy particularly during football games and events at the Bryce Jordan Center. Therefore, we determined that a pedestrian bridge could be built over this intersection that will utilize aluminum (as well as steel). After evaluating these three ideas, we decided the pedestrian bridge would be the most practical, beneficial to Penn State and State College, and profitable for Alcoa.

This bridge will have four walkways, one over each possible crosswalk and the traffic lights currently monitoring the intersection will be hung from the frame of the bridge. The bare frame of the bridge will be made of steel, as it is cheaper and stronger than aluminum. This frame will be wrapped in aluminum to prevent corrosion and give a sleeker appearance. Additionally, aluminum grating will comprise the surface on which pedestrians walk and handrails will be made of aluminum.

We believe a pedestrian bridge is an important investment for Penn State University to make. Not only will it save costs of paying policemen to patrol the intersection during events, but it will also make transportation much more efficient for both pedestrians and drivers.