EDSGN 100
SECTION 003
GROUP 5
PROJECT 2
OBJECTIVE

• Apply use of aluminum products to improve the efficiency of energy use and/or increase sustainability of the campus.
## PROPERTIES OF ALUMINUM

- Lightweight
- Strong
- Resistant to Corrosion
- Versatile
- Highly recyclable

### ALLOY PROPERTIES

<table>
<thead>
<tr>
<th>ALLOY PROPERTIES</th>
<th>STANDARD PRIMECAST ALLOY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MECHANICAL</strong></td>
<td><strong>ZINC ALLOY</strong></td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>psi X 10^6</td>
</tr>
<tr>
<td>MPA</td>
<td></td>
</tr>
<tr>
<td>Yield Strength</td>
<td>psi X 10^5</td>
</tr>
<tr>
<td>MPA</td>
<td></td>
</tr>
<tr>
<td>Elongation</td>
<td>(%) in 2&quot;</td>
</tr>
<tr>
<td>Young's Modulus</td>
<td>psi X 10^6</td>
</tr>
<tr>
<td>MPA, X 10^3</td>
<td></td>
</tr>
<tr>
<td>Shear Strength (MPA)</td>
<td>psi X 10^6</td>
</tr>
<tr>
<td>MPA</td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td>Brinell</td>
</tr>
</tbody>
</table>

### PHYSICAL

<table>
<thead>
<tr>
<th>ALLOY PROPERTIES</th>
<th><strong>ZINC ALLOY</strong></th>
<th>**PER MOLD ZA-22</th>
<th>**PER MOLD S58-F</th>
<th>**PER MOLD S56-T5</th>
<th>**DIE CAST S60</th>
<th>**WROUGHT AI 8091-T6</th>
<th><strong>BRONZE</strong></th>
<th><strong>STEEL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>lbsin³</td>
<td>0.093</td>
<td>0.093</td>
<td>0.090</td>
<td>0.10</td>
<td>625</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kg/M³</td>
<td></td>
<td>2766</td>
<td>2766</td>
<td>2713</td>
<td>2788</td>
<td>640</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting Range</td>
<td>DEG F</td>
<td>1035-1135</td>
<td>1035-1135</td>
<td>1035-1100</td>
<td>1035-1200</td>
<td>1035-1200</td>
<td>1035-1200</td>
<td>1035-1200</td>
</tr>
</tbody>
</table>

Note: The values for zinc alloy, aluminum alloy, and steel are standardized and may vary slightly.
PRELIMINARY IDEAS

• Implementation of aluminum in elevator systems around campus
• Dumpsters entirely made from aluminum across campus
• Aluminum door knobs
DECISION FACTORS

• Human Factors
• Innovation
• Quality of Life
• Idea Implementation
• Economic viability
• Chemical composition of aluminum allows for less corrosion and rust
• Lightweight (energy required to dump garbage into trash truck is substantially less)
• Damaged dumpsters are easily recyclable
WHY WE CHOSE THIS?
HUMAN FACTORS

- Minimized chances of catastrophic failure due to corrosion
- Minimized leakage of refuse from dumpster
INNOVATION

• New to Penn State campus
• Higher % recycle returned in lifecycle
• Leans technology in the life-cycle to a more efficient direction
QUALITY OF LIFE

• Less energy require to move and manage aluminum dumpsters
  • Smaller lift motors
    • Less energy used
    • Less fuel used
  • More efficient system
IMPLEMENTATION

- Aluminum is more:
  - Malleable
  - Dumpsters can be made via dye-cast or CNC
- Implementation process is simple
ECONOMIC VIABILITY

• Short run cost is higher than long run cost
  • More $$ to produce per unit volume
  • Less volume lost to corrosion over time.
• Steel price fluctuated with societal demand
  • Olympics or other large construction projects
• Aluminum price is economically more stable
FINAL SOLUTION IMPLEMENTATION

• Evaluate design of original steel dumpsters and replicate for production of Aluminum dumpsters.
• Disposal of old steel dumpsters to steel recycling plant
• Have new dumpsters placed at previous locations
SOURCES

• www.primecast.ca
• http://wiki.answers.com/Q/Which_costs_more_aluminum_or_steel#slide1