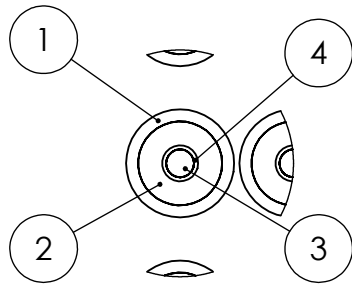
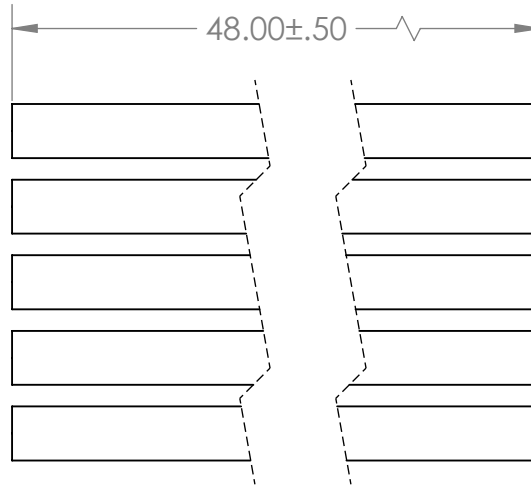
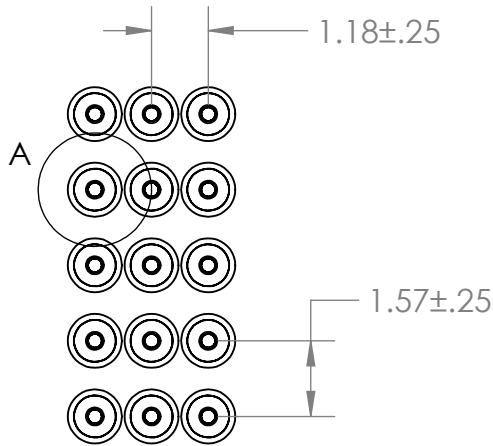
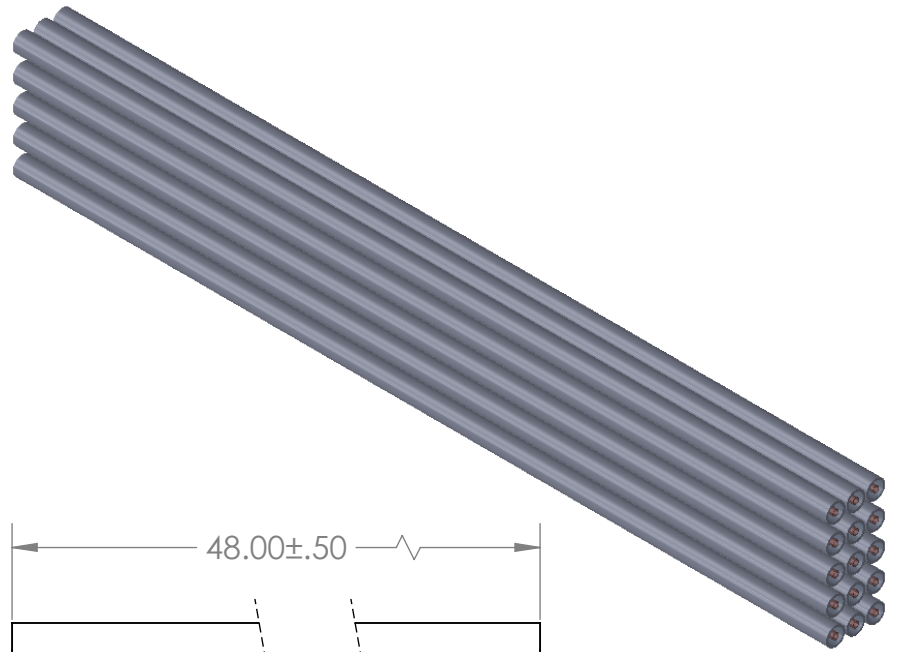


2

1



DETAIL A
SCALE 1 : 2



B

B

A

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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	Aaron E	4/26/24
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS: Water radiator made from thermal mass piping. Part numbers match drawing no. 3 where part descriptions and pricing given.		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			

TITLE: Water radiator		
SIZE A	DWG. NO.	REV
SCALE 1:4	WEIGHT:	SHEET 1 OF 1

2

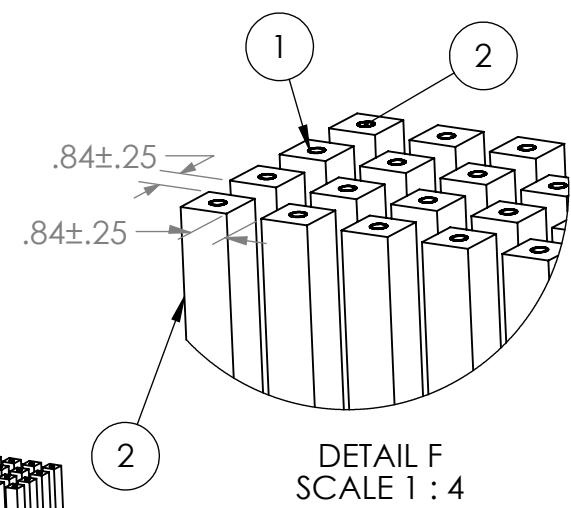
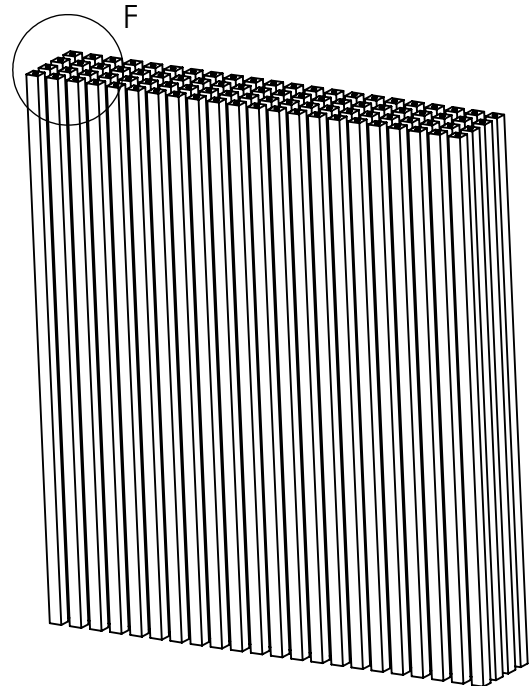
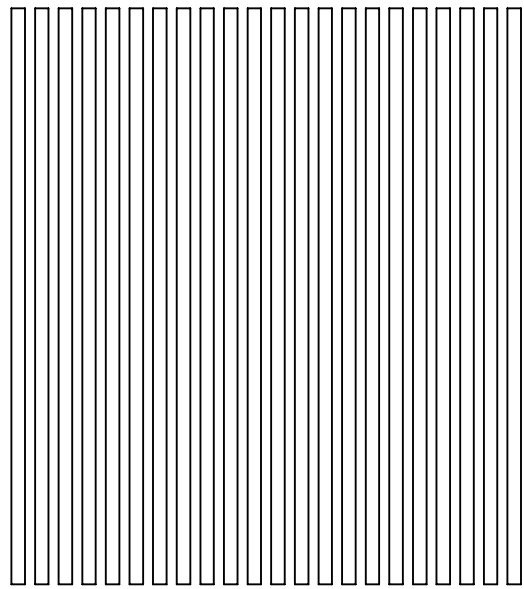
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2

1

B

B



DETAIL F
SCALE 1 : 4

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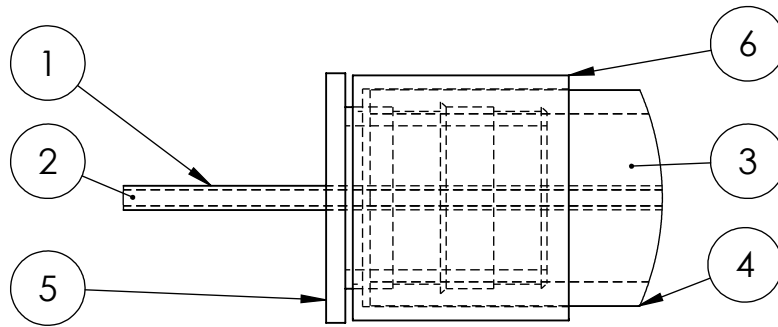
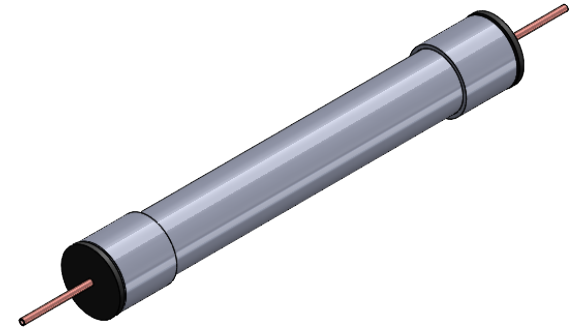
		UNLESS OTHERWISE SPECIFIED:	NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	Aaron E
		TOLERANCES:	CHECKED	4/24/24
		FRACTIONAL \pm	ENG APPR.	
		ANGULAR: MACH \pm BEND \pm	MFG APPR.	
		TWO PLACE DECIMAL \pm	Q.A.	
		THREE PLACE DECIMAL \pm	COMMENTS: The concrete radiator is made from teh concrete copper bars as the thermal mass	
		INTERPRET GEOMETRIC TOLERANCING PER:		
		MATERIAL		
		Concrete/ Copper		
		FINISH		
	NEXT ASSY	USED ON		
	APPLICATION			
		DO NOT SCALE DRAWING		

TITLE:		
<h1>Concrete Radiator</h1>		
SIZE	DWG. NO.	REV
A	1	2
SCALE: 1:16		WEIGHT:
		SHEET 1 OF 1

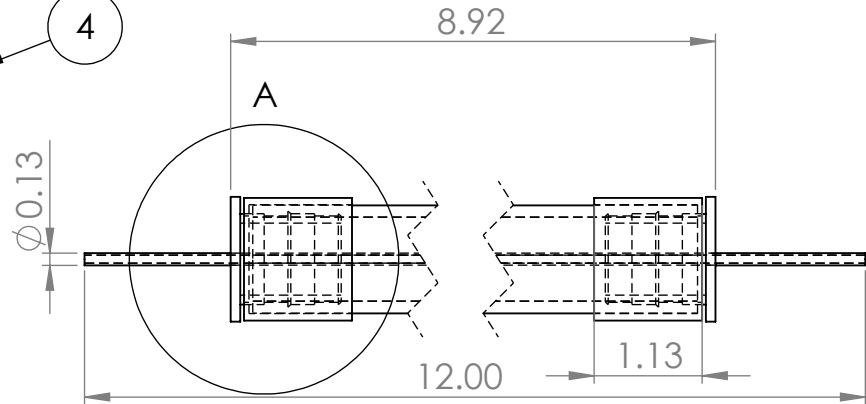
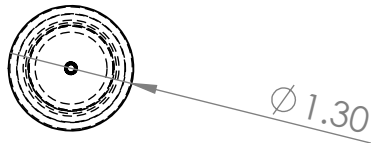
2

1

ITEM NO.	PART	DESCRIPTION	QTY.
1	Copper Tube	Heat tranfer material (1ft)	1
2	Ethylene Glycol	Working fluid for thermal energy transfer	0.000284 gal
3	Water (TES)	Used to store thermal energy	0.0219 gal
4	PEX-A	Encases TES	1
5	PEX Cap	Hold in TES/ hold copper centered	2
6	PEX Expansion Ring	Contracts PEX to fit cap	2



DETAIL A
SCALE 1 : 1



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	AE
		TOLERANCES:	CHECKED	9/24/24
		FRACTIONAL ±	ENG APPR.	
		ANGULAR: MACH ± BEND ±	MFG APPR.	
		TWO PLACE DECIMAL ±	Q.A.	
		THREE PLACE DECIMAL ±	COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:		
		MATERIAL		
NEXT ASSY	USED ON	FINISH		
	APPLICATION	DO NOT SCALE DRAWING		

TITLE:		
<h1>Water Bar</h1>		
SIZE	DWG. NO.	REV
A	1	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

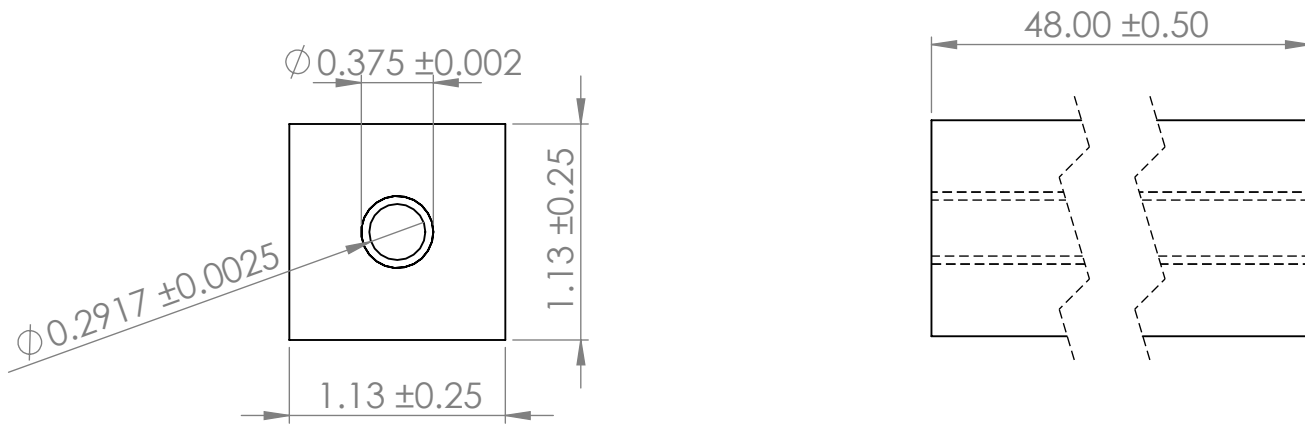
2

1

ITEM NO.	PART	DESCRIPTION	Cost (\$/ft)
1	Copper Pipe	Transfers heat from the concrete to fluid	0.52
2	Concrete	Concrete is used as the thermal energy storage	0.045
3	Ethylene Glycol	Runs in the copper pipe as the cooling fluid for heat transfer with the concrete	0.47

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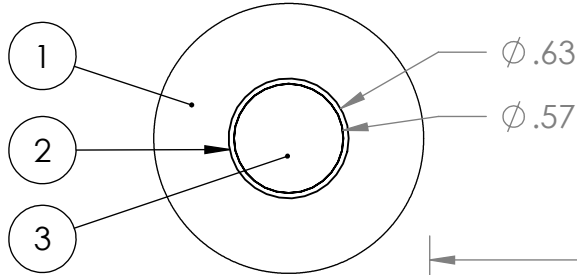
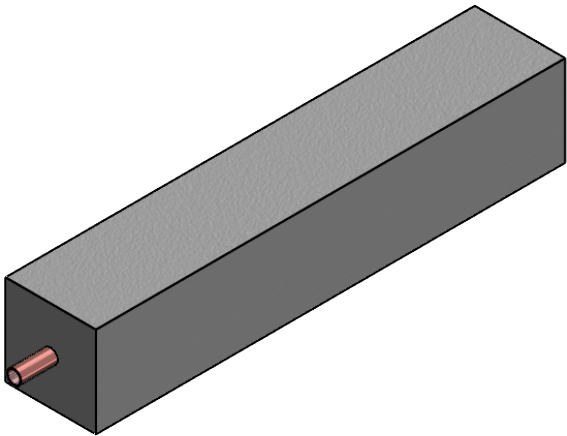
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	Aaron E	4/25/24
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS: Copper tube has the cooling fluid running through to cool the concrete (therml mass). The concrete is then used to store thermal energy used for cooling the air		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		Concrete/ Copper			
		FINISH			
NEXT ASSY	USED ON				
	APPLICATION	DO NOT SCALE DRAWING			

TITLE:		
<h1>Concrete Thermal Mass</h1>		
SIZE	DWG. NO.	REV
A	5	
SCALE: 1	WEIGHT:	SHEET 1 OF 1

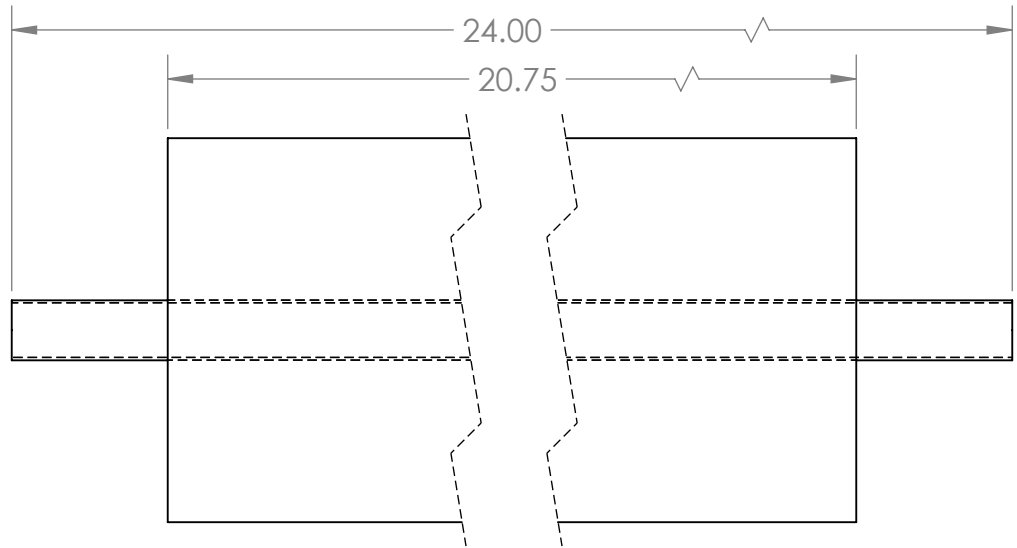
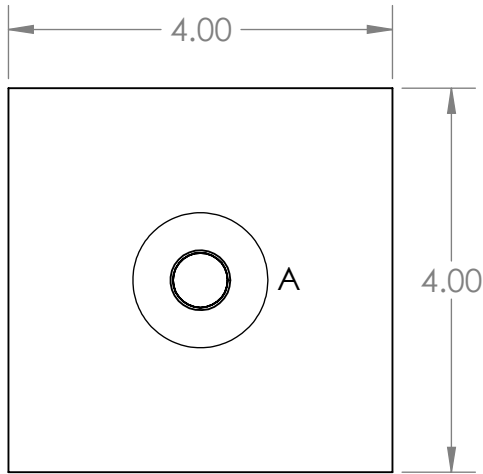
2

1

ITEM NO.	PART	DESCRIPTION	QTY.
1	Concrete	Thermal Energy Storage	12.8 kg
2	Copper Tube	Transfers heat from concrete to working fluid	1
3	Ethylene Glycol	Working fluid for heat transfer	0.0264 gal



DETAIL A
SCALE 1 : 1



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		DIMENSIONS ARE IN INCHES	DRAWN	AE
		TOLERANCES:	CHECKED	9/24
		FRACTIONAL \pm	ENG APPR.	
		ANGULAR: MACH \pm BEND \pm	MFG APPR.	
		TWO PLACE DECIMAL \pm	Q.A.	
		THREE PLACE DECIMAL \pm	COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:		
		MATERIAL		
NEXT ASSY	USED ON	FINISH		
	APPLICATION	DO NOT SCALE DRAWING		

TITLE:
Concrete TES

SIZE	DWG. NO.	REV
A	2	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

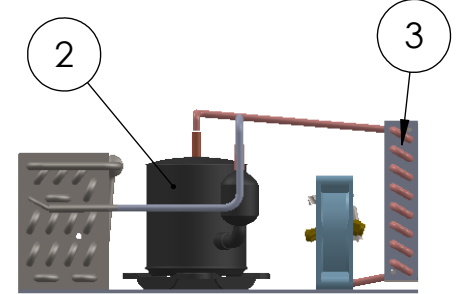
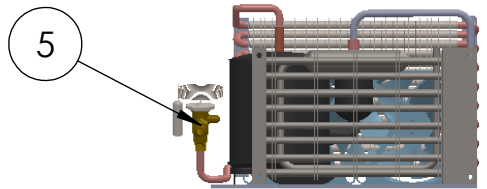
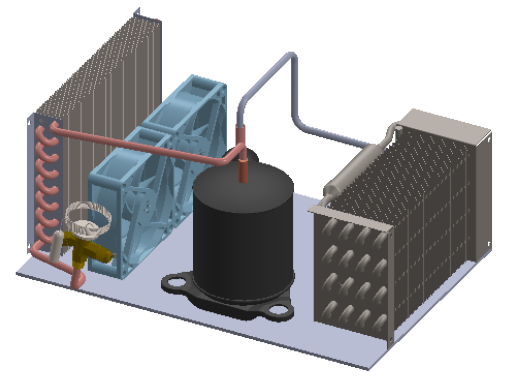
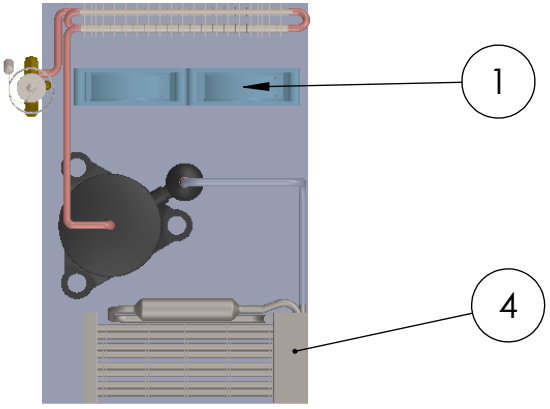
2

1

PART NUMBER	FUNCTION
1	Fans [1]
2	Compressor [2]
3	Condenser [3]
4	Evaporator [4]
5	Expansion Valve [5]
6	Base Plate

B

B



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	Aaron E 4/26/24
		TOLERANCES:	CHECKED	
		FRACTIONAL ±	ENG APPR.	
		ANGULAR: MACH ± BEND ±	MFG APPR.	
		TWO PLACE DECIMAL ±	Q.A.	
		THREE PLACE DECIMAL ±	COMMENTS: Vapor-compression refrigeration cycle that will be used to cool the thermal mass. Part 5 will direct the cooling fluid to the thermal mass.	
		INTERPRET GEOMETRIC TOLERANCING PER:	SIZE	DWG. NO.
		MATERIAL	A	2
		FINISH	SCALE 1:8	WEIGHT:
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	SHEET 1 OF 1	REV 2

Citations
 [1]N. Kakadiya, "CPU fan," GRABCAD, [Online]. Available: <https://grabcad.com/library/cpu-fan-36>
 [2]I. Rana, "18k Compressor drawing of Split Air Conditioner," GRABCAD, Accessed: Mar. 24, 2024. [Online]. Available: <https://grabcad.com/library/18k-compressor-drawing-of-split-air-conditioner-1>
 [3]Chero, "Heat Exchanger," GRABCAD, Accessed: Apr. 24, 2024. [Online]. Available: https://grabcad.com/library/heat-exchanger-311/details?folder_id=13667651
 [4]V. Buzunov, "Evaporator," GRABCAD, Accessed: Mar. 24, 2024. [Online]. Available: <https://grabcad.com/library/evaporator-19>
 [5]M. Abbas, "Expansion Valve," GRABCAD, Accessed: Mar. 24, 2024. [Online]. Available: <https://grabcad.com/library/expansion-valve-1>

2

1

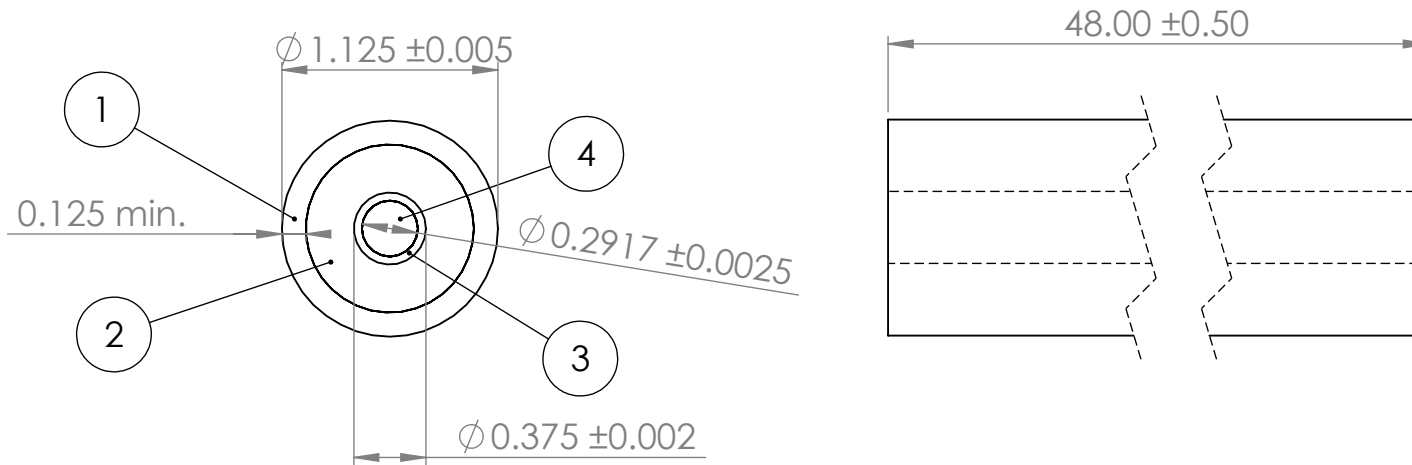
2

1

ITEM NO.	PART NUMBER	DESCRIPTION	Cost (\$/ft)
1	PEX Pipe	Surrounding pipe enclosing Water Thermal Mass	.62
2	Water Thermal Mass	Water used as thermal energy storage	.012
3	Copper Pipe	Used to encase cooling fluid	0.52
4	Ethylene Glycol	Runs through the copper pipe to cool and freeze the water surrounding	.047

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		DIMENSIONS ARE IN INCHES	DRAWN	Aaron E
		TOLERANCES:	CHECKED	4/25/24
		FRACTIONAL ±	ENG APPR.	
		ANGULAR: MACH ± BEND ±	MFG APPR.	
		TWO PLACE DECIMAL ±	Q.A.	
		THREE PLACE DECIMAL ±	COMMENTS: The pipe encased water as the thermal mass that is cooled using chilled ethylene glycol that runs through the copper pipe	
		INTERPRET GEOMETRIC TOLERANCING PER:		
		MATERIAL		
NEXT ASSY	USED ON	FINISH		
	APPLICATION	DO NOT SCALE DRAWING		

TITLE: Thermal Mass Piping		
SIZE	DWG. NO.	REV
A	3	2
SCALE: 1:5	WEIGHT:	SHEET 1 OF 1

2

1