

Motivation, Goal, Impact

Goal:

Enable safer stair use for older adults who rely on standard walkers.

Motivation:

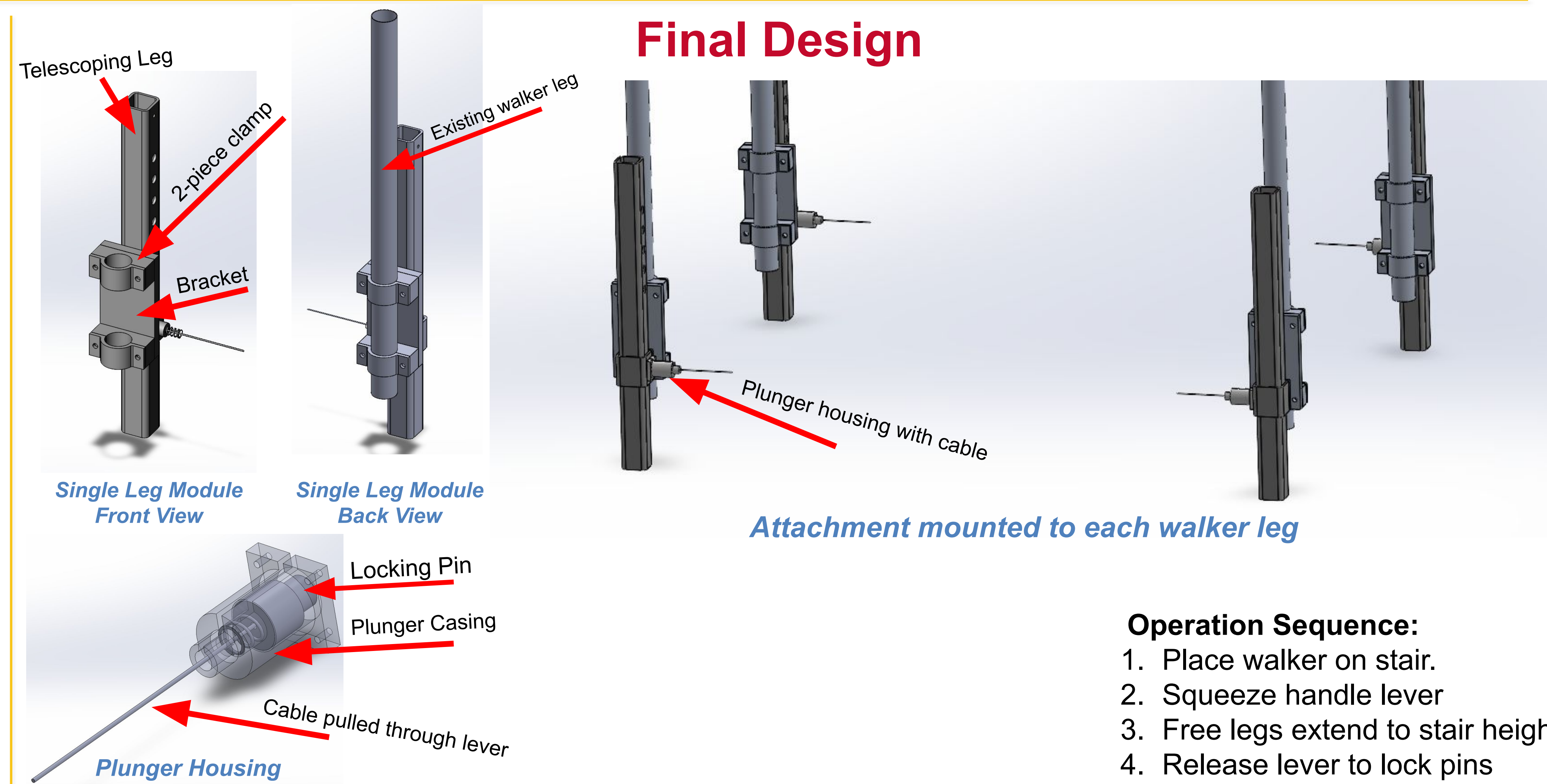
Standard walkers lose stable four-point contact on stairs, increasing tipping risk and forcing users to rely on handrails or assistance.

Impact:

The attachment allows users to keep their existing walker while improving stair accessibility, independence, and confidence.

Requirements

- No reliance on external supports
- Accommodate multiple stair geometries
- Minimal added physical and cognitive demand
- Able to attach to most variants of walkers
- Withstand the weight and forces of the user



Operation Sequence:

1. Place walker on stair.
2. Squeeze handle lever
3. Free legs extend to stair height
4. Release lever to lock pins

Design Calculations & Decisions

Bracket Design

- Reduced mounting distance to improve factor of safety

Cable-Actuated Locking Design

- Implemented a double pull brake cable for simultaneous pin actuation
- Spring Selection: Minimize actuation force and compression force.

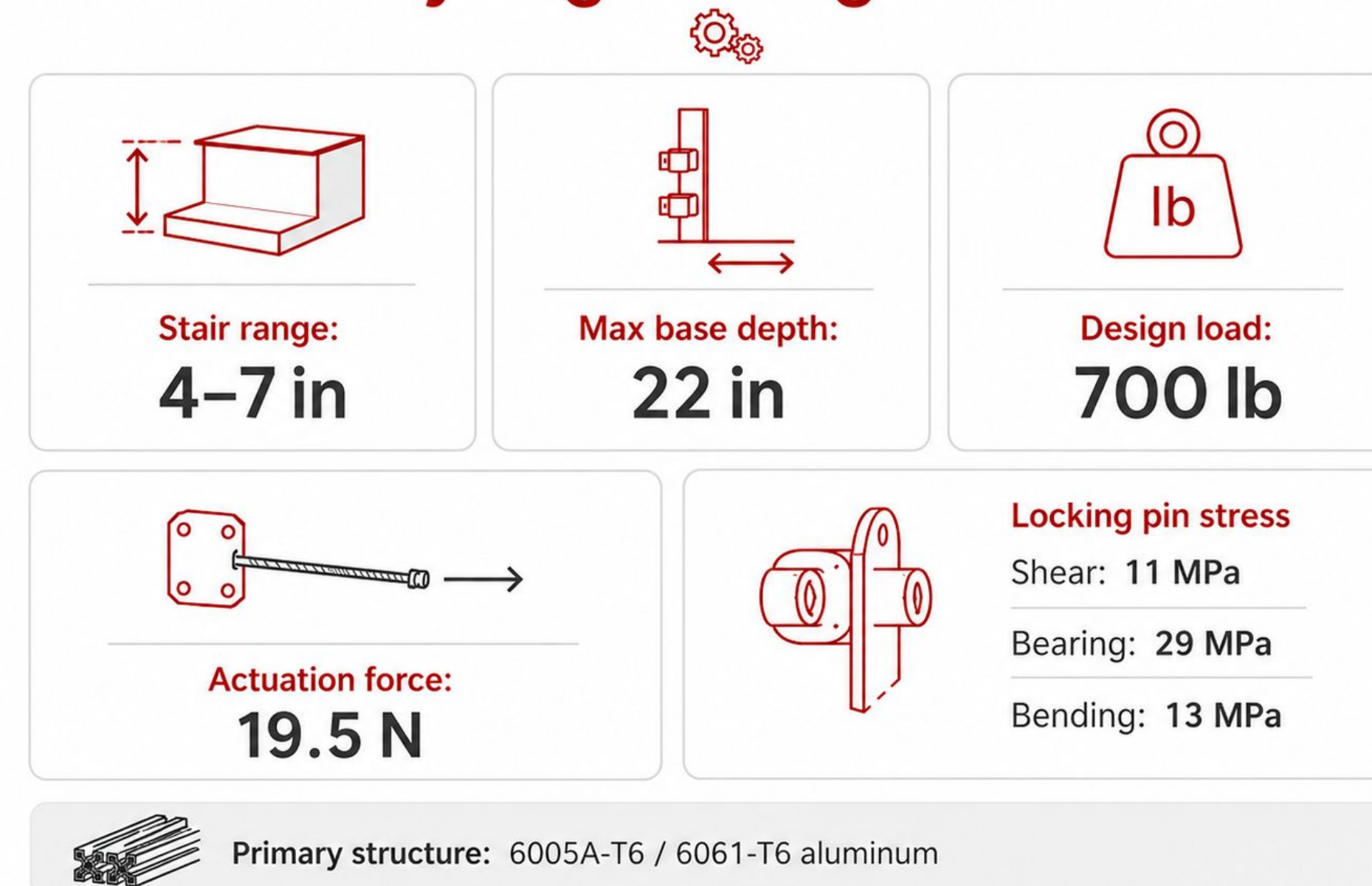
Extension Leg Design

- Square profile to maintain pin alignment
- Avoided buckling; Bending governs max stress ≈ 79.4 MPa

Locking Pin Design

- Bearing stress at the pin-tube interface is the governing failure mode

Key Engineering Results



Prototype & Test Results



Product in use attached to the walker.



Close up of the prototype with all subassemblies in use.

Initial Results

- Extendable leg remains level with the environment
- Pin actuation works well against shear forces