JELD-WEN Optimization of Bi-Fold Flow Cell
Senior Design II - Fall 2021

THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

JW JELD-WEN WINDOWS & DOORS

Team:
Advisors/Mentors:

Noah Edwards   SE   Eva Cooper   EE   Parth Upadhyay   ME   John Dunne
Evan Broadhead   SE   Adam Price   EET   Jerry Dahlberg

Objective

The JELDWEN_CELL team's objective is to optimize the split, paint and stack section in the bi-fold cell for one-piece flow.

Specifications & Deliverables

General Requirements (1)

- COVID-19 compliance
- NEC & OSHA compliance

Performance Specifications (1)

- Throughput of 4 doors/min + 15 - 20%
- NIOSH Lifting Index ≤ 1.0
- Number of Workers ≤ 6
- DPMO = JW Standard

Project Deliverables (2)

- Design Implementation
- Standard Work for Operation
- Time Study & Analysis
- Quality Analysis
- Ergonomic Analysis
- Future Recommendations

Budget Overview

Description	Cost
Positioning Bar	$493.45
Stacking Table	$758.50
Travel	$1,800.00
Total	$3,051.95

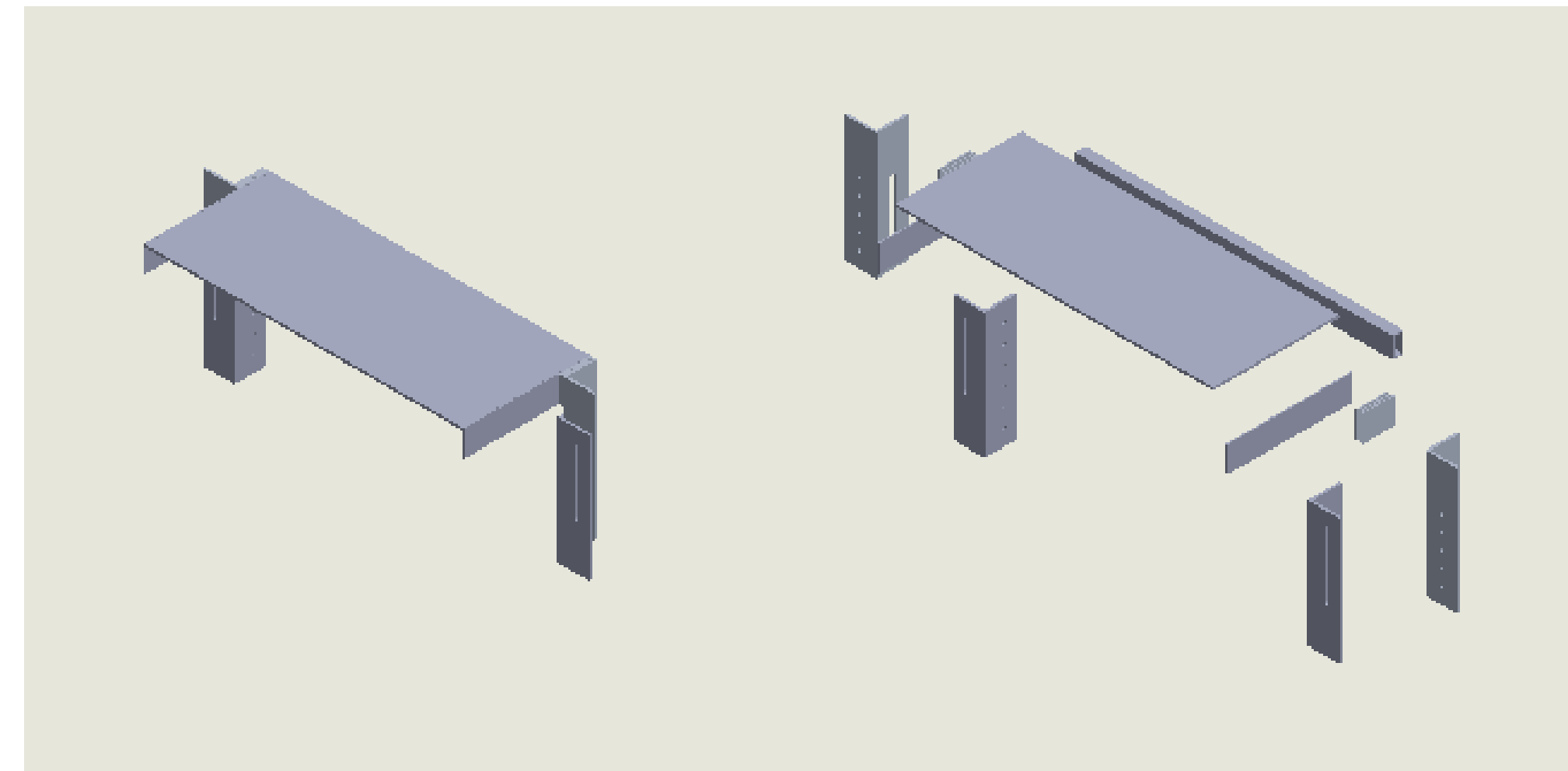## Improvements to Paint Machine Loading

Figure 1. Door positioning bar for paint loading drawing

- Reduce material handling
- Separation of stacked doors
- Protective silicon between door and aluminum
- Height adjustment for different door width
- 6XXX grade aluminum alloy

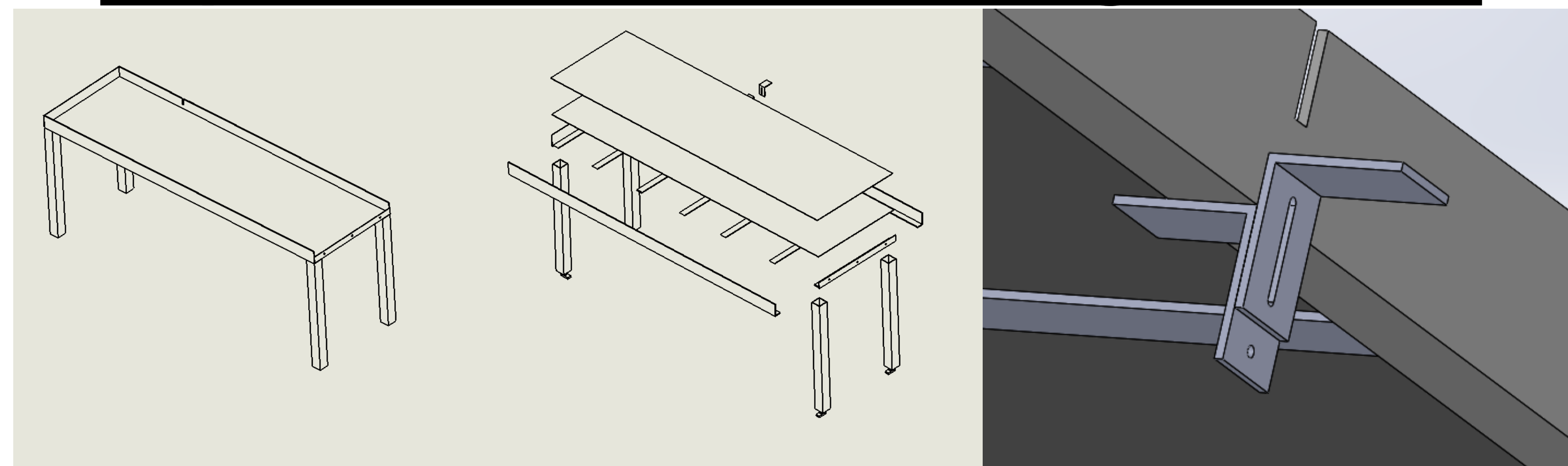## Improvements to Stacking Process

Figure 2. Door stacking table for hinge machine loading drawing

- Reduce material handling
- Door stacking
- Reduce stop time
- Adjustable legs
- Aluminum frame
- Sensor attached to sensor mount

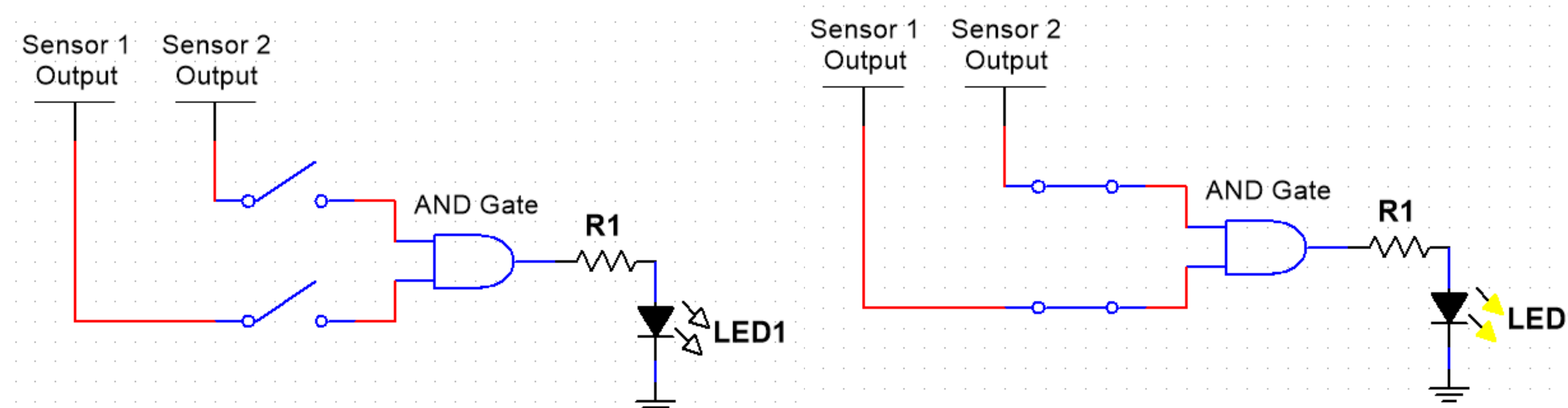## Improvements to Sensor Design

Figure 3. AND Gate: OFF   Figure 4. AND Gate: ON

- Two sensors connected by AND Gate
- Conveyor will stop, when both sensors are activated
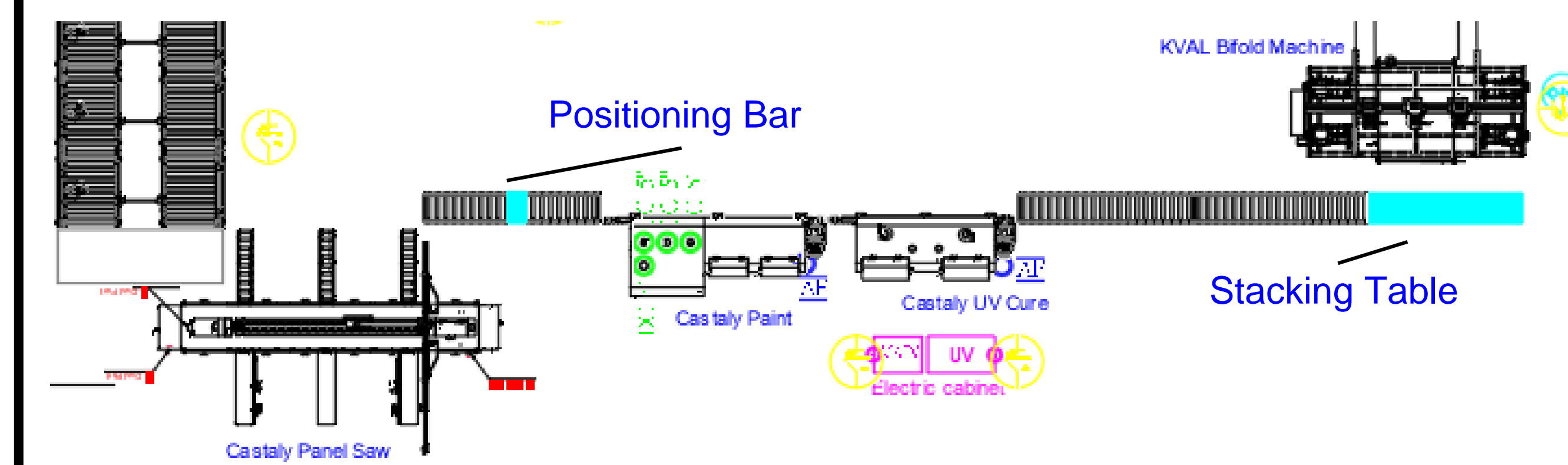
Implementation

Figure 4. Schematic of Facility Layout

Figure 5. Improvements to Paint Loading Machine   Figure 6. Improvements to Loading Hinge Machine

Figure 7. Sensor Implementation View 1   Figure 8. Sensor Implementation View 2

Results

Before:

Cycle Time:
- Paint Loading: 19.2 sec
- Hinge Loading: 31.7 sec

Throughput: 0.99 doors/min

NIOSH Lifting Index:
- Paint Loading: 0.99
- Hinge Loading: 1.95

Defects: Unknown

Operators : 6

After:

Cycle Time:
- Paint Loading: 9.7 sec
- Hinge Loading: 5.7 sec

Throughput: 1.17 doors/min

NIOSH Lifting Index:
- Paint Loading: 0.50
- Hinge Loading: 0.99

Defects: Unknown

Operators : 6

References

1. Broadhead, Cooper, Edwards, Price, and Parth Upadhyay. 2021. "JELDWEN_CELL Project - Project Performance Specification Document: Revision B." Charlotte: JELDWEN_CELL Project Team
2. Broadhead, Cooper, Edwards, Price, and Parth Upadhyay. 2021. "JELDWEN_CELL Project - Statement of Work (SOW): Revision B." Charlotte: JELDWEN_CELL Project Team