

Bolts, Nuts and Washers.

- (13) 1/2" x 40mm
- (2) 1/2" x 90mm
- (2) 3/8" x 40mm
- (2) 3/8" x 65mm
- (8) 1/2" washers, large
- (15) 1/2" lock washers
- (11) 1/2" hex nuts
- (4) 1/2" wing nuts
- (8) 3/8" washers
- (4) 3/8" lock washers
- (4) 3/8" hex nuts
- (2) 20mm washers
- (2) 20mm castle nuts with split pins

DISCLAIMER:

I have build these racks and have used them without a problem.

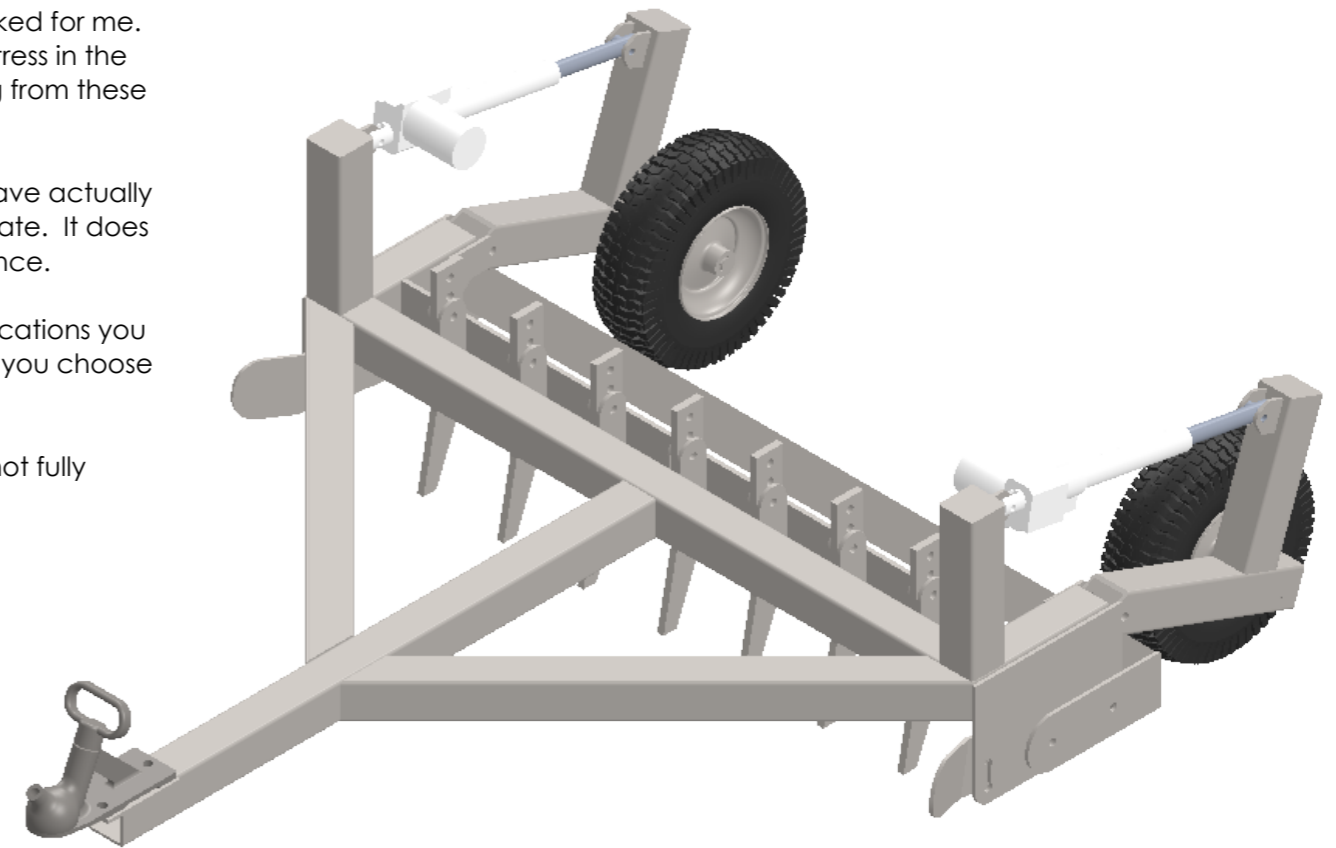
Be warned that I am not an engineer and there has been very little in the way of strength analysis done on this. It is all eyeball engineering.

I provide the plans as an example of something that has worked for me. They are provided for educational purposes only. I want to stress in the strongest possible terms that if you choose to build something from these plans then you do so entirely at your own risk.

Where the plans feature a "QA Date" this only means that I have actually built the item in the plans and completed the build on that date. It does **NOT** mean that the design passed any form of quality assurance.

I have no control of the quality of construction nor the modifications you may make to the design. I take no responsibility for anything you choose to do with these plans.

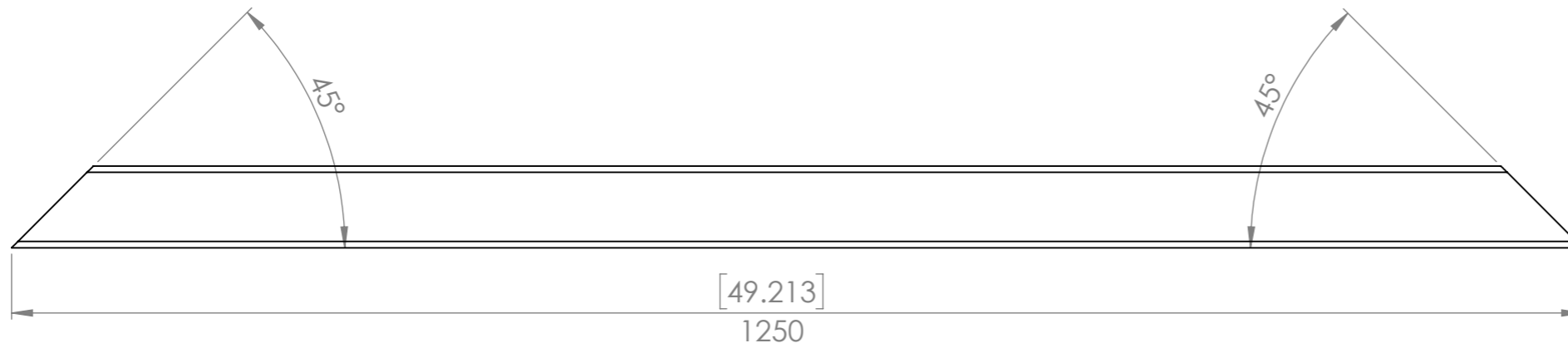
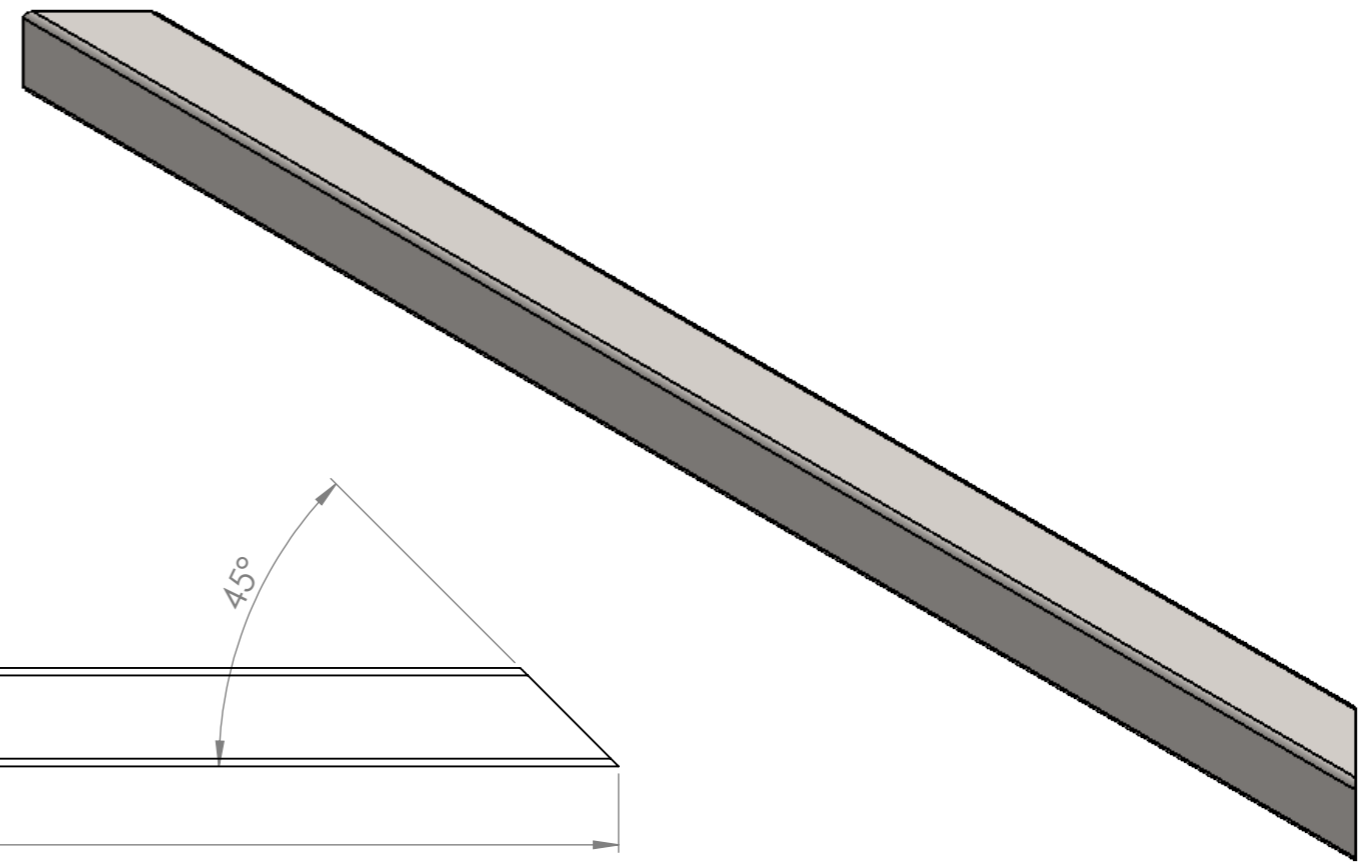
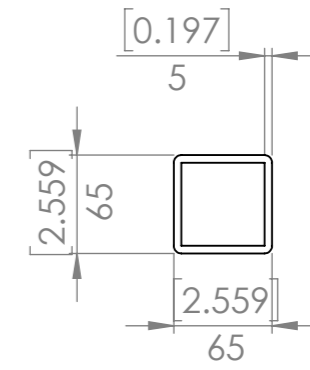
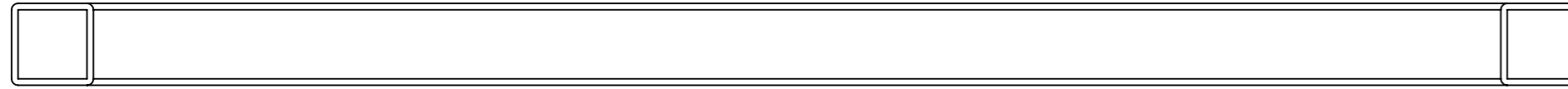
If you do not fully understand everything above or if you do not fully agree with it then DO NOT USE THESE PLANS.




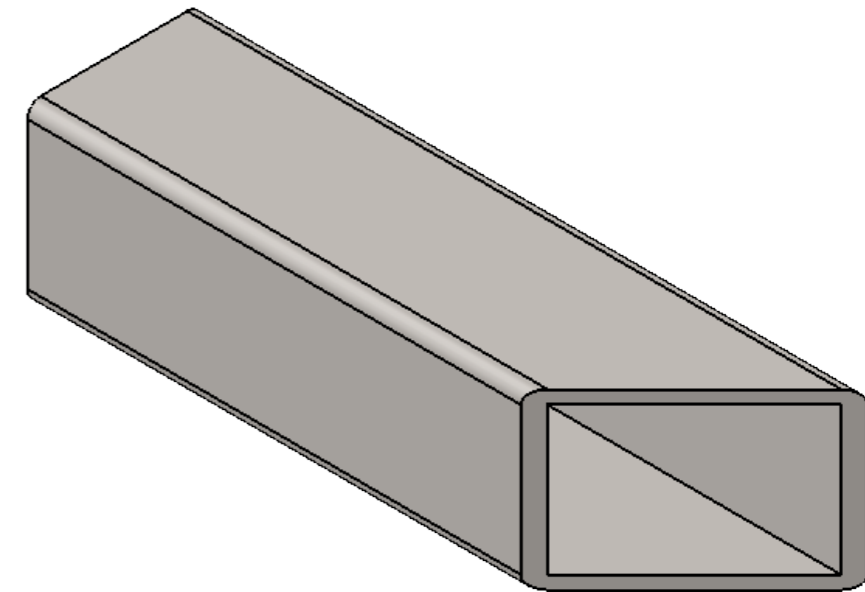
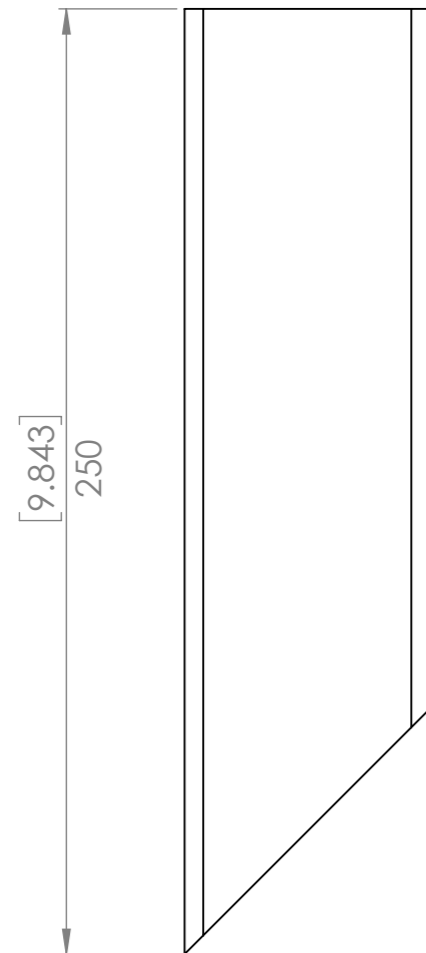
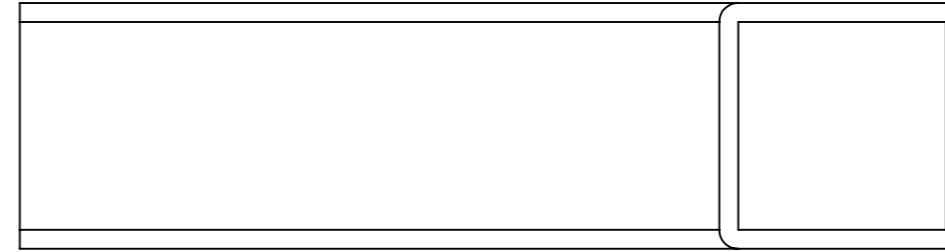
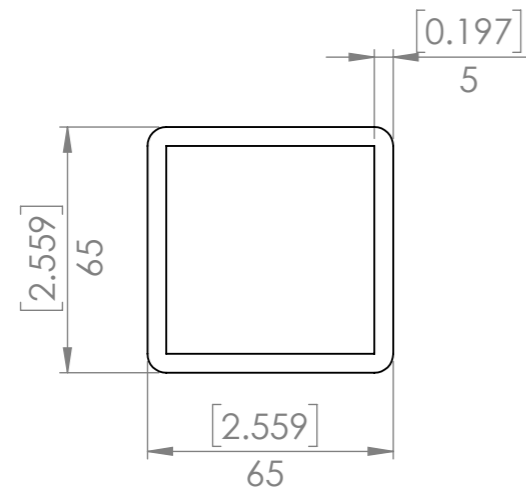
QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
1	p0080-001	Crossmember	Plain Carbon Steel	10893.38
2	p0080-002	Side member	Plain Carbon Steel	1999.39
4	p0080-003	Post	Plain Carbon Steel	2298.15
2	p0080-004	Drawbar	Plain Carbon Steel	7105.26
6	p0080-005	SHS Cap	Plain Carbon Steel	196.73
2	p0080-006	General Tab	Plain Carbon Steel	187.50
6	p0080-007	Actuator Tab	Plain Carbon Steel	83.59
2	p0080-008	Side Plate	Plain Carbon Steel	2507.40
1	p0080-009	Hitch Plate	Plain Carbon Steel	550.83
2	p0080-010	Leg	Plain Carbon Steel	3261.45
2	p0080-011	Axel	Plain Carbon Steel	1.46
14	p0080-012	Finger Mount	Plain Carbon Steel	227.22
1	p0080-013	Angle Crossmember	Plain Carbon Steel	8543.21
2	p0080-014	Edger	Plain Carbon Steel	1156.69
2	p0080-015	Leveler Arm	Plain Carbon Steel	982.18
1	p0080-016	Leveler Bar	Plain Carbon Steel	9614.97
2	p0080-017	Bush	Plain Carbon Steel	56.32
7	p0080-018	Finger	Plain Carbon Steel	1444.32
1	p0080-021	Tow Hitch		
1	p0080-022	Centre Drawbar	Plain Carbon Steel	9192.61


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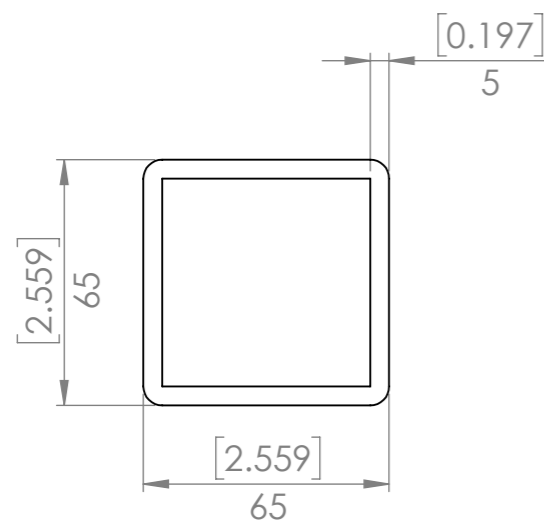
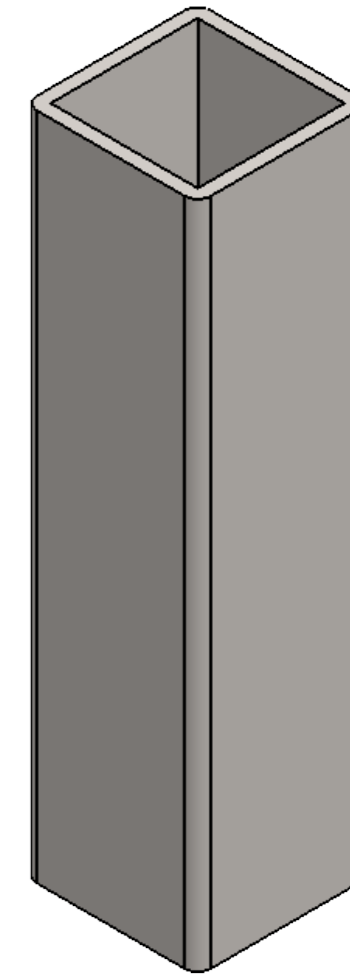
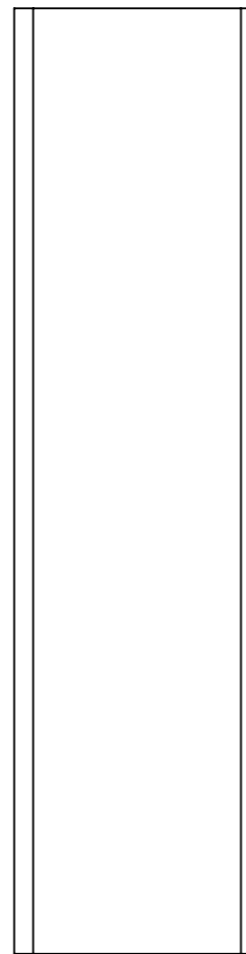
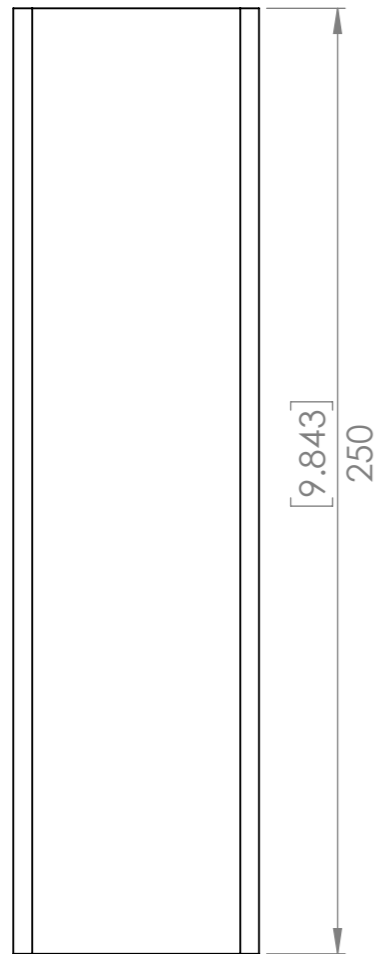
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SURFACE FINISH:									
TOLERANCES:									
LINEAR:									
ANGULAR:									
DRAWN		NAME	SIGNATURE	DATE			TITLE: Gravel Grader		
CHK'D									
APPV'D									
MFG									
Q.A					MATERIAL: Assembly		DWG NO. p0080-A3		A3
				WEIGHT: 128986.92		SCALE:1:10		SHEET 1 OF 28	



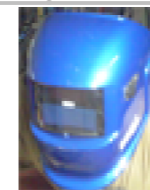
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DRAWN	NAME Merlin	DATE 2017-03-28						PART NO. p0080-001		A3	
Q.A	NAME Merlin	DATE 2017-07-15						SCALE:1:5		SHEET 2 OF 28	
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: SHS		STOCK SIZE: 65x65x5		MATERIAL: Plain Carbon Steel		WEIGHT: 10893.38	



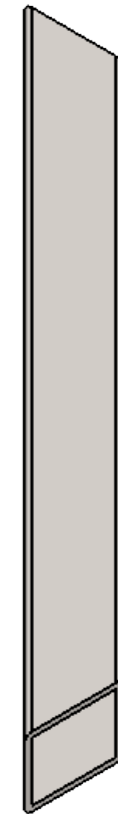
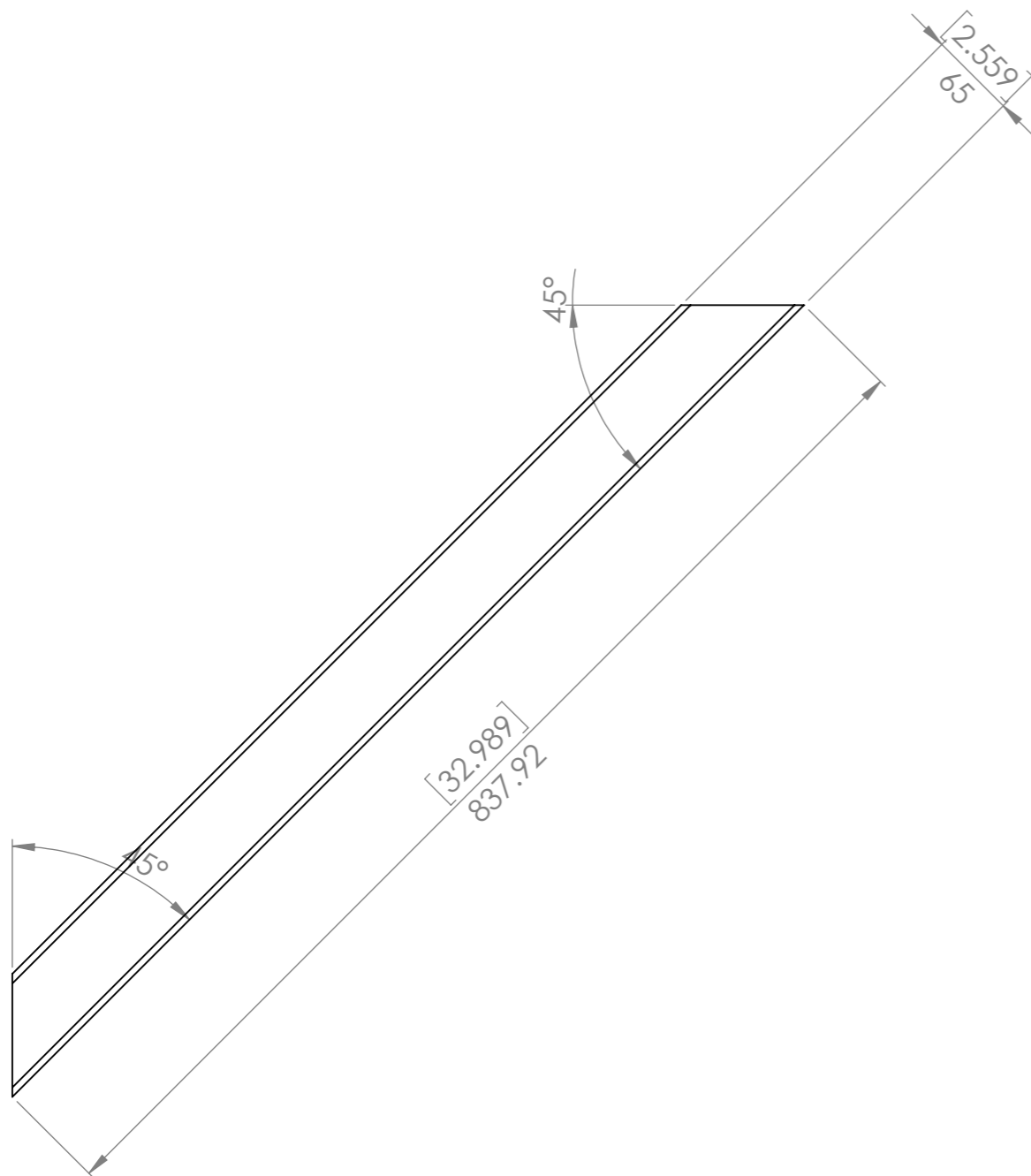
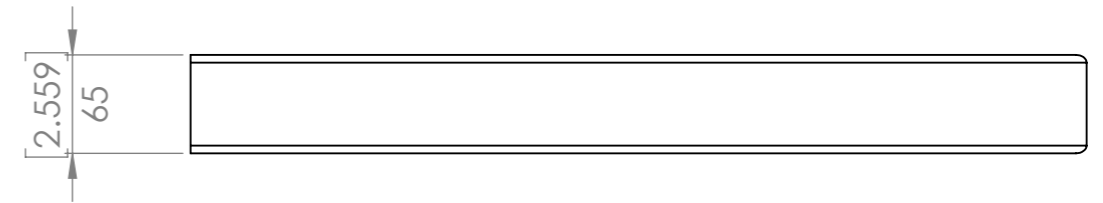
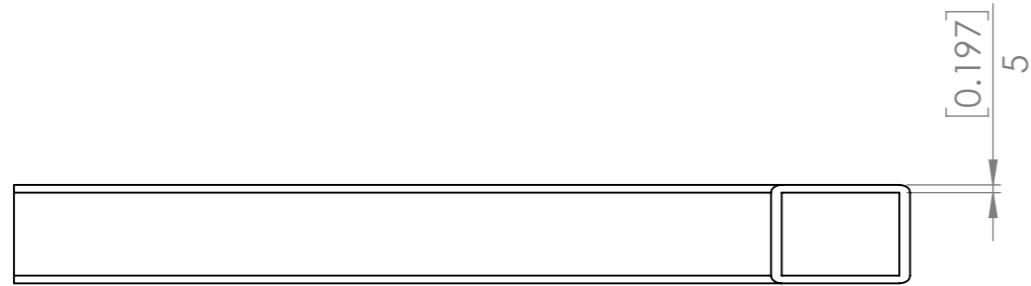
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DRAWN	NAME Merlin	DATE 2017-03-28							
Q.A	NAME Merlin	DATE 2017-07-15				PART NO.		p0080-002	
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				STOCK SIZE:	65x65x5				
		MATERIAL:		Plain Carbon Steel		WEIGHT: 1999.39		SHEET 3 OF 28	
						PART NO.		A3	




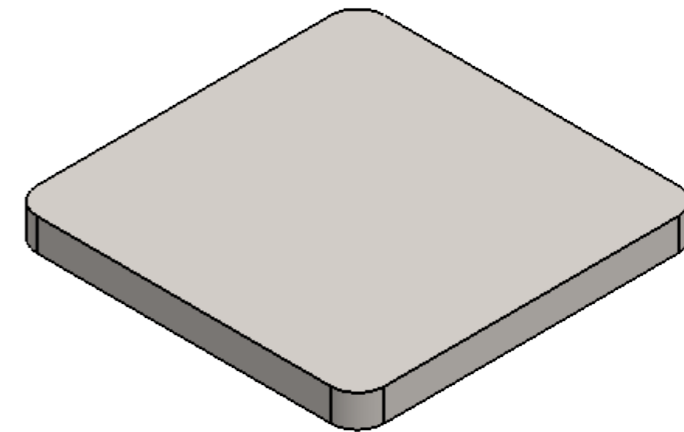
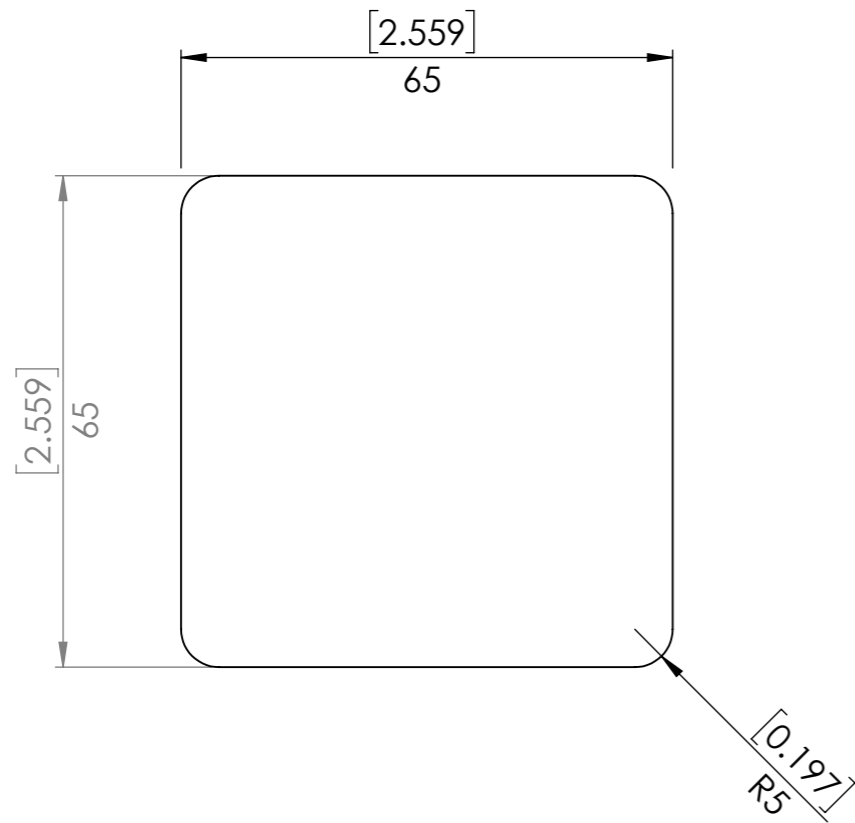
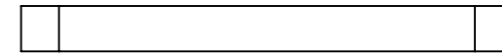
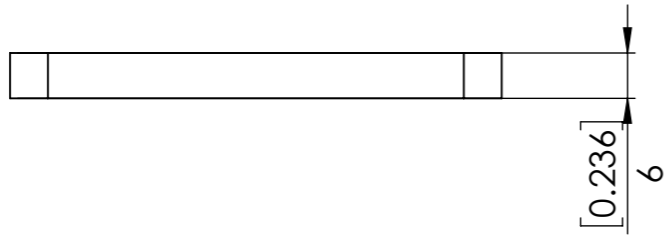
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DRAWN		NAME		DATE		TITLE: Post			
Q.A		Merlin		2017-03-28					
		Merlin		2017-07-15		STOCK:		SHS	
						STOCK SIZE:		65x65x5	
						MATERIAL:		Plain Carbon Steel	
						WEIGHT: 2298.15		SCALE: 1:2	
								PART NO. p0080-003	
								SHEET 4 OF 28	




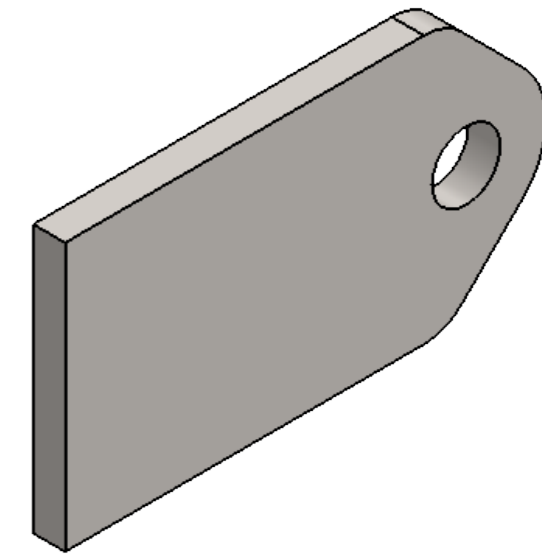
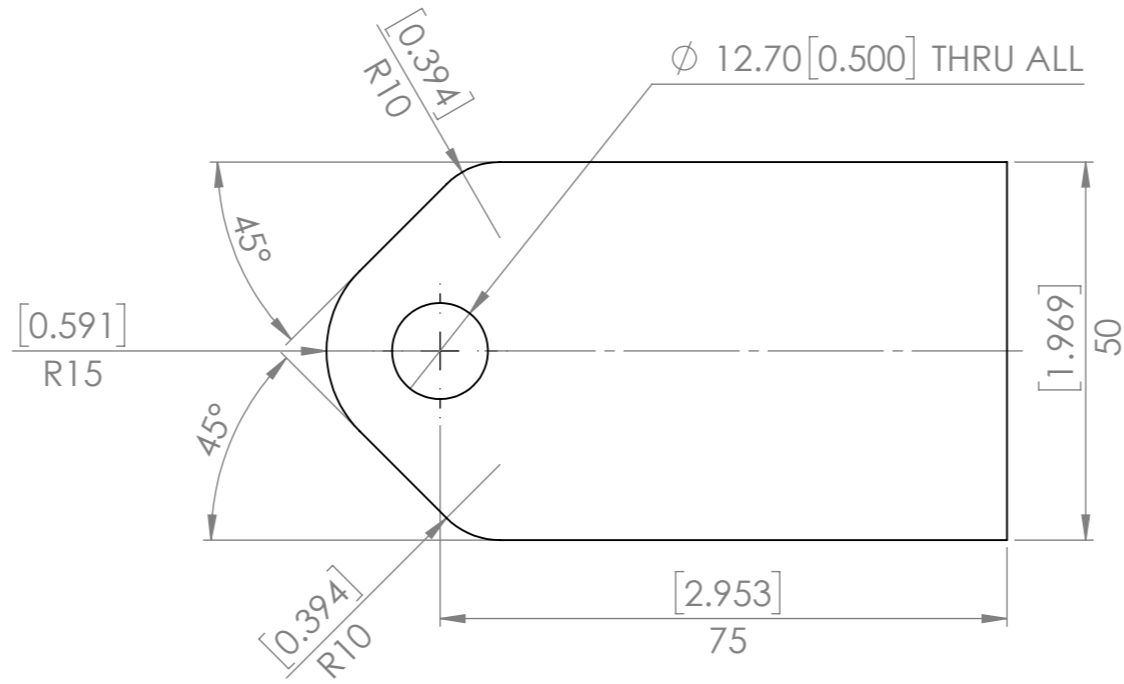
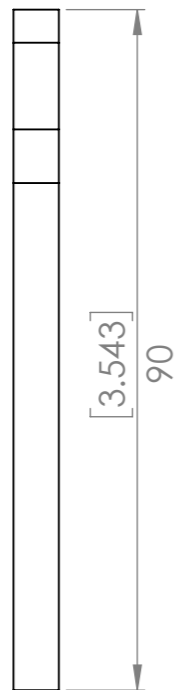
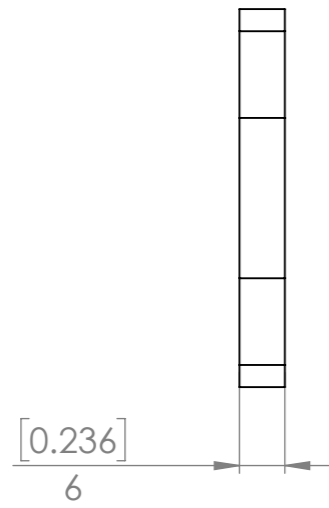
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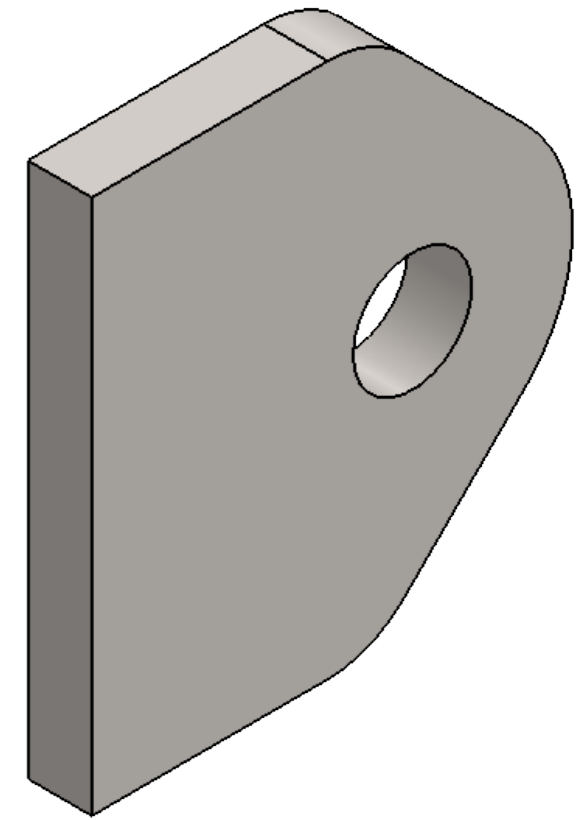
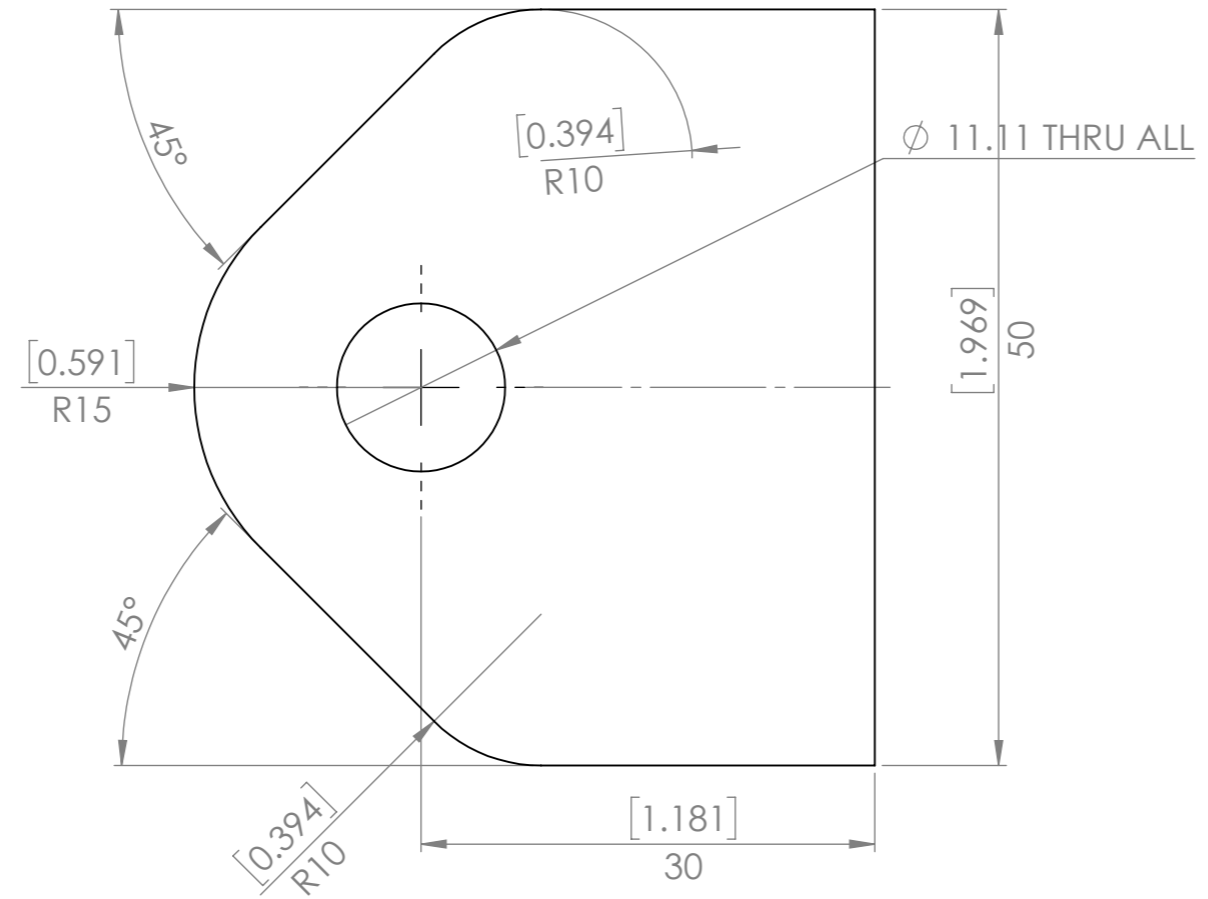
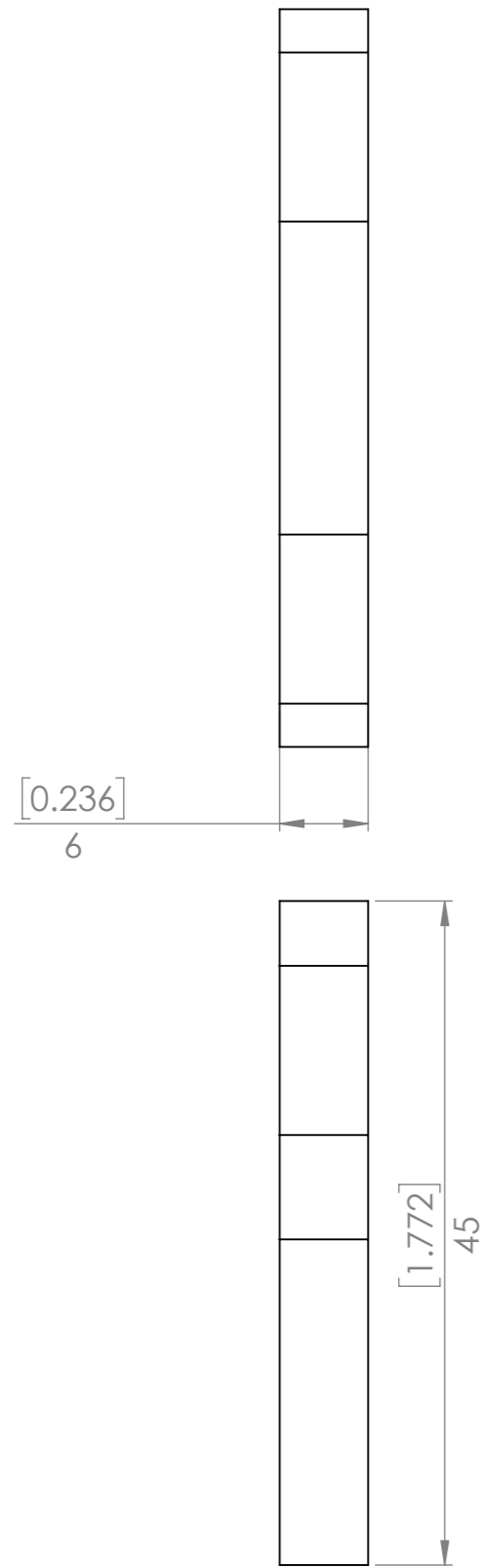
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build Drawbar					
DRAWN	NAME Merlin	DATE 2017-03-28								TITLE:	
Q.A	NAME Merlin	DATE 2017-07-15								PART NO. p0080-004	
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: SHS STOCK SIZE: 65x65x5 MATERIAL: Plain Carbon Steel		WEIGHT: 7105.26		SCALE:1:5 SHEET 5 OF 28			




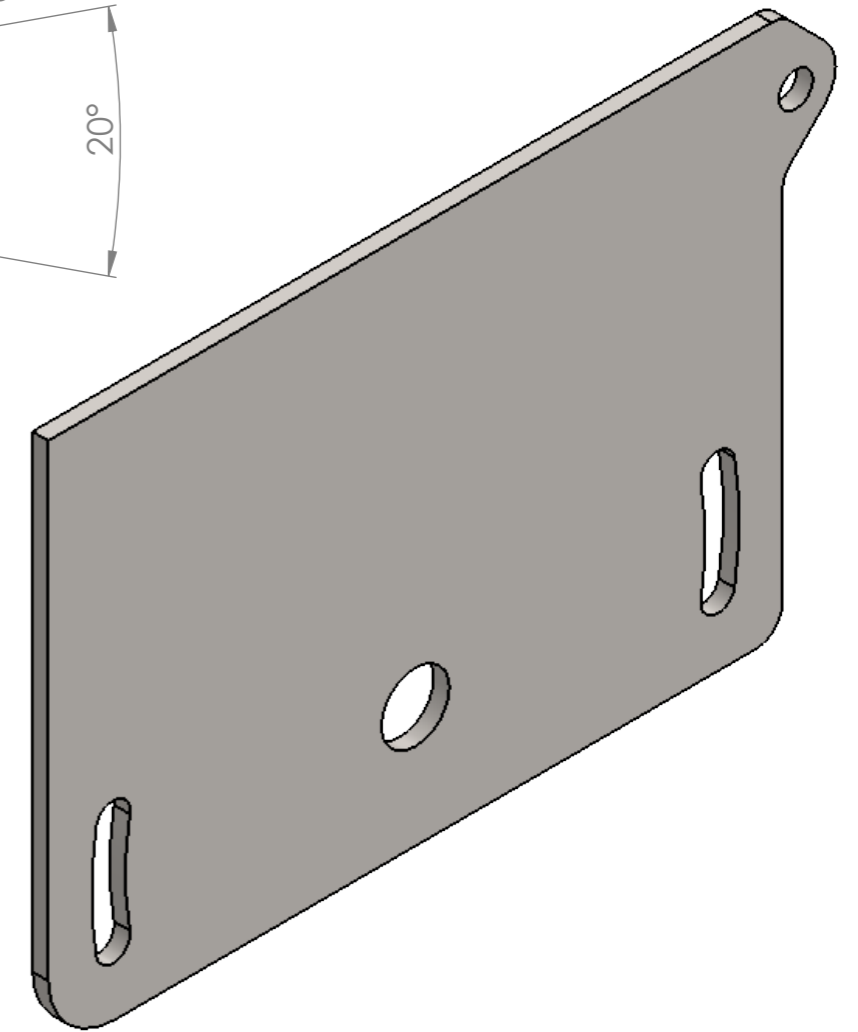
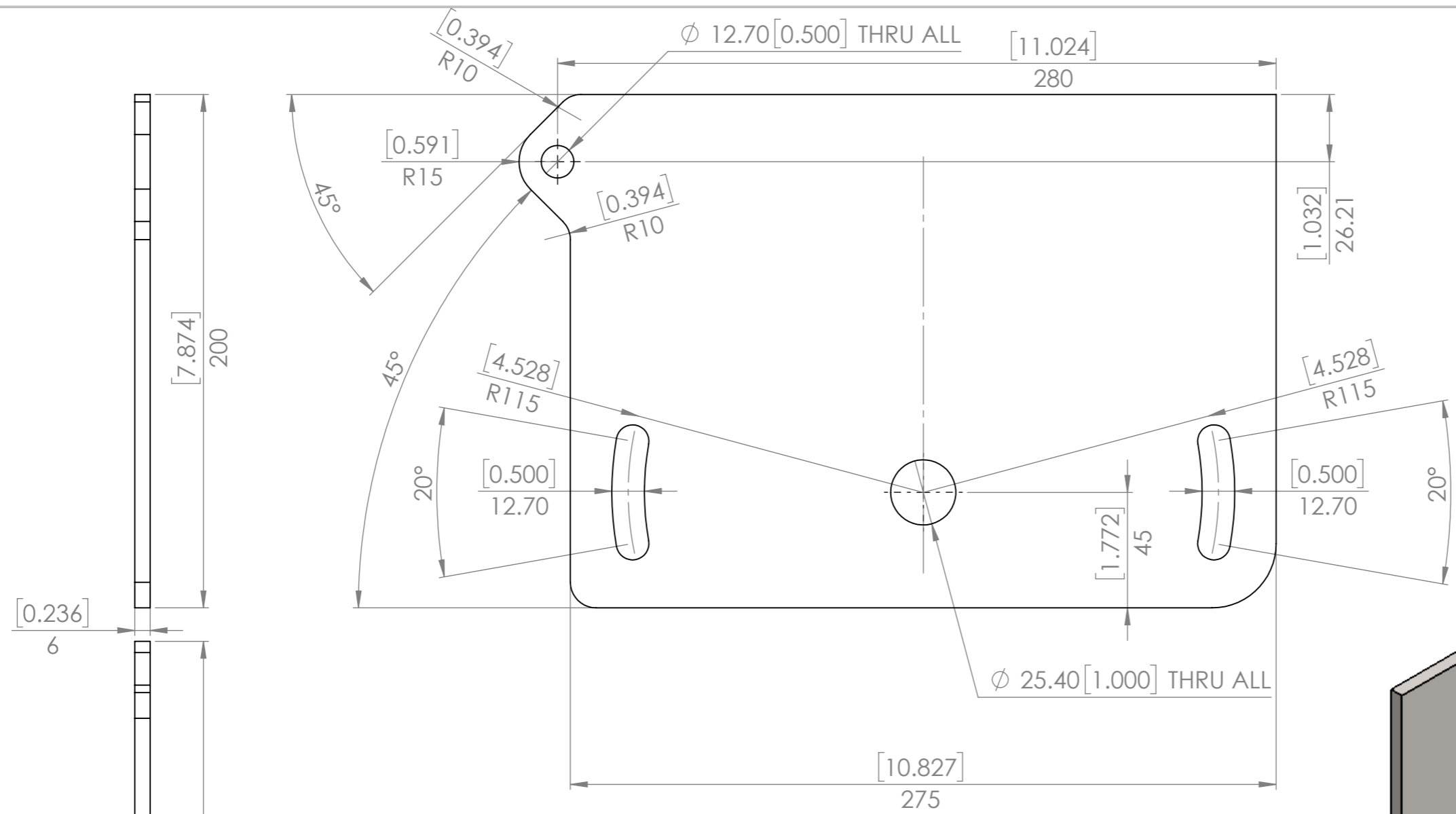
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN		NAME		DATE		TITLE: SHS Cap			
		Merlin		2017-03-28					
Q.A		NAME		DATE		PART NO. p0080-005			
		Merlin		2017-07-15					
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		STOCK SIZE:		6mm					
		MATERIAL:		Plain Carbon Steel		SHEET 6 OF 28			
		WEIGHT:		196.73					




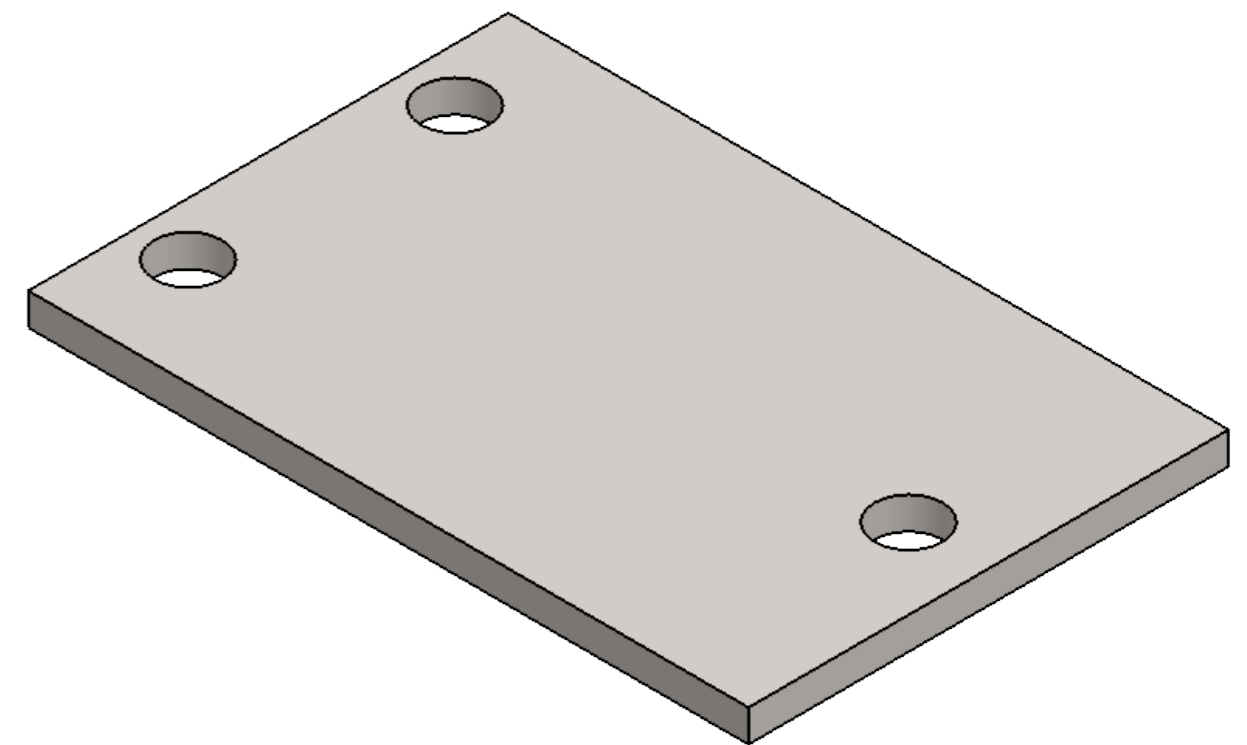
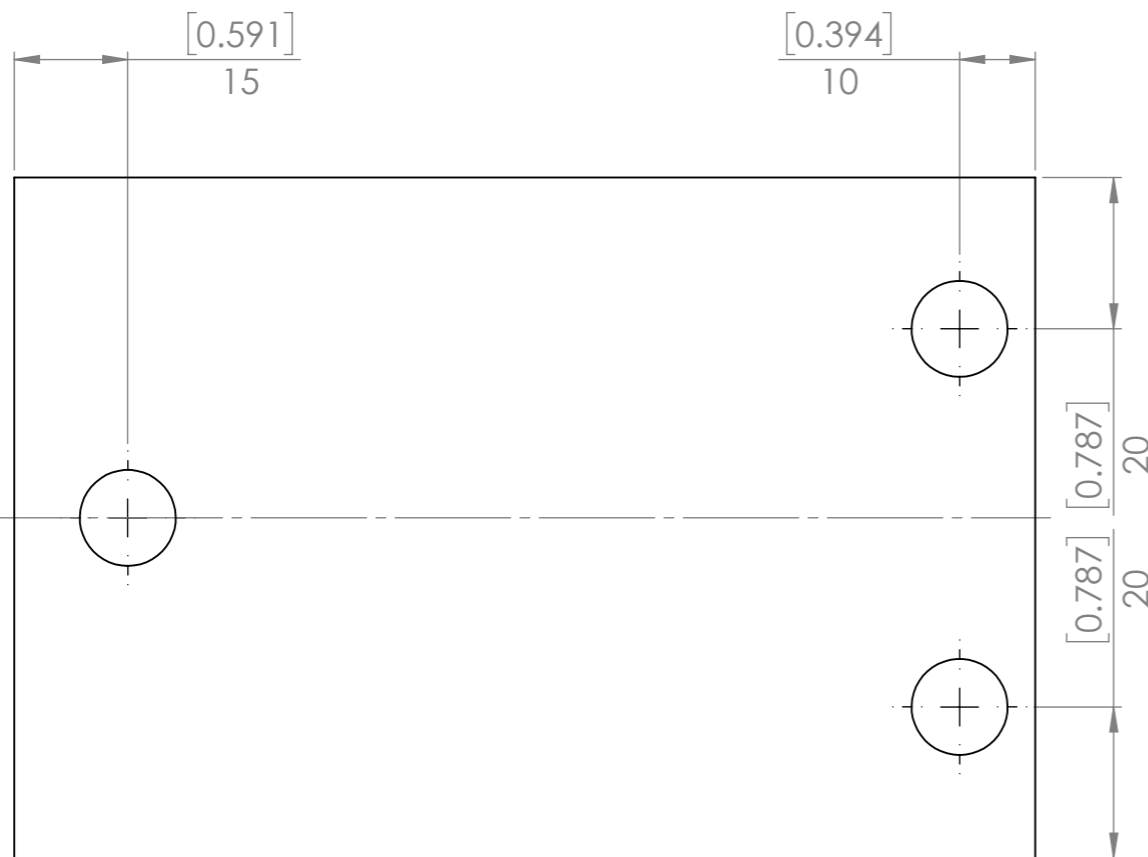
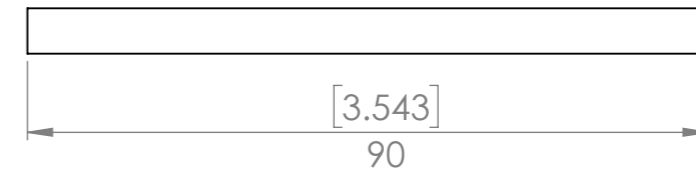
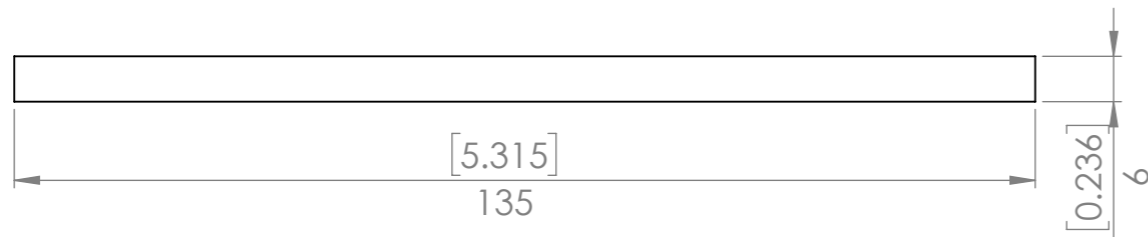
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build General Tab					
DRAWN	NAME Merlin	DATE 2017-03-28								TITLE:	
Q.A	NAME Merlin	DATE 2017-07-15								PART NO.	
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: Plate STOCK SIZE: 6mm MATERIAL: Plain Carbon Steel		PART NO. p0080-006		A3			
		WEIGHT: 187.50		SCALE:1:1		SHEET 7 OF 28					




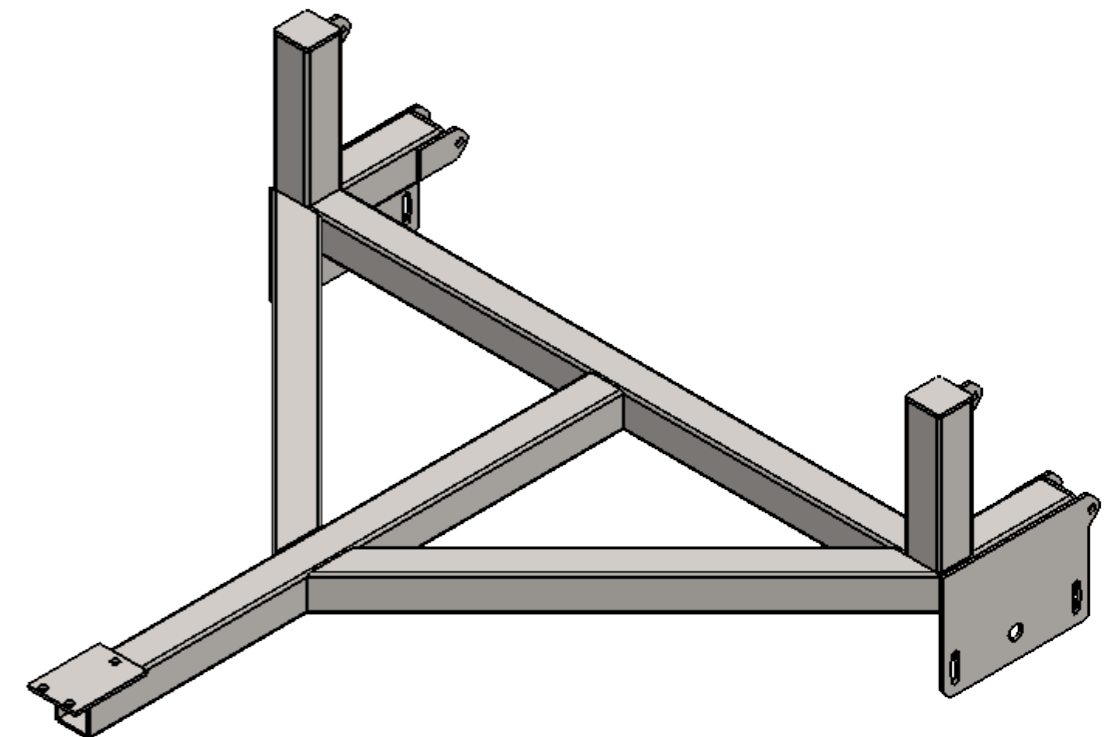
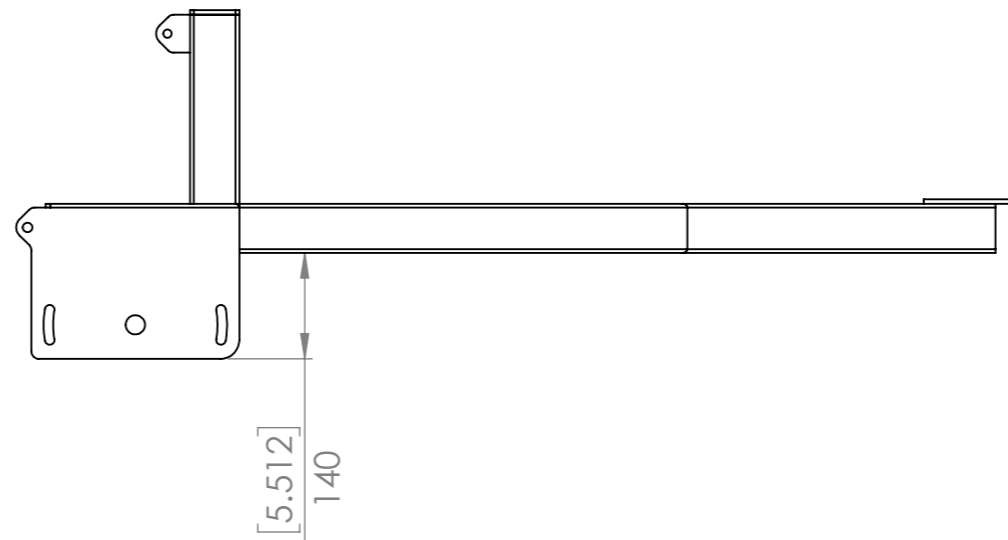
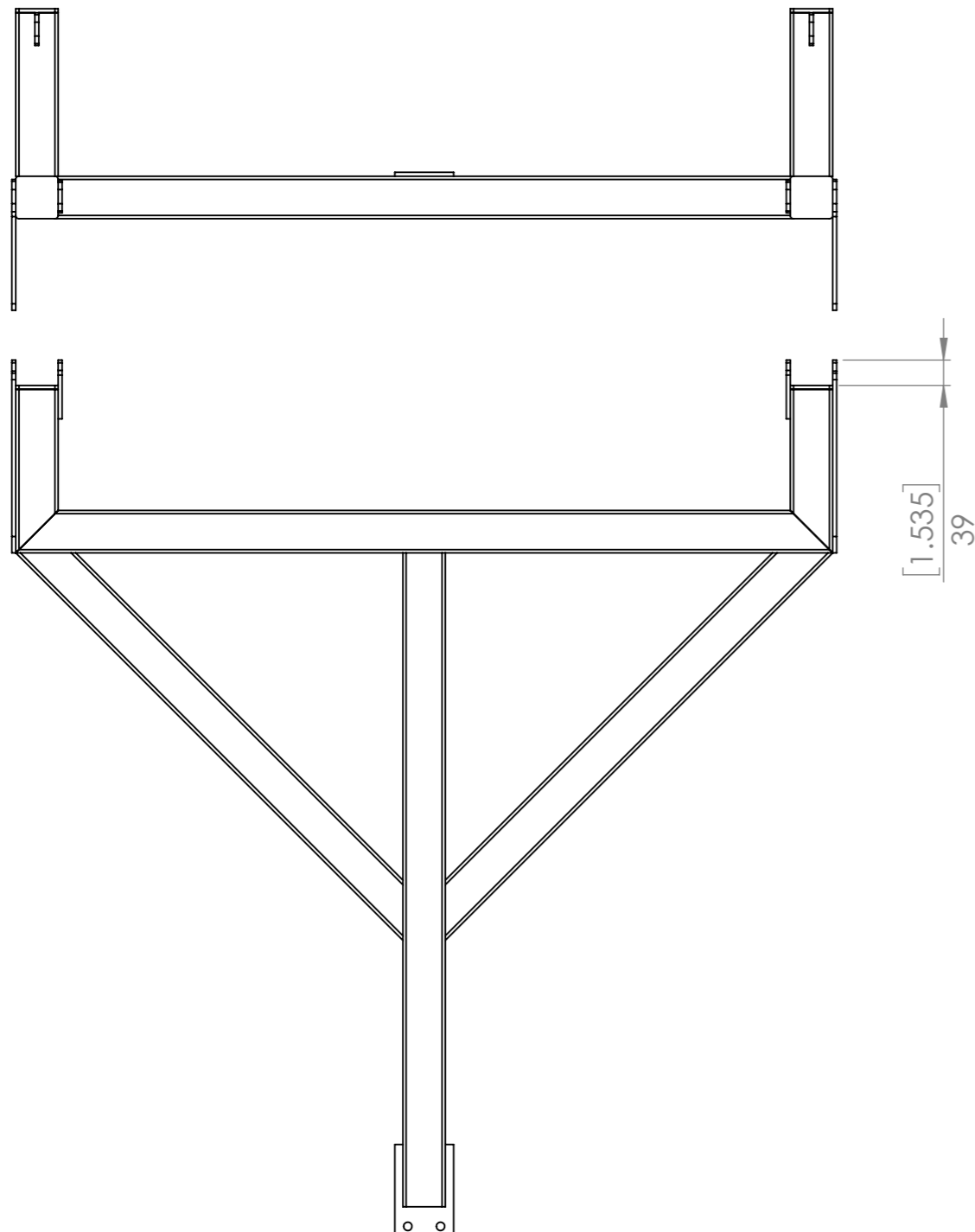
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN Merlin 2017-03-28		DATE				Actuator Tab			
Q.A Merlin 2017-07-15									
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		STOCK SIZE: 6mm							
		MATERIAL: Plain Carbon Steel						SCALE:2:1	
		WEIGHT: 83.59							




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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						TITLE: Designed 2 Build Side Plate					
DRAWN Merlin		DATE 2017-03-28									
Q.A Merlin		DATE 2017-07-15									
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				STOCK SIZE: 6mm		MATERIAL: Plain Carbon Steel		SCALE:1:2			
				WEIGHT: 2507.40		SHEET 9 OF 28					

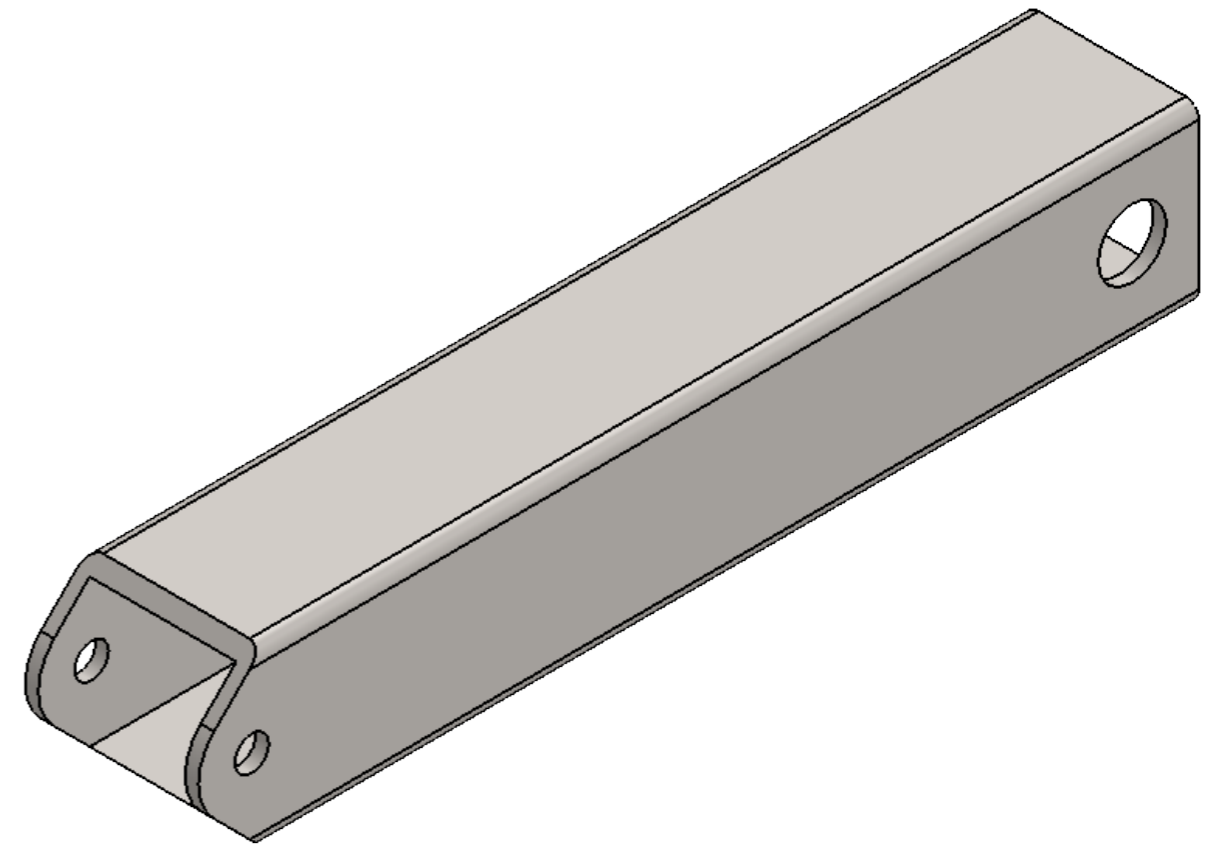
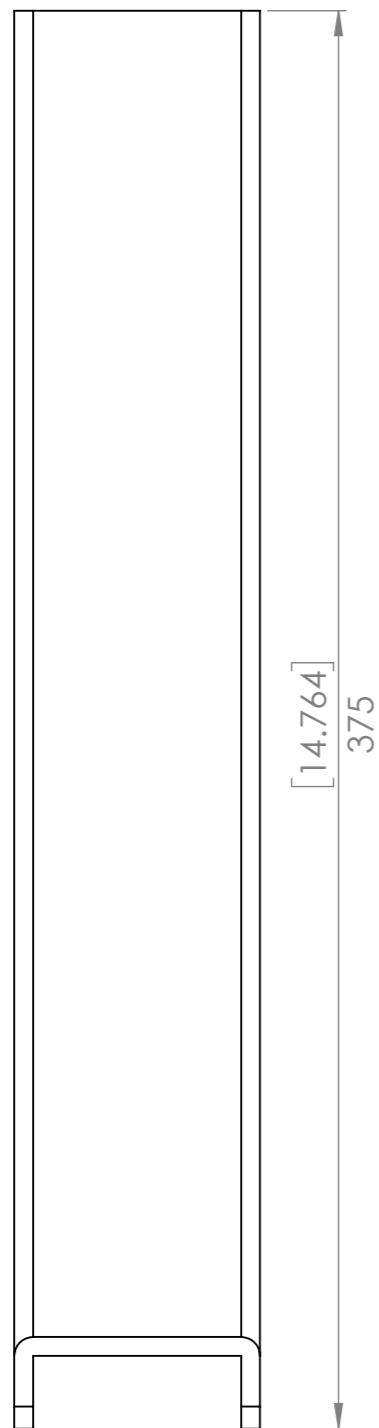
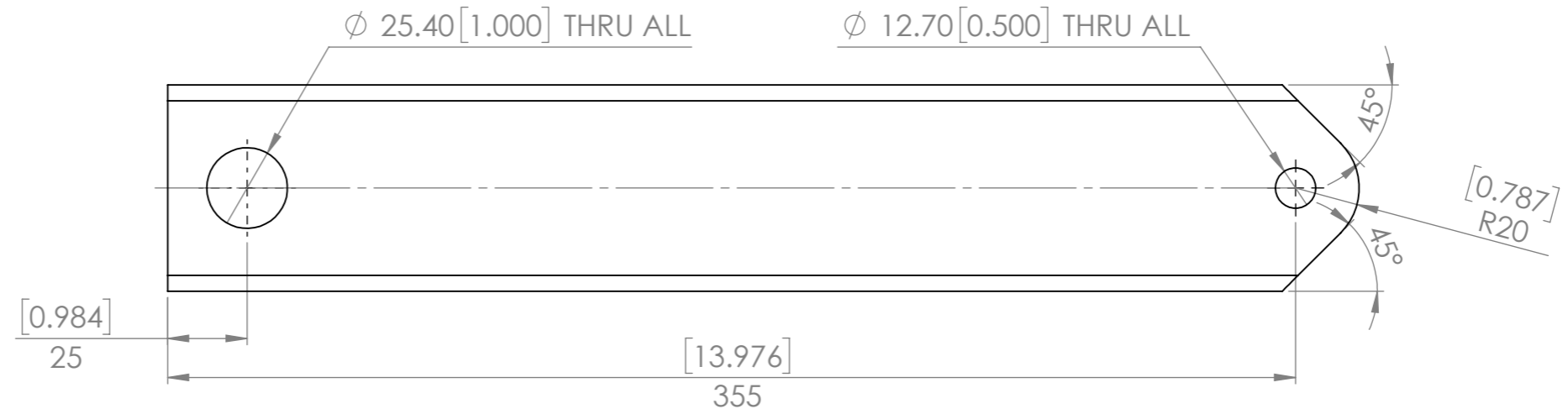
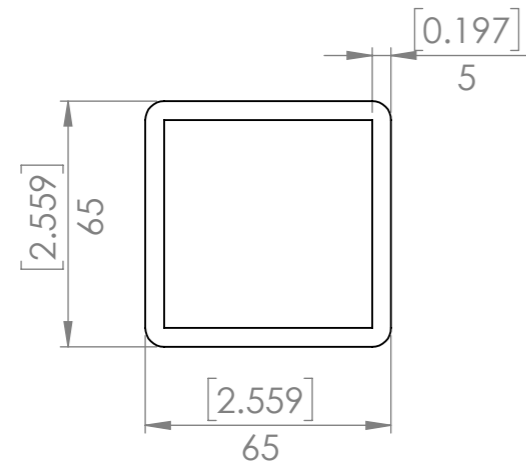



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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build Hitch Plate			
NAME	DATE								
DRAWN Merlin	2017-03-28								
Q.A Merlin	2017-07-15								
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				Plain Carbon Steel		WEIGHT: 550.83		SCALE:1:1	

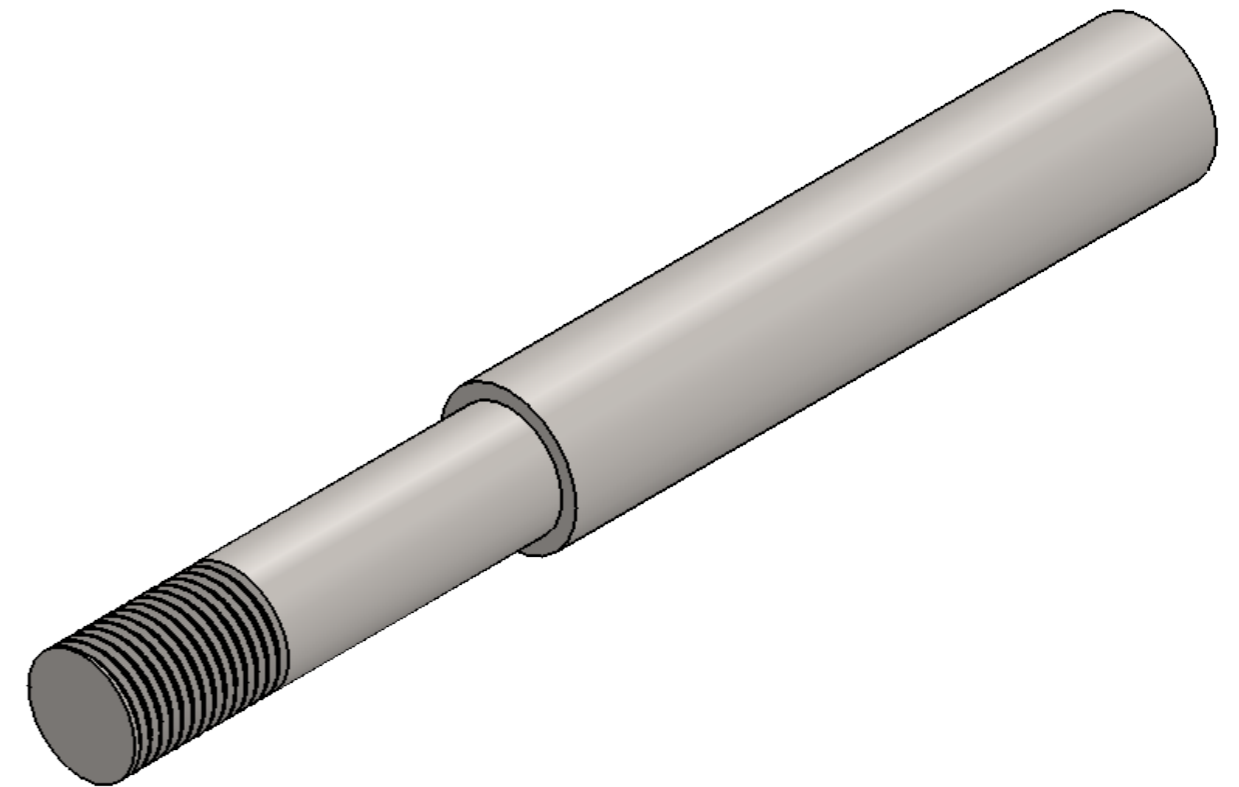
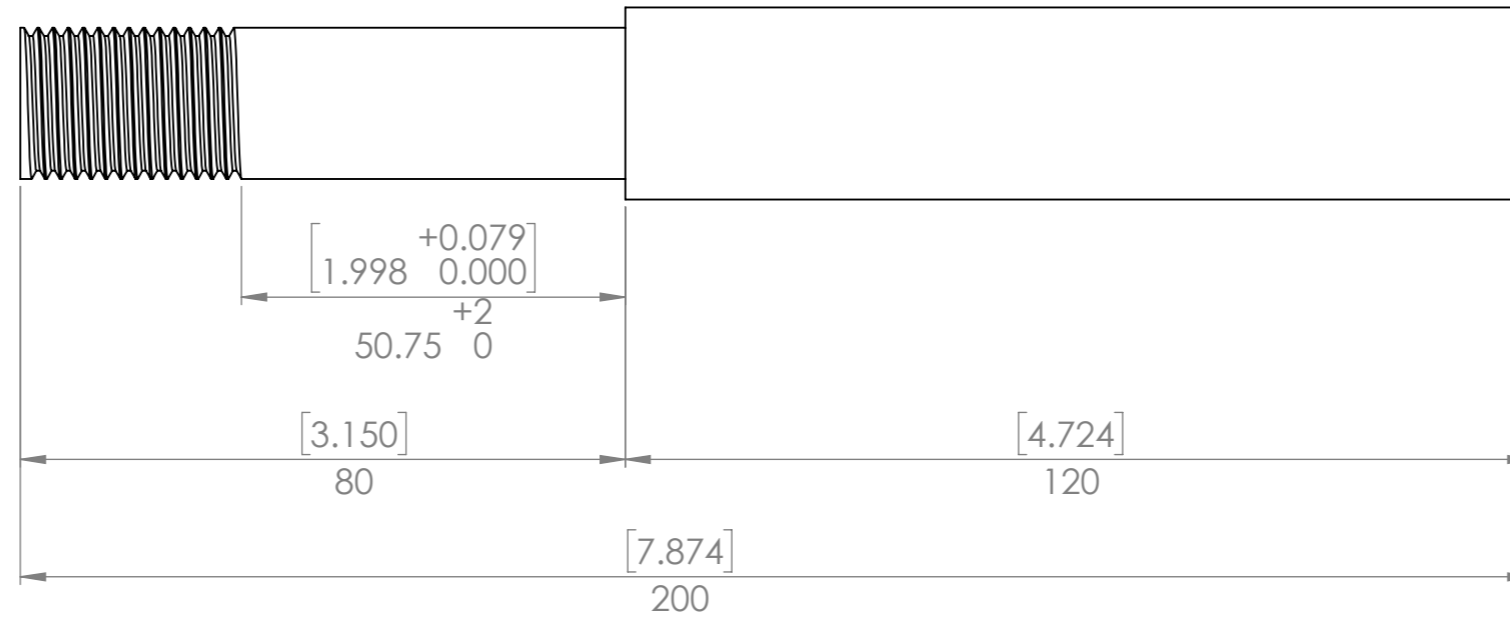
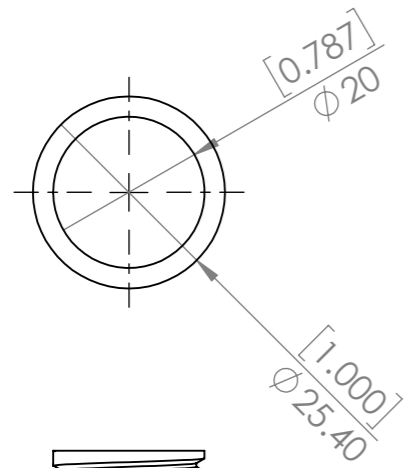



QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
1	p0080-001	Crossmember	Plain Carbon Steel	10893.38
2	p0080-002	Side member	Plain Carbon Steel	1999.39
2	p0080-003	Post	Plain Carbon Steel	2298.15
2	p0080-004	Drawbar	Plain Carbon Steel	7105.26
4	p0080-005	SHS Cap	Plain Carbon Steel	196.73
2	p0080-006	General Tab	Plain Carbon Steel	187.50
2	p0080-007	Actuator Tab	Plain Carbon Steel	83.59
2	p0080-008	Side Plate	Plain Carbon Steel	2507.40
1	p0080-009	Hitch Plate	Plain Carbon Steel	550.83
1	p0080-022	Centre Drawbar	Plain Carbon Steel	9192.61

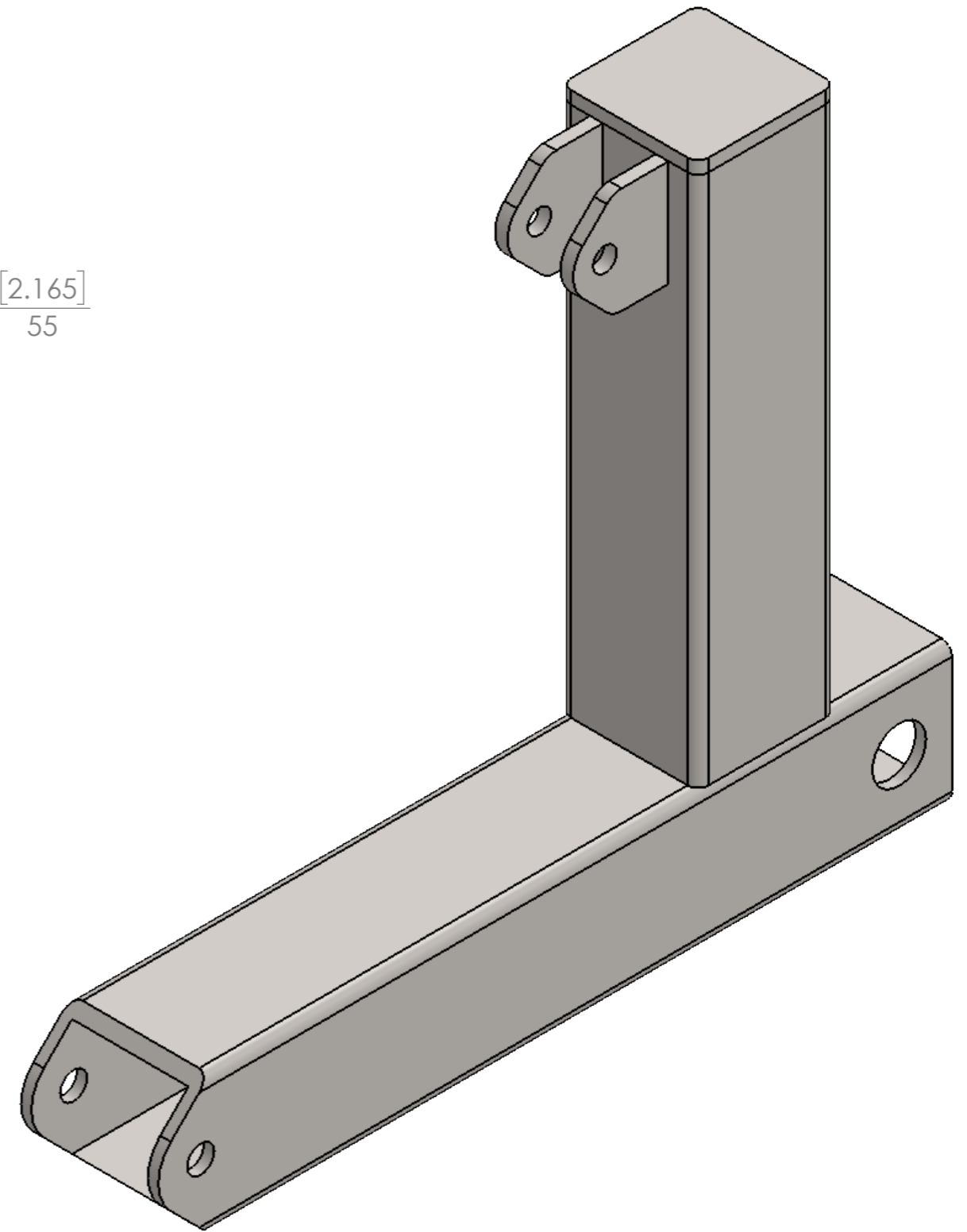
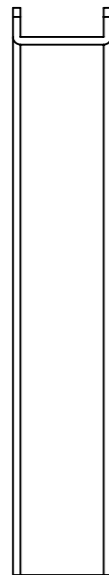
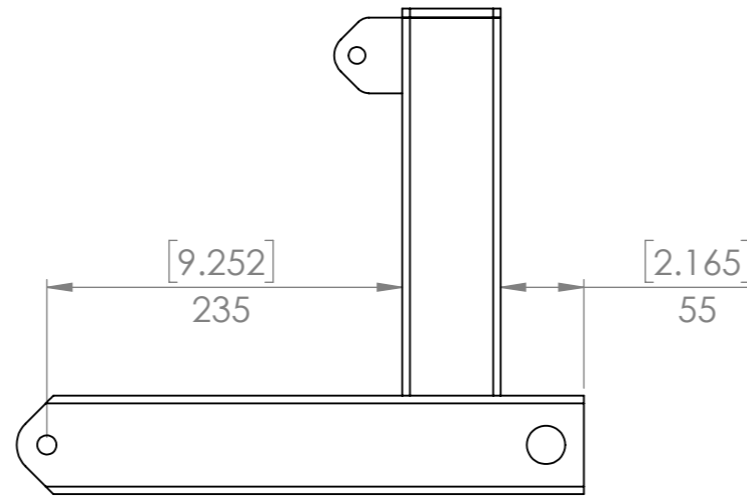
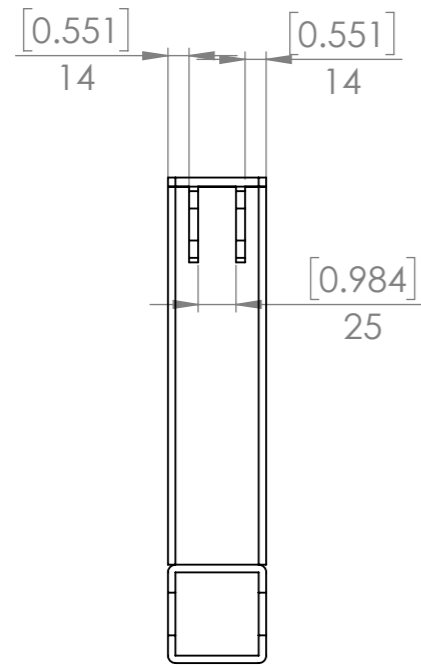
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build Main Frame			
DRAWN Merlin		DATE 2017-03-28		TITLE:					
Q.A Merlin		DATE 2017-07-15							
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		WEIGHT: 49786.30		SCALE:1:10		SHEET 11 OF 28			




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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN Merlin		DATE 2017-03-28				Leg			
Q.A Merlin		DATE 2017-07-15							
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		STOCK SIZE: 65x65x5		MATERIAL: Plain Carbon Steel					
		WEIGHT: 3261.45		SCALE: 1:2		SHEET 12 OF 28			

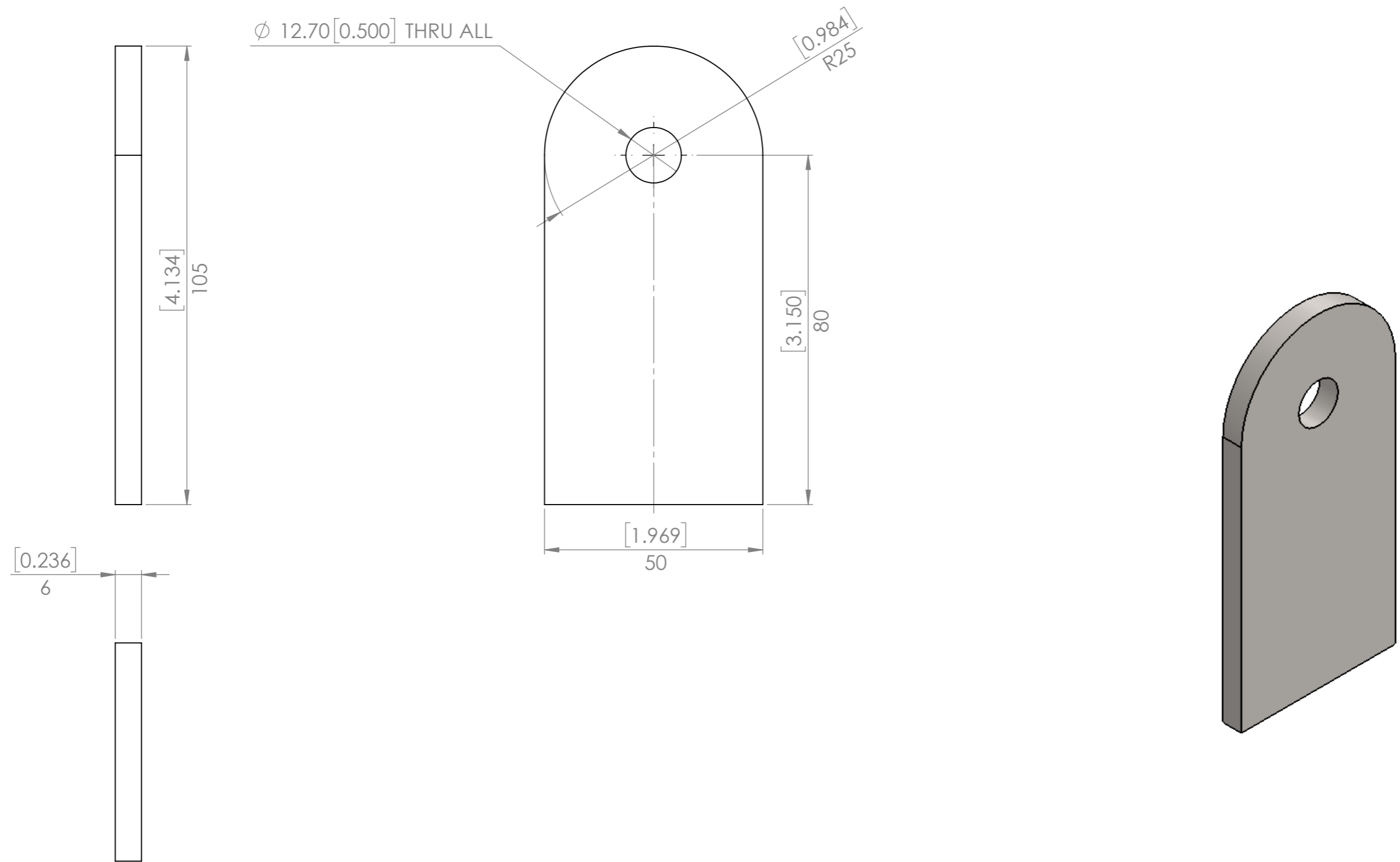



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								<h2 style="text-align: center;">Axel</h2>			
NAME	DATE										
DRAWN Merlin	2017-03-28										
Q.A Merlin	2017-07-15										
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: Rod		TITLE: <h1 style="text-align: center;">Axel</h1>					
				STOCK SIZE: 25 mm							
				MATERIAL: Plain Carbon Steel							
		WEIGHT: 1.46				PART NO. p0080-011		A3			
						SCALE:1:1		SHEET 13 OF 28			

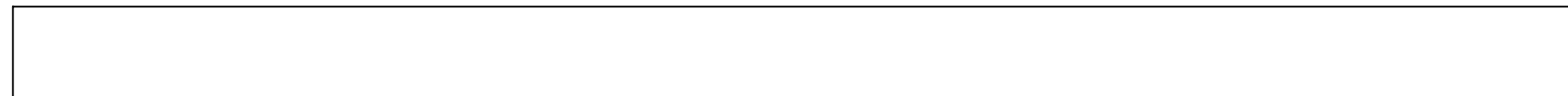
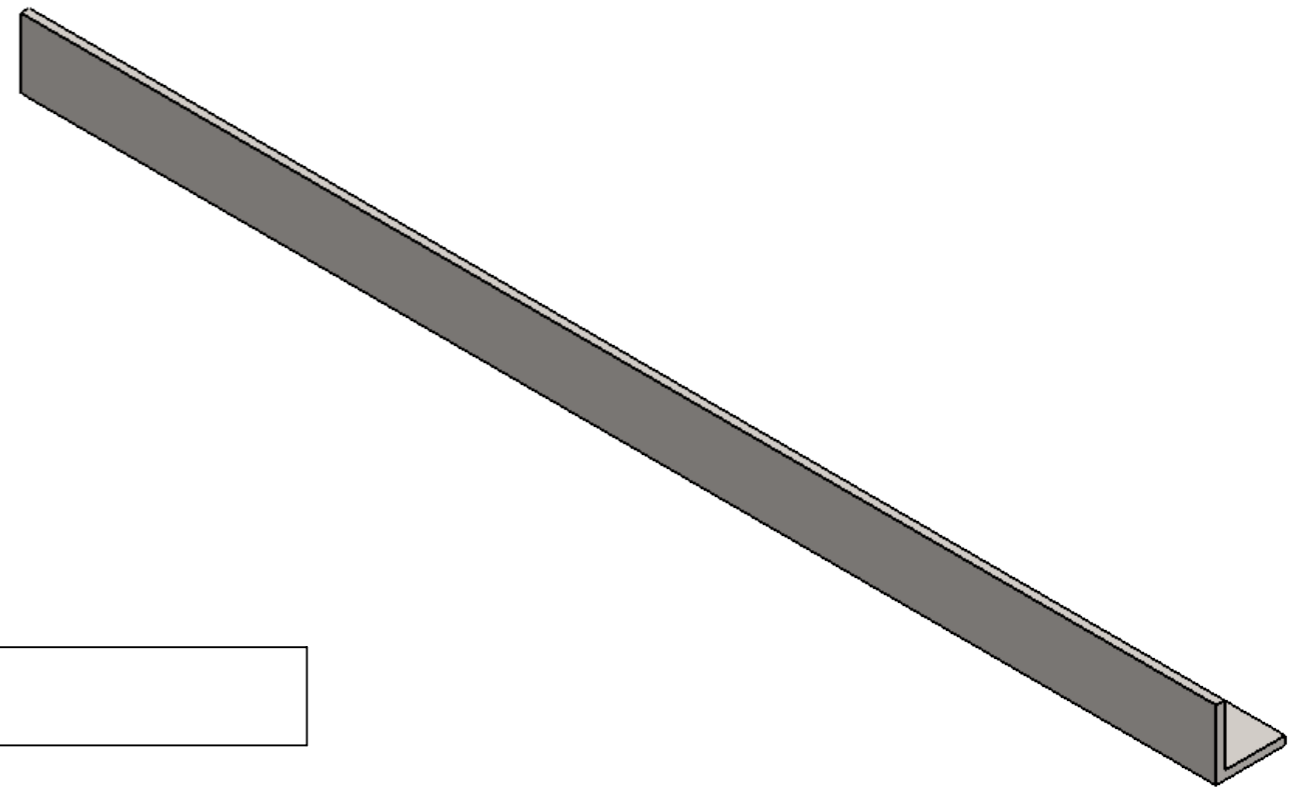
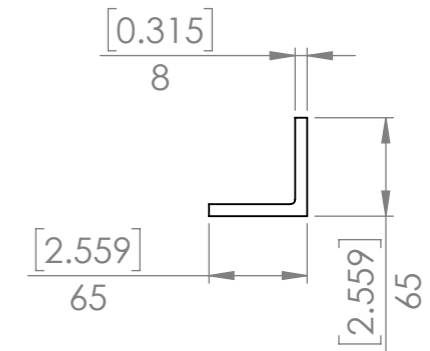
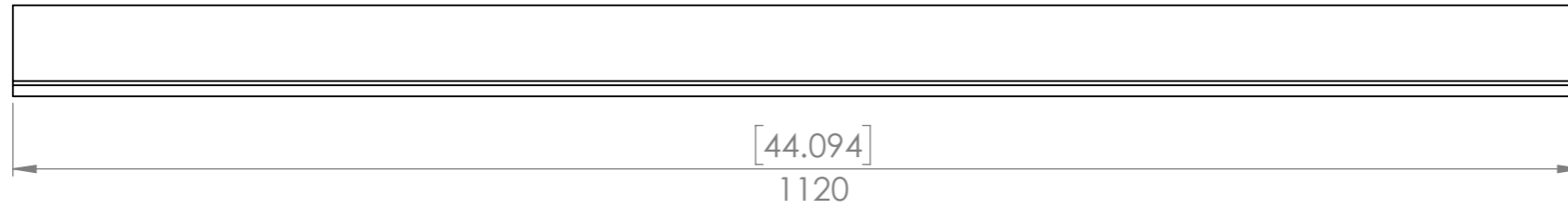



QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
1	p0080-003	Post	Plain Carbon Steel	2298.15
1	p0080-005	SHS Cap	Plain Carbon Steel	196.73
2	p0080-007	Actuator Tab	Plain Carbon Steel	83.59
1	p0080-010	Leg	Plain Carbon Steel	3261.45

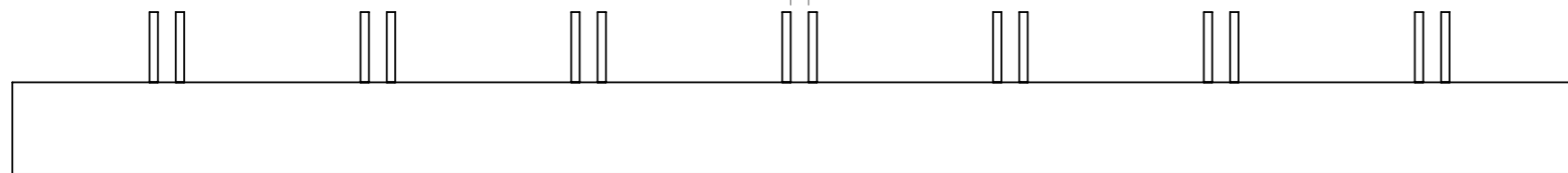
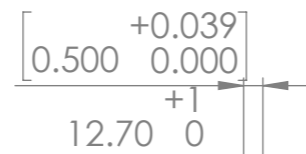
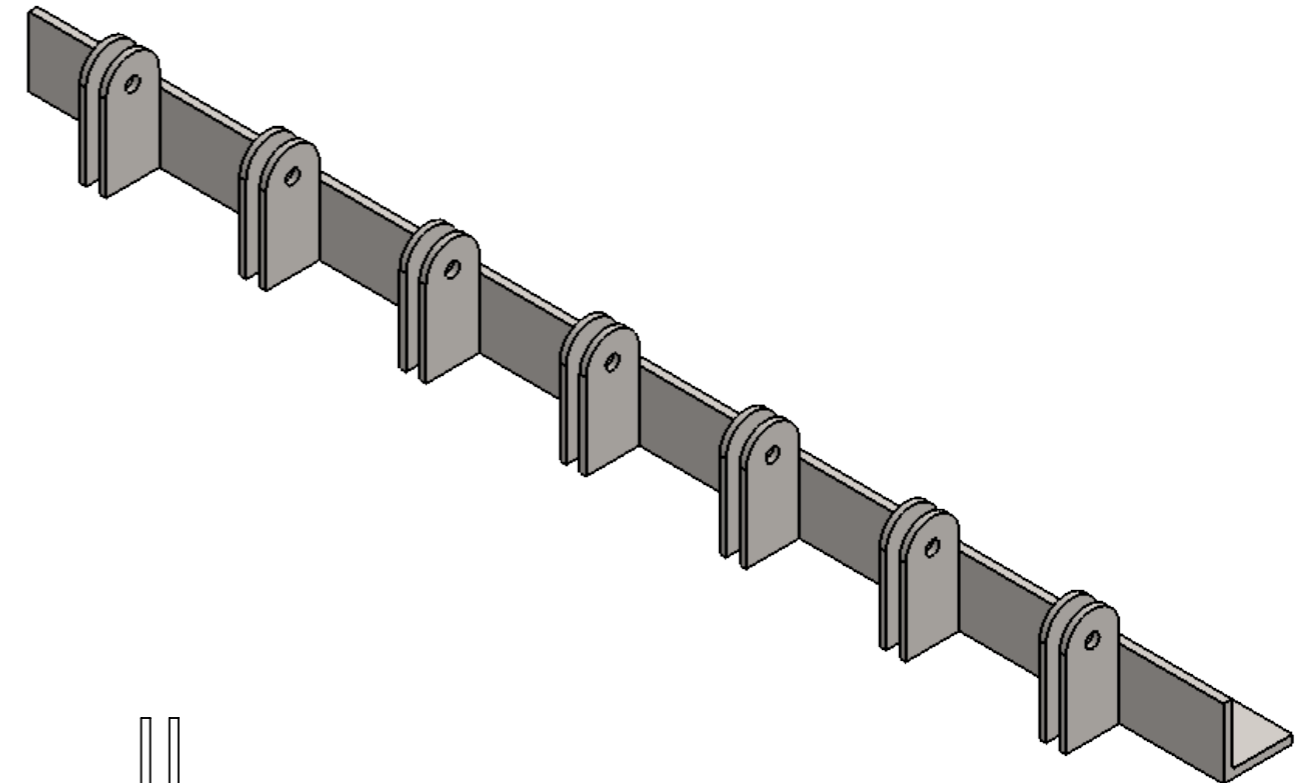
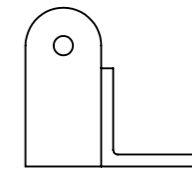
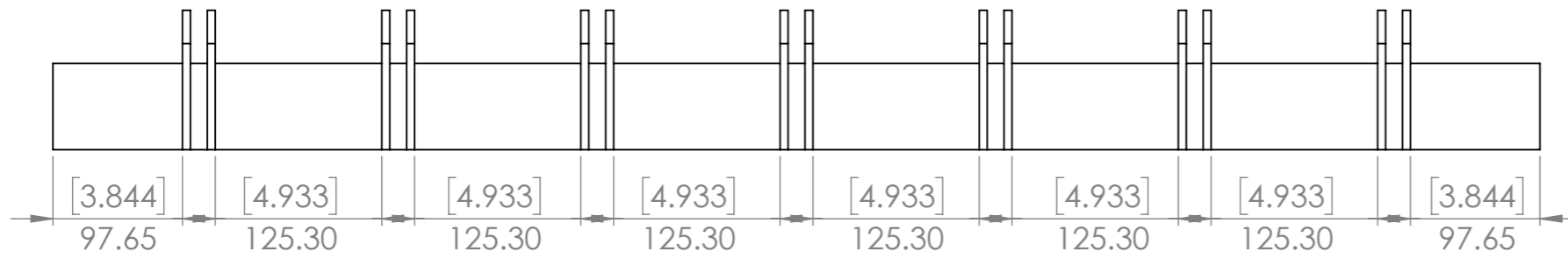
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH: Paint	DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION A
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree				Designed 2 Build	
DRAWN Merlin		DATE 2017-03-28		TITLE: Leg Assembly	
Q.A Merlin		DATE 2017-07-15		PART NO. p0080-A02	
 <p>Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.</p>		STOCK: STOCK SIZE: MATERIAL: Assembly WEIGHT: 5923.50		SCALE:1:5 SHEET 14 OF 28	




UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN Merlin		DATE 2017-03-29				Finger Mount			
Q.A Merlin		DATE 2017-07-15							
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				STOCK SIZE: 6mm					
		MATERIAL: Plain Carbon Steel		WEIGHT: 227.22		SCALE:1:1		SHEET 15 OF 28	

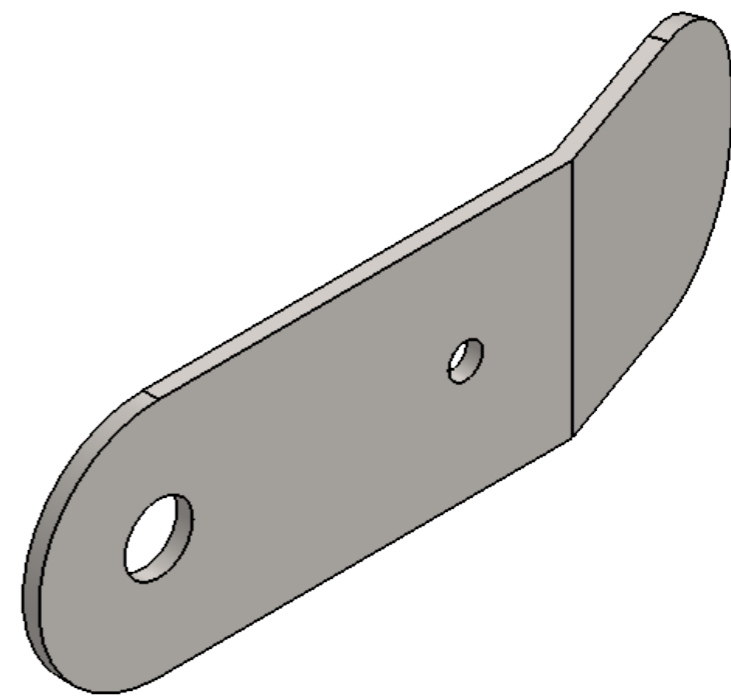
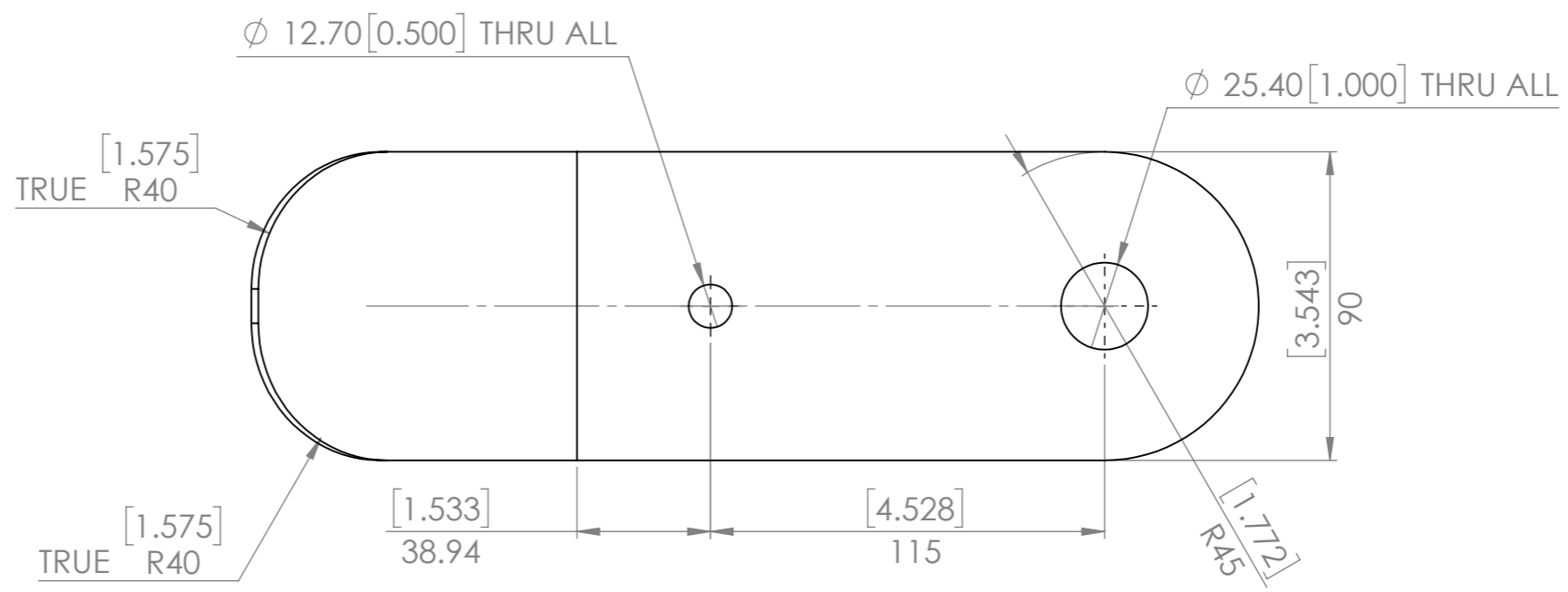
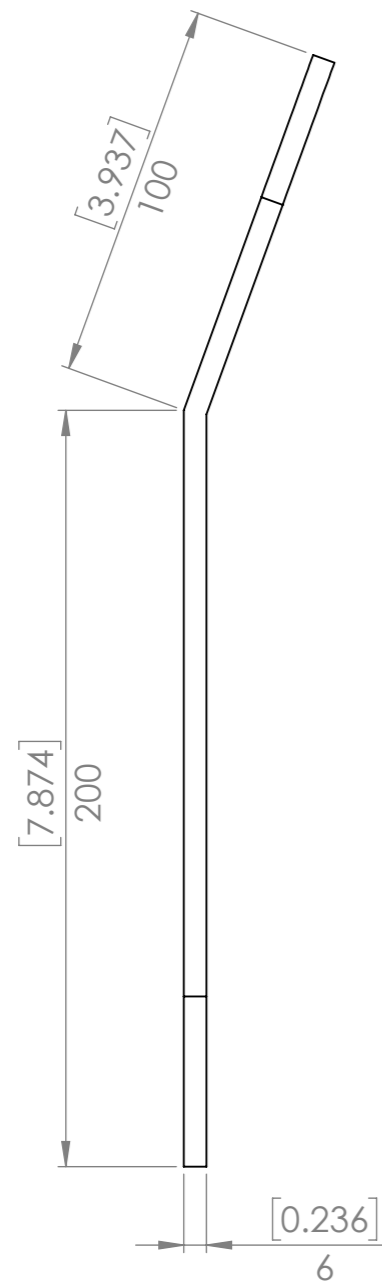



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						<h2>Designed 2 Build</h2> <h3>Angle Crossmember</h3>			
	NAME	DATE							
DRAWN	Merlin	2017-03-29				TITLE:			
Q.A	Merlin	2017-07-15							
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				STOCK SIZE: 65x65x8					
				MATERIAL: Plain Carbon Steel		WEIGHT: 8543.21		SCALE: 1:5	

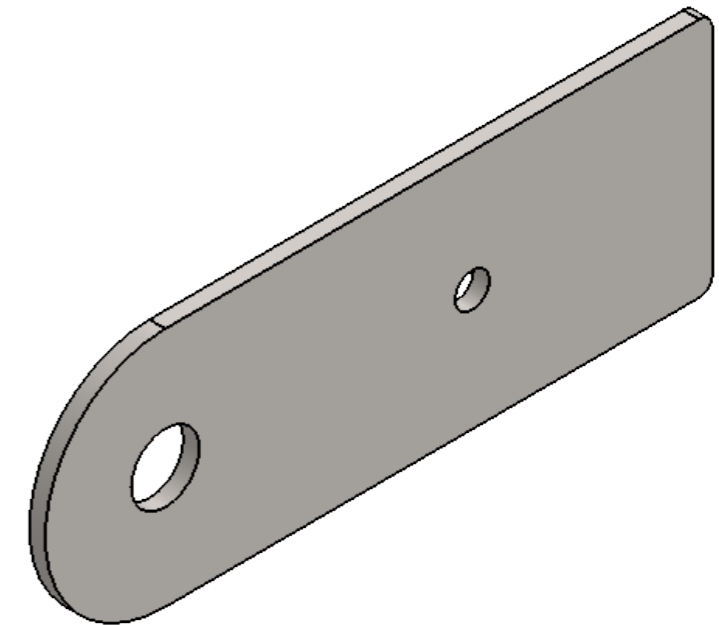
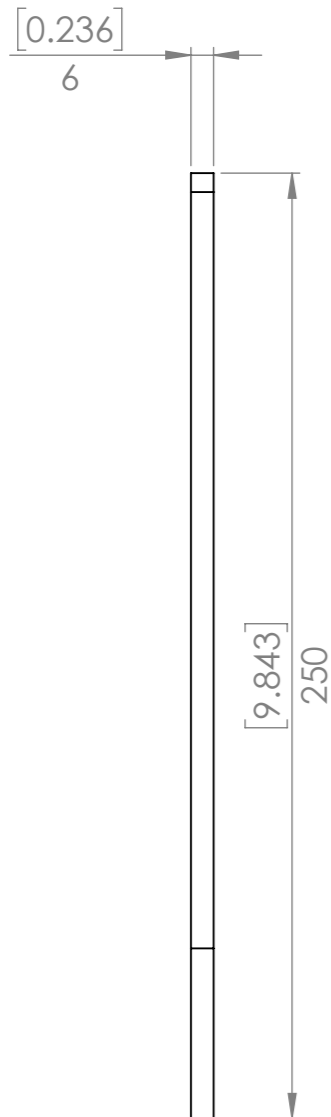
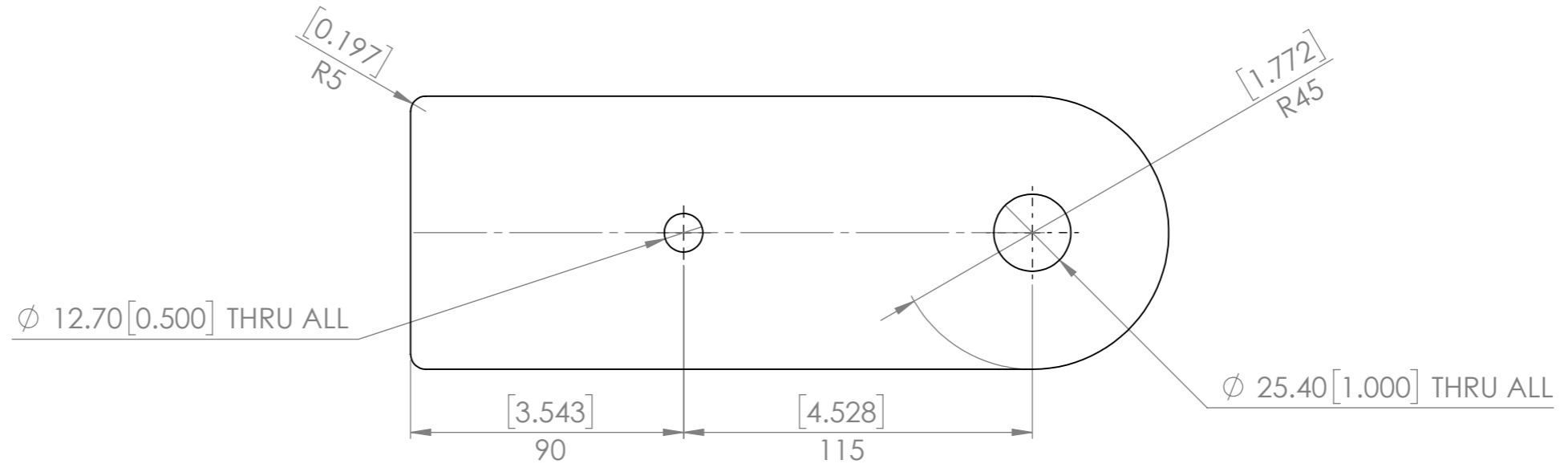


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH: Bare	DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION A
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree				Designed 2 Build	
DRAWN	NAME Merlin	DATE 2017-03-		TITLE: Finger Attachment	
Q.A	NAME Merlin	DATE 2017-07-15		PART NO. p0080-A03	
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		STOCK SIZE:		SHEET 17 OF 28	
		MATERIAL: Assembly		A3	
		WEIGHT: 11724.25			

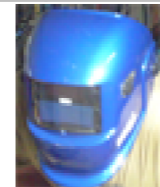
QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
14	p0080-012	Finger Mount	Plain Carbon Steel	227.22
1	p0080-013	Angle Crossmember	Plain Carbon Steel	8543.21



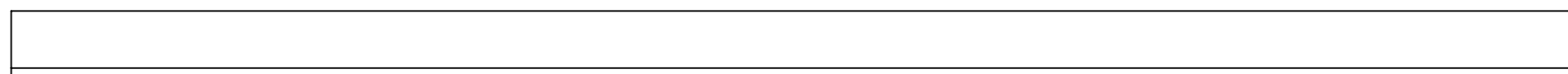
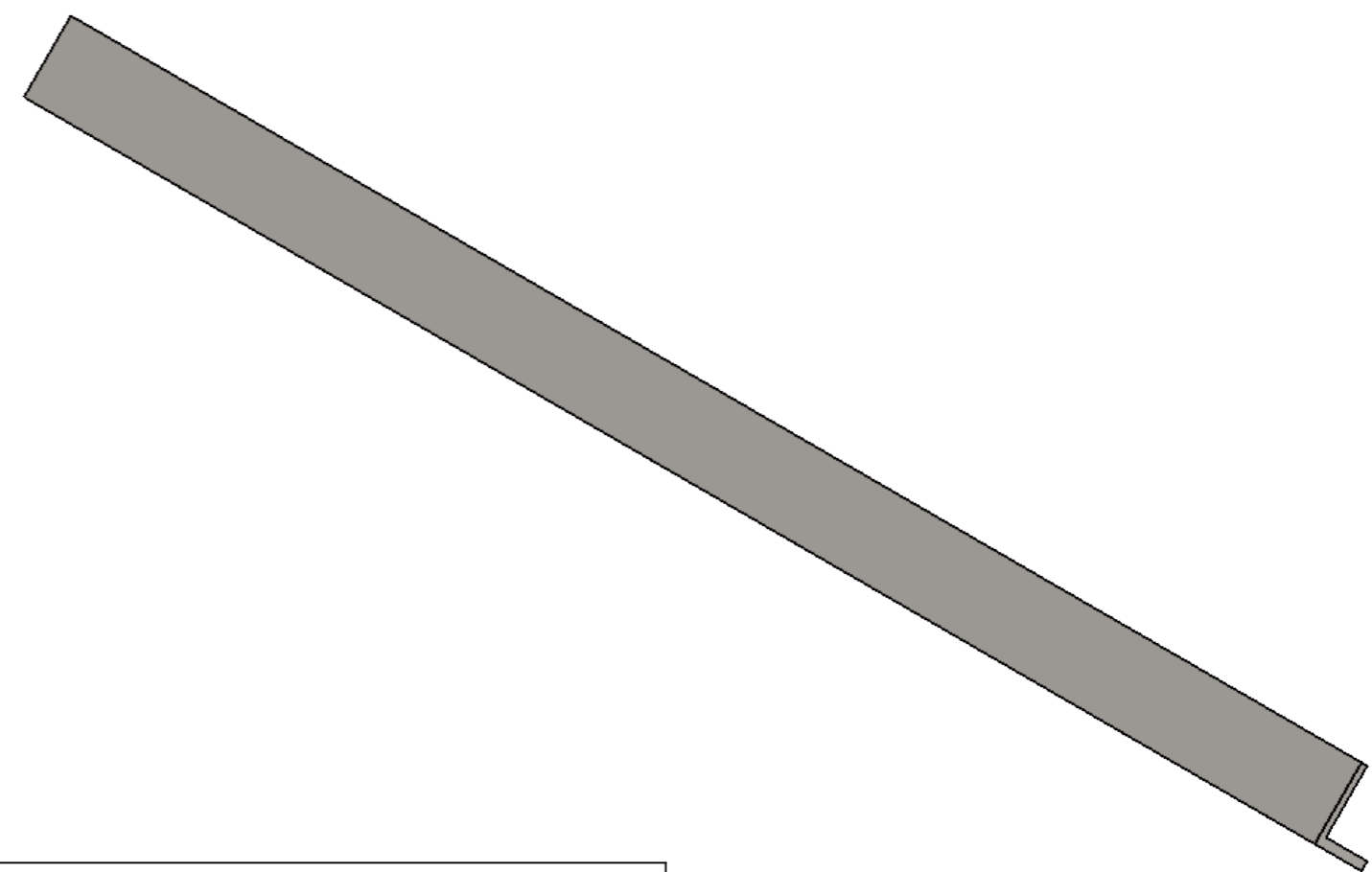
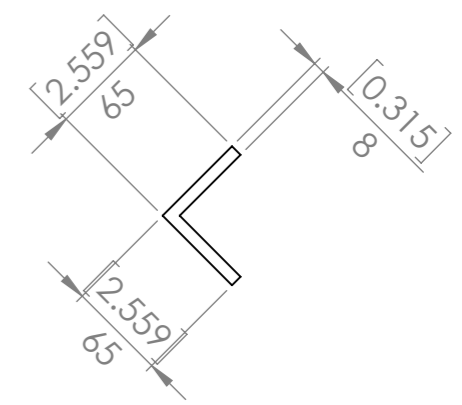
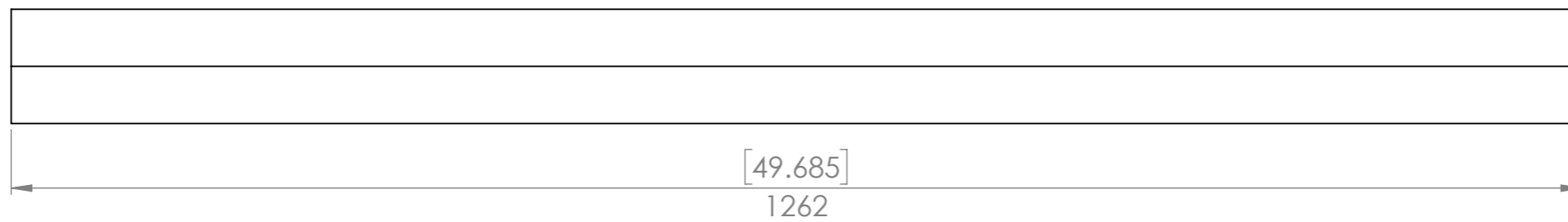
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						<h2>Designed 2 Build</h2> <h3>Edger</h3>			
NAME	DATE								
DRAWN Merlin	2017-03-29								
Q.A Merlin	2017-07-15								
 <p>Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.</p>		STOCK:	Plate			PART NO.	p0080-014		A3
		STOCK SIZE:	6mm						
		MATERIAL:	Plain Carbon Steel			SCALE:1:2	SHEET 18 OF 28		
		WEIGHT: 1156.69							




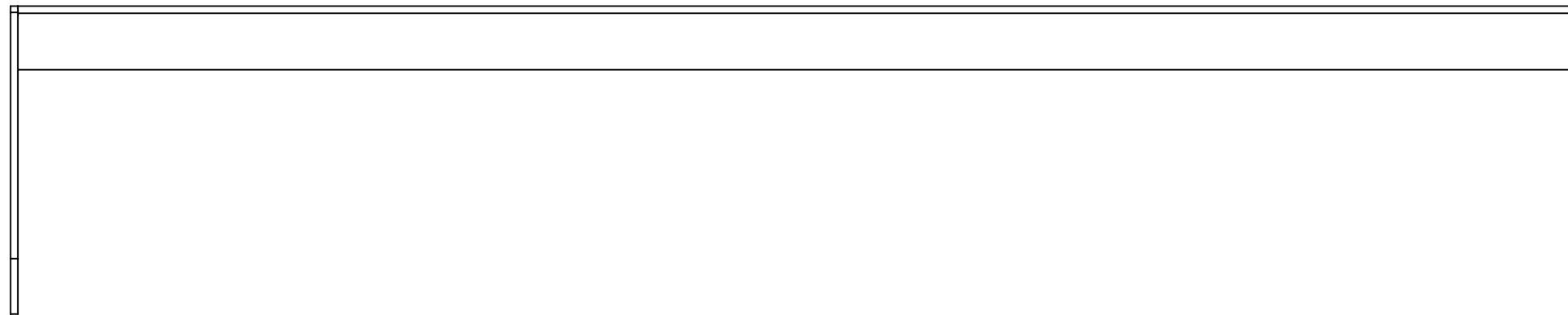
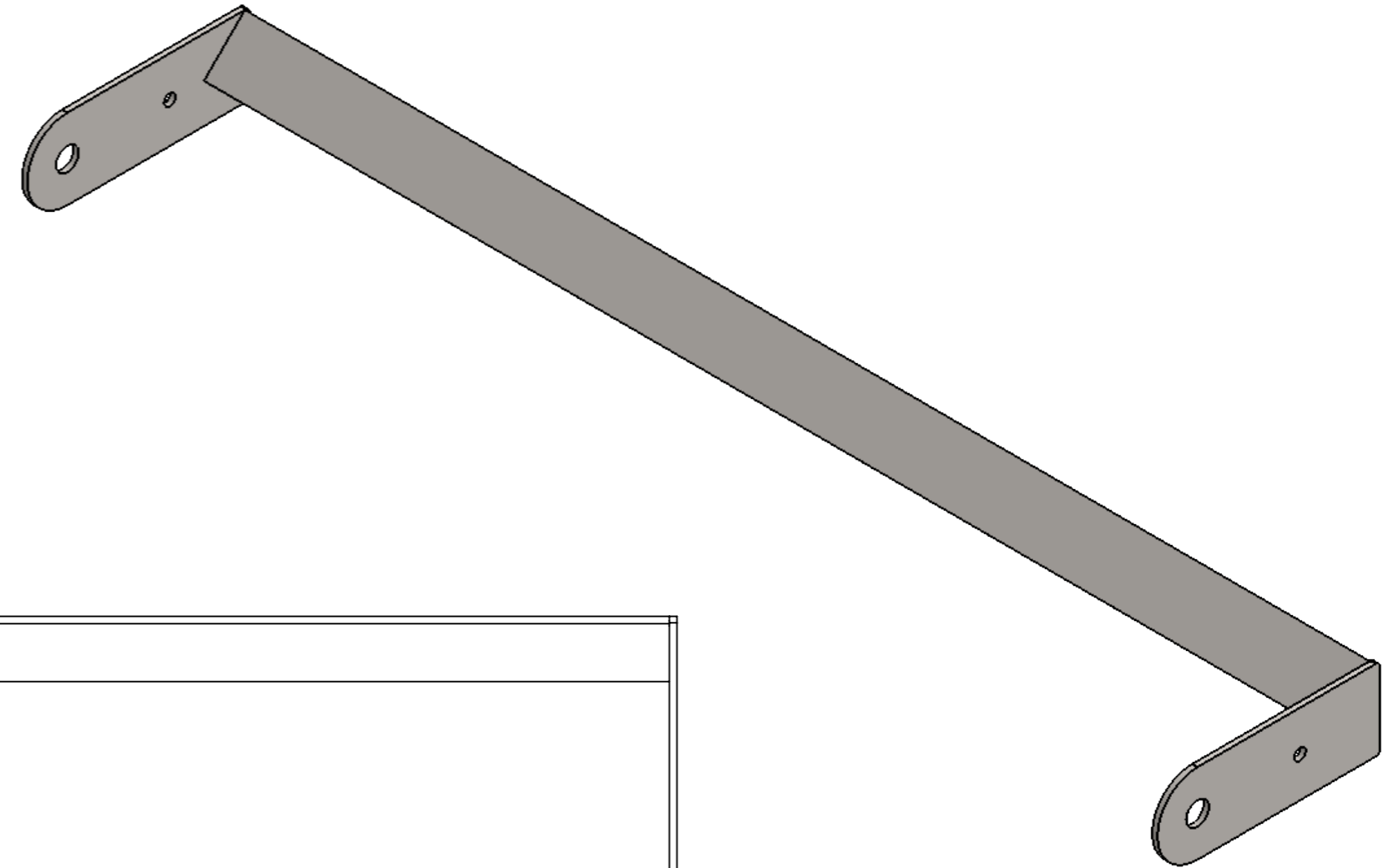
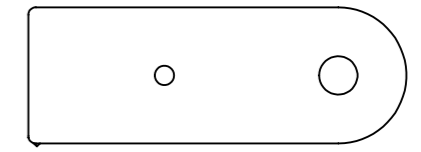
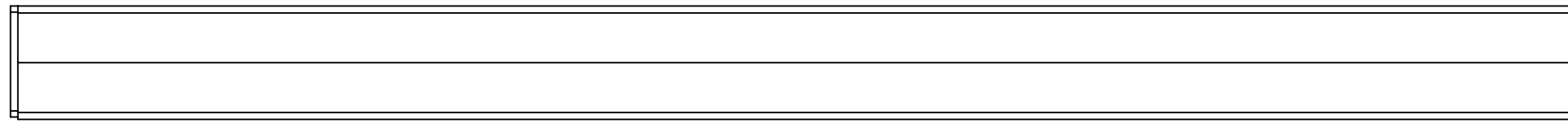
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
						Leveler Arm			
						p0080-015			
						A3			
						SCALE:1:2			
						SHEET 19 OF 28			
						WEIGHT: 982.18			
						STOCK: Plate			
						STOCK SIZE: 6mm			
						MATERIAL: Plain Carbon Steel			
						PART NO. p0080-015			
						SCALE:1:2			
						WEIGHT: 982.18			
						SHEET 19 OF 28			




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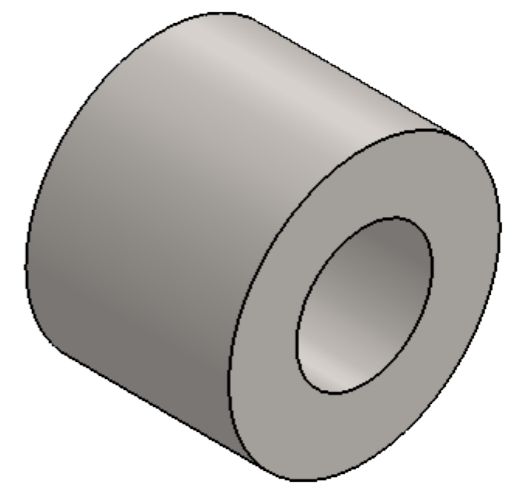
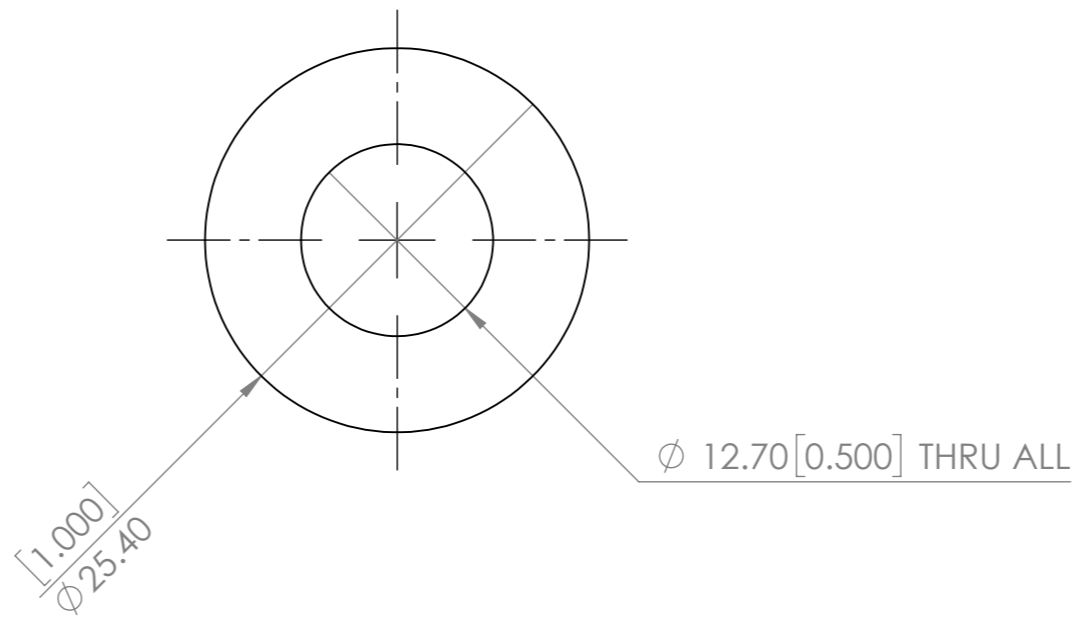
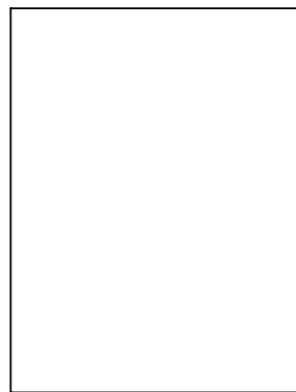
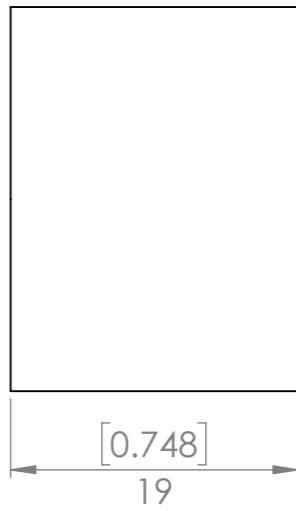



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						<h2>Designed 2 Build</h2> <h3>Leveler Bar</h3>			
	NAME	DATE							
DRAWN	Merlin	2017-03-29							
Q.A	Merlin	2017-07-15							
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: Angle		PART NO. p0080-016		A3	
				STOCK SIZE: 65x65x8					
				MATERIAL: Plain Carbon Steel		WEIGHT: 9607.35		SCALE: 1:5	

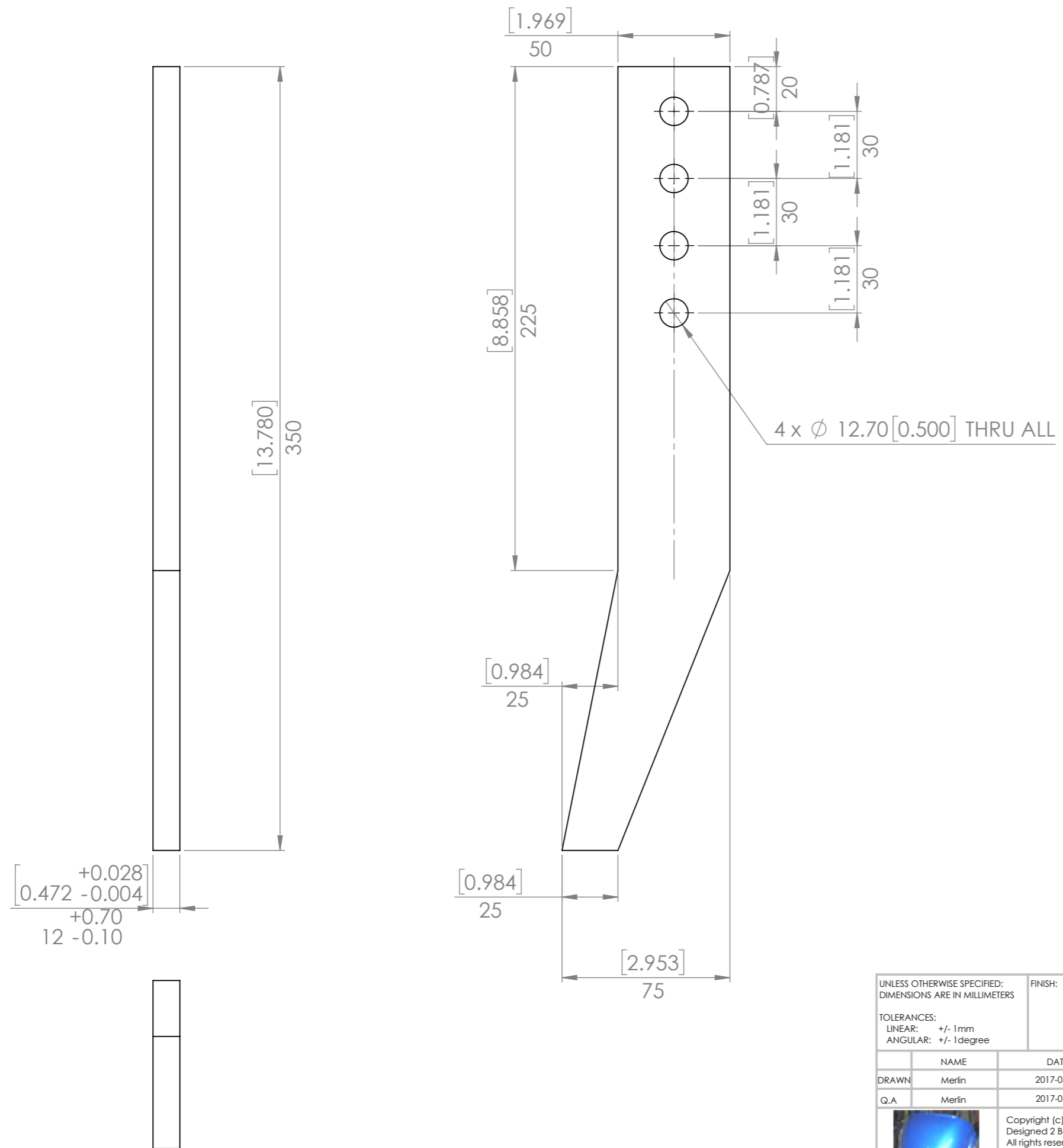


QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
2	p0080-015	Leveler Arm	Plain Carbon Steel	982.18
1	p0080-016	Leveler Bar	Plain Carbon Steel	9614.97


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH: Bare	DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION A
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree				Designed 2 Build	
NAME	DATE				
DRAWN Merlin	2017-03-29			Floating Leveler	
Q.A Merlin	2017-07-15				
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		STOCK SIZE:			
		MATERIAL:	Assembly	PART NO.	p0080-A04
		WEIGHT: 11579.33		SCALE:1:5	A3
				SHEET 21 OF 28	

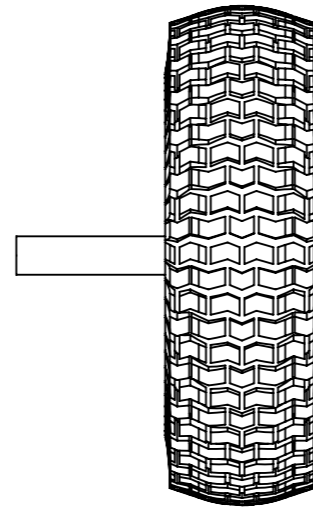
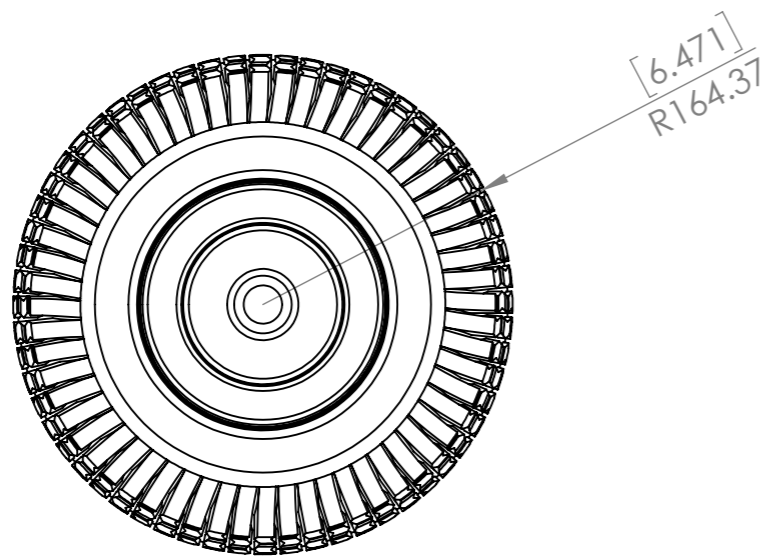


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree		Designed 2 Build							
DRAWN Merlin 2017-03-29		DATE 2017-03-29		TITLE: Bush		PART NO. p0080-017		A3	
Q.A Merlin 2017-07-15		STOCK: Rod		STOCK SIZE: 1"		MATERIAL: Plain Carbon Steel		WEIGHT: 56.32	
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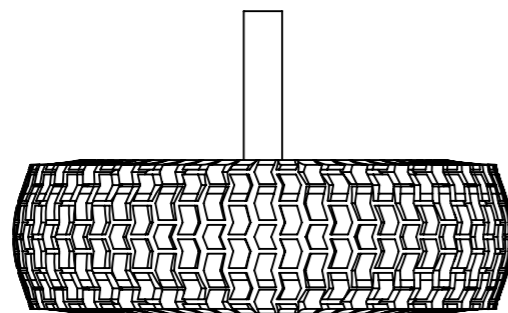



[0.472 -0.004]
+0.028
+0.70
12 -0.10

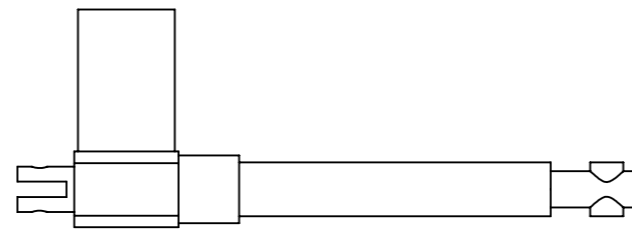
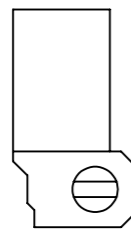
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN Merlin		DATE 2017-03-30				Finger			
Q.A Merlin		DATE 2017-07-15							
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				STOCK SIZE: 12mm					
				MATERIAL: Plain Carbon Steel		SCALE:1:2		SHEET 23 OF 28	
				WEIGHT: 1444.32		A3			



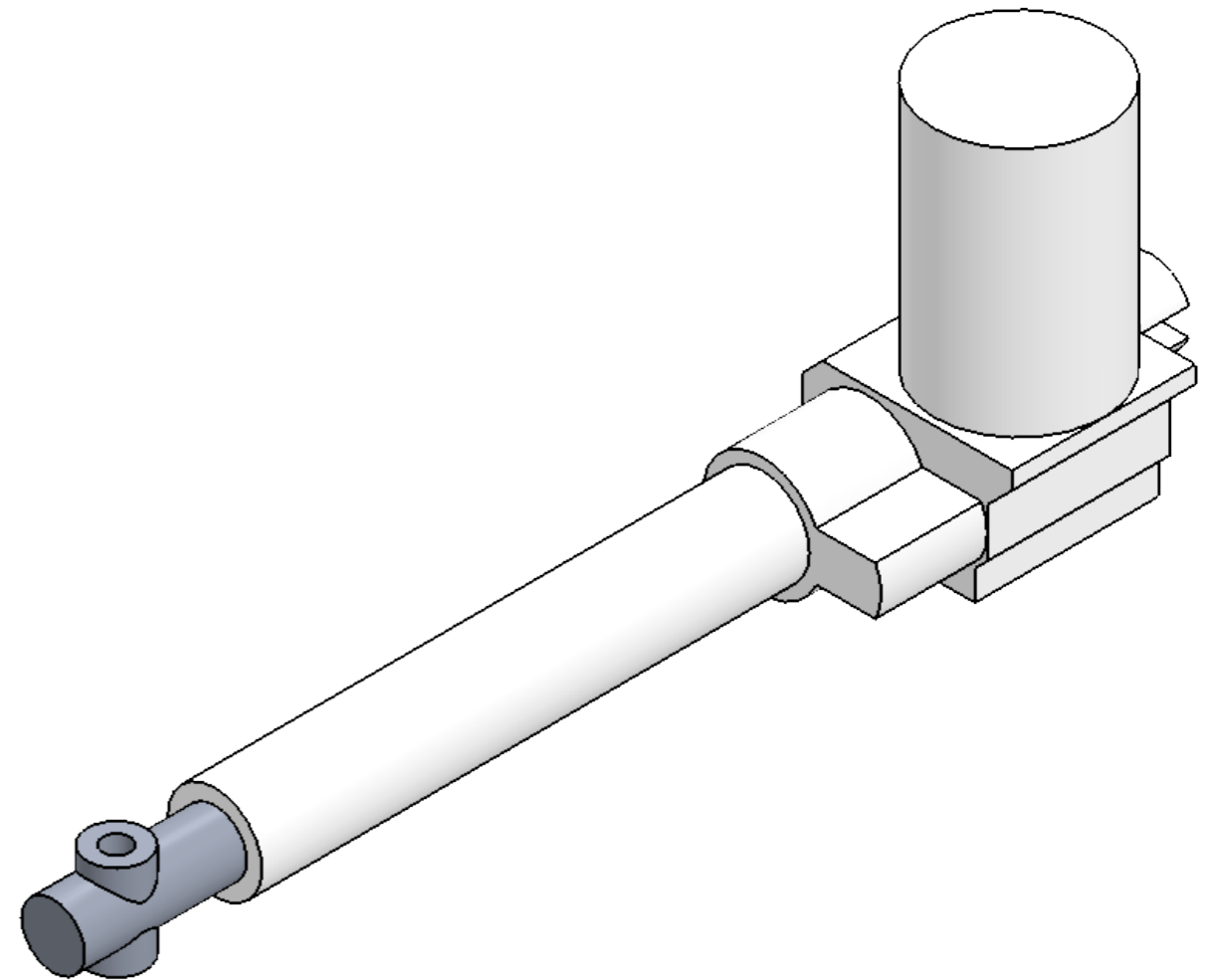
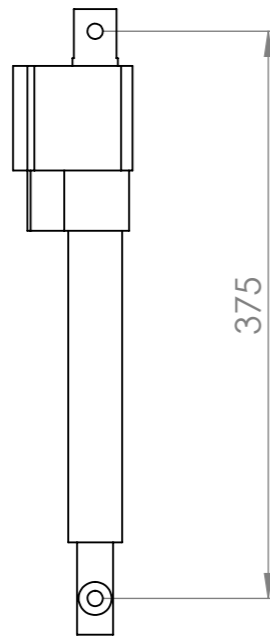
Diameter 330mm (13")
 I used a pair of wheels that are usually sold for wheelbarrows. The important thing is that they are a large enough diameter to allow the raising of the fingers and small enough to allow the fingers to be lowered into the gravel.




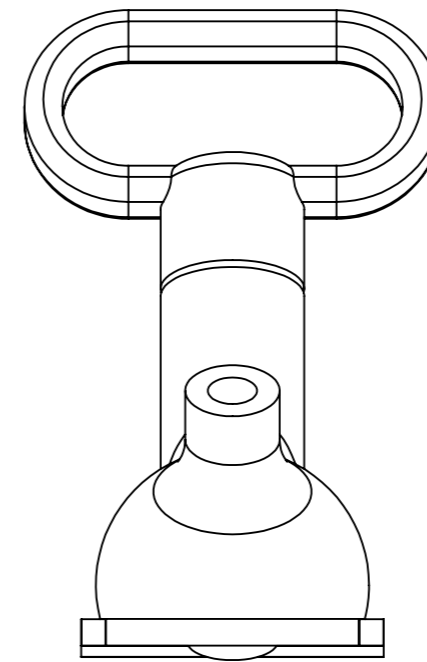
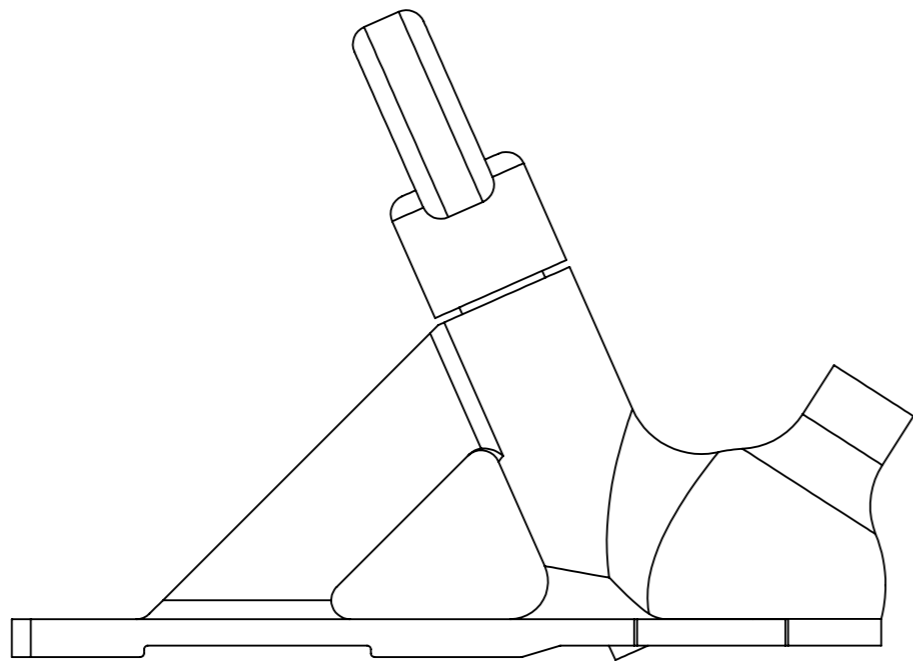
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TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build			
DRAWN		NAME		DATE		TITLE: Wheel			
Q.A						PART NO. p0080-019			
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK:		SCALE:1:5		SHEET 24 OF 28	
				STOCK SIZE:				A3	
				MATERIAL:					
				WEIGHT:					



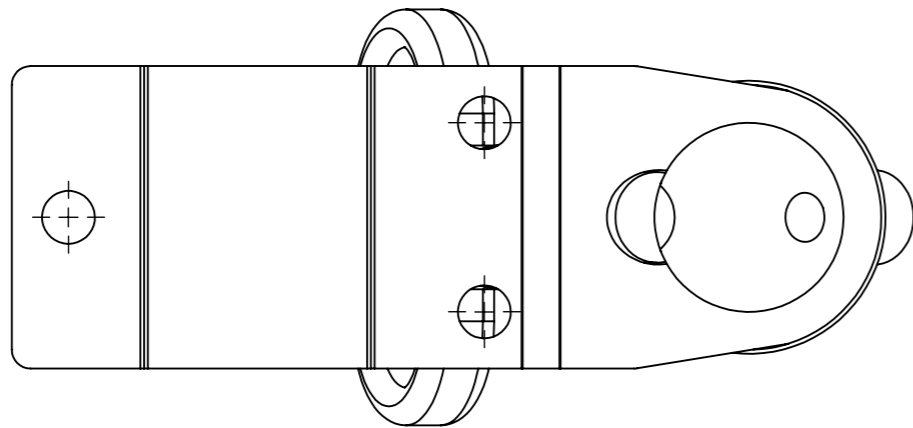
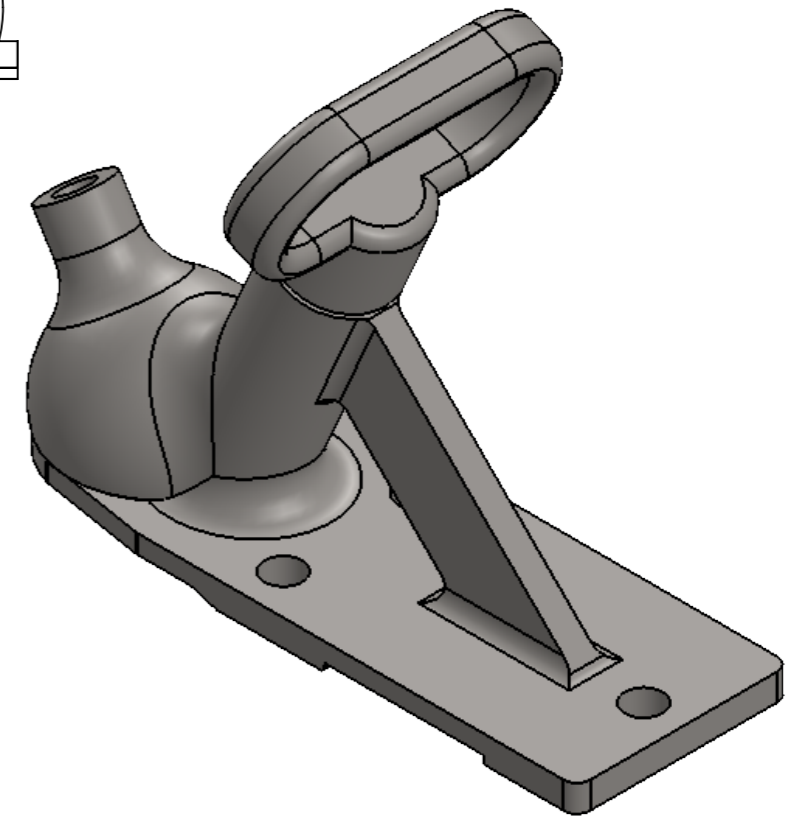
Linear Actuator
 200mm (8") stroke
 See links on web page for sources.




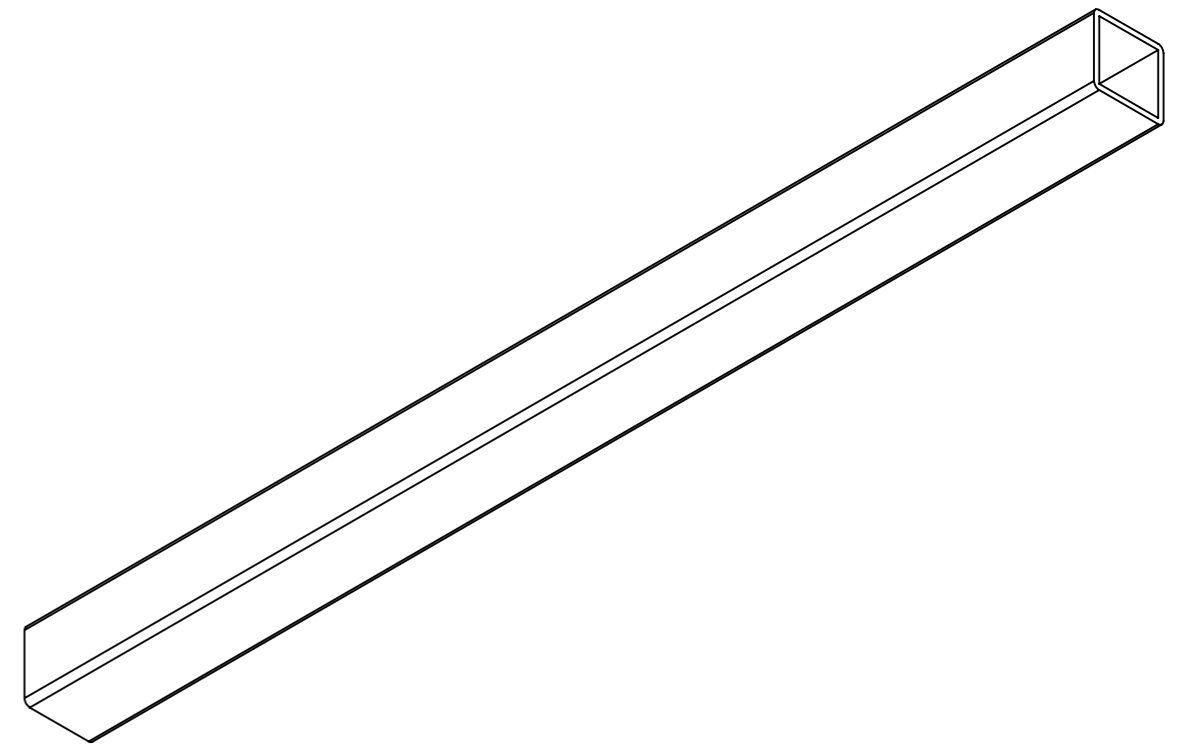
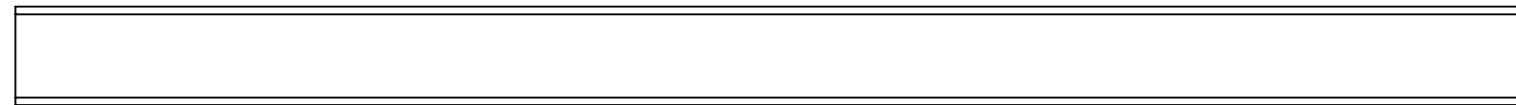
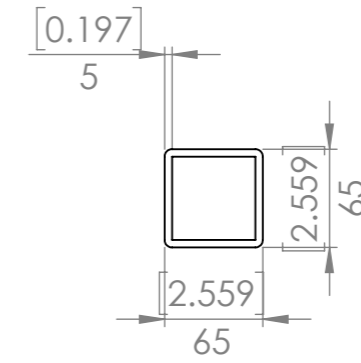
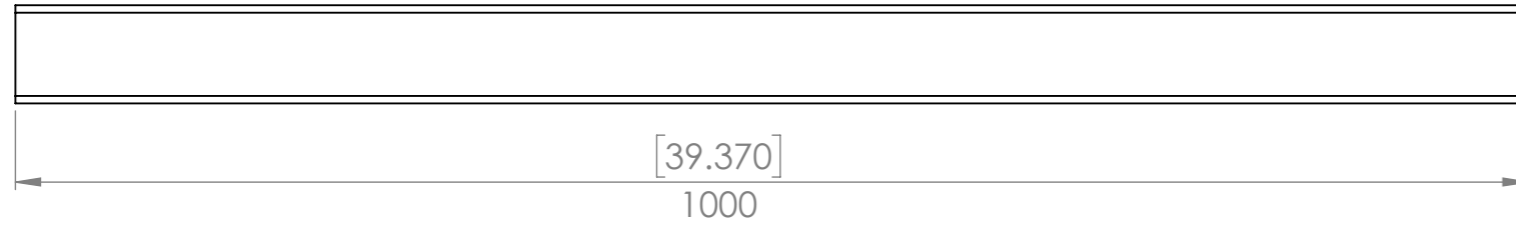
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						Designed 2 Build Linear Actuator 8"			
NAME	DATE								
DRAWN Merlin	2017-03-03					TITLE:			
Q.A Merlin						PART NO. p0080-020			
		Copyright (c)2017 Designed 2 Build All rights reserved. Permission is hereby granted to produce one item from these plans for personal use only.		STOCK: STOCK SIZE: MATERIAL: Assembly		WEIGHT: 1206.81		SCALE:1:5	
						SHEET 25 OF 28		A3	




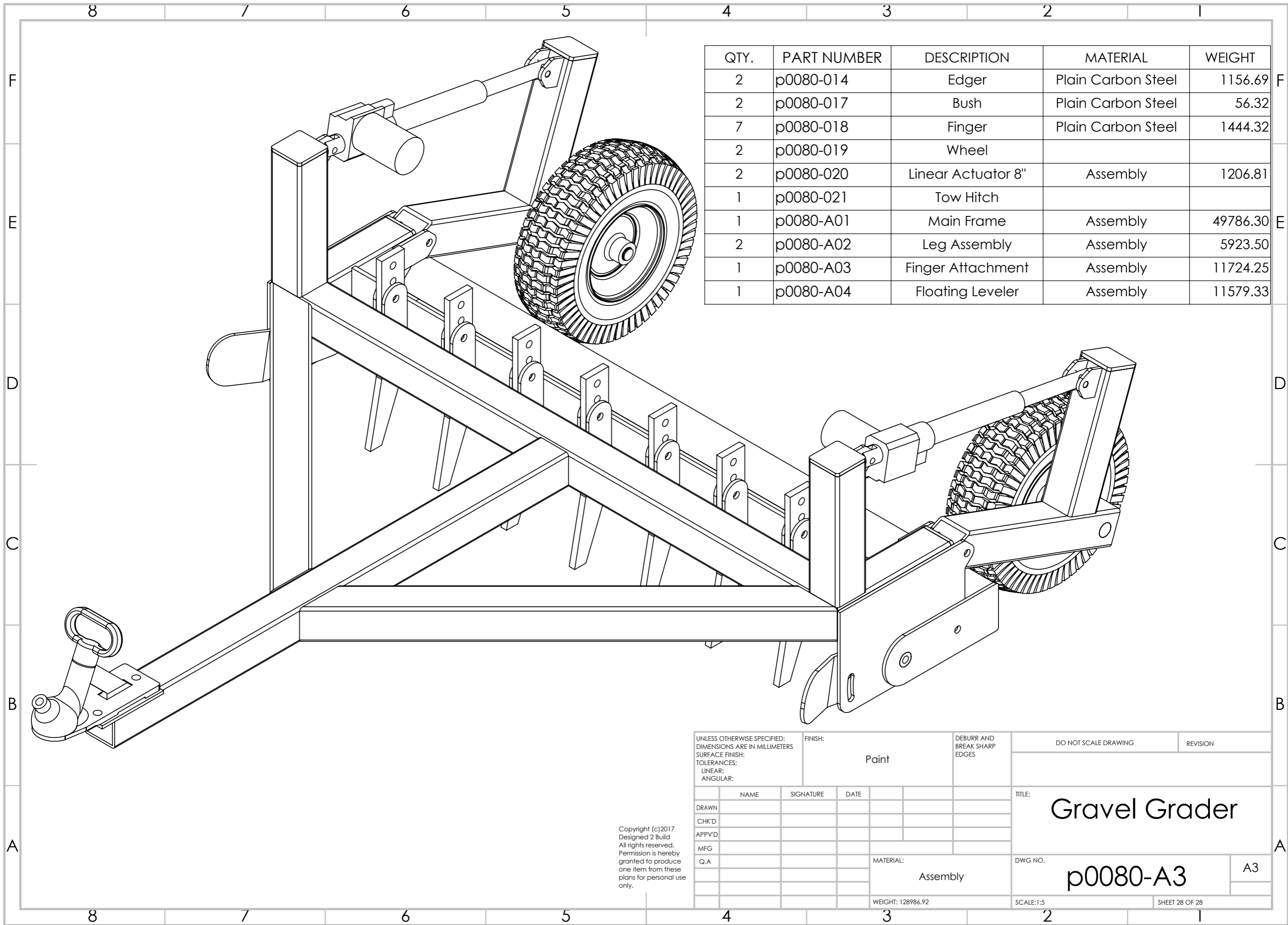
Any old tow ball hitch you can get your hands on will do.



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION		A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree											
	NAME	DATE								TITLE:	
DRAWN	Merlin	2017-03-30								Tow Hitch	
Q.A	Merlin									PART NO.	
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				STOCK SIZE:						A3	
				MATERIAL:						SCALE:1:2	
				WEIGHT:						SHEET 26 OF 28	



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS		FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION A	
TOLERANCES: LINEAR: +/- 1mm ANGULAR: +/- 1degree						TITLE: Designed 2 Build Centre Drawbar			
	NAME	DATE							
DRAWN	Merlin	2017-03-28							
	NAME	DATE							
Q.A	Merlin	2017-07-15							
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				STOCK SIZE: 65x65x5					
				MATERIAL: Plain Carbon Steel					
		WEIGHT: 9192.61		SCALE: 1:5		SHEET 27 OF 28			



QTY.	PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT
2	p0080-014	Edger	Plain Carbon Steel	1156.69
2	p0080-017	Bush	Plain Carbon Steel	56.32
7	p0080-018	Finger	Plain Carbon Steel	1444.32
2	p0080-019	Wheel		
2	p0080-020	Linear Actuator 8"	Assembly	1206.81
1	p0080-021	Tow Hitch		
1	p0080-A01	Main Frame	Assembly	49786.30
2	p0080-A02	Leg Assembly	Assembly	5923.50
1	p0080-A03	Finger Attachment	Assembly	11724.25
1	p0080-A04	Floating Leveler	Assembly	11579.33

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: TOLERANCES: LINEAR: ANGULAR:		FINISH: Paint	DEBURR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
DRAWN	NAME	SIGNATURE	DATE	TITLE: Gravel Grader	
CHK'D				DWG NO. p0080-A3	
APPV'D				A3	
MFG				SCALE: 1:5	
Q.A			MATERIAL: Assembly	SHEET 28 OF 28	
			WEIGHT: 128986.92		

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