



Stay safe, swage safe

SwageSafe – Strand Products

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Background

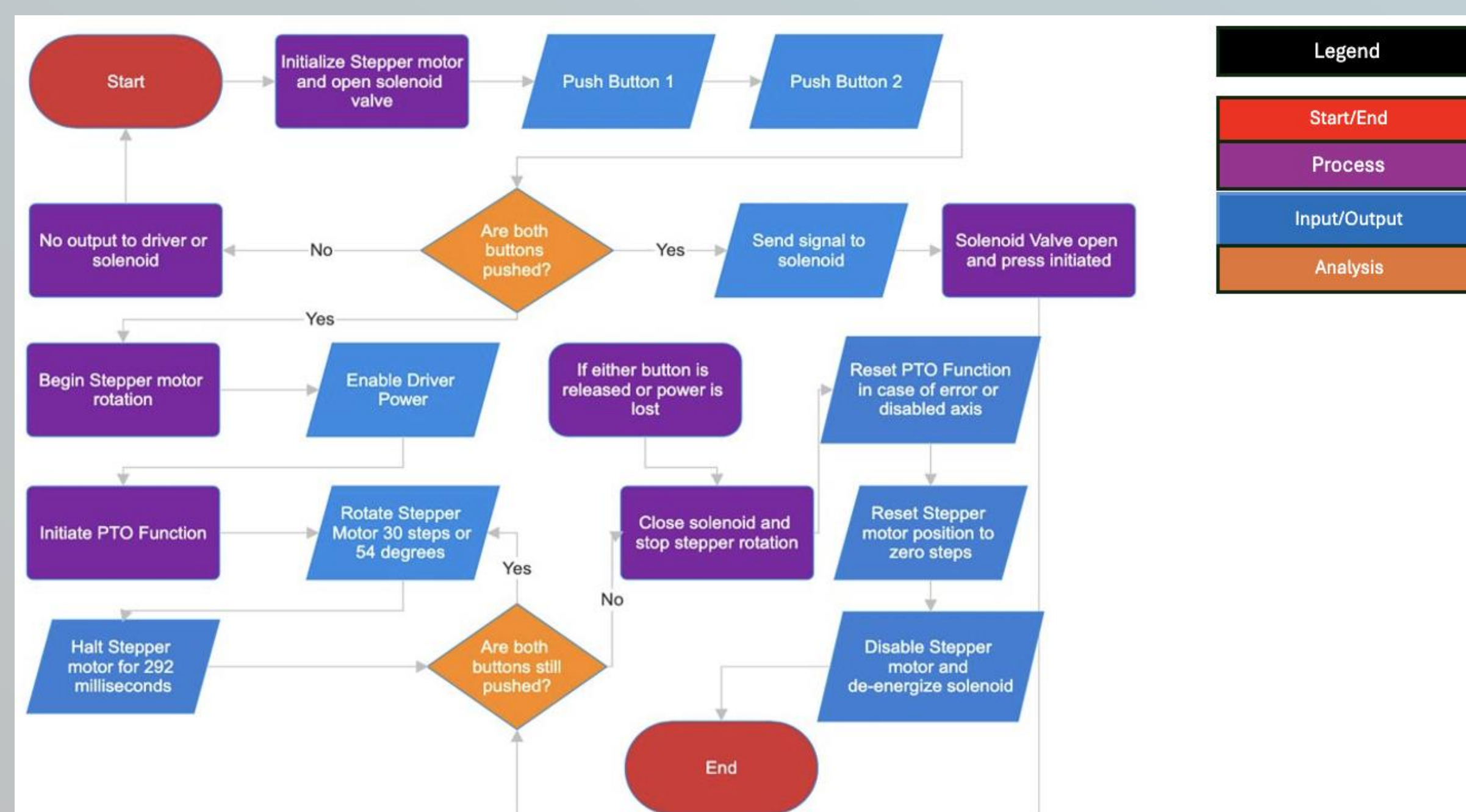
Approximately 2000 incidents per year are associated with manual wire-swaging processes using press machines. Motivated by the concern for operator safety, our engineering team developed a safety-enhancing device aimed at mitigating risks while boosting efficiency. The device allows operators to maintain a safer distance from the press machine by semi-automating wire insertion, alignment, and rotation. By integrating two-button controls, operators can safely rotate the wire while the press is active, reducing the need for manual intervention near the hazardous area. Our goal is to enhance workplace safety and streamline the swaging process, ultimately increasing productivity and output. Through this innovation, we hope to create a safer and more efficient working environment for operators in wire-swaging industries.

Device specifications

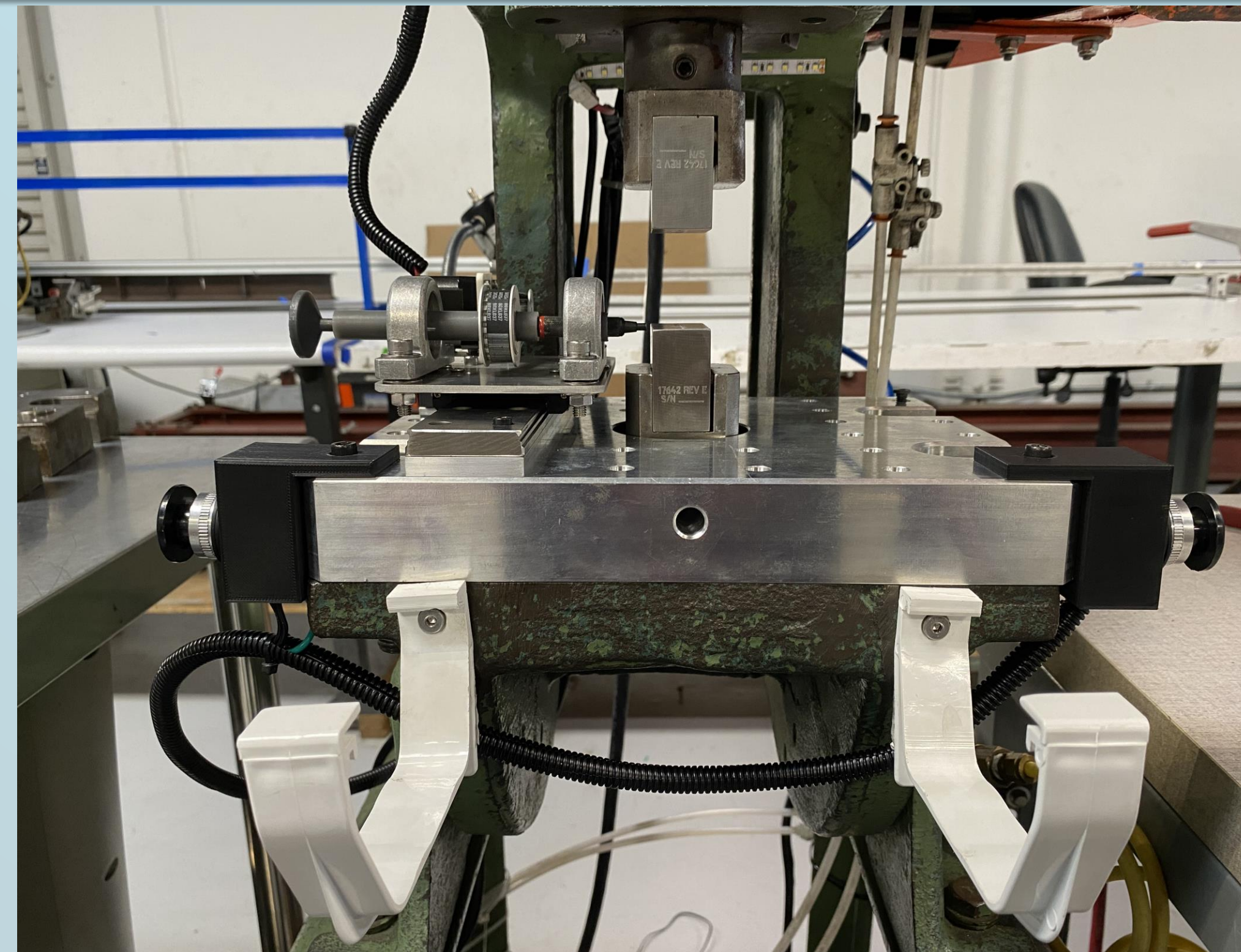
- Grip a wire
- Rotate wire consistently
- Align wire with multiple cavities on a die
- Integrate a two-button activation (dead-man switch)
- Actuate the press

Needs	Description	Target Specifications
Operator Safety	Injury	0
Strength of Bond	Strength	650 (lbf)
Tolerance	Swaged ball diameter	0.189 ± .004 inches
Durability	Number of Cycles	400,000 cycles
Efficiency	Parts per hour	146/hour

Functional Flow Diagram

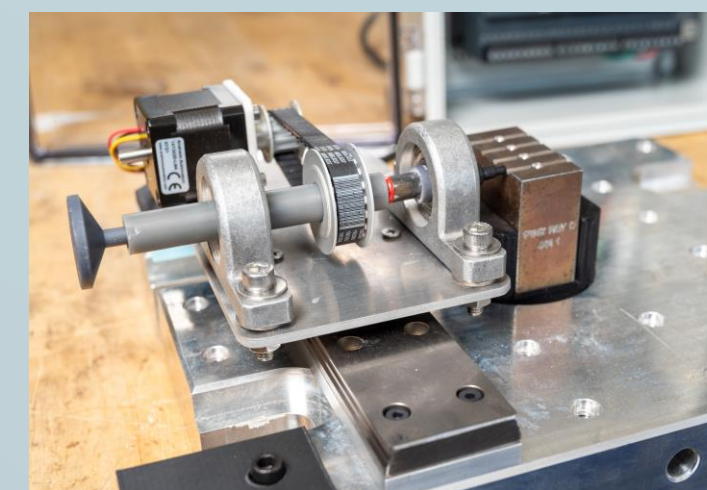


Final Design



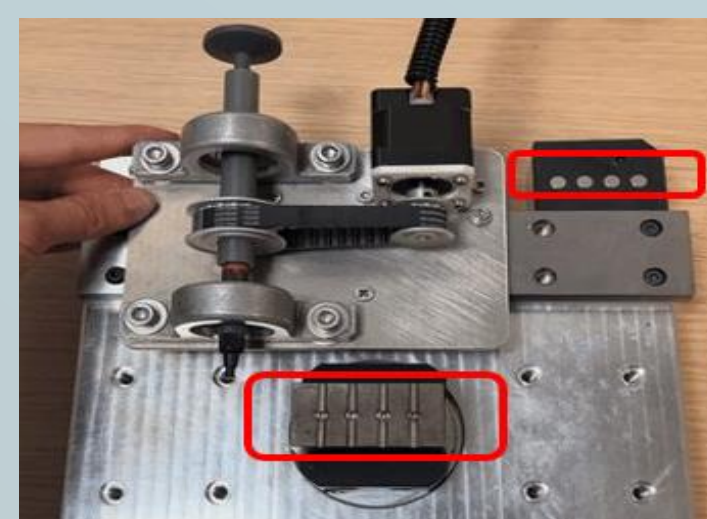
Rotational Gripping device mounted on the press.

Key Components



Spring Loaded Collet System

The system consists of a gripper/collet mechanism for holding the wire, a stepper motor, motor pulley, gripper pulley, timing belt, and two profile-mounted bearings. The gear ratio from the motor to the gripper is 1.8:1.



Alignment System

Four magnets are used to precisely align the device with the die cavities in the press machine. The device is mounted on a low-profile carriage and rail system, allowing it to slide in and out smoothly.



Electronics

- Schneider Electric programmable logic controller (PLC) which controls rotation and timing.
- Two buttons wired in series – begins the process, only if both pressed simultaneously.



Air Control Valve

- Replaced foot pedal (left) with electronic control valve (right)
- Actuates the press to begin swaging

Swaged Wire Tensile Strength Test

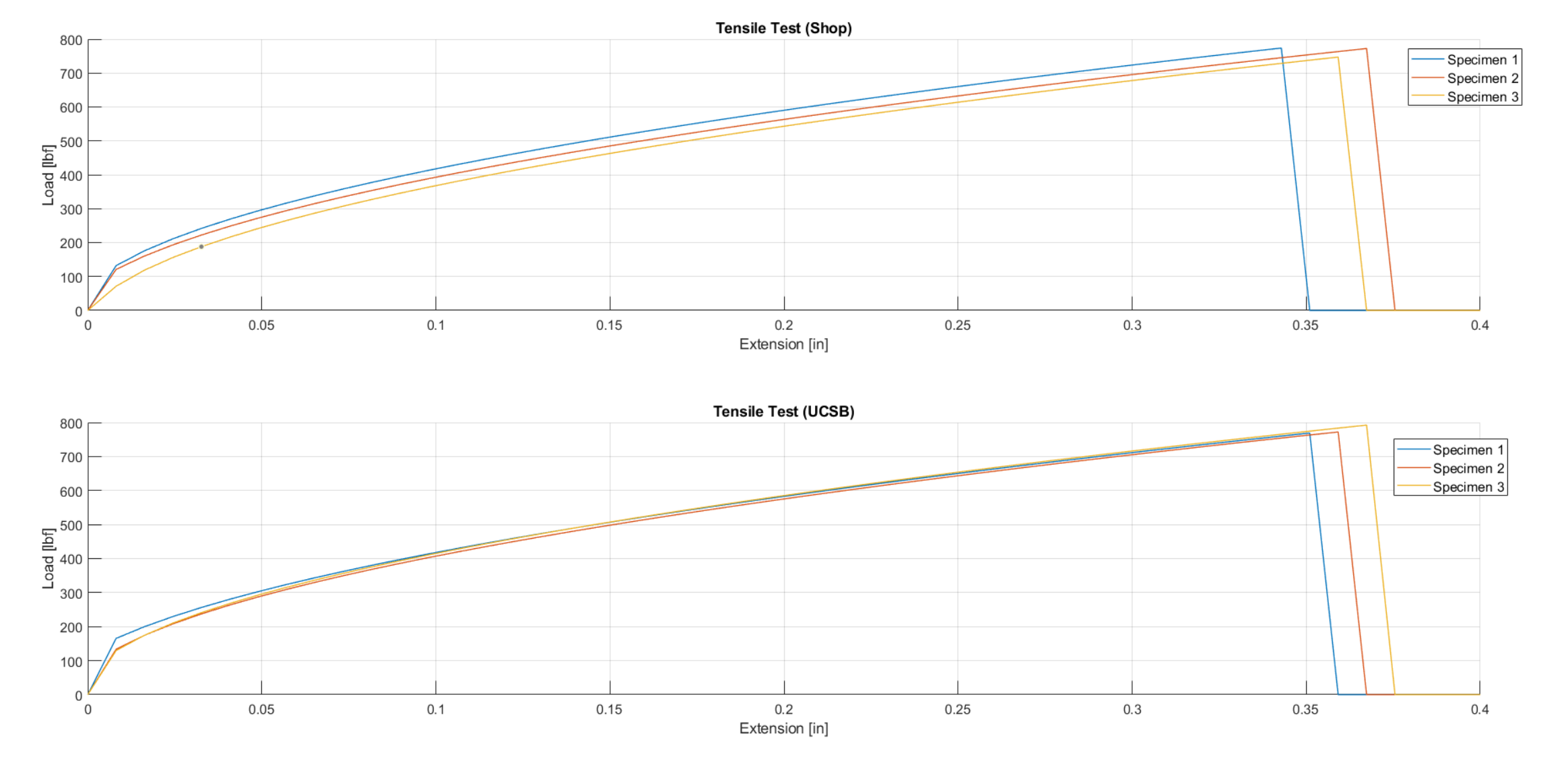
UCSB	Maximum Load (Lbf)	Results
Sample 1	781.155	Pass
Sample 2	778.223	Pass
Sample 3	779.628	Pass
STD. DEV.	1.46637	

Shop	Maximum Load (Lbf)	Results
Sample 1	789.838	Pass
Sample 2	788.292	Pass
Sample 3	795.126	Pass
STD. DEV.	3.58352	

Consistency and effectiveness comparison of the device to check the max load before failure:

- Device passed the threshold for passing (650 lbf)
- Device yielded results with a low standard deviation

Extension Vs. Load Strength Test Comparison Graphs



- Load (lbf) vs. Extension (in)
- Top - Strand Products made swaged samples
- Bottom – UCSB made samples
- A similar slope for UCSB made samples, shows consistency

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