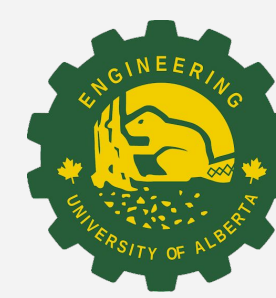


Design of Walker Prototype



MEC E 460
Fall 2025

Flow Motion Inc.
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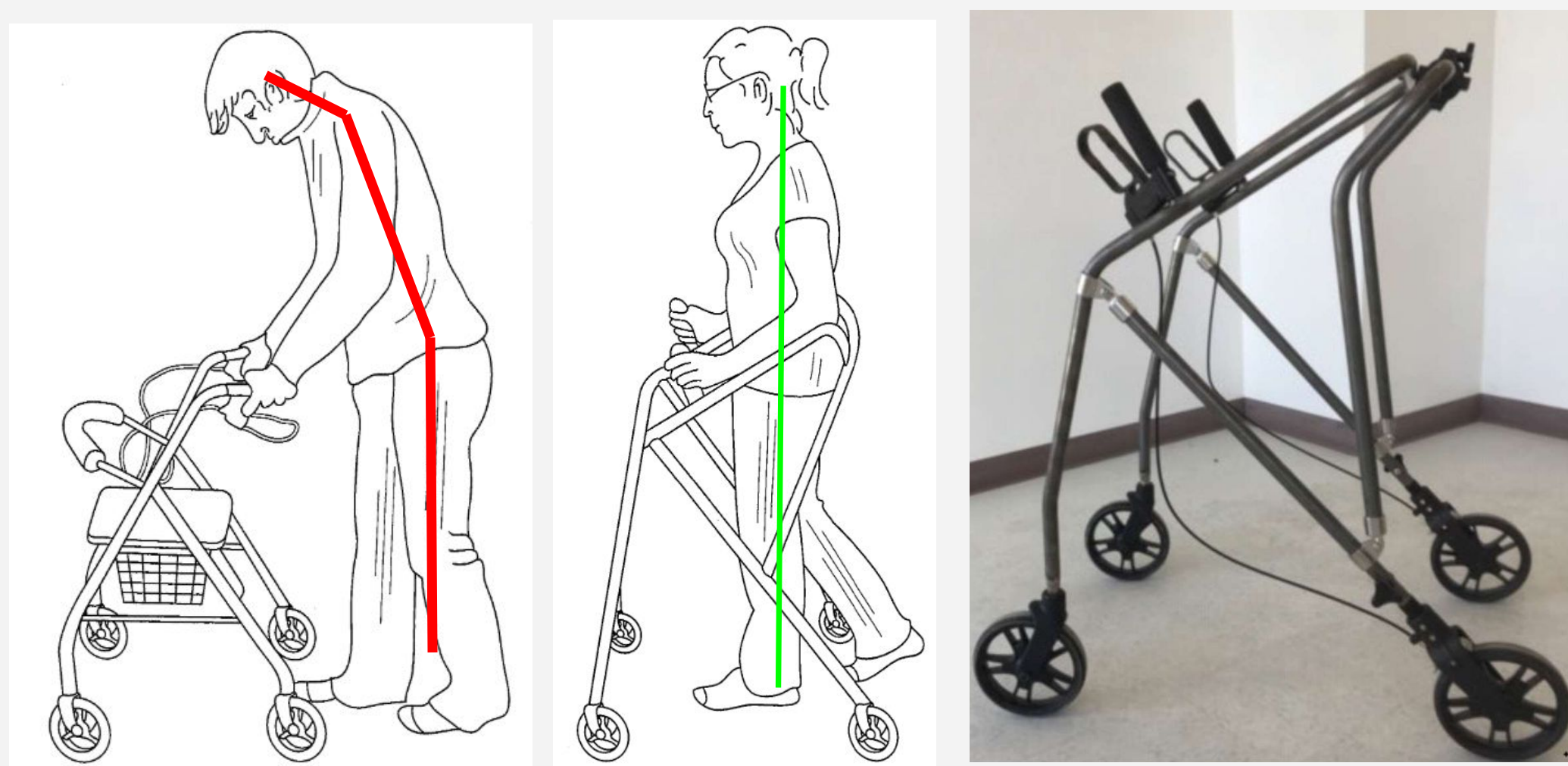
Client: Dr. Flo Slomp
Advisor: Dr. Lauren Welte

Background

Project Motivation

Traditional walker designs do not align with optimal ergonomic and biomechanical function. They restrict the user's natural stride, encourage a forward-lean posture that creates undue strain on the wrists and back, and reinforce negative stigmas as users are seen behind the walker, emphasizing disability over independence.

Our client, Dr. Flo Slomp, reimagined traditional walker design and developed an open-faced concept that addresses the major biomechanical limitations of traditional walkers, however, the early prototypes require further engineering development to reach a fully functional, user-friendly design.



Design Objectives

Problem Definition

Improve the current open-faced design by implementing a user-friendly collapsing mechanism, height adjustable wheel assemblies, an integrated seat and backrest, a smaller collapsed configuration, and an IV pole attachment.

Key Specifications

Maximum load capacity, stability, frame material, wheels, and brakes

Engineering Analysis

FEA: 7075-T6 Aluminum has an infinite fatigue strength of 23ksi, and a yield strength of 70 ksi. The FEA shows that all stresses are safe from fatigue under normal conditions, and this implies a minimum factor of 3.5 against yielding, providing sufficient strength to safely handle extremes such as falls and slips.

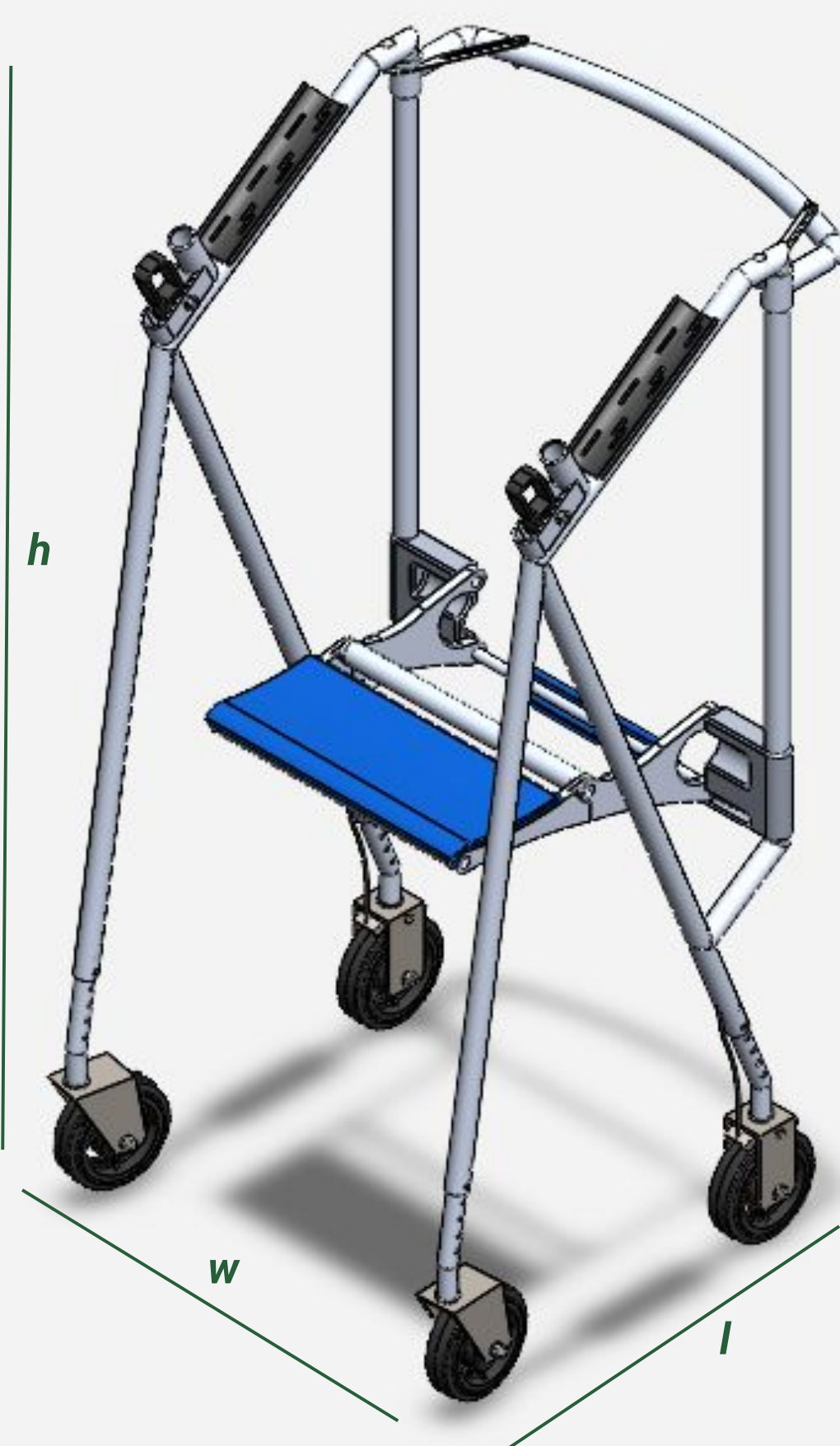
Tipping Angles: Forward, backward, and sideways tipping was analyzed to ensure that the ISO standards were met.

Static Loads and Stresses: Each of the components in the walker frame were simplified into beams. Axial force and stress, shear force and stress as well as moments and bending stress were calculated to identify failure points.

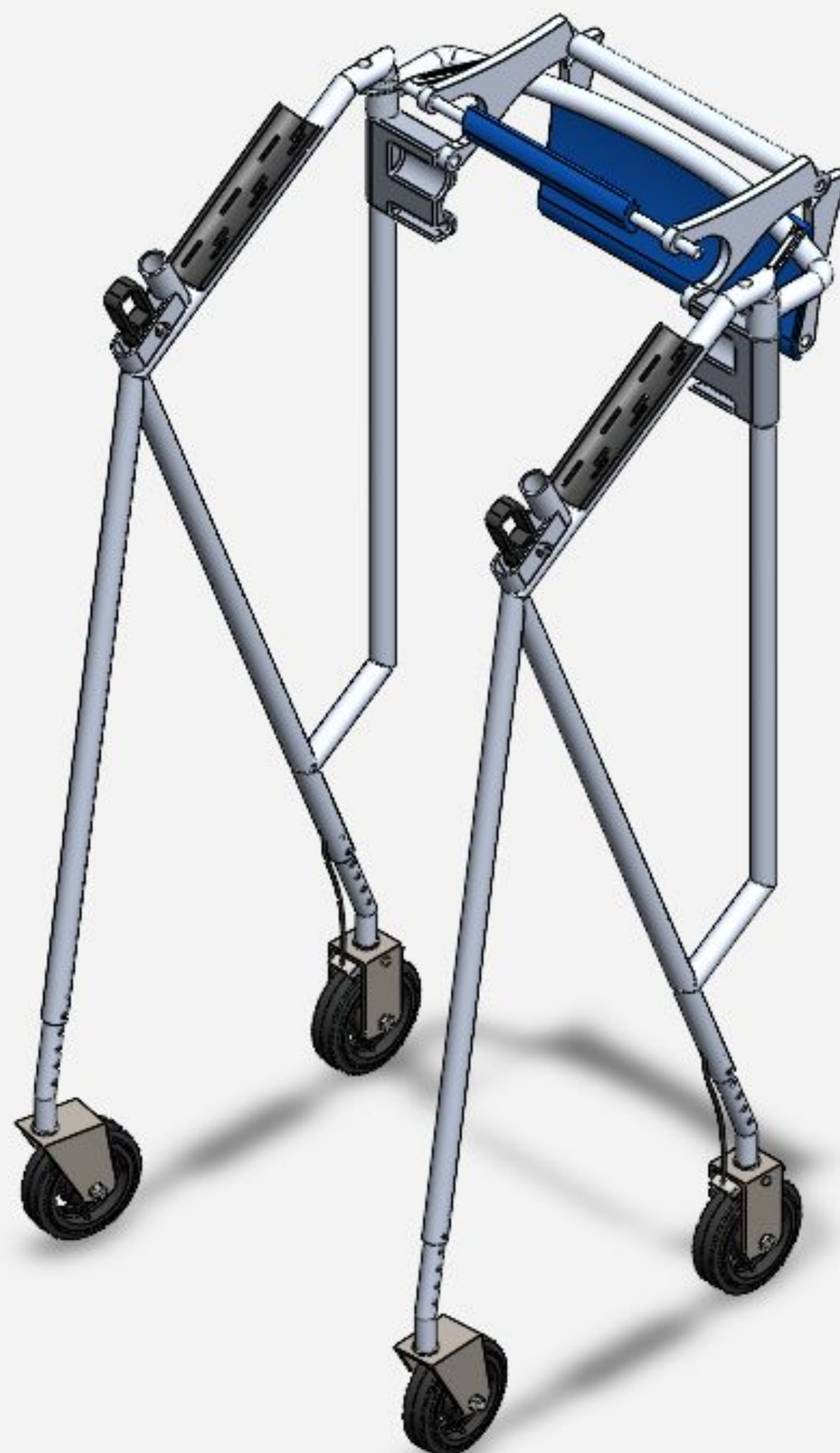
Seat and Backrest: Each seat arm can handle the rated load of 100 kg with a safety factor of 7 against yield. The friction based height system won't allow the seat to slip even if the rails were lubricated, let alone dry or in the rain.

Solution and Design Features

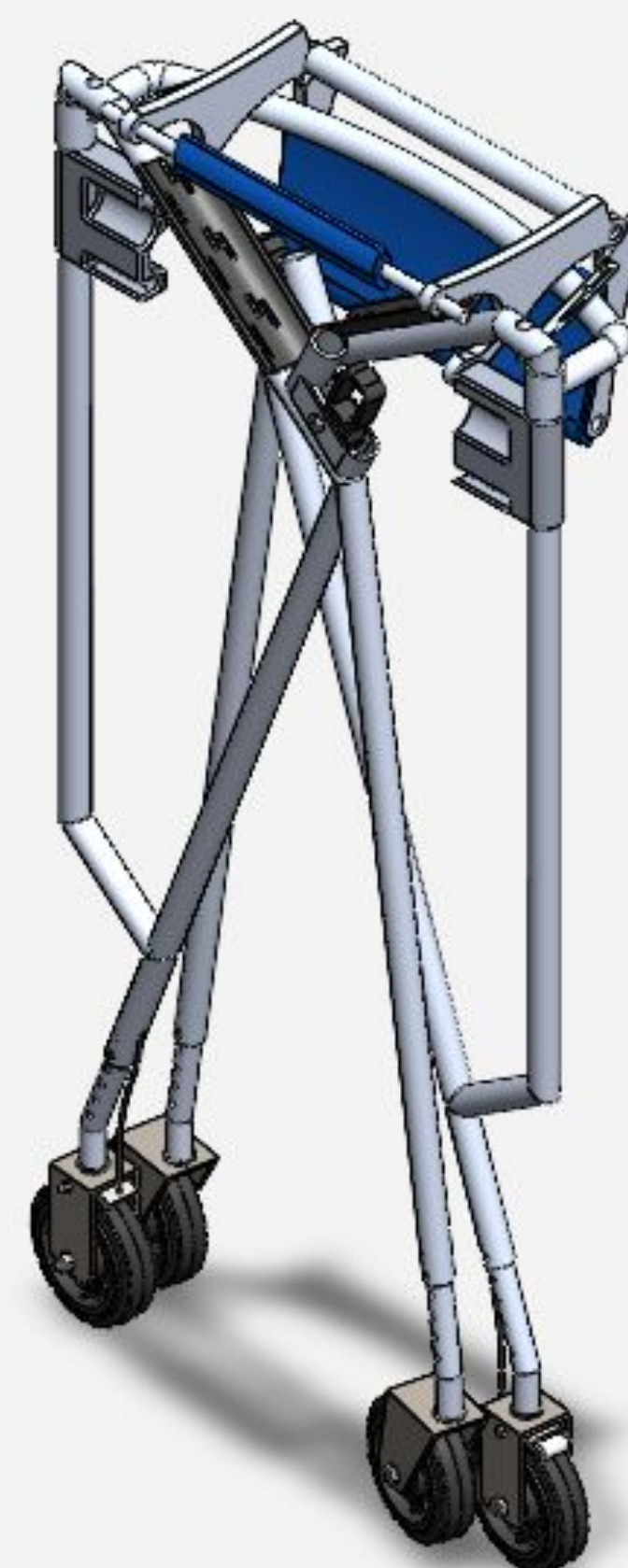
Seated Position



Standing Position (Open)

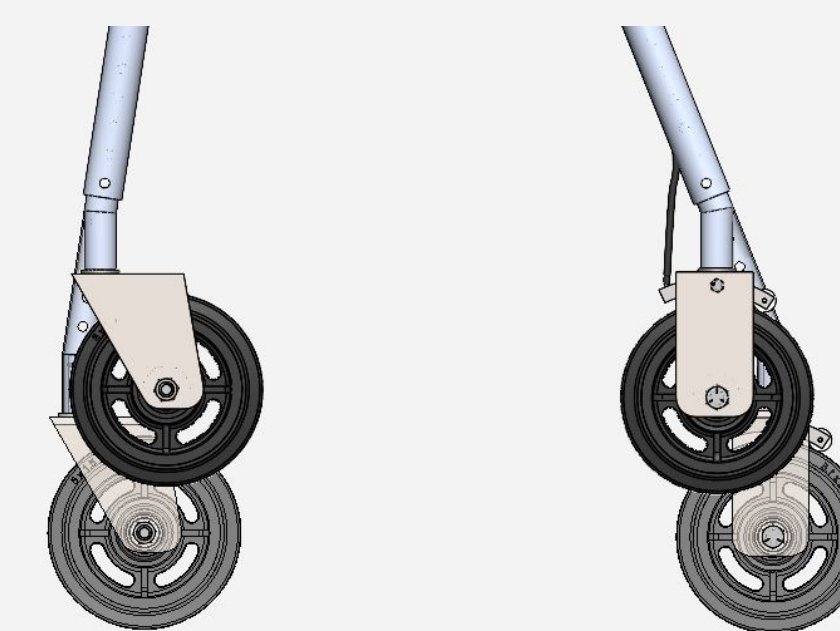
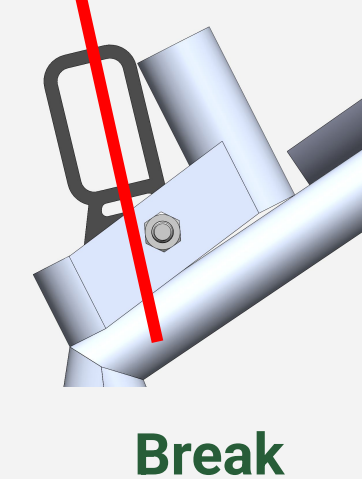
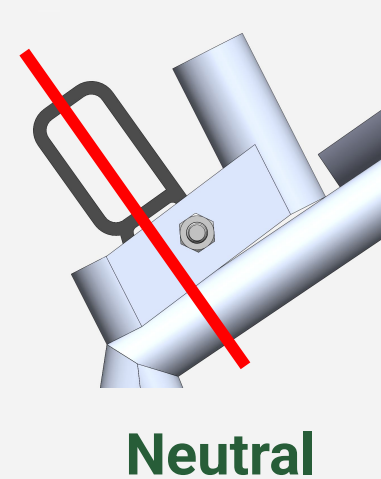
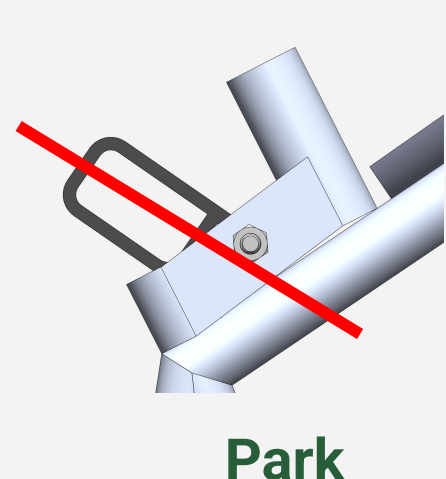


Folded Position (Collapsed)



Design Comparison

Features	Institutional Model	Tri-fold Design
Seat	No seat included	Height adjustable from 50 - 60 cm
Maximum Collapsed Length	140 cm	100 cm
Walker Weight	≈12 kg	10 kg
Height Adjustable Wheels	✗	✓



Wheels: 6 different height adjustments (20 cm difference)

	<i>l</i> - Length (m)	<i>w</i> - Width (m)	<i>h</i> - Height (m)
Open	0.64	0.61	1.23
Collapsed	0.28	0.61	1.00