

Design of a Testing Setup for Diffusion Coefficient Measurement

Design Activity No. 7: Detailed Drawings Report

MECH 463 - Design 3: Mechanical Engineering Project

McGill University, Department of Mechanical Engineering

GROUP 20

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January 23rd, 2023

1. Gantt Chart

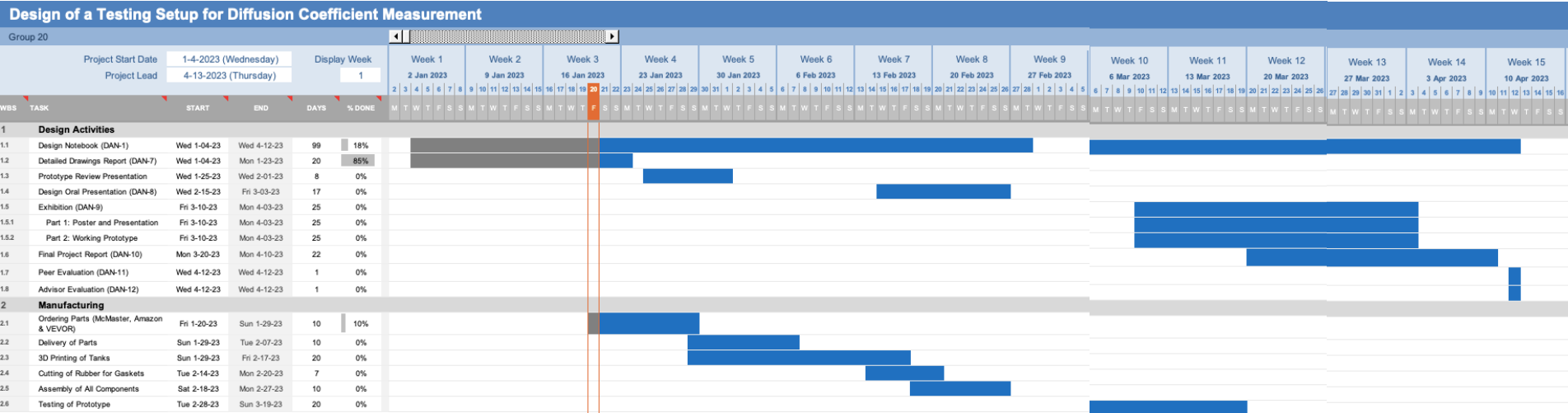


Figure 1: Gantt Chart for Winter Semester.

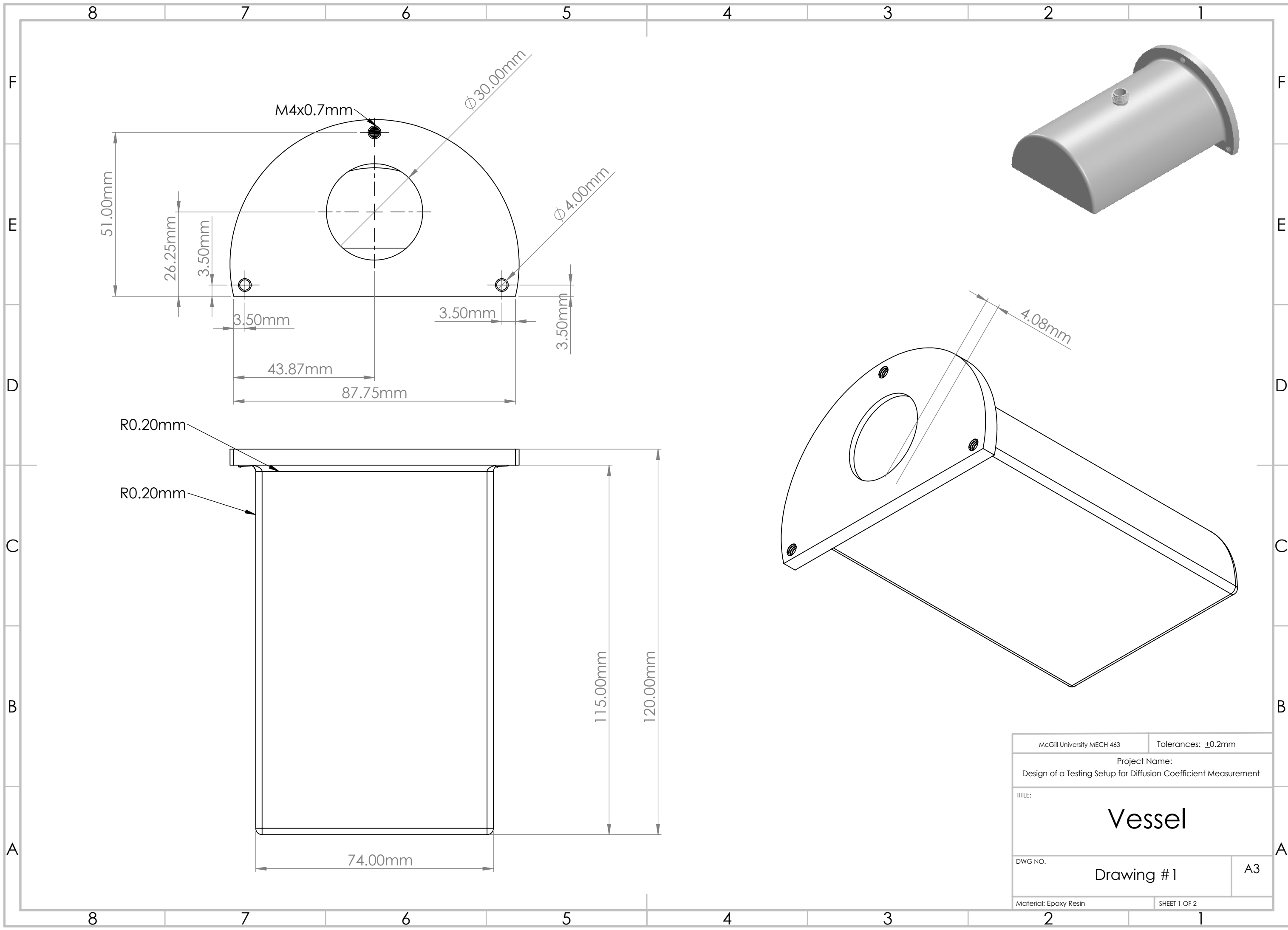
2. Bill of Materials

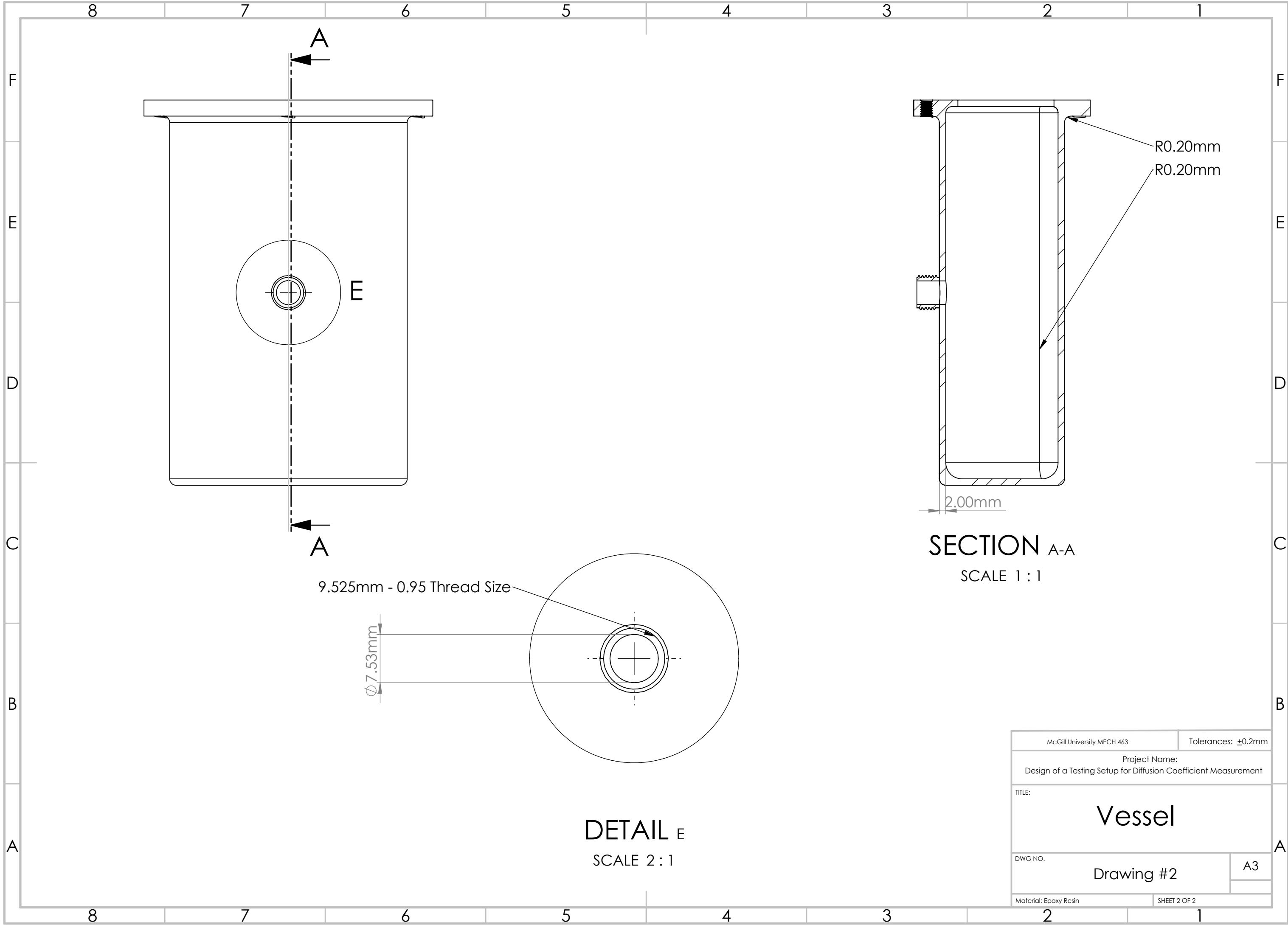
Table 1: Detailed Bill of Materials.

Product	Number of Items	Drawing #'s	Process	Web Link to Product	Provider	Delivery Time	Total Cost Estimate
Tank	2	1,2	3D Printing	N/A	McGill Cube	N/A	233 \$
Rubber (gasket)	2	3	Purchase	[1]	Amazon	4 weeks	11.25 \$
Hotplate, stir bar & temperature sensor probe	2		Purchase	[2]	VEVOR	10 days	191.98 \$
Bolt	3	4	Purchase	[3]	McMaster-Carr	5 days	31.68 \$
Washer	3	5	Purchase	[4]	McMaster-Carr	5 days	3.43 \$
Nut	3	6	Purchase	[5]	McMaster-Carr	5 days	3.33 \$
Cap	2	7	Purchase	[6]	McMaster-Carr [23]	5 days	8.02\$
						Total	482.69 \$

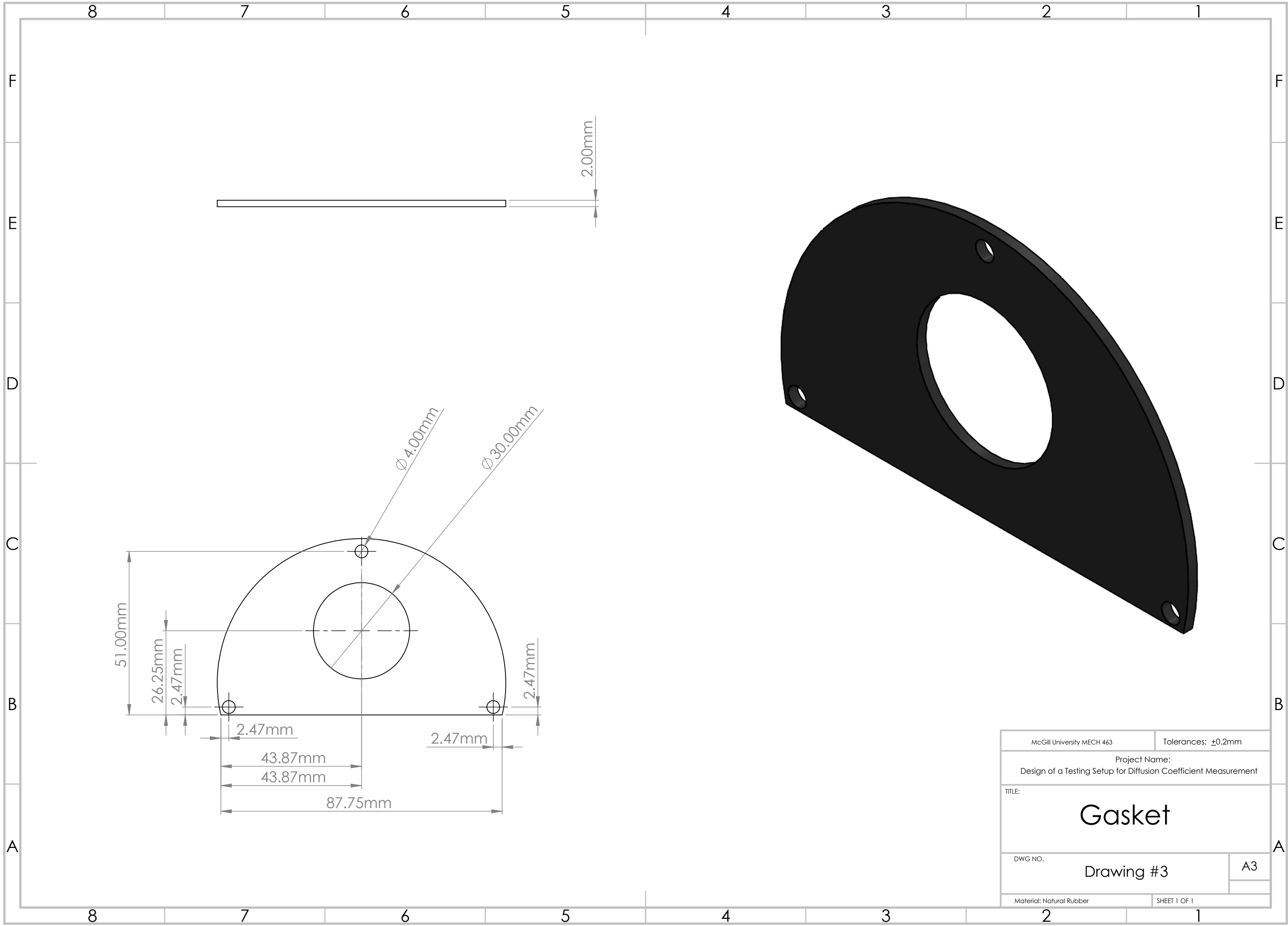
3. Drawings and Notes

- For drawings 1 and 2, the vessel will be 3D printed with epoxy resin. Two vessels will be printed as the assembly requires two identical tanks as shown in drawing 8.
- For drawing 3, the purchased rubber will be cut to the appropriate dimensions using scissors.
- Drawings 4, 5, 6, and 7 were made from 3D CADs from the supplier (McMaster-Carr). The parts will be ordered in quantities according to the bill of material presented in Table 1.
- The experimental setup design also consists of two hot plates, two stir bars and two temperature probes. No drawings were made for these items since no 3D CADs were available from the manufacturer. The link to these parts is provided in the bill of materials.

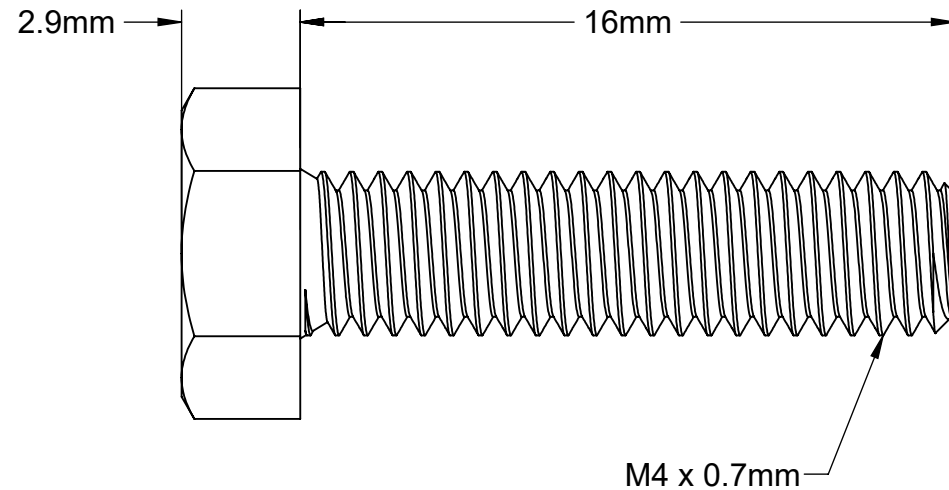
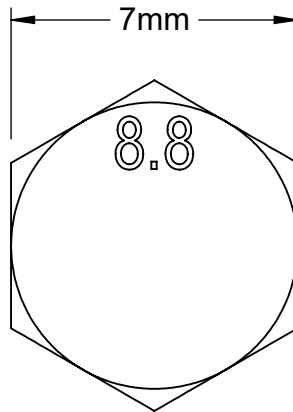
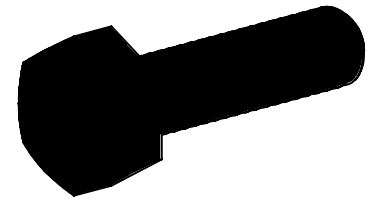





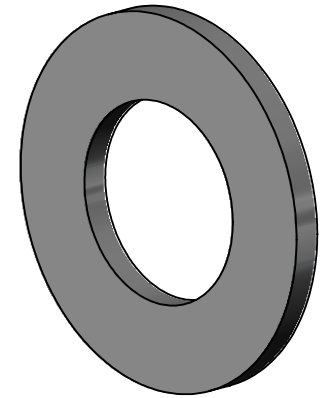
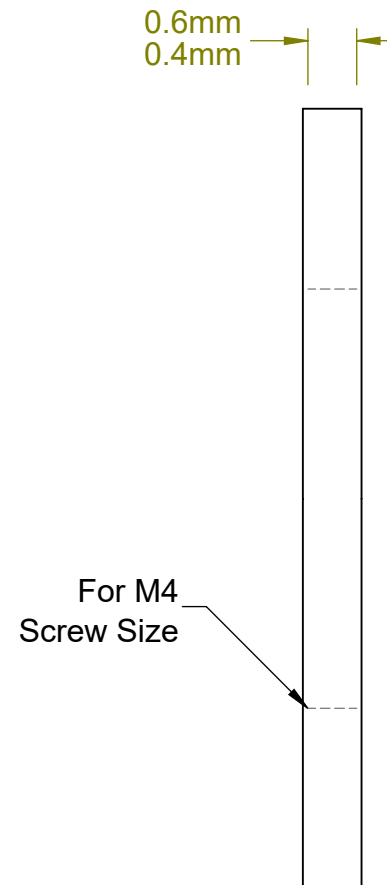
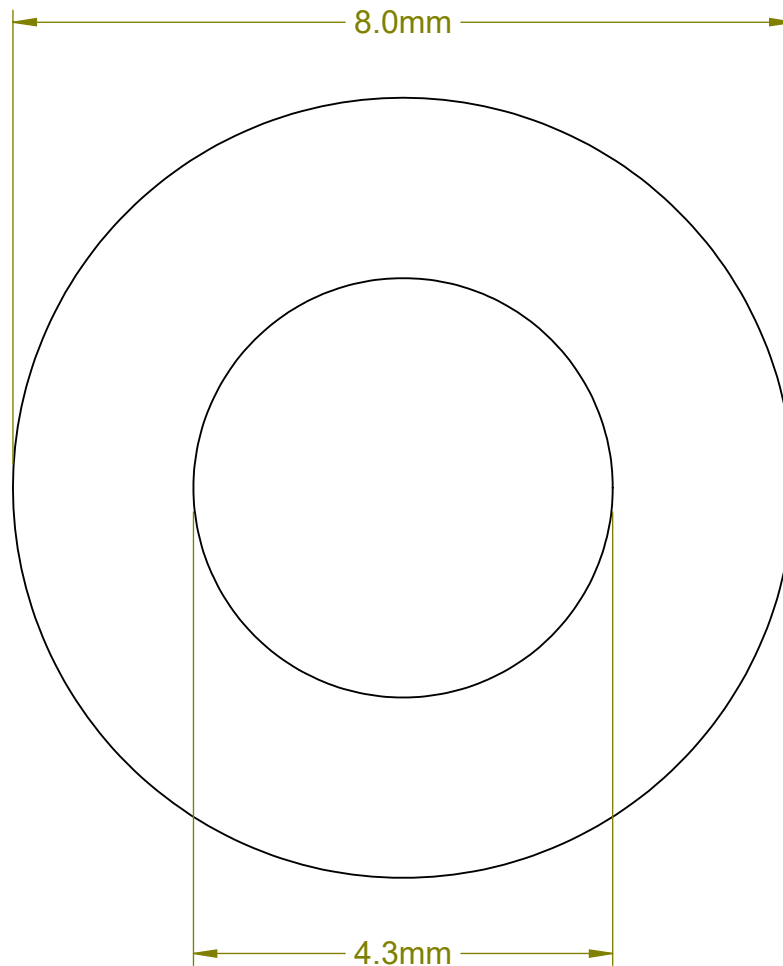
McGill University MECH 463		Tolerances: $\pm 0.2\text{mm}$	
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement			
TITLE: Vessel			
DWG NO. Drawing #2			A3
Material: Epoxy Resin		SHEET 2 OF 2	




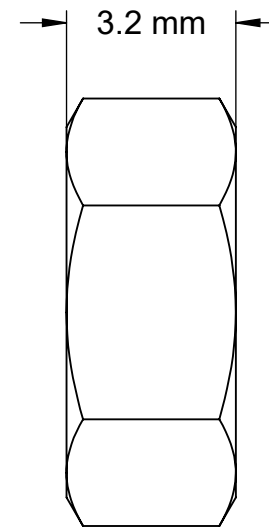
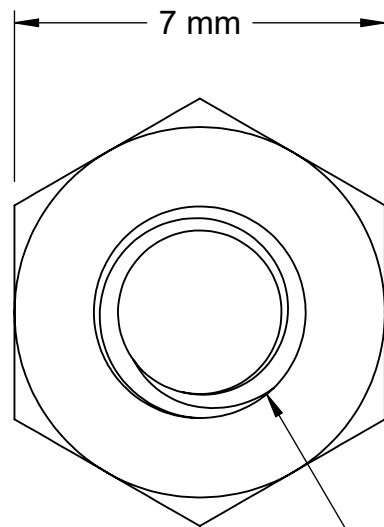
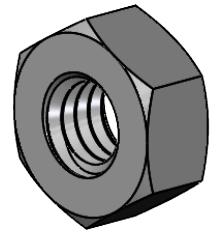
McGill University MECH 463		Tolerances: ±0.2mm	
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement			
TITLE: Gasket			
DWG NO.		Drawing #3	
Material: Natural Rubber		SHEET 1 OF 1	
		A3	




McGill University MECH 463	Tolerances: $\pm 0.2\text{mm}$
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement	
McMASTER-CARR 	Drawing #4
http://www.mcmaster.com © 2022 McMaster-Carr Supply Company	Medium-Strength Class 8.8 Steel Hex Head Screw
Information in this drawing is provided for reference only.	

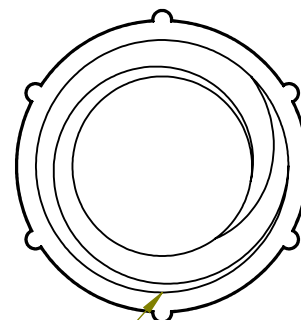
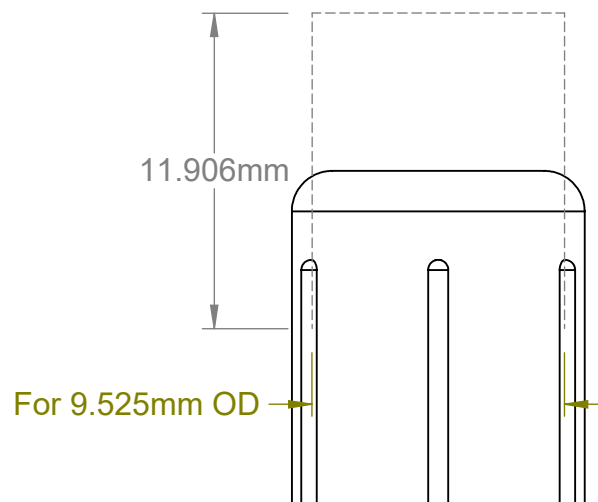


McGill University MECH 463	Tolerances: $\pm 0.2\text{mm}$
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement	
McMASTER-CARR 	Drawing #5
http://www.mcmaster.com © 2022 McMaster-Carr Supply Company	General Purpose 18-8 Stainless Steel Washer
Information in this drawing is provided for reference only.	




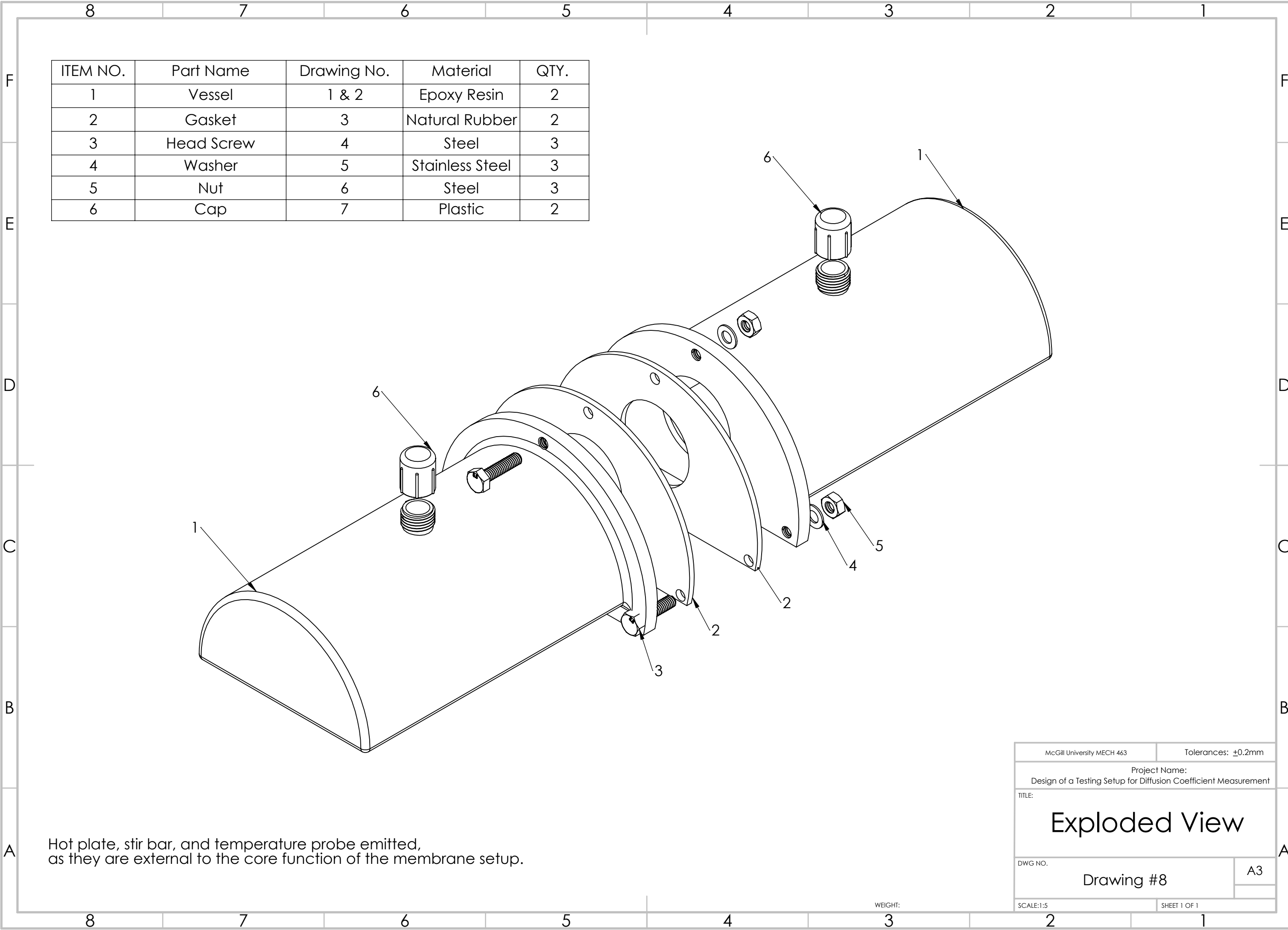
M4 x 0.7 mm Thread

McGill University MECH 463	Tolerances: $\pm 0.2\text{mm}$
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement	
McMASTER-CARR  http://www.mcmaster.com © 2021 McMaster-Carr Supply Company	Drawing #6
Information in this drawing is provided for reference only.	Steel Hex Nut



9.525mm - 0.95 Thread Size

McGill University MECH 463	Tolerances: $\pm 0.2\text{mm}$
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement	
McMASTER-CARR 	Drawing #7
http://www.mcmaster.com © 2021 McMaster-Carr Supply Company	Plastic Caps
Information in this drawing is provided for reference only.	



ITEM NO.	Part Name	Drawing No.	Material	QTY.
1	Vessel	1 & 2	Epoxy Resin	2
2	Gasket	3	Natural Rubber	2
3	Head Screw	4	Steel	3
4	Washer	5	Stainless Steel	3
5	Nut	6	Steel	3
6	Cap	7	Plastic	2

Hot plate, stir bar, and temperature probe emitted,
as they are external to the core function of the membrane setup.

McGill University MECH 463		Tolerances: $\pm 0.2\text{mm}$	
Project Name: Design of a Testing Setup for Diffusion Coefficient Measurement			
TITLE: <h1>Exploded View</h1>			
DWG NO.		A3	
Drawing #8			
SCALE: 1:5		SHEET 1 OF 1	

4. References

- [1] "33-014-062-012-012 Pure Gum Rubber, 40A Durometer, Smooth Finish, No Backing, 0.062" Thickness, 12" Width, 12" Length, Tan : Amazon.ca: Industrial & Scientific," *www.amazon.ca*. <https://www.amazon.ca/33-014-062-012-012-Rubber-Durometer-Backing-Thickness/dp/B00P5VVCVK> (Accessed Jan. 20, 2023)
- [2] "VEVOR Magnetic Stirrer Hot Plate Digital Hotplate Magnetic Stirrer 2000 RPM 2L | VEVOR CA," Vevor. https://www.vevor.ca/magnetic-stirrer-c_11062/vevor-magnetic-stirrer-hot-plate-digital-hotplate-stirrer-2000-rpm-2l-w-stand-p_010520615645?v_tag=a9d1c7d0-9904-11ed-a764-4358508bed87.1&gclid=Cj0KCQIAIKmeBhCkARIsAHy7WVsiXIB5RoGNO1zWw2NWNpYI5U88BBu9HNFbcU_kkCH_2rleneoZGUUAq1XEALw_wcB (Accessed Jan. 20, 2023)
- [3] "McMaster-Carr," *www.mcmaster.com*. <https://www.mcmaster.com/bolts/hex-head-screws-4/system-of-measurement~metric/length~16-mm/thread-size~m4/?fbclid=IwAR0y0APQuKrRNDQYNk7Su1lmyuR8qnXpFOq0o8bhK6rHI74-5Rkj3B3NmAw> (Accessed Jan. 20, 2023)
- [4] "McMaster-Carr," *www.mcmaster.com*. https://www.mcmaster.com/98689A113/?fbclid=IwAR3cydbC796jaHT54whlFTSpcKbXPUj_081ootixml_RG6Ac_Fk9azNGHAc (Accessed Jan. 20, 2023)
- [5] "McMaster-Carr," *www.mcmaster.com*. <https://www.mcmaster.com/90592A090/?fbclid=IwAR22MHJQ4XkSO5zW2vKhoF0vn6DsTLq9h-g2rc80iPfoR9s56ONsW2HOKbA> (Accessed Jan. 20, 2023)\
- [6] "McMaster-Carr," *www.mcmaster.com*. https://www.mcmaster.com/1277K23/?fbclid=IwAR1bK0NAsMNdUCLO3nYIkgU21Y5hgdw_TGILu3dSb9Yi3LFQRdlm8gVKmk (Accessed Jan. 20, 2023)