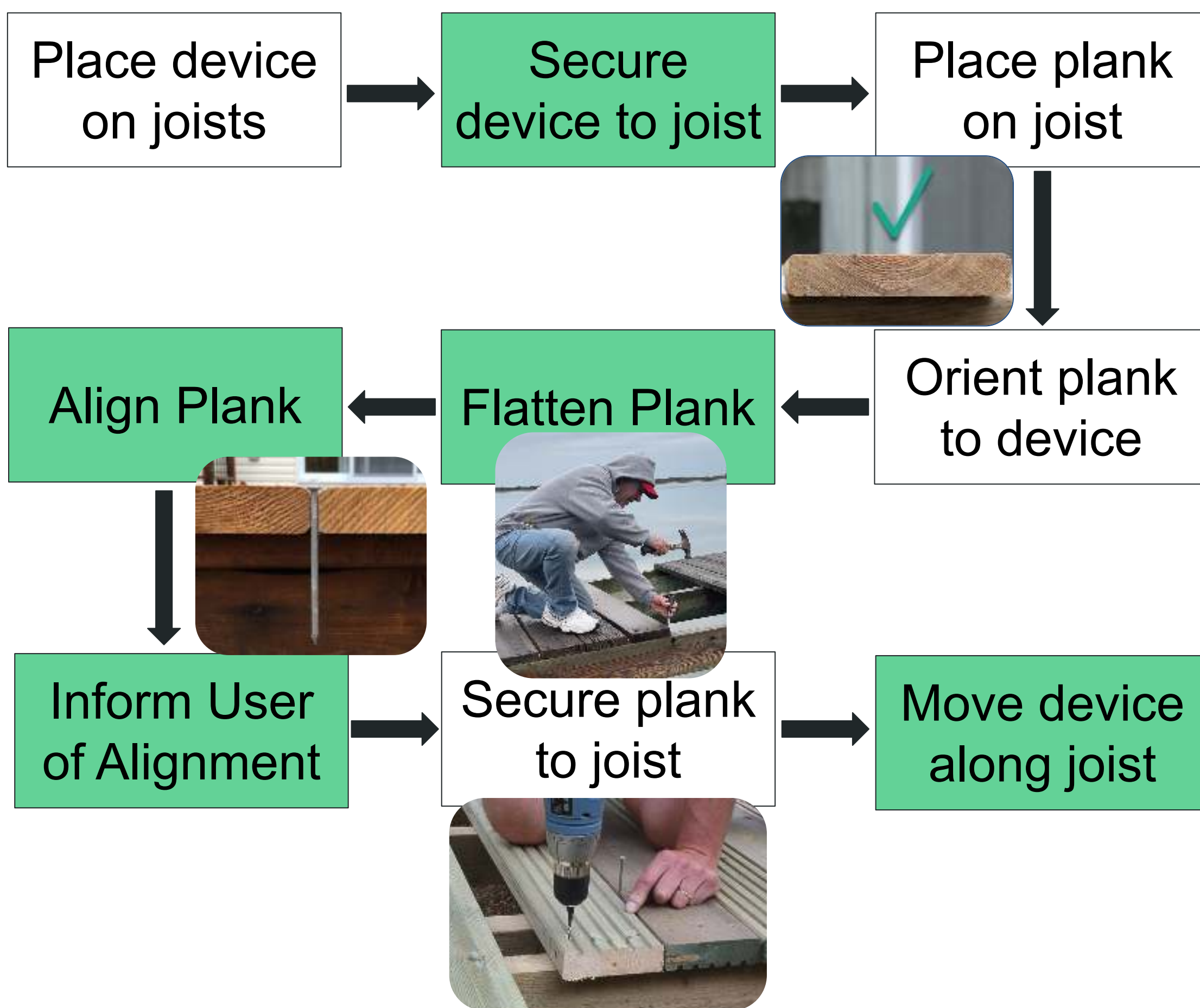
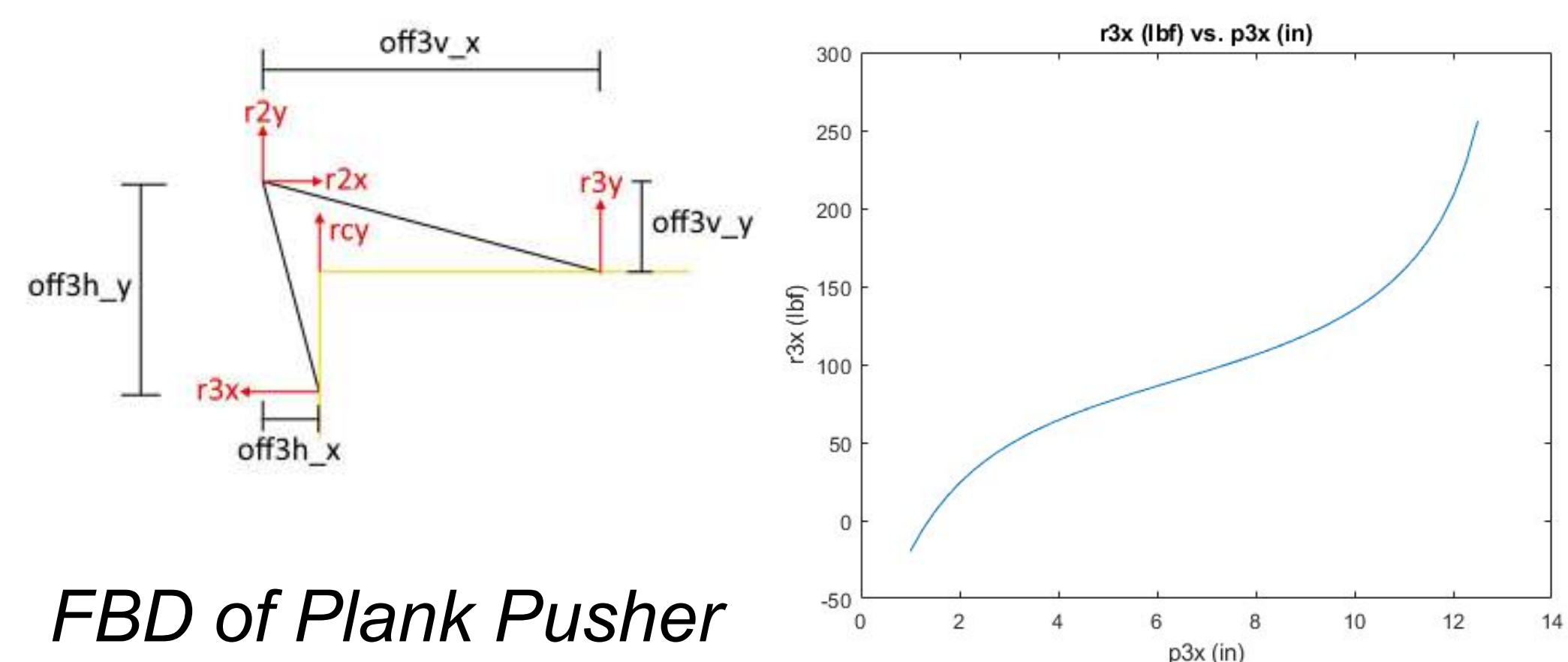


Problem Definition

Product Function User Function

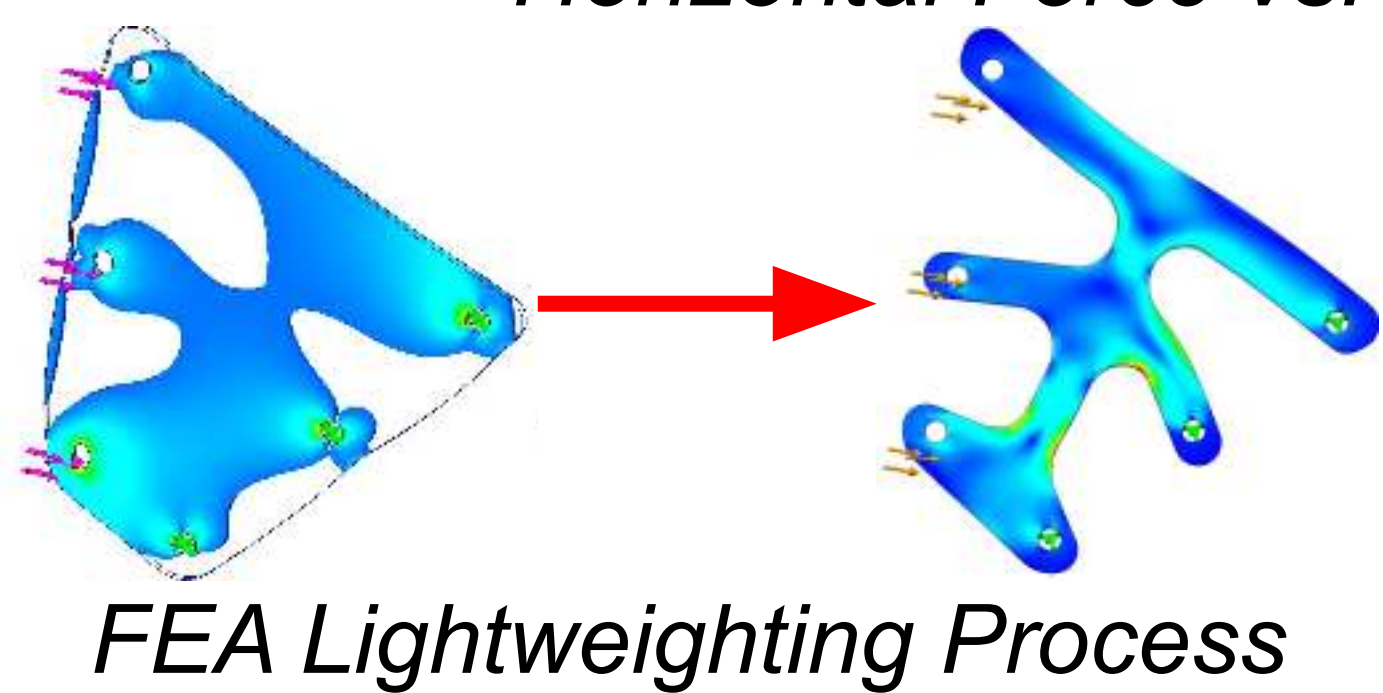


Design Calculations & Analysis

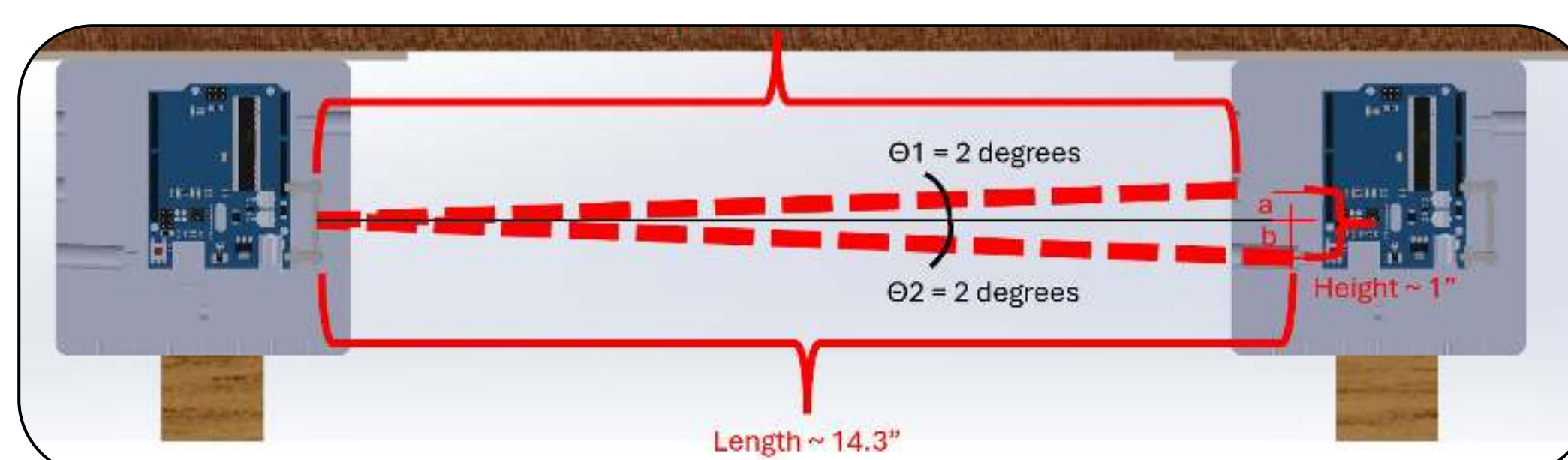


FBD of Plank Pusher

Horizontal Force vs. Distance



FEA Lightweighting Process



Laser Alignment Geometry

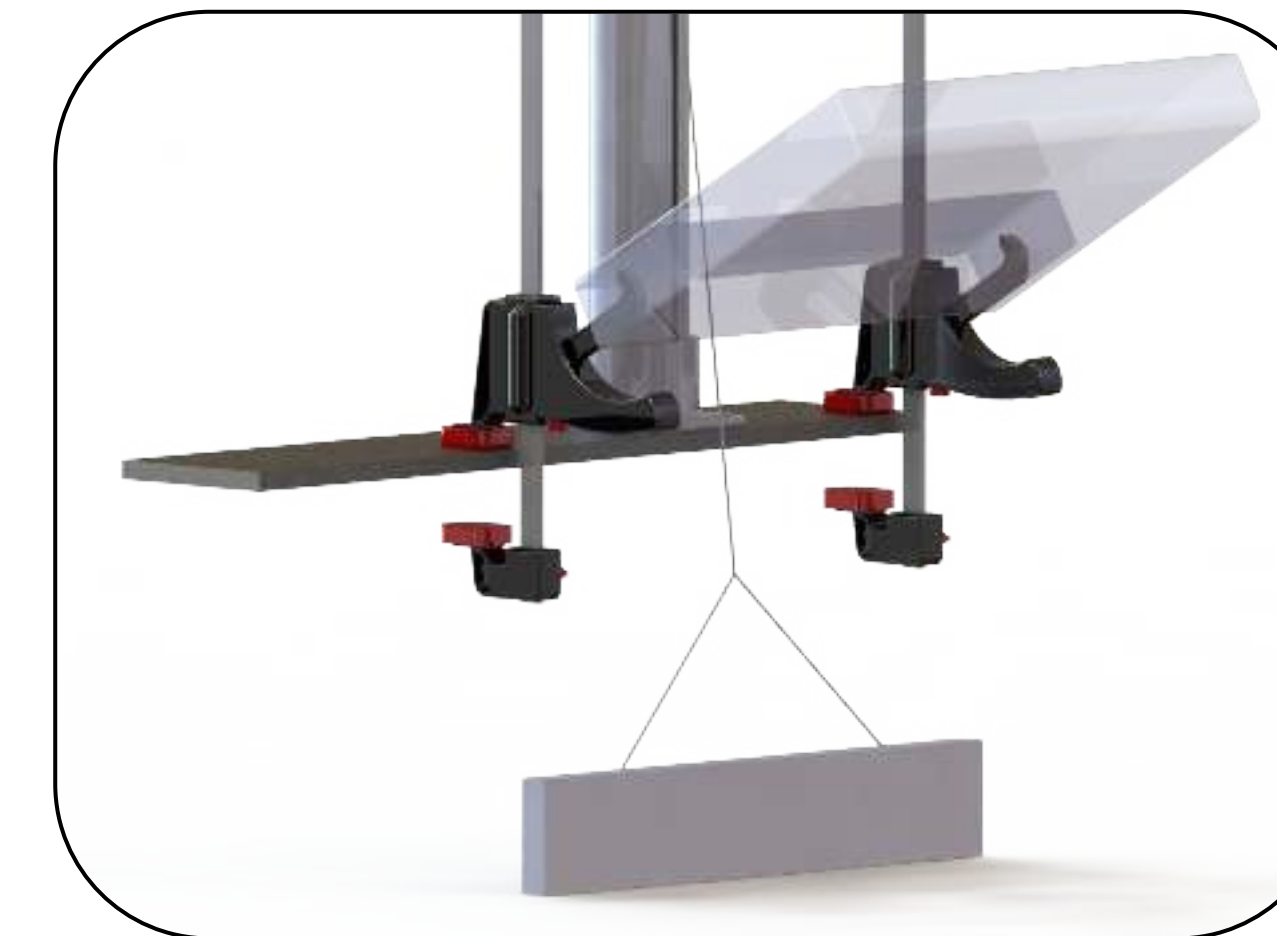
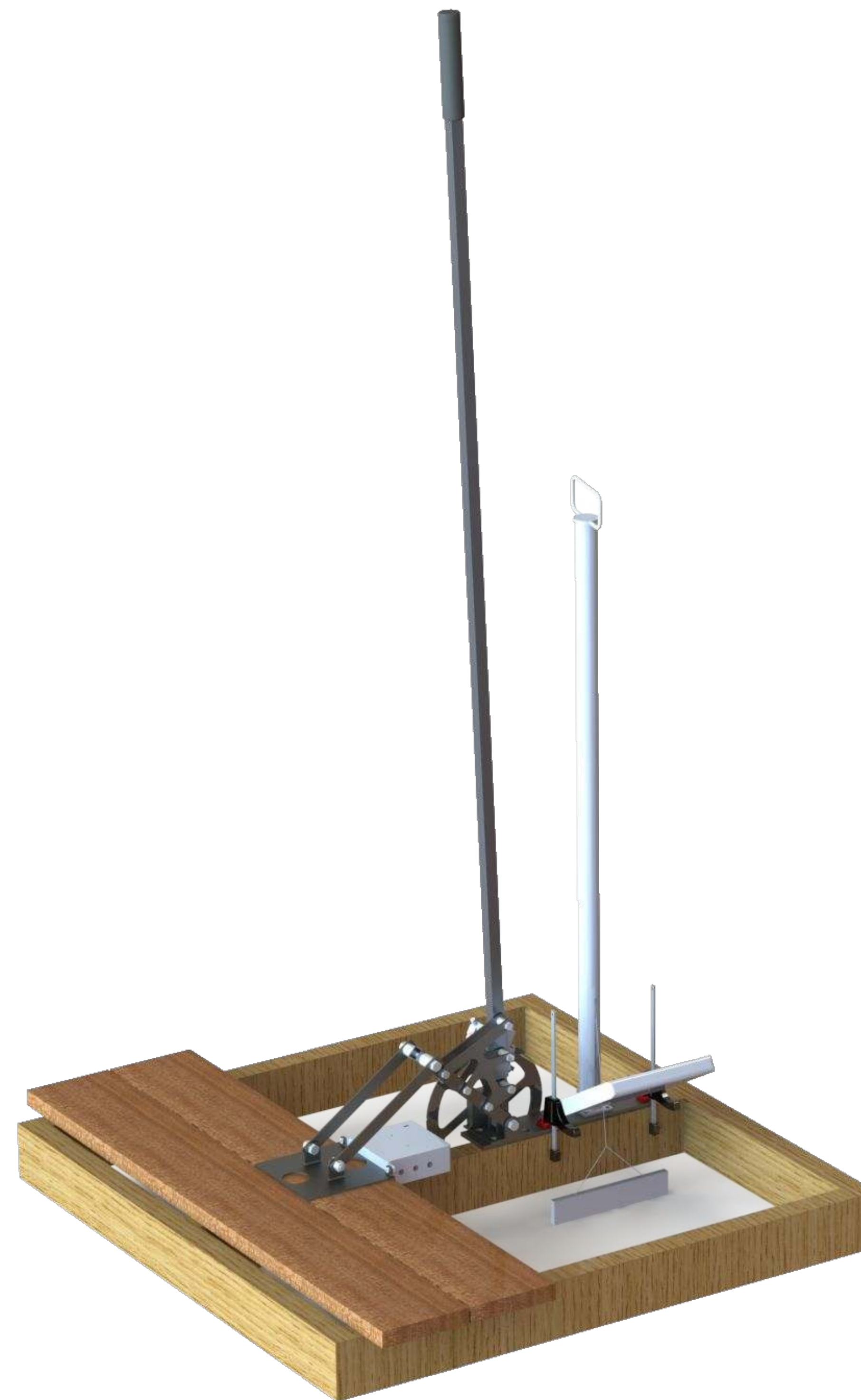
Calculated force necessary to deflect wood: **220 lbf in worst case**

Calculated forces at each linkage to verify design feasibility and set part strength requirements.

Used FEA analysis to verify part safety factors and optimize part geometry.

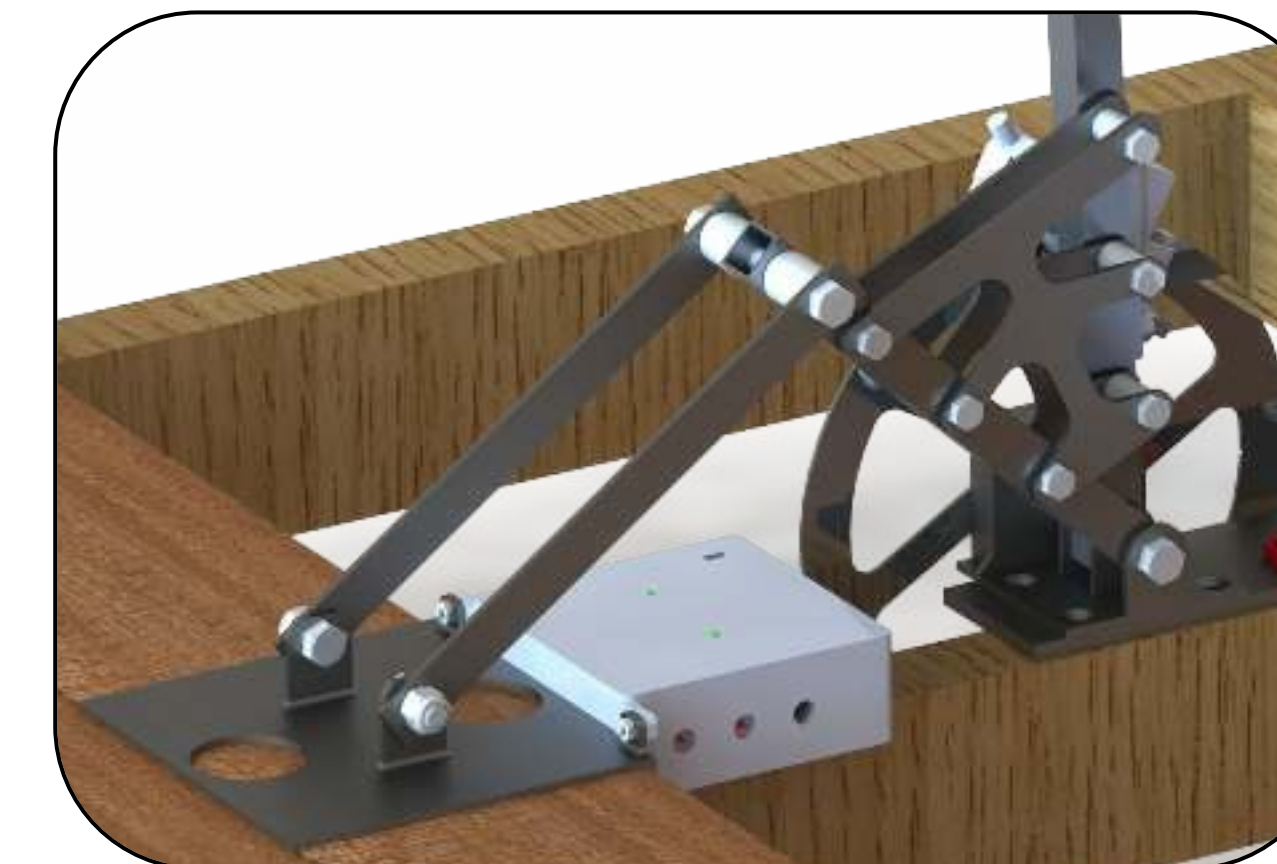
Hand calculations were performed for laser alignment and fastener strength/torque specs.

Final Design



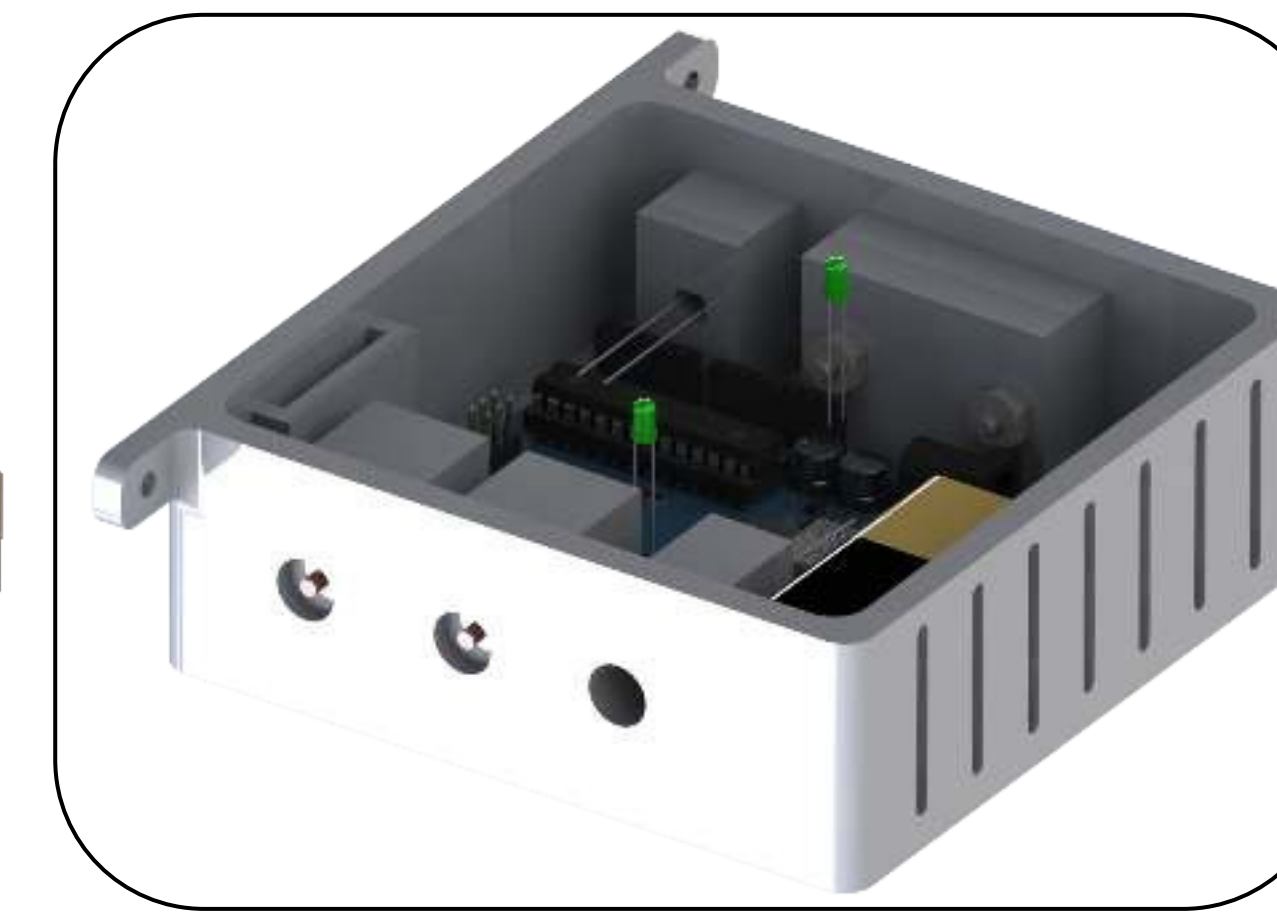
Base

- Clamps to the joist to secure the device
- Compress clamps with foot pedal
- Cable mechanism allows releasing the clamps while standing using the quick release handle



Linkages

- Flattens and presses planks together
- Bicycle brake keeps force applied while the user screws/nails deck board
- Lever is long enough to use while standing, and reduces necessary effort



Laser Level

- Detects flatness/straightness of the plank using lasers with retroreflectors
- Provides visual and auditory feedback
- Housing designed with accuracy of 4mm radius from center of photoresistor

Prototype & Test Results

Test Results

Original method of installation:

- 5-7 minutes to install 1 plank
- Requires at least 2 people for installation
- 5 steps done on hands & knees

Using our device:

- 1-2 minutes to install 1 plank
- Only requires 1 person for installation
- 1 step done on hands & knees
 - 0 with extended nail gun

