

ANEUVAS TECHNOLOGIES INC.

CLEAN HOOD AND ROOM

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Mechanical Engineering

PROJECT DESCRIPTION

- CLIENT: ANEUVAS TECHNOLOGIES INC.
 - OVERSEEN BY DR. TIMOTHY BECKER
 - COMPANY RESEARCHES AND MANUFACTURES MICROCATHETERS
- ORIGINAL SCOPE
 - TO DESIGN AND BUILD A PORTABLE CLEAN HOOD AND CLEAN ROOM
- REVISED SCOPE
 - TO DESIGN AND BUILD A PORTABLE CLEAN HOOD
 - TO DESIGN A PORTABLE CLEAN ROOM AND ONLY MANUFACTURE THE FRAME

PROJECT DESCRIPTION CONT.

- CLEAN HOOD DIMENSIONS 24" x 48" x 40"
 - FIT OVER SMALL EQUIPMENT
 - OUTPUT A POSITIVE PRESSURE FLOW
- CLEAN ROOM FRAME DIMENSIONS 72" x 96" x 84"
 - CAN BE DISASSEMBLED AND REASSEMBLED
 - CARRIED BY 3 - 4 PEOPLE
- PROJECT WILL BENEFIT THE CLIENT'S RESEARCH AND PRODUCT MANUFACTURING

WHAT ARE CLEAN ROOMS/HOODS?

- PRIMARILY USED FOR MANUFACTURING AND/OR SCIENTIFIC RESEARCH
- CONTROLLED ENVIRONMENTS
 - LOW LEVEL OF POLLUTANTS
- PRODUCE VARIOUS CONTROLLED LEVELS OF CONTAMINATION

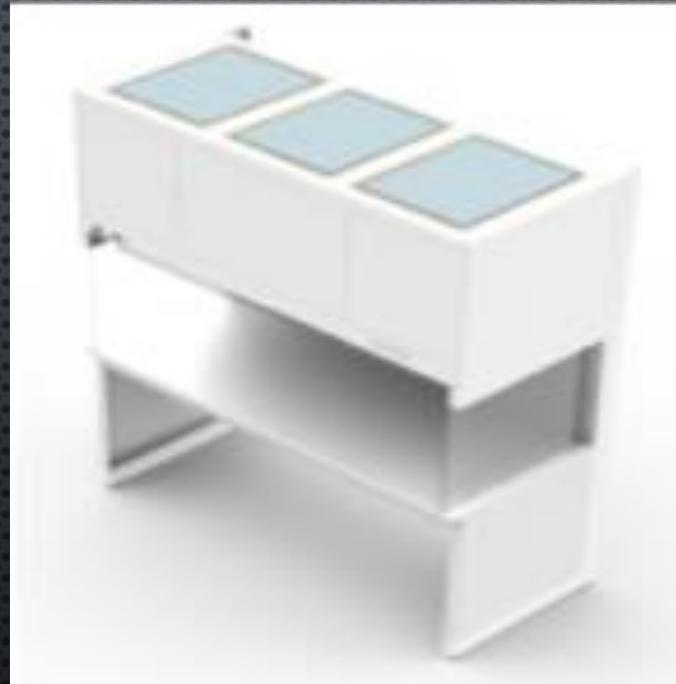


Figure 1. Vertical Flow Hood [1]



Figure 2. Softwall Clean Room [2]

CUSTOMER REQUIREMENTS

Table 1. Customer Requirements

Customer Requirements	Weight	Objective	Met
Inexpensive	5	Low cost and remain within budget	No
Portable	3	Transportable by 2-3 people	Yes
Positive Pressure	5	Meet FDA classification requirements of number of particles in the air per cubic meter	Yes
Visibility	2	Ability to see inside the structure	Yes
Clean	4	Maintain an ISO classification	Yes
Reliability	3	Reassurance that the structure will not fail	Yes
Durability	3	Last for an extended period of time	Yes

FINAL DESIGN

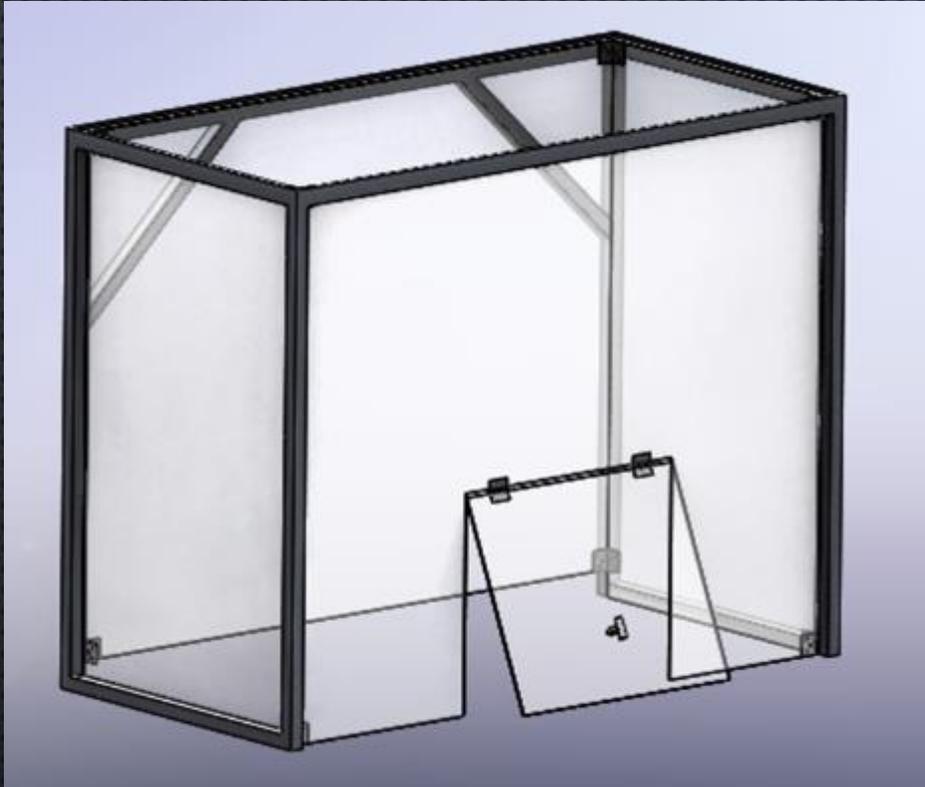


Figure 3. Final CAD Hood Design



Figure 4. Final CAD Room Frame Design

ENGINEERING REQUIREMENTS

Table 2. Engineering Requirements

Engineering Requirements	Hood Targets	Hood Test Results
Area (m^2)	< 0.557	0.754
Pressure (Pa)	> 78000	80790.2
Cost (\$)	< 2000	\$2500
Weight (kg)	< 68.04	29.11
Assembly Time (min)	< 10	1.40
Power FFU (W)	520	520
Particle Count (ISO)	< ISO10	ISO 3
Velocity (m/s)	> 0.58	> 0.58

HOOD DESIGN CONCEPTS

- HOOD DESIGN #1
 - ALUMINUM FRAMING
 - POLYCARBONATE INNER SHELL
 - HINGED DOOR
 - RUBBER LINING
 - SEAL AIR GAPS

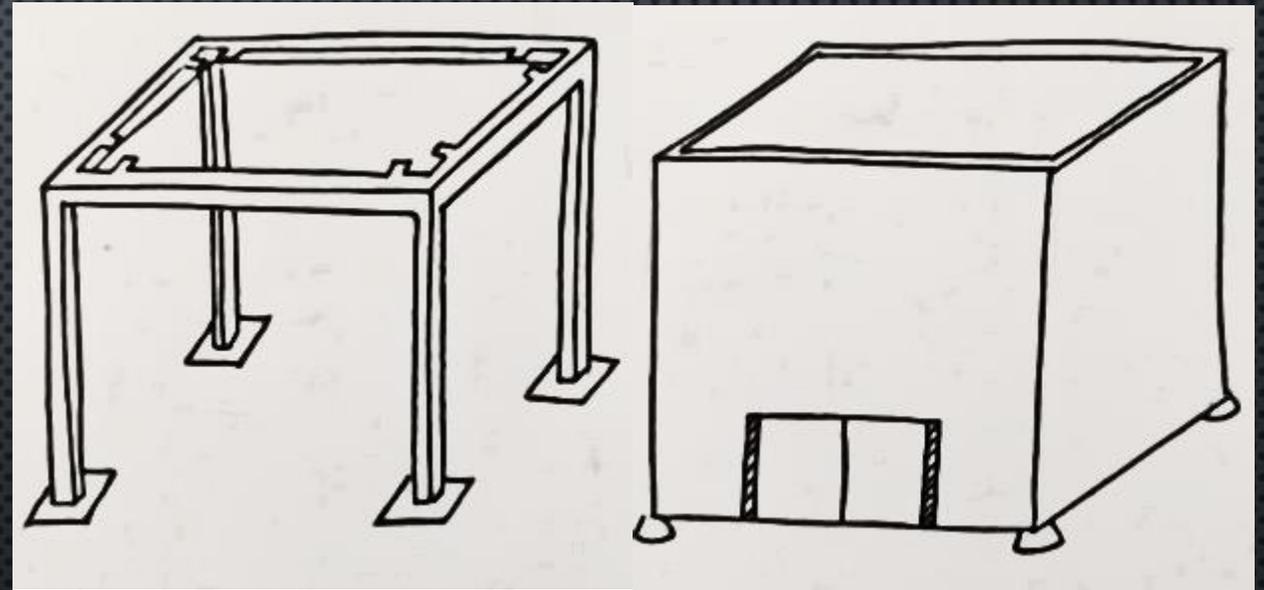


Figure 5. Hood Design #1

HOOD DESIGN CONCEPTS

- HOOD DESIGN #2
 - STEEL FRAMING
 - ACRYLIC INNER SHELL
 - WITHOUT A DOOR
 - FOAM LINING
 - SEAL AIR GAPS

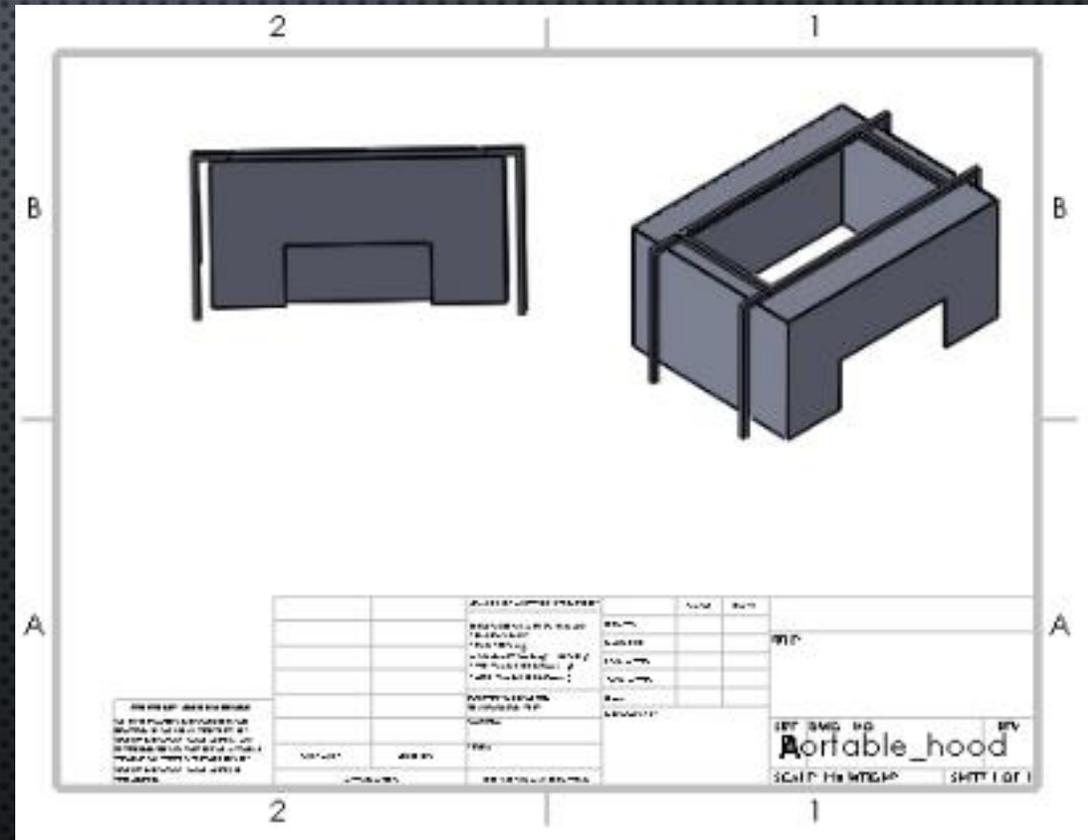


Figure 6. Hood Design #2

ROOM DESIGN CONCEPTS

- ROOM DESIGN #1
 - ALUMINUM FRAMING
 - SOFT WALLS AND DOOR
 - 40 MIL VINYL
 - DUAL LOCK (HOOK AND LOOP FASTENER)
 - MOUNT VINYL TO FRAME
 - RUBBER LINING
 - SEAL AIR GAPS

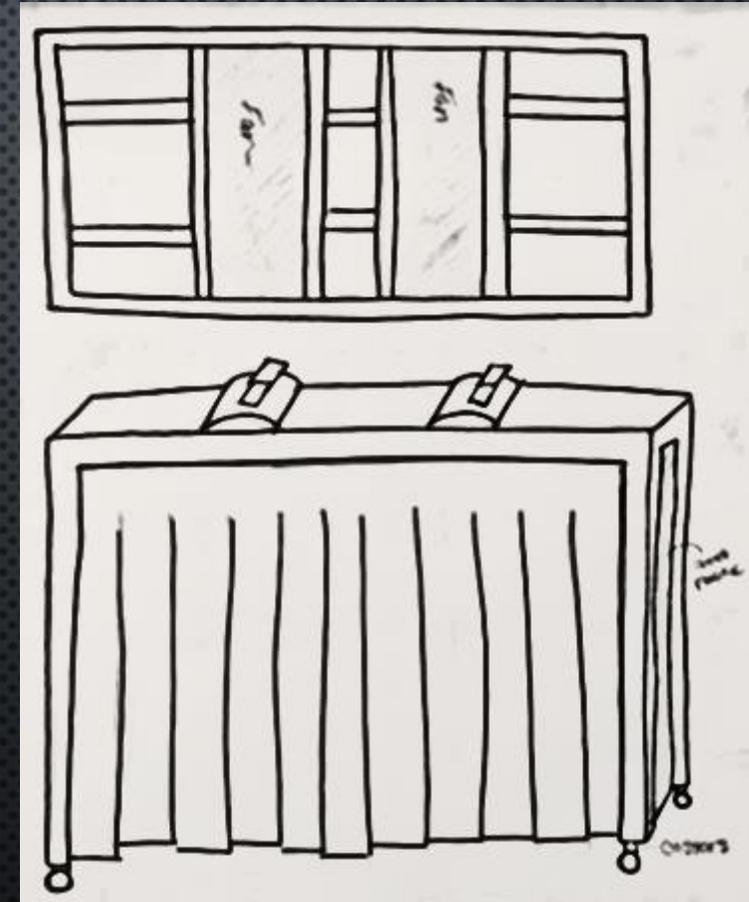


Figure 7. Room Design #1

ROOM DESIGN CONCEPTS

- ROOM DESIGN #2
 - STEEL FRAMING
 - TELESCOPING LEGS
 - CONNECTION PINS
 - SOFT WALLS AND DOOR
 - 0.25" PLASTIC SHEETING
 - VELCRO
 - MOUNT PLASTIC TO FRAME
 - RUBBER LINING
 - SEAL AIR GAPS



Figure 8. Room Design #2

MANUFACTURING THE HOOD



Figure 9. Cut Aluminum Frame



Figure 10. Finished Aluminum Frame and Polycarbonate



Figure 11. WisperFlow FFU

FULLY ASSEMBLED HOOD



Figure 12. Finished Hood with FFU



Figure 13. Hood Door Handle and Hook

MANUFACTURING THE ROOM FRAME



Figure 14. Legs and Supports of Steel Frame



Figure 15. Welded Top of Steel Frame

MANUFACTURING THE ROOM FRAME



Figure 16. Telescoping Ends for Frame Top



Figure 17. Telescoping Ends from Top to Support Legs

FINAL VISUAL OF THE ROOM FRAME

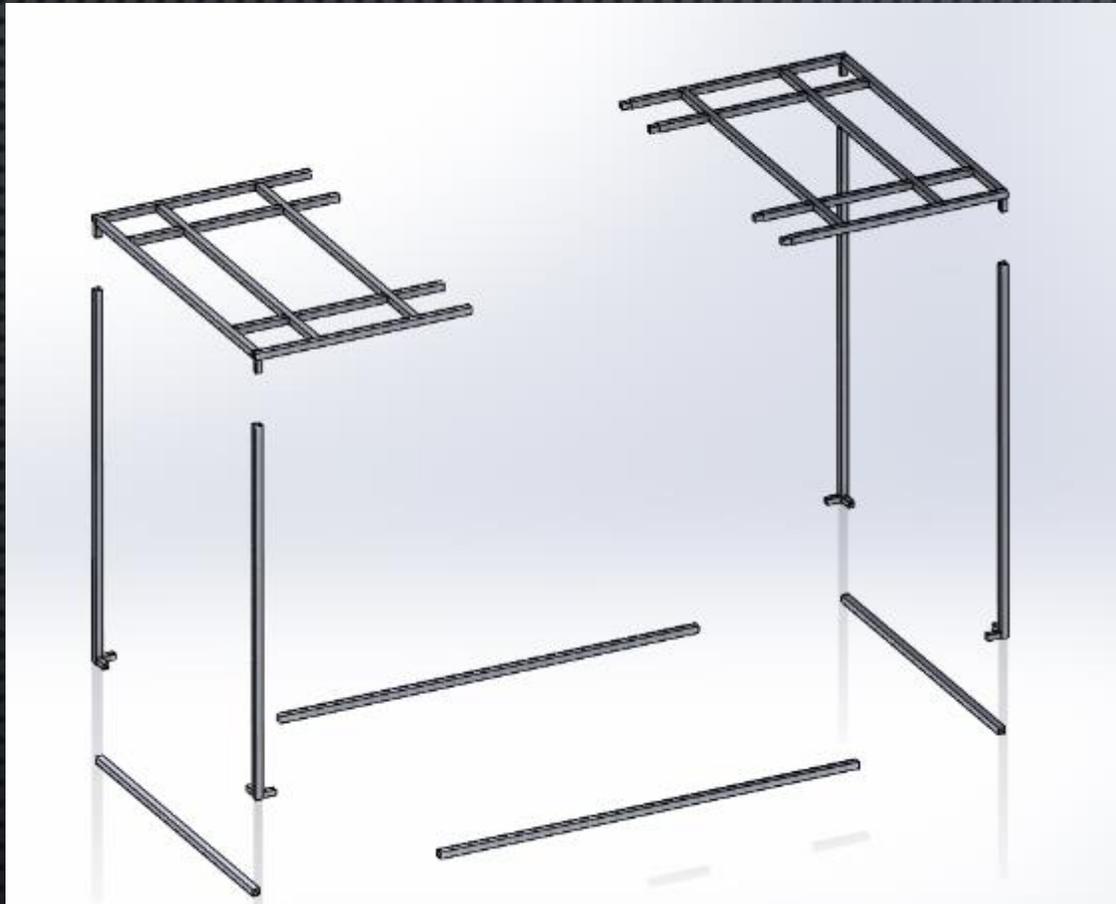


Figure 18. CAD Exploded View



Figure 19. CAD of Fully Assembled Room Frame

PRESSURE TESTING

- DATA COLLECTED USING DAQ SYSTEM
- CALIBRATED USING MONOMETER
- UTILIZING TWO PRESSURE SENSORS

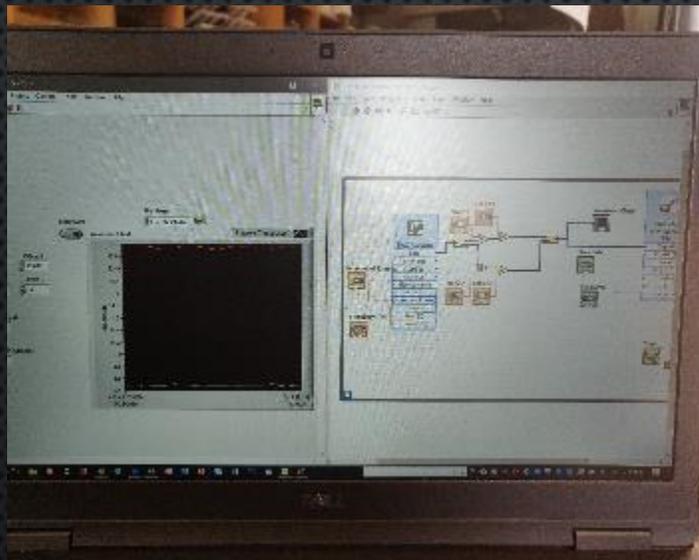


Figure 20. LabView

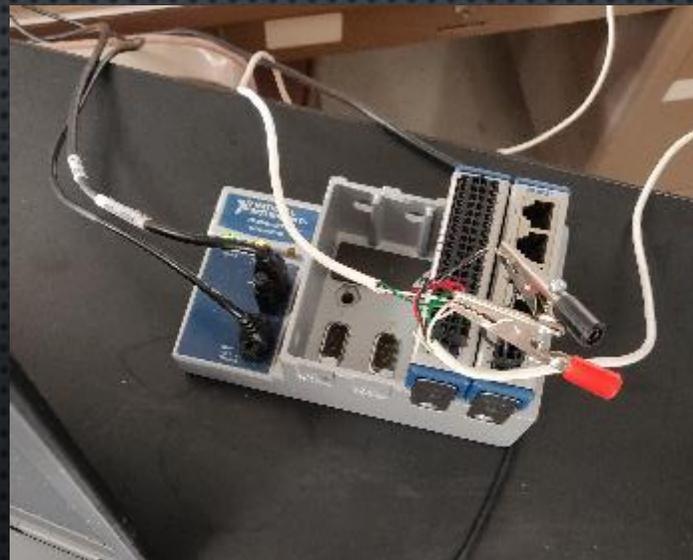


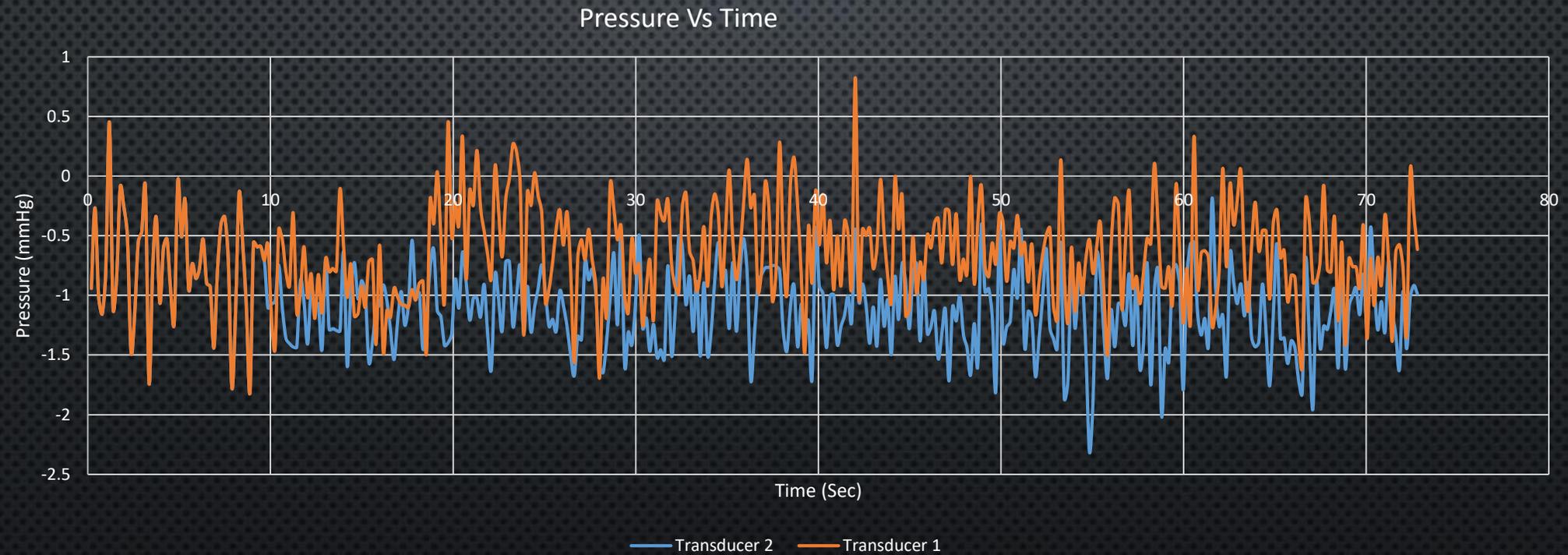
Figure 21. DAQ



Figure 22. Sphygmomanometer

PRESSURE DATA

Table 3. Pressure vs Time Data



BILL OF MATERIALS

Bill of Materials								
Clean Dream Team								
Portable Hood								
Part #	Part Name	Qty	Description	Functions	Material	Dimensions	Cost	Total Cost
1	Aluminum Frame	6	Hood Frame DONATED -98C	Supports Fan	Aluminum	1"X 1/8" thick - 5 - 6' length	\$-	\$-
2	Welding Aluminum Frame	1	Welding of the aluminum frame		Aluminum	1"X 1/8" thick - 5 - 6' length and 1 - 7' length	\$300	\$300
3	Polycarbonate	1	For 3 sheets Material For Hood	Creates convering for hood	Polycarbonate	48"x48"x1/4"	\$530.00	\$530.00
4	Cut Polycarbonate	1	Cut the polycarbonate	Is the inner shell of the hood	Polycarbonate	48"x48"x1/4"	\$240.00	\$240.00
5	Epoxy	5	seals the polycarbonate	creates a seal for no air to escape	Plastic	n/a	\$6.75	\$33.73
6	Rubber lining	1	cushions FFU to frame	to prevent air leakage between frame and FFU	Rubber	19/32" X 10'	\$16.74	\$16.74
7	Magnets	1	Holds door	Keeps door open for ease of adjustments within hood	Neodymium	1/2 diam.	\$4.76	\$4.76
8	Machine Screws	1	tightens hinges	secures the hinges	Zinc plated	32x1/2	\$3.54	\$3.54
9	Ardrino	1	Test Pressure within Unit	To test Pressure within unit	N/A		\$36.89	\$36.89
10	Power Cord	1	Power the FFUs - 3 wire power tool replacement cord	Power the FFU	N/A		\$12.97	\$12.97
11	Interior L Brackets	4	Stainless Steel Brackets to support the polycarbonate	support	Stainless steel		\$13.08	\$52.32
12	Nuts	1	fasten the brackets to polycarbonate	support	Stainless steel		\$4.24	\$4.24
13	Handle	1	assist in opening door		steel		\$4.88	\$4.88
14	Hook	1	prop door up		steel		\$-	\$-
15	Screws	100	fasten the brackets to polycarbonate	support	stainless steel		\$5.60	\$5.60
16	Rubber pads	1	Placed at bottom of frame to stabalize	reduce slip and scratches	rubber		\$5.00	\$5.00
17	Hinges	1	hinges for hood	allows the hood door to open	Zinc plated	2-1/2'	\$1.97	\$1.97
							Total Cost Estimate:	\$1,252.63
Portable Room								
Part #	Part Name	Qty	Description	Functions	Material	Dimensions	Cost	Total Cost
10	Steel Frame and cutting	120	Steel - 110' - 1.5"x1.5"x1/8"	Framing for the protable room	steel	1.5"x1.5"x1/8"	\$435.78	\$435.78
12	White Powder Coat	120	Powder coat the steel frame	Protect the steel and to reduce particals released by the steel	Powder coat		\$750.74	\$750.74
17	Power Cord	1	Power the FFUs - 3 wire power tool replacement cord	Power the FFU	N/A		\$12.97	\$12.97
18	Heavy Duty Swivel Caster Wh	4	600lb capacity swivel caster wheels - DONATED	Allows for the portable room to be stationary and move	5 x 1-1/4 in nylon poly	Wheels - 5 x 1-1/4, Fran	\$-	\$-
							Total Cost Estimate:	\$1,199.49
							Overall Total Estimate:	\$2,452.12
							Total Budget:	\$2,000.00
							Remaining Budget:	(\$452.12)

FUTURE WORK

- HOOD
 - ADD SUPPORT FEET ON THE BOTTOM OF THE HOOD
 - STABILIZES THE FRAME ON THE TABLE
- ROOM
 - POWDER COATING
 - ORDER AND ATTACH VINYL
 - TEST THE UNIT

THANK YOU!

- ANEUVAS TECHNOLOGIES INC.
 - DR. TIMOTHY BECKER
- NORTHERN ARIZONA UNIVERSITY
 - DR. SARA OMAN
 - MR. PERRY WOOD
 - NAU MACHINE SHOP
- PALOMINO GLASS INC.
- MAYORGA'S STEEL INC.
- MOUNTAIN SHINE CUSTOM FINISHING
- COCONINO HIGH SCHOOL
 - MR. CRAIG HOWDESHELL

RESOURCES

- [1] “HORIZONTAL VS VERTICAL LAMINAR FLOW HOODS,” *TERRA UNIVERSAL BLOG*, 20-FEB-2018. [ONLINE]. AVAILABLE: [HTTPS://WWW.TERRAUNIVERSAL.COM/BLOG/ALL-TERRA-BLOGS/HORIZONTAL-VS-VERTICAL-LAMINAR-FLOW-HOODS/](https://www.terrauniversal.com/blog/all-terra-blogs/horizontal-vs-vertical-laminar-flow-hoods/). [ACCESSED: 27-OCT-2018].
- [2] “MODULAR CLEANROOM SOLUTIONS,” *PORTABLE CLEAN ROOM - WEAVER TECHNOLOGIES*. [ONLINE]. AVAILABLE: [HTTP://WWW.WEAVERTECH.COM/CLEAN-ROOM/PORTABLE-SOFTWALL-CLEANROOMS](http://www.weavertech.com/clean-room/portable-softwall-cleanrooms). [ACCESSED: 26-SEP-2018].