Problem
- Current Access System design does not meet industry standards in low ground pressure (LGP) configuration with extra-wide track shoes.
- Operator safety while accessing the cab is very important.

Background
- Machine Access / Egress System is located on the left hand side of the D8T track-type tractor.
- Current design is addressed through risk-assessment but needs improvement in order to meet ISO Standards.

Customer Requirements
- Ease of use
- Safety / Reliability
- Fully compliant design
- Robust enough to survive in the field
- Cost of project: less than $2000

Alternative Solutions
- Mechanically Controlled Ladder
  - Hinged platform with up and down position
  - In up position when bulldozer is moving
  - Would eliminate the need for handhold and steps

- Hinged Handhold
  - Hinged handle with up and down position
  - Bolts to location as current design

- Extended Handhold
  - Bolts to same location as current design
  - Use more material with same design and add more bends

- Stirrup Step
  - Weld to same location as current design
  - Drop step design down lower

Analysis
- Creo Parametric Simulate and Finite Element Analysis were used to model and analyze how the parts of the final design would act under different situations.
- Static, Modal, and G-loading tests were analyzed.
- Models were compared against the current design parts.
- To validate the final design of the handhold, a thicker tubing can be used and an extra plate on the backing of the panel can be added for more stability and will create less stress.

Impact on Society / Sustainability
- Implementation provides a safe and fully compliant design.
- Safer points of reach that provide stability.
- Operator is less likely to sustain injury while accessing the cab.

Economic Analysis
The Machine Access System Senior Design Project used $24 on material for prototyping. The extra material in the handhold and in the step will create an increase in the production cost of the system comparable to the previous design.
- Estimated Cost of Production: $100.85 (includes materials of the handhold and step only)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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<tbody>
<tr>
<td>1&quot; OD ASTM/A53M Pipe Tubing</td>
<td>$76.90</td>
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<tr>
<td>Sand Casting &amp; Steel Material</td>
<td>$15.74</td>
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<tr>
<td>Bending of Handhold</td>
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<tr>
<td>Welding of Step</td>
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<tr>
<td>Other Machining</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$100.85</strong></td>
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