Next Generation Alevo Elderly Walker

Ashley Howell | ah894 | R1.0 | 24 NOV 2020

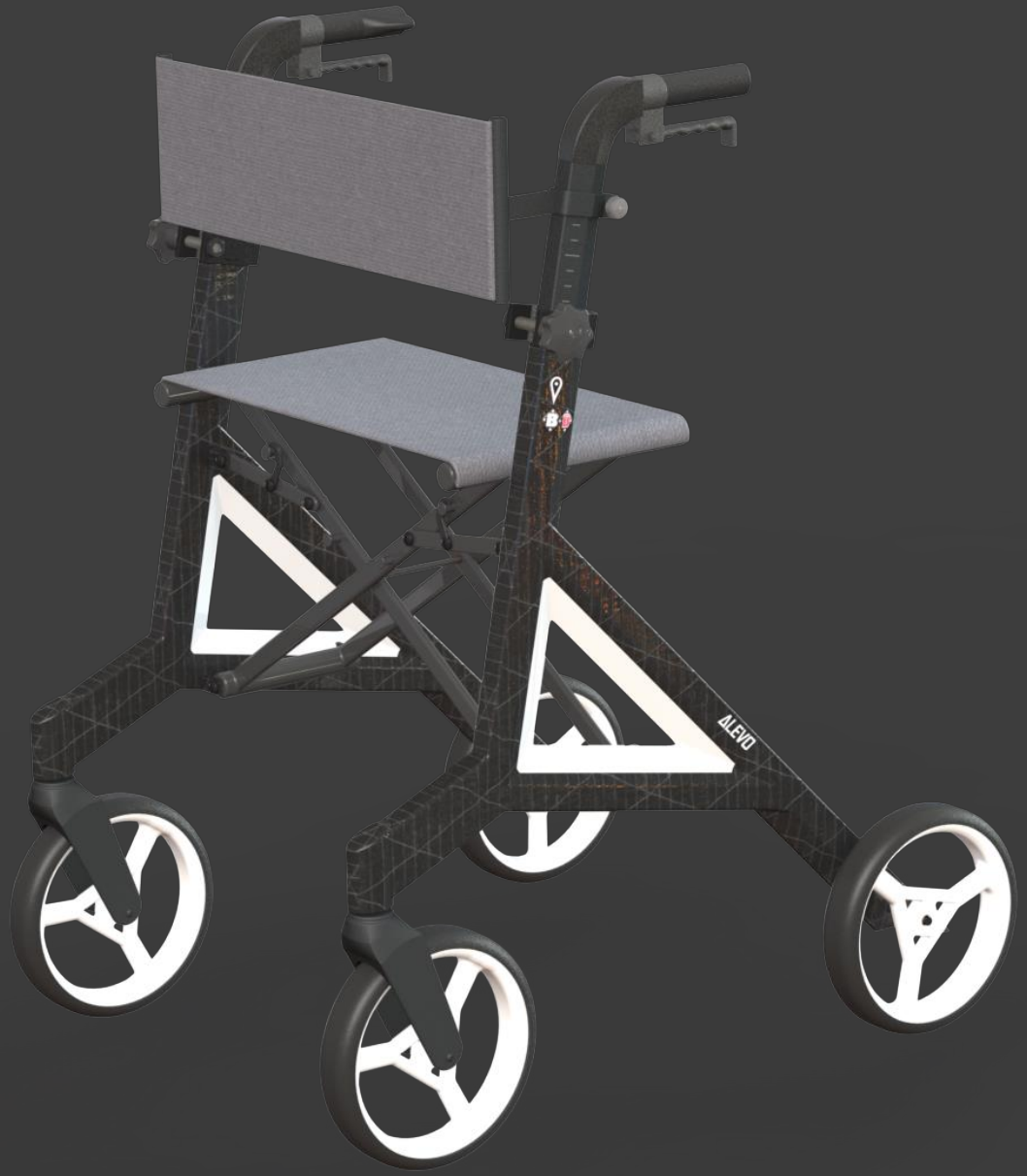
M2 Project Materials Submission, MeEn 272

This document provides the following design artifacts for the Alevo Elderly Walker assembly:

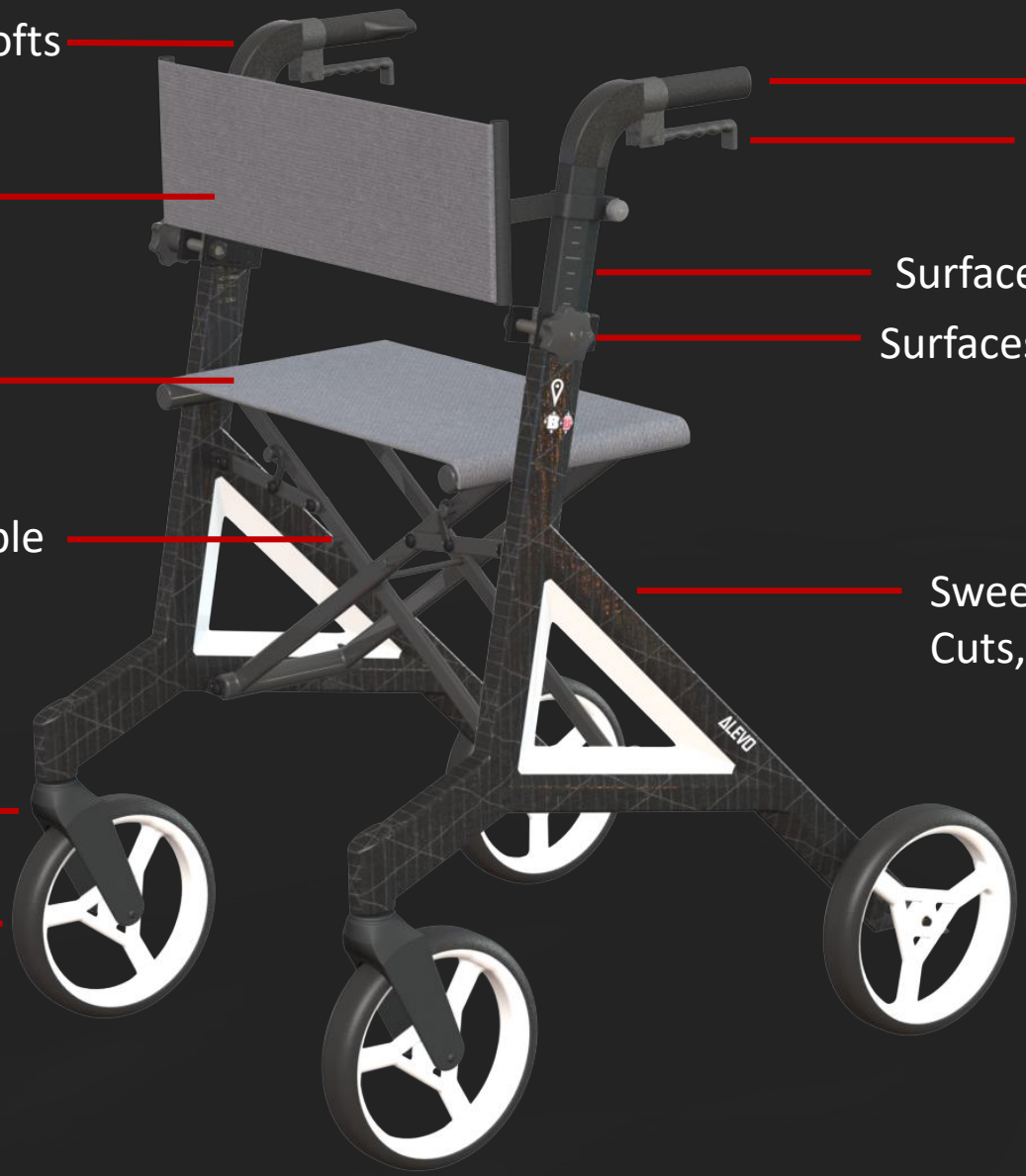
1. Title page with rendering of final assembly
2. Full page non-annotated rendering of final assembly
3. Full page photo illustration of benchmark and next generation walker
4. Full page annotated rendering showing method for making parts
5. Full page annotated exploded rendering showing names of subassemblies
6. Annotated exploded renderings showing names of parts
7. One page of conceptual sketches
8. Renders showing closing capabilities
9. CAD strategies
10. Articulation of why the new design is justifiably next generation
11. Articulation of analyses and results
12. Assembly Drawings of the assembly
13. Engineering Drawings

Revision History

Revision	Date	Description
R1.0	24 Nov 2020	Initial Release


ALEVO


Ergonomic brake handles
Larger, elastic seat and backrest
Infinite height adjustment + markings
GPS tracker
Sharper design
Reflective wheels



Surfaces, Master Model, Lofts

Surfaces, Master Model

Surfaces, Master Model

Solid Extrusions, Cuts, Design Table

Solid Extrusions, Lofts, Cuts

Solid Extrusions, Cuts, Patterns, Design Table, Threads

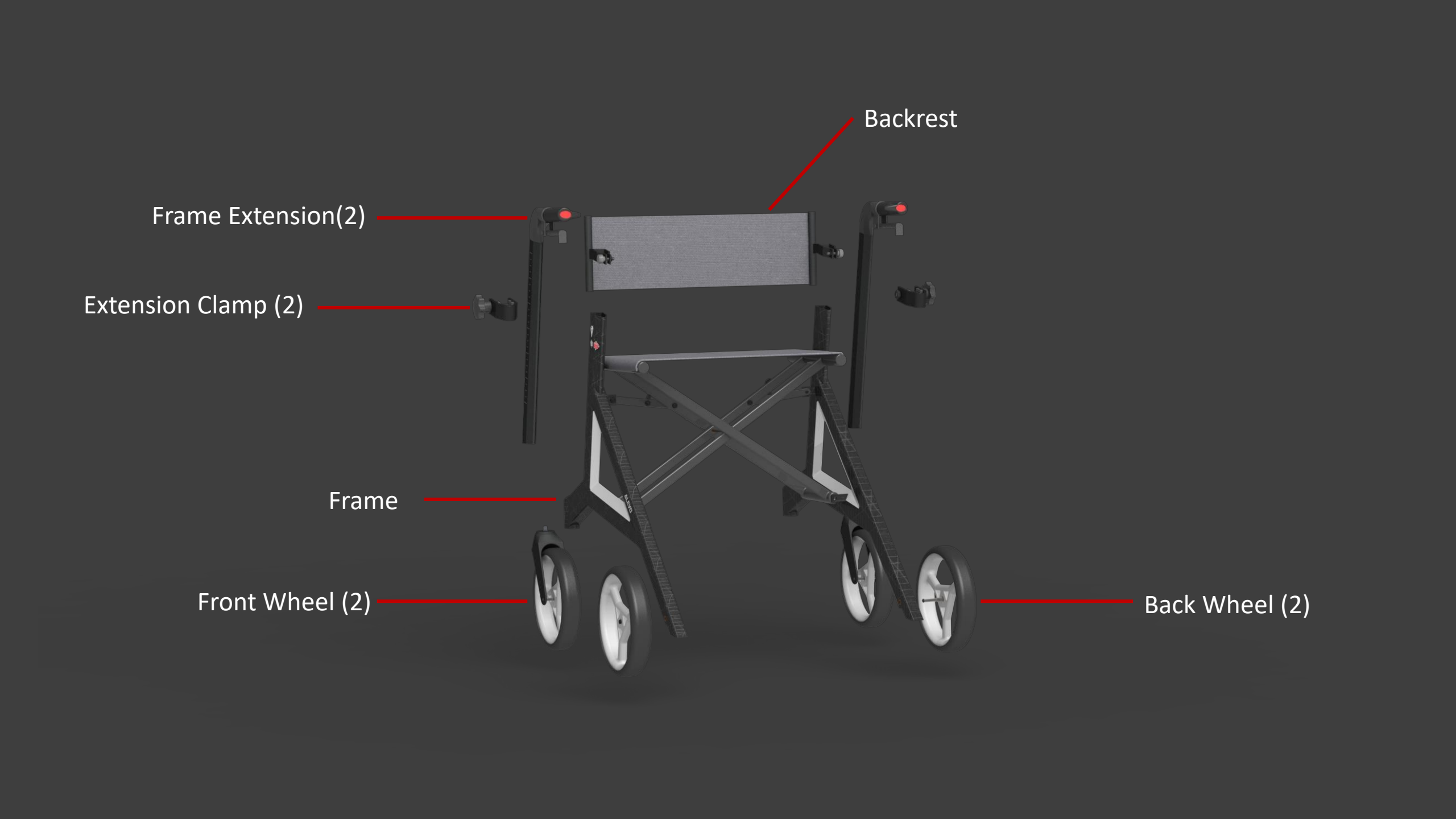
Solid Extrusions, Lofts

Lofts

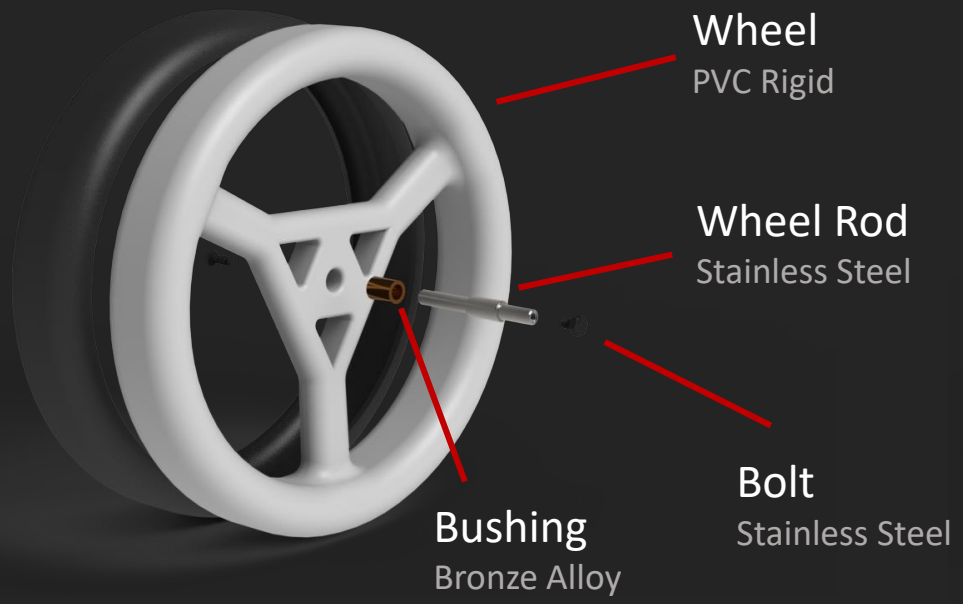
Surfaces, Master Model, Cuts, Patterns

Surfaces, Master Model

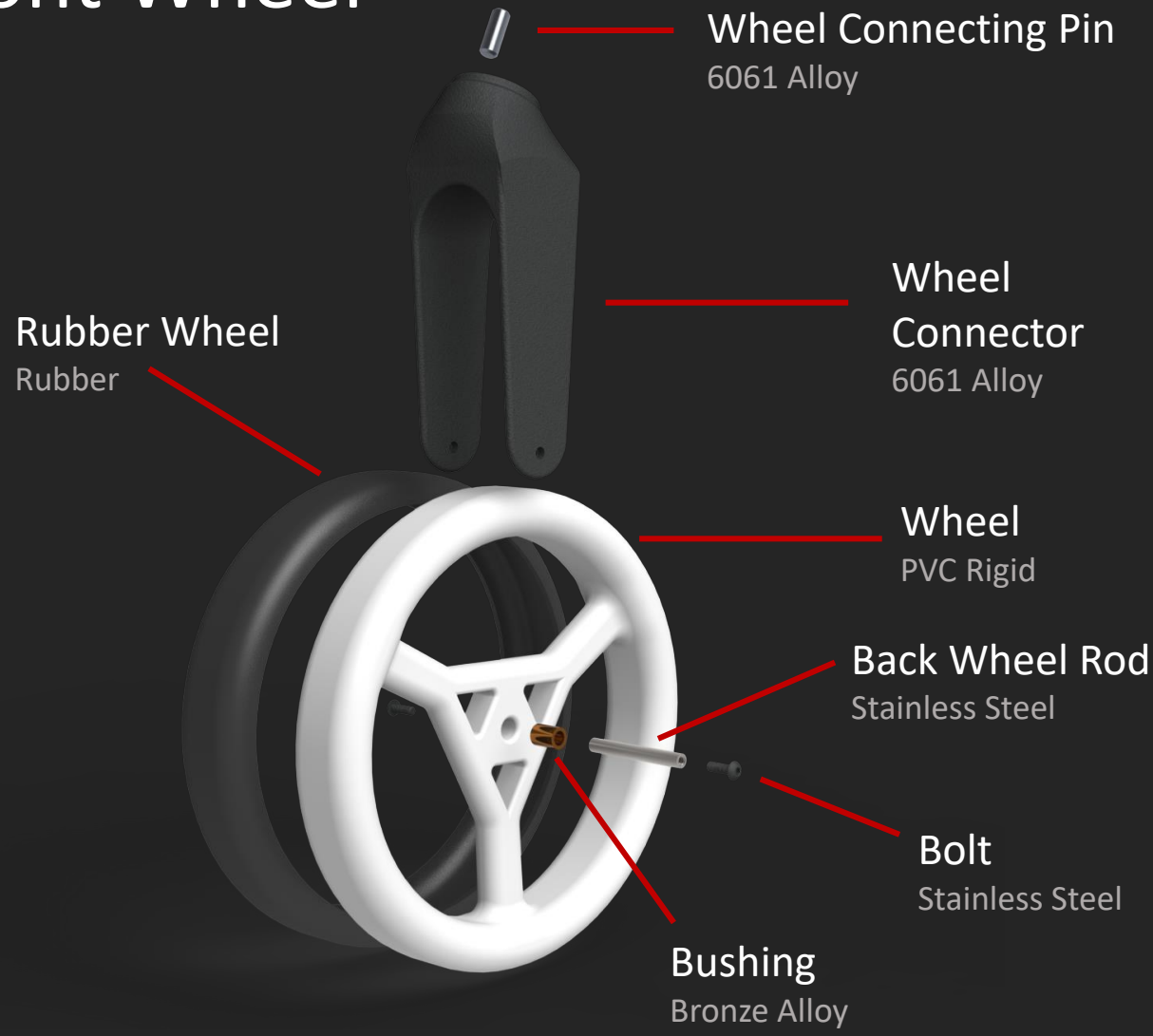
Sweeps, Solid Extrusions, Surfaces, Cuts, Design Table, Decals


Backrest
Frame Extension(2)
Extension Clamp (2)
Frame
Front Wheel (2)
Back Wheel (2)

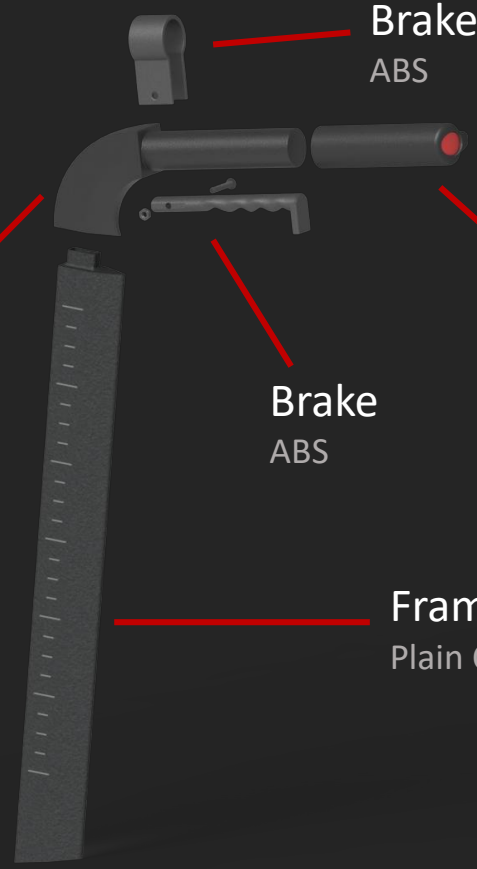
Back Wheel



Front Wheel



Frame Extension



Brake Connection
ABS

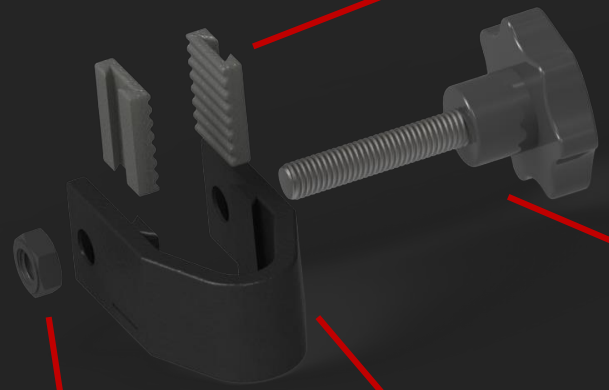
Handle Connection
6061 Alloy

Brake
ABS

Rubber Handle
Rubber

Frame Extension
Plain Carbon Steel

Frame Extension Clamp



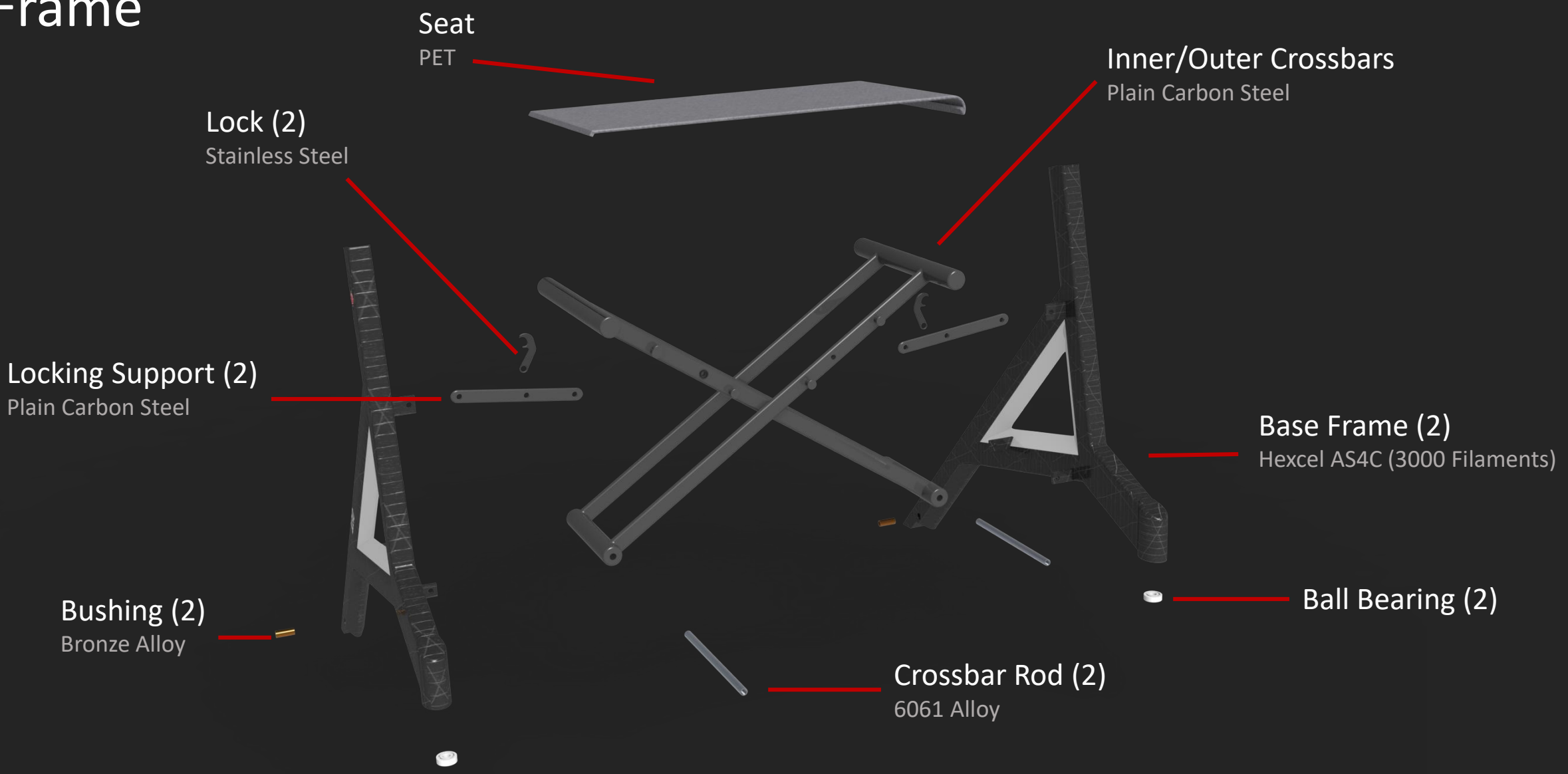
Rubber Stopper
Rubber

Knob/Bolt
ABS/Steel

Nut
ABS

Rubber Stopper Clamp
ABS

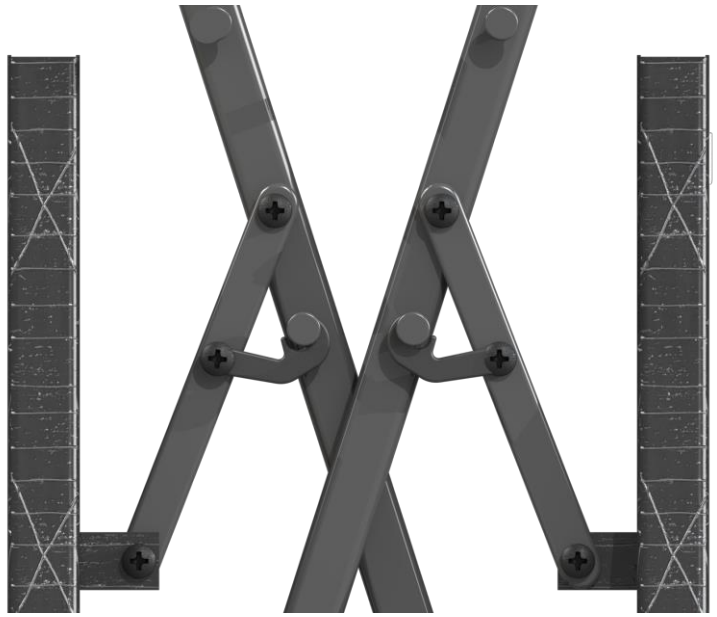
Frame



*Nuts and bolts not shown to improve clarity

Closed Frame

Locking Mechanism Close Up



*Seat and backrest hidden for clarity

Next Generation Justification

The benchmark design is the Alevo Elderly Walker developed by Bischoff & Bischoff and designed by the Porsche Design Studio to be a high-end elderly walker. On average, it earned between 4 and 4.5 stars on e-commerce sites. Improvements were made based on consumer reviews and assumptions.

Features for improvement based on consumer reviews:

1. Enlarge the backrest and make more comfortable
2. Increase the height range of the handles

Features assumed needing improvement:

3. Multiple width settings
4. Optional GPS tracking in case of lost or missing walker (or user)
5. Sharper, cleaner design
6. Ergonomic brake handles

The next generation design accounts for items 1-2 and 4-6, all of which shown in the side by side illustration of the benchmark and next generation product shown below.

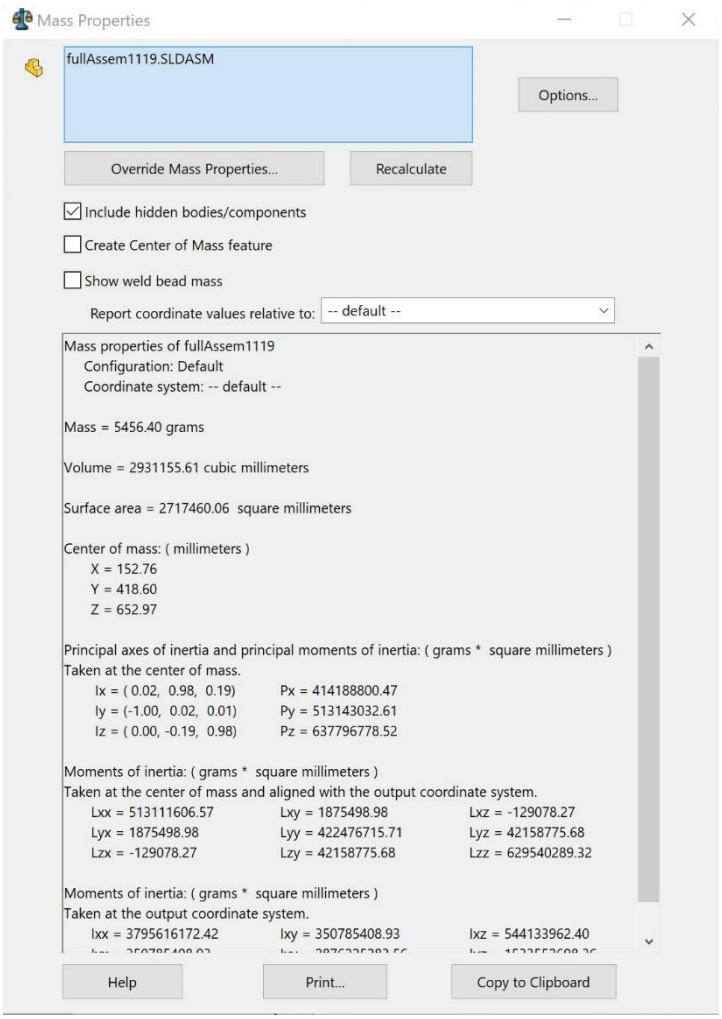
The next generation design maintains the iconic features seen in the original, namely:

- Lightweight (under 13 lb) carbon fiber frame
- Iconic Porsche Design Studio's compact triangular shapes
- Integrated reflectors on the sides
- Ergonomic handle grips
- Bischoff & Bischoff logo and "ALEVO" marker placement on the frame

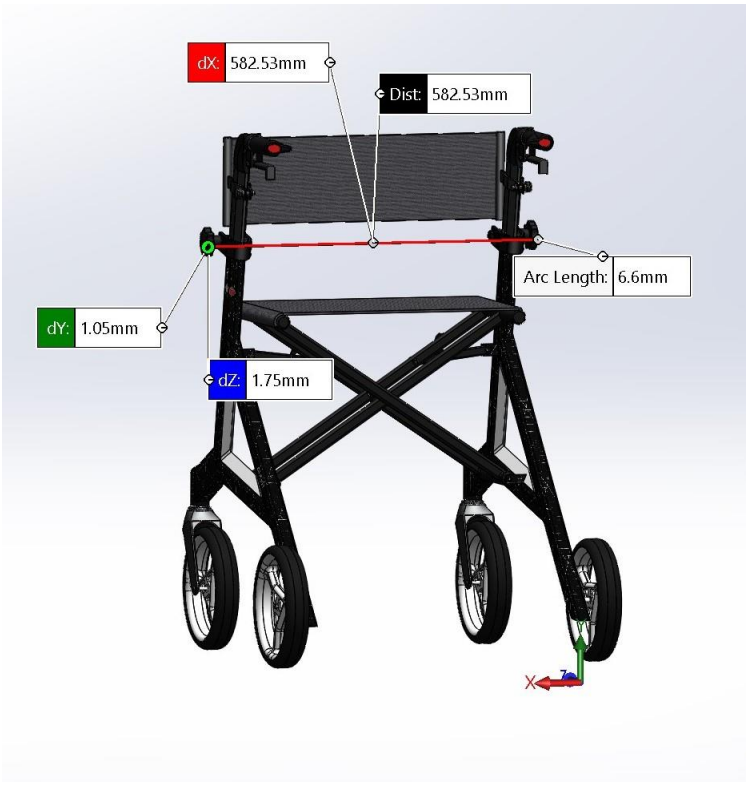
Summary of Analyses Performed

To ensure a quality product was being designed, several performance evaluations were conducted throughout the modeling process and corrections were made accordingly. The following tests were performed:

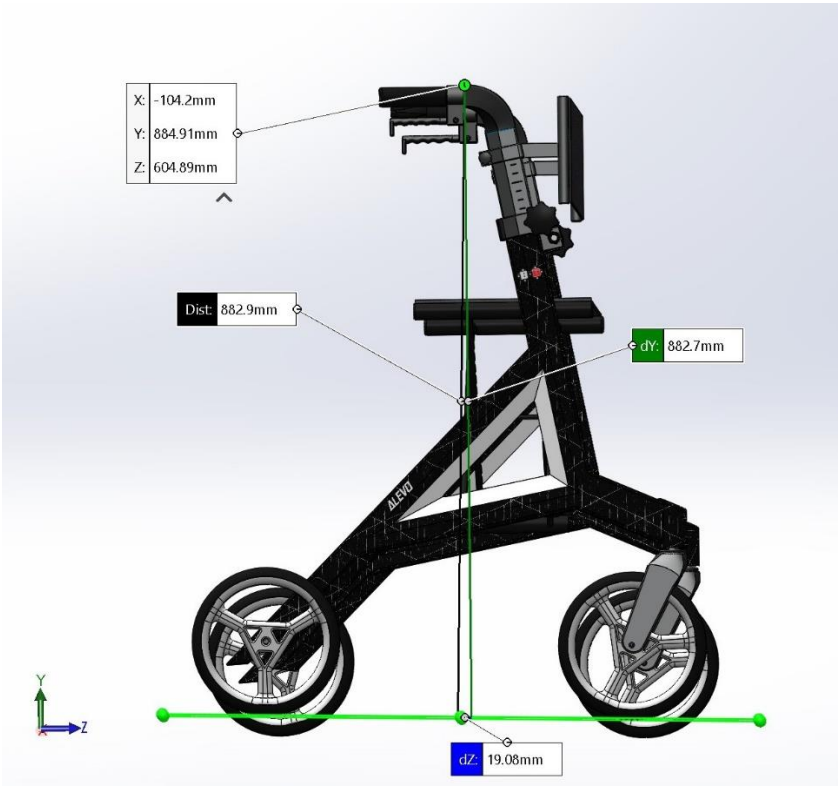
- Mass properties for each part
    - All had assigned material and realistic mass/volume
- Mass of total assembly
    - Weight was 12.03 lbs; Benchmark was 13lbs
- Width of product
    - Distance was 582.53 mm; Benchmark was 635mm
- Height of product
    - Height in shown configuration was 882.9 mm; Benchmark was 810-960mm
        - Interference detection analysis on complete assembly



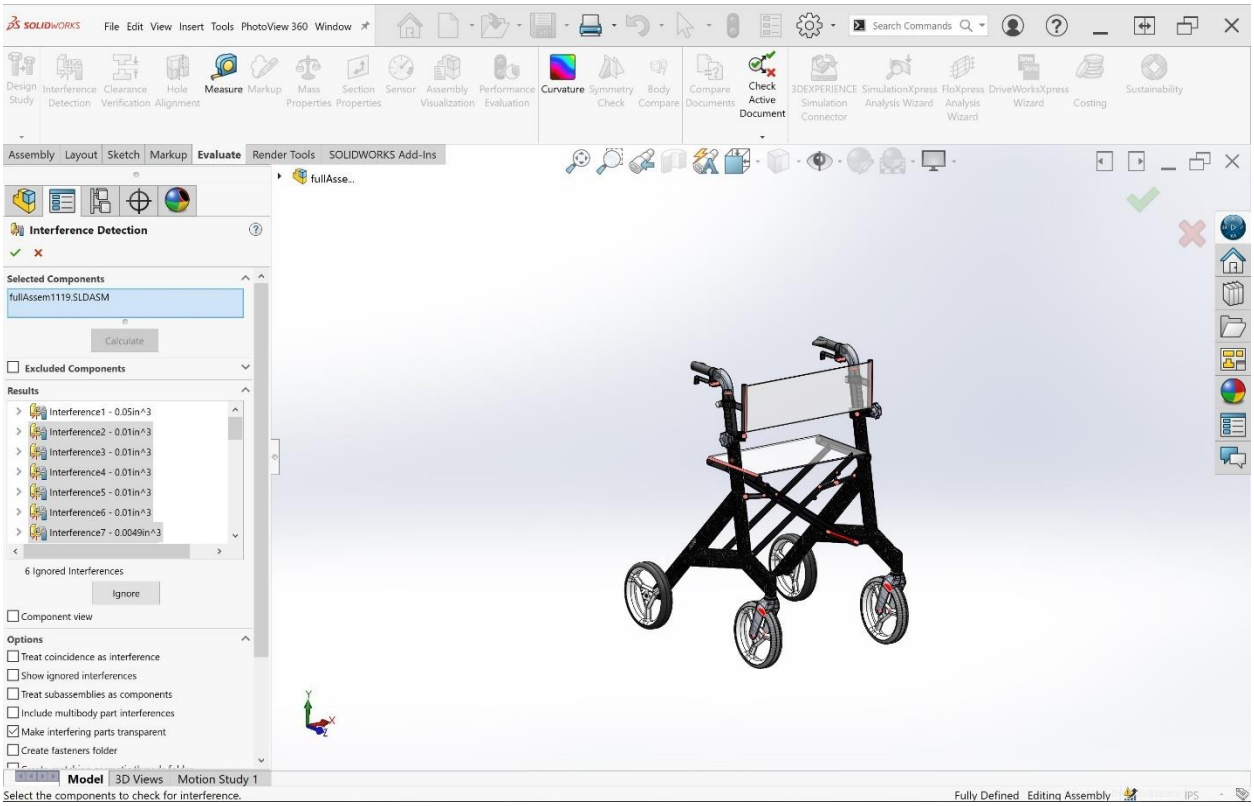
Mass Properties of Full Assembly (5456.4g -> 12.03 lbs)



Width of Walker



Height of Walker



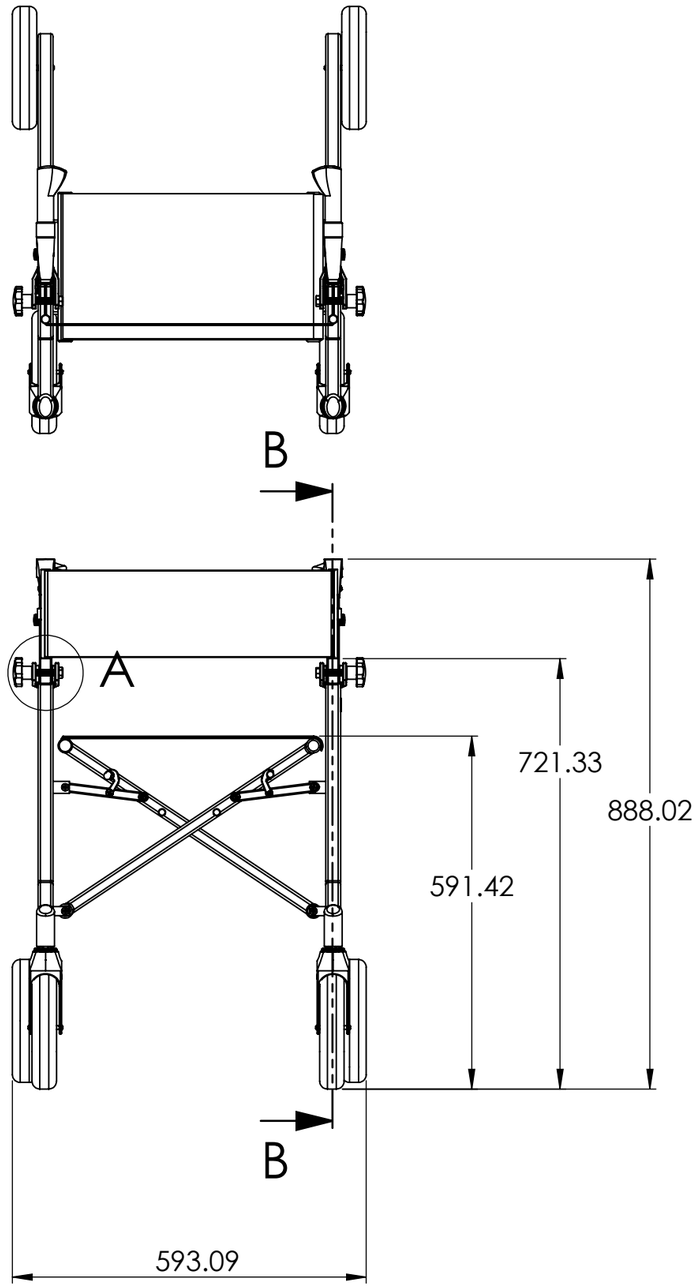
Interference Detection

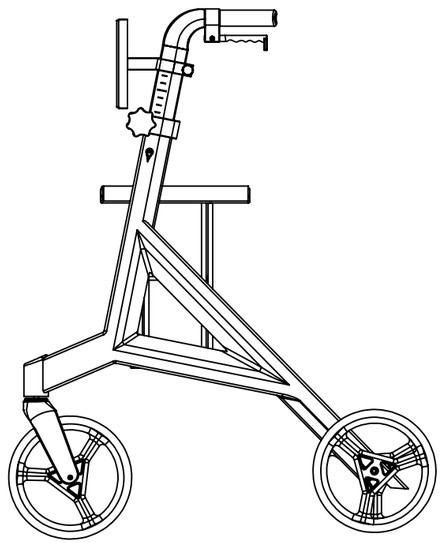
Small interferences between the threads on nuts and bolts, and between the seat/backrest and their respective connectors. There should be large interferences between the rubber handles and the handle connections and between the wheels and their rubber coverings, but as the program crashed each time trying to compute it, tolerances for these fits were removed and should be added on the engineering drawings.

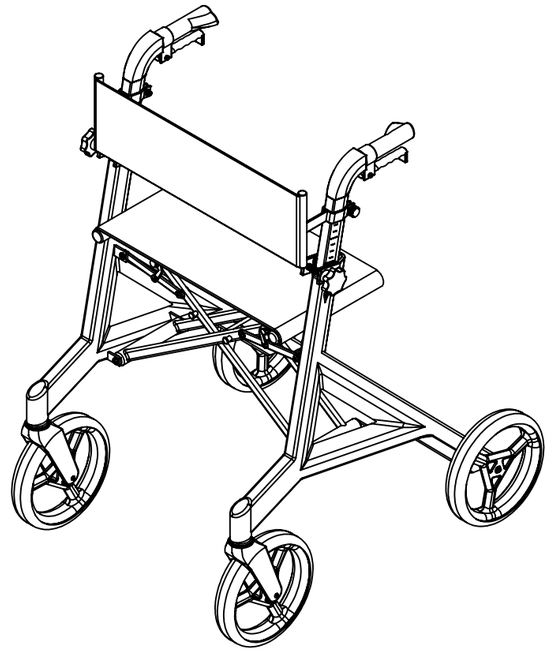
ACTUAL PROBLEM

The rubber of the front wheels interferes with the wheel connectors. The connectors (both the casing and the spacing for the wheel) should be widened to resolve this problem.

REVISIONS		
REV.	DESCRIPTION	DATE
1	INITIAL RELEASE	2020 NOV 23







UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	R. P. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	SEE PART DRAWINGS	
FINISH	VARIOUS	

COMMENTS
WEIGHT IN POUNDS IS 12.02 LBS

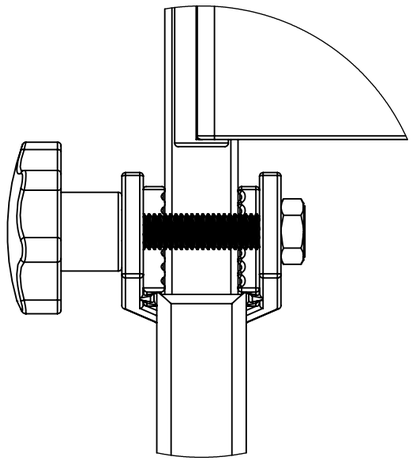
BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

TITLE:
ALEVO ELDERLY WALKER

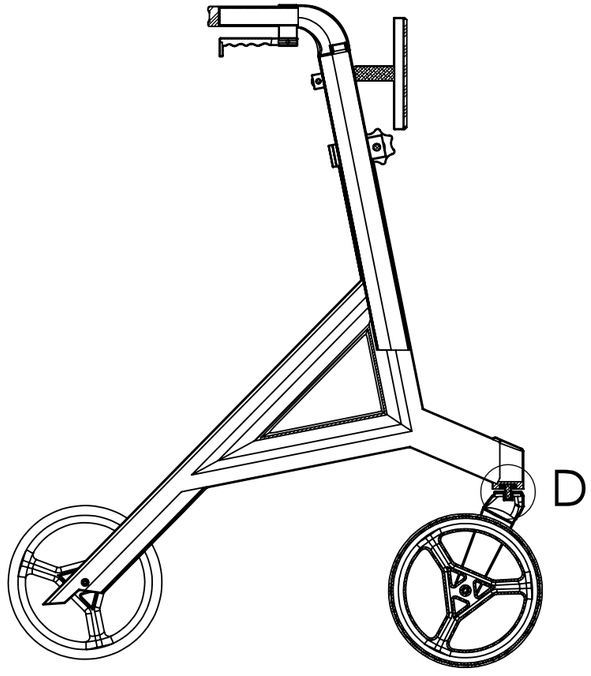
SIZE	DWG. FILE	REV
B	FULLASSEM1119R	1

SCALE: 1:10 | WEIGHT: 5451.83 | SHEET 1 OF 3

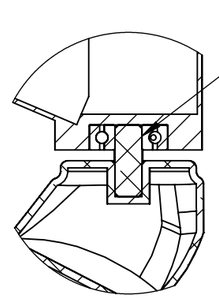
SOLIDWORKS Educational Product. For Instructional Use Only.



DETAIL A
SCALE 3 : 5



SECTION B-B
SCALE 1 : 8



DETAIL D
SCALE 3 : 5

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	R. P. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	SEE PART DRAWINGS	
FINISH	VARIOUS	

COMMENTS
WEIGHT IN POUNDS IS 12.02 LBS

BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

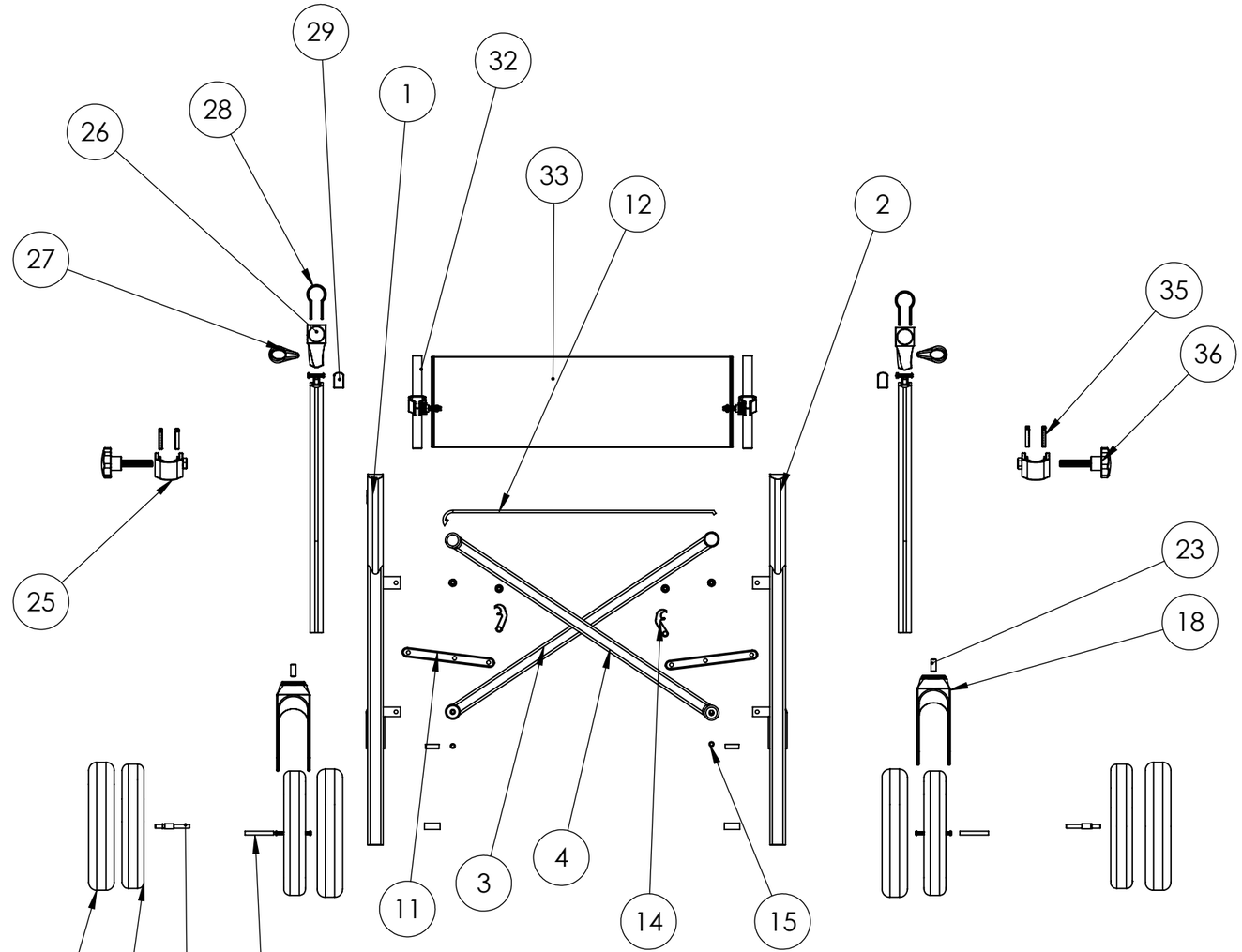
TITLE:
ALEVO ELDERLY WALKER

SIZE	DWG. FILE	REV
B	FULLASSEM1119R	1

SCALE: 1:10 | WEIGHT: 5451.83 | SHEET 2 OF 3

SOLIDWORKS Educational Product. For Instructional Use Only.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Left		2
2	Right		2
3	Inner		1
4	Outer		1
5	6658K119		2
6	5972K91		2
7	2867T116		2
8	98886A741		8
9	95836A680		6
10	95836A684		2
11	locking_support		2
12	seat		1
13	locking_support_spacer		1
14	lock		2
15	crossbar_rod		2
16	wheel		4
17	rubber_wheel		4
18	wheel_connector		2
19	6658K122		4
20	92095A192		6
21	91280A127		2
22	wheel_rod		2
23	wheel_connecting_pin		2
24	back_wheel_rod		2
25	rubber_stopper_clamp		2
26	handle_connection		2
27	rubber_handles		2
28	brake_connection		2
29	brake		2
30	97763A426		2
31	90593A003		2
32	backrest_clip		2
33	backrest2		1
34	1373T67		2
35	rubber_stopper		4
36	60795K34		2
37	98886A743		2



NOTES:
1. HARDWARE (WITH ONE EXCEPTION) IS NOT SHOWN IN EXPLODED VIEW IN ORDER TO MAXIMIZE CLARITY, BUT IS FEATURED IN BILL OF MATERIALS

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	R. P. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	SEE PART DRAWINGS	
FINISH	VARIOUS	

COMMENTS
WEIGHT IN POUNDS IS 12.02 LBS

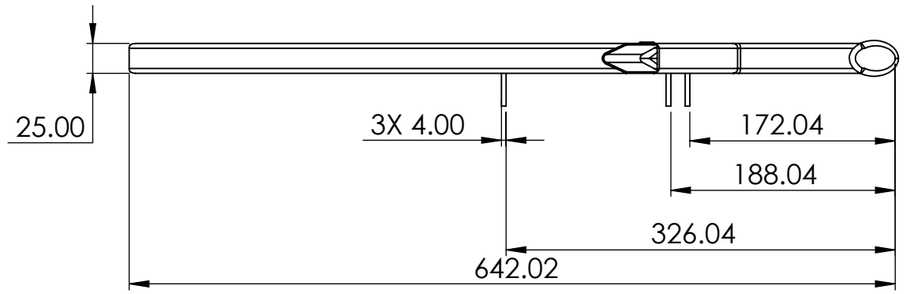
BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

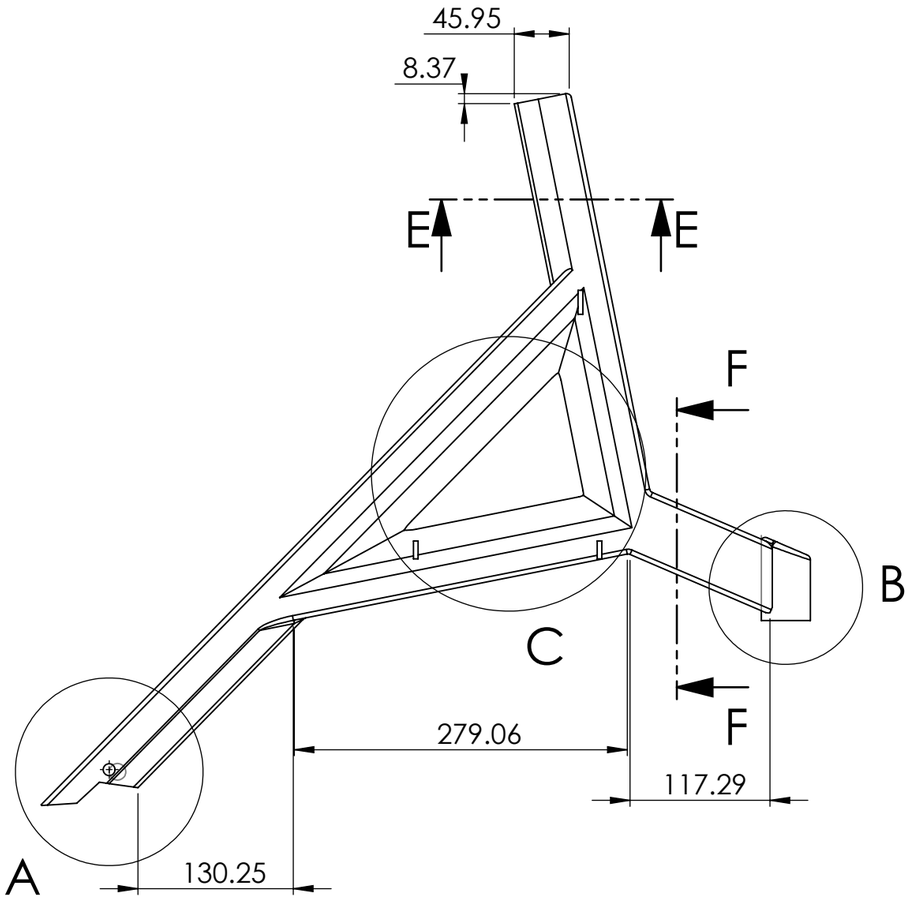
TITLE:
ALEVO ELDERLY WALKER

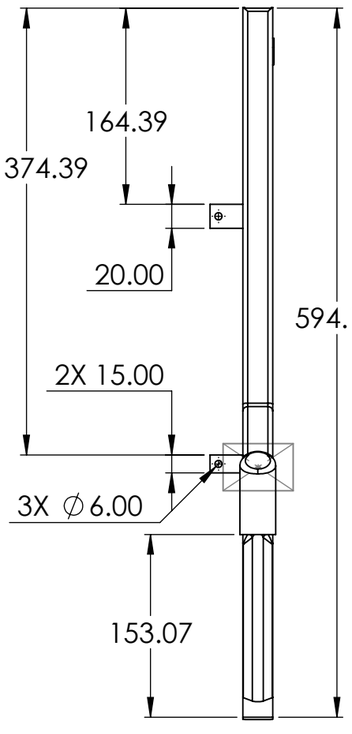
SIZE	DWG. FILE	REV
B	FULLASSEM1119R	1

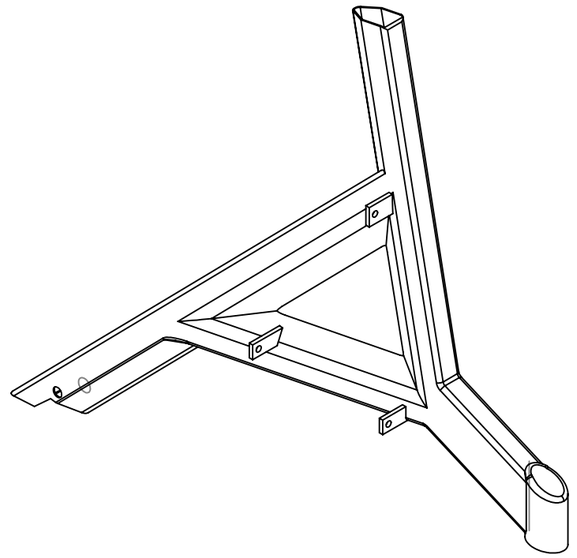
SCALE: 1:10 | WEIGHT: 5451.83 | SHEET 3 OF 3

SOLIDWORKS Educational Product. For Instructional Use Only.









NOTES:
1. CONSTANT 1.27 MM (0.050 IN) THICKNESS UNLESS STATED OTHERWISE
2. SECTION VIEWS E AND F ARE INFITESIMELY SMALL SLICES
3. ALL FILLETS ARE 2 MM UNLESS STATED OTHERWISE
4. THE PROFILE SHOWN IN SECTION VIEW E IS CONSTANT THROUGHOUT THE PART WITH THE EXCEPTION OF THE EXTRUSION CONNECTING DETAIL B WHICH IS SHOWN IN SECTION VIEW F

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	C. A. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	HEXCEL AS4C (3000 FILAMENTS)	
FINISH	CARBON FIBER INLAY UNIDIRECTIONAL	

COMMENTS
THE WEIGHT IN POUNDS IS 0.88 LBS

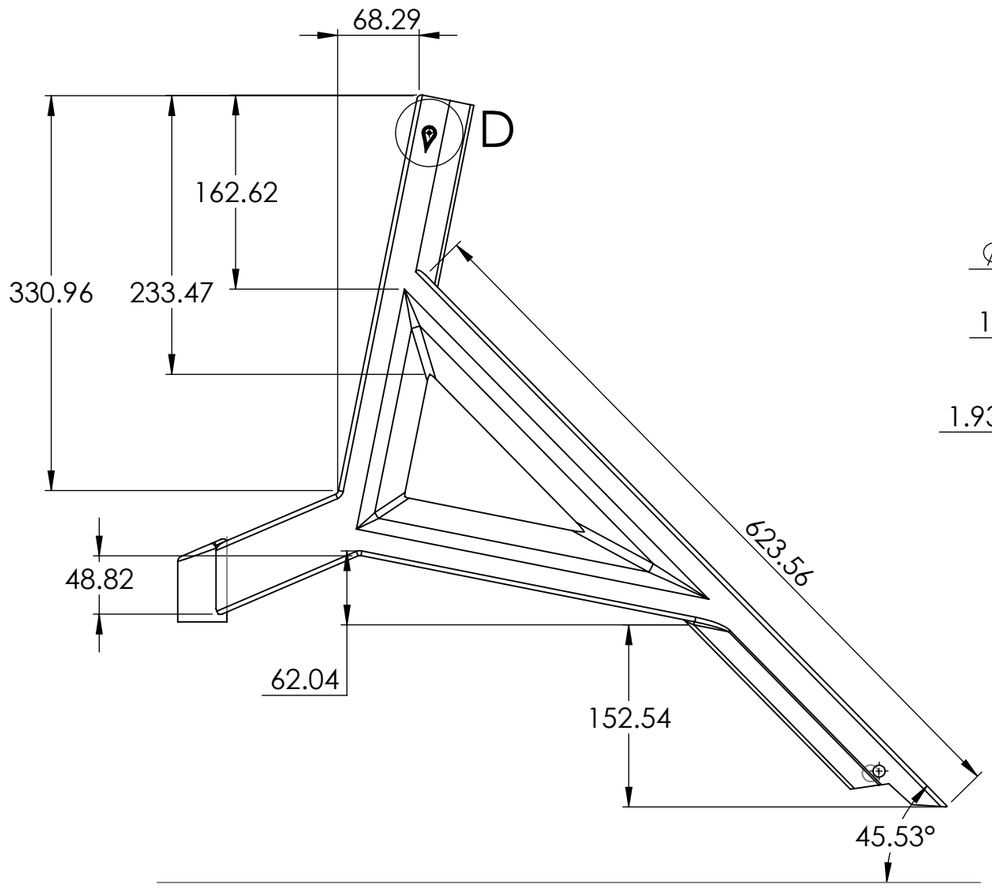
BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

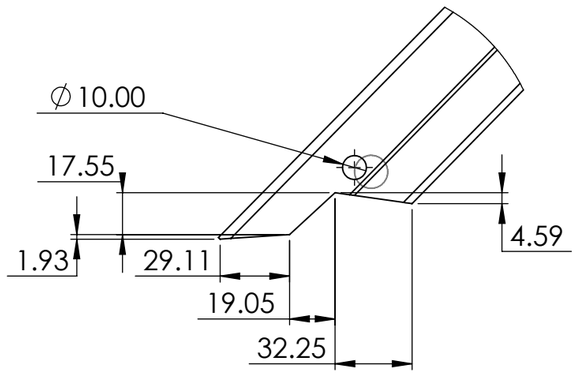
TITLE:
LEFT BASE FRAME

SIZE	DWG. FILE	REV
B	BASE_FRAME3D	1

SCALE: 1:5 | WEIGHT: 399.375 | SHEET 1 OF 3

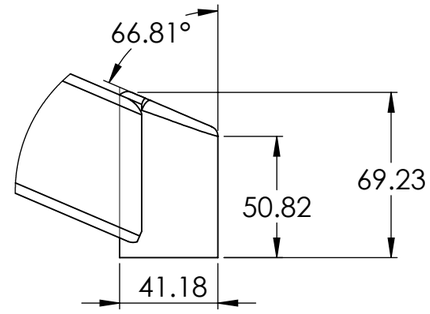
SOLIDWORKS Educational Product. For Instructional Use Only.





DETAIL A

SCALE 2 : 5



DETAIL B

SCALE 2 : 5

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE INCH: 0.0 = ± 0.02 0.00 = ± 0.01 0.000 = ± 0.005 MM: 0. = ± 0.50 0.0 = ± 0.25 0.00 = ± 0.15 0.000 = ± 0.05 ANGULAR: 0.0 = ± 1 0.00 = ± 0.5		
DO NOT SCALE DRAWING	COMMENTS THE WEIGHT IN POUNDS IS 0.88 LBS	

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	C. A. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	HEXCEL AS4C (3000 FILAMENTS)	
FINISH	CARBON FIBER INLAY UNIDIRECTIONAL	

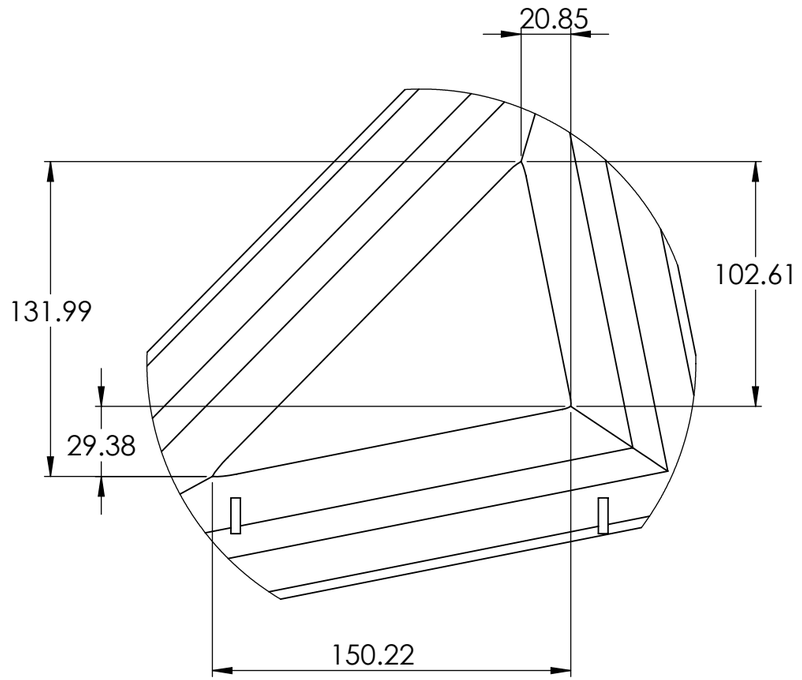
BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

TITLE:
LEFT BASE FRAME

SIZE	DWG. FILE	REV
B	BASE_FRAME3D	1

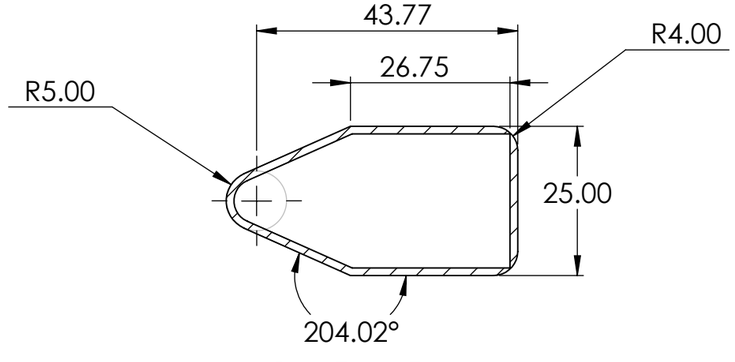
SCALE: 1:5 | WEIGHT: 399.375 | SHEET 2 OF 3

SOLIDWORKS Educational Product. For Instructional Use Only.



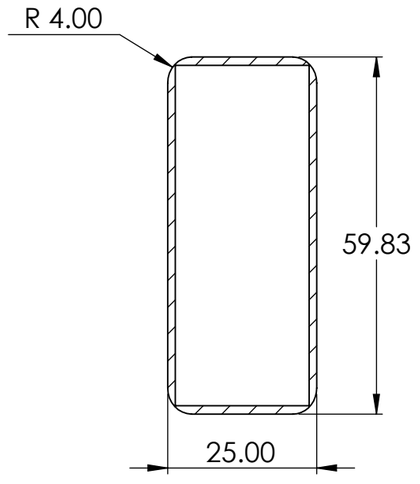
DETAIL C

SCALE 2 : 5



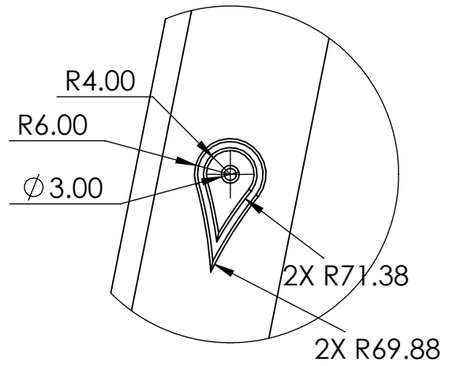
SECTION E-E

SCALE 1 : 1



SECTION F-F

SCALE 1 : 1



DETAIL D

SCALE 1 : 1

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	C. A. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	HEXCEL AS4C (3000 FILAMENTS)	
FINISH	CARBON FIBER INLAY UNIDIRECTIONAL	

COMMENTS
THE WEIGHT IN POUNDS IS 0.88 LBS

BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

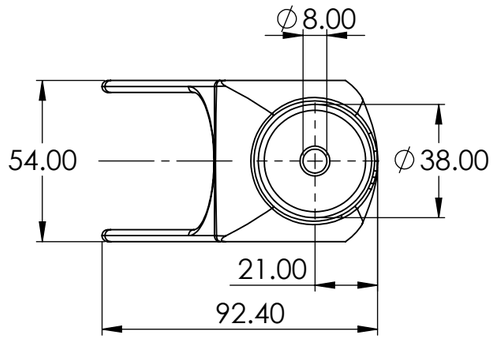
TITLE:
LEFT BASE FRAME

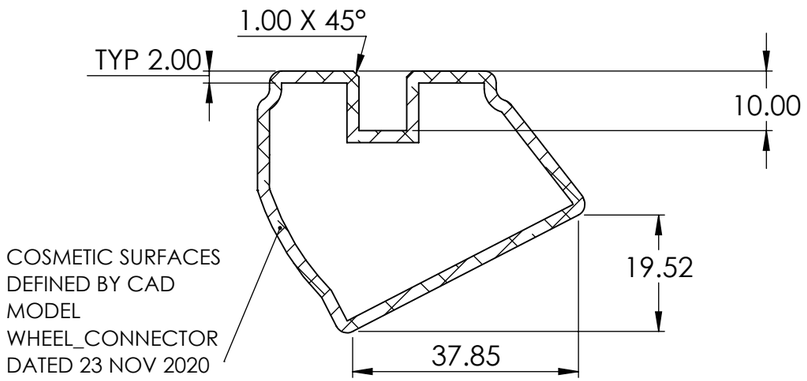
SIZE	DWG. FILE	REV
B	BASE_FRAME3D	1

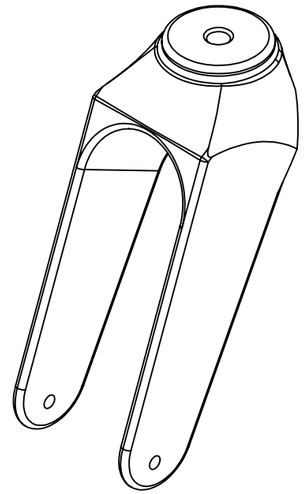
SCALE: 1:5 | WEIGHT: 399.375 | SHEET 3 OF 3

SOLIDWORKS Educational Product. For Instructional Use Only.

REVISIONS		
REV.	DESCRIPTION	DATE
1	INITIAL RELEASE	2020 NOV 24

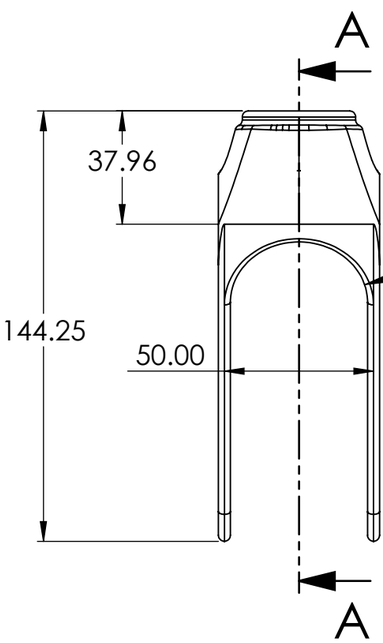


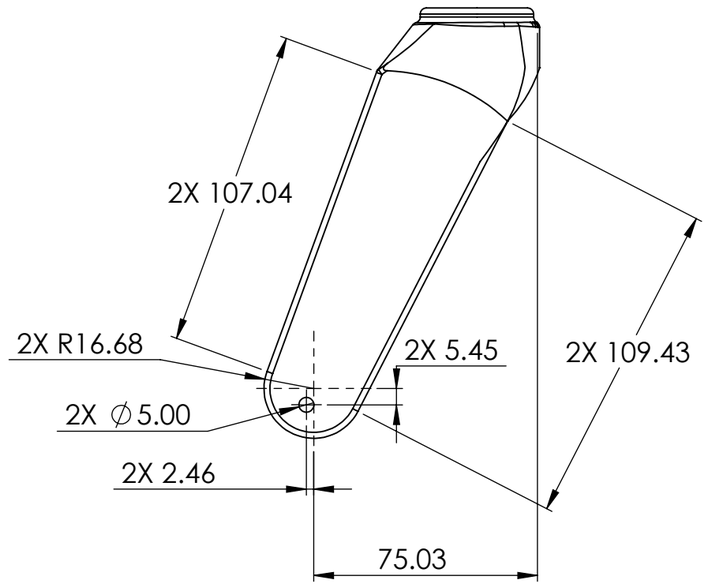




SECTION A-A

SCALE 1 : 1





NOTES:
1. FILLETS ARE 2 MM UNLESS OTHERWISE STATED
2. AS THE WALL DISTANCE IN THE LEGS IS 4MM, THE 2MM THICKNESS RESULTS IN SOLID AREAS
3. HIDDEN LINES NOT FEATURED TO IMPROVE CLARITY

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	C. LORE	2020 NOV 24
UNITS	MMGS	
MATERIAL	6061 ALLOY	
FINISH	DARK POWDERCOAT	
COMMENTS		

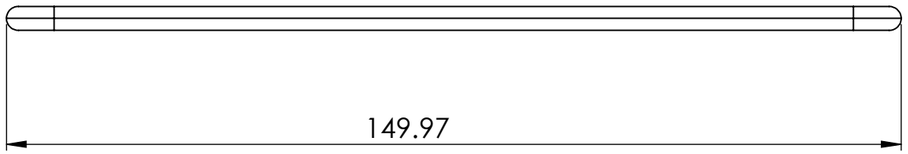
BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

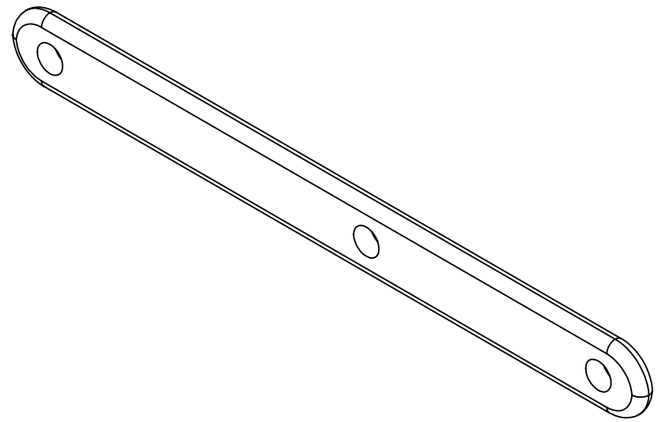
TITLE:
WHEEL CONNECTOR

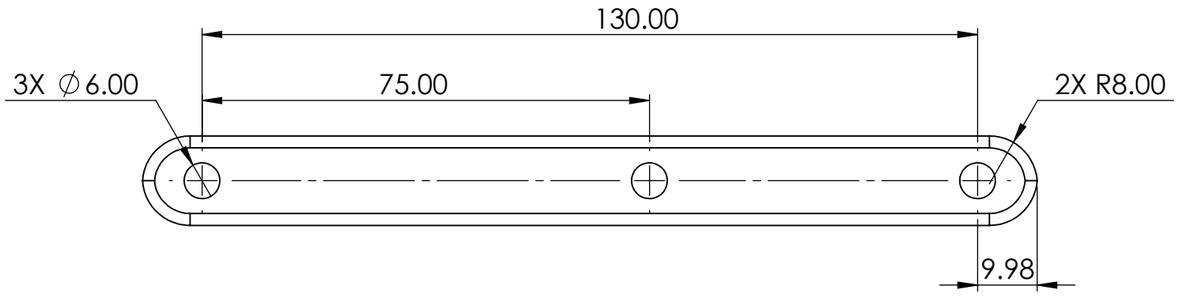
SIZE	DWG. FILE	REV
B	WHEEL_CONNECTOR _DRAWING	1
SCALE: 1:2	WEIGHT: 143.59	SHEET 1 OF 1

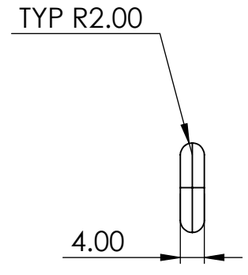
SOLIDWORKS Educational Product. For Instructional Use Only.

REVISIONS		
REV.	DESCRIPTION	DATE
1	INITIAL RELEASE	2020 NOV 23









UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

INCH:
0.0 = ± 0.02
0.00 = ± 0.01
0.000 = ± 0.005

MM:
0. = ± 0.50
0.0 = ± 0.25
0.00 = ± 0.15
0.000 = ± 0.05

ANGULAR:
0.0 = ± 1
0.00 = ± 0.5

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	A. S. HOWELL	2020 NOV 23
CHECKED	R. P. HOWELL	2020 NOV 23
UNITS	MMGS	
MATERIAL	PLAIN CARBON STEEL	
FINISH	BLACK SPRAY PAINT	
COMMENTS		

BYU ENGINEERING
IRA A. FULTON COLLEGE OF ENGINEERING

TITLE:
LOCKING SUPPORT

SIZE	DWG. FILE	REV
B	LOCKING_SUPPORT	1

SCALE: 1:1 | WEIGHT: 61.64 | SHEET 1 OF 1

SOLIDWORKS Educational Product. For Instructional Use Only.