Introduction:

The goal of this project was to design and construct a secure 30-gallon metal shipping container which could be used to transport and store a variety of items in a secure manner. The container must be secured by two independent locking methods; one of which is required to be electro-mechanical, while the other must be purely mechanical. It was anticipated that these locking mechanisms were integrated together into a single locking feature.

Emphasis was placed on the following parameters:

- Ergonomics
- Portability
- Easy of Use
- Designed to 49 CFR 178 Subpart M
- Secuerness
- Cost Effectiveness

Simulations:

FEA simulations were created to mimic various forces applied to the handles of the container during a maximum weight loading scenario. This load was determined using the weight capacity rating of 500 pounds of the 30-gallon drum, along with the added maximum dry weight of the container of 55 pounds. Five simulations were performed based on various lifting scenarios. The one which produced the smallest safety factor against yielding is shown and simulates the container being lifted via a strap looped between the handles.

<table>
<thead>
<tr>
<th>Material</th>
<th>Yield Strength</th>
<th>Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1026 Steel</td>
<td>60.2 ksi</td>
<td>Yielding 3.5</td>
</tr>
<tr>
<td>1018 Steel</td>
<td>53.7 ksi</td>
<td>Failure 4.2</td>
</tr>
</tbody>
</table>

Load Stresses

Max. 15 ksi

Functionality:

The functionality of the lid, locking mechanisms, and seal was tested using the constructed prototype container. The locking ring kept the lid sealed to retain internal dryness in a driving rain simulation. The solenoid kept the locking ring from rotating until a combination was entered into the keypad, then the locking ring was rotated to open the lid.

Moving Forward:

The prototype of the container did not meet all the requirements of the project; future work must be performed, including:

- Fitment of the pressure relief valve
- Sanding and painting
- Loose wire shielding and placement
- Keypad and electronics fitted into a watertight keypad housing