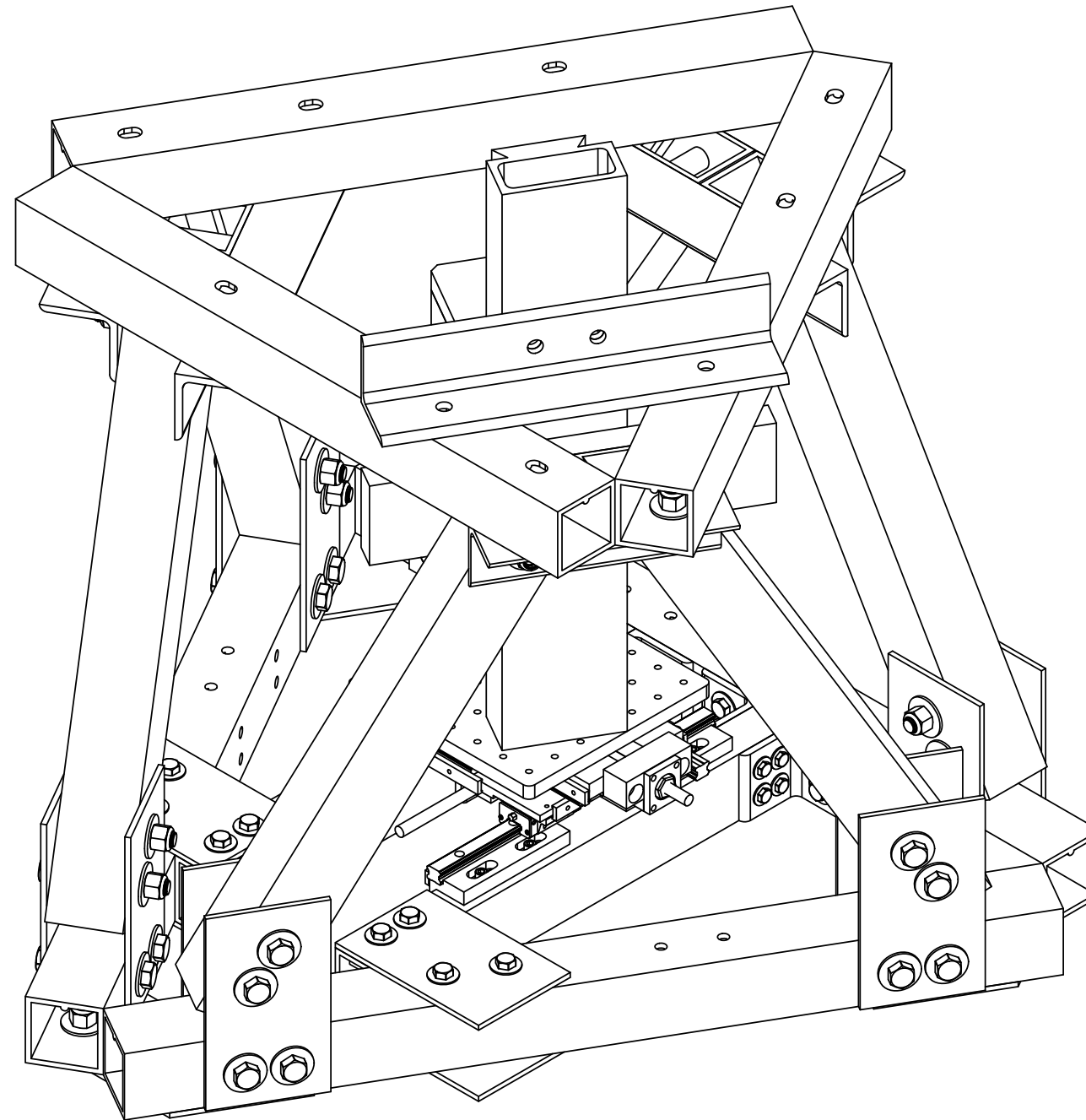


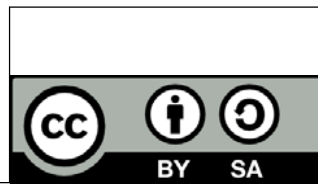
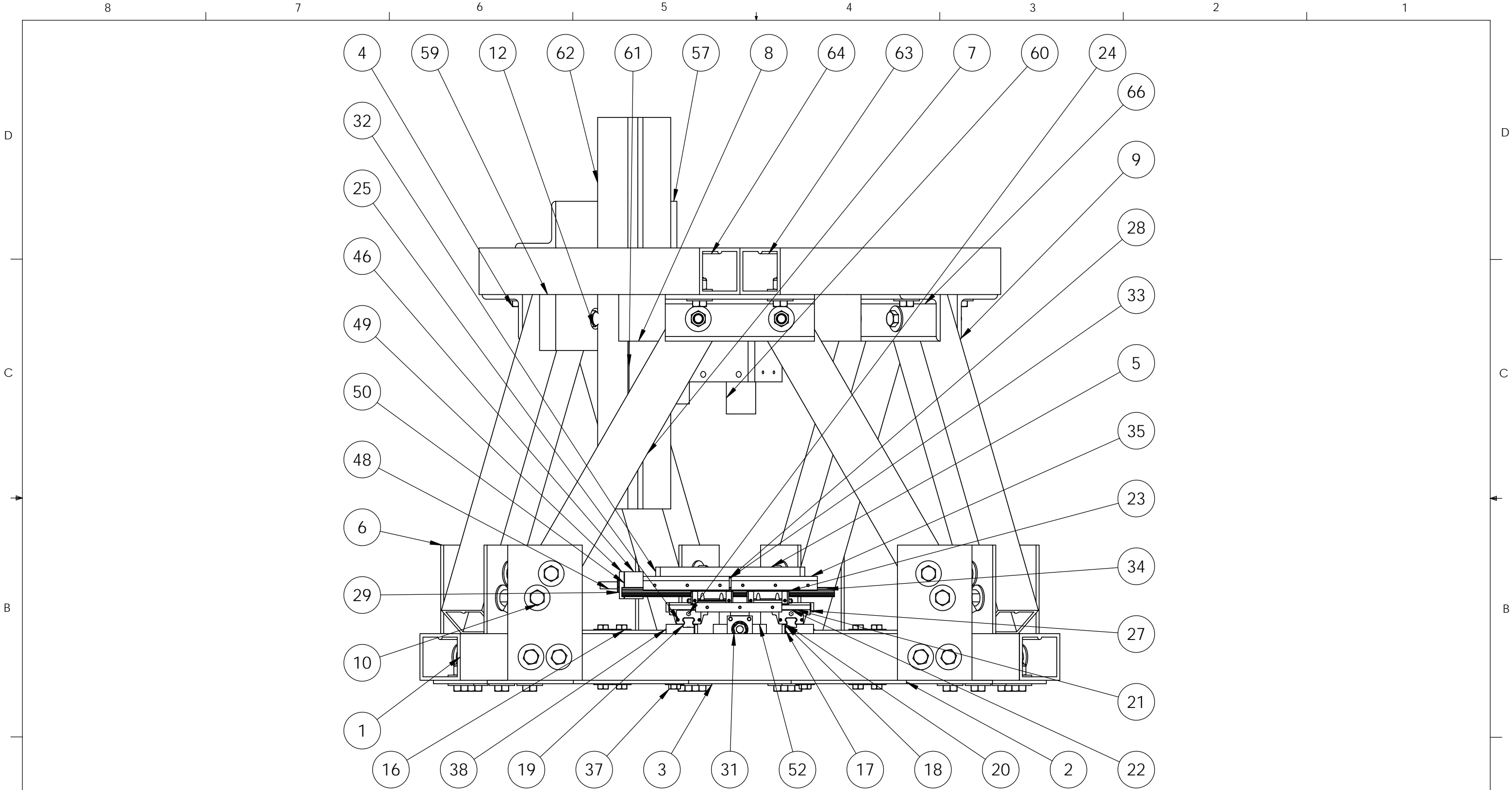
Self-Replicating Milling Machine

Julian Leland, 2012
Swarthmore College
E90 Senior Design Project

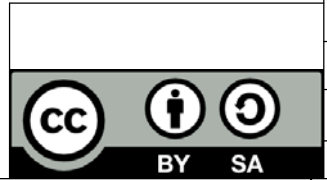
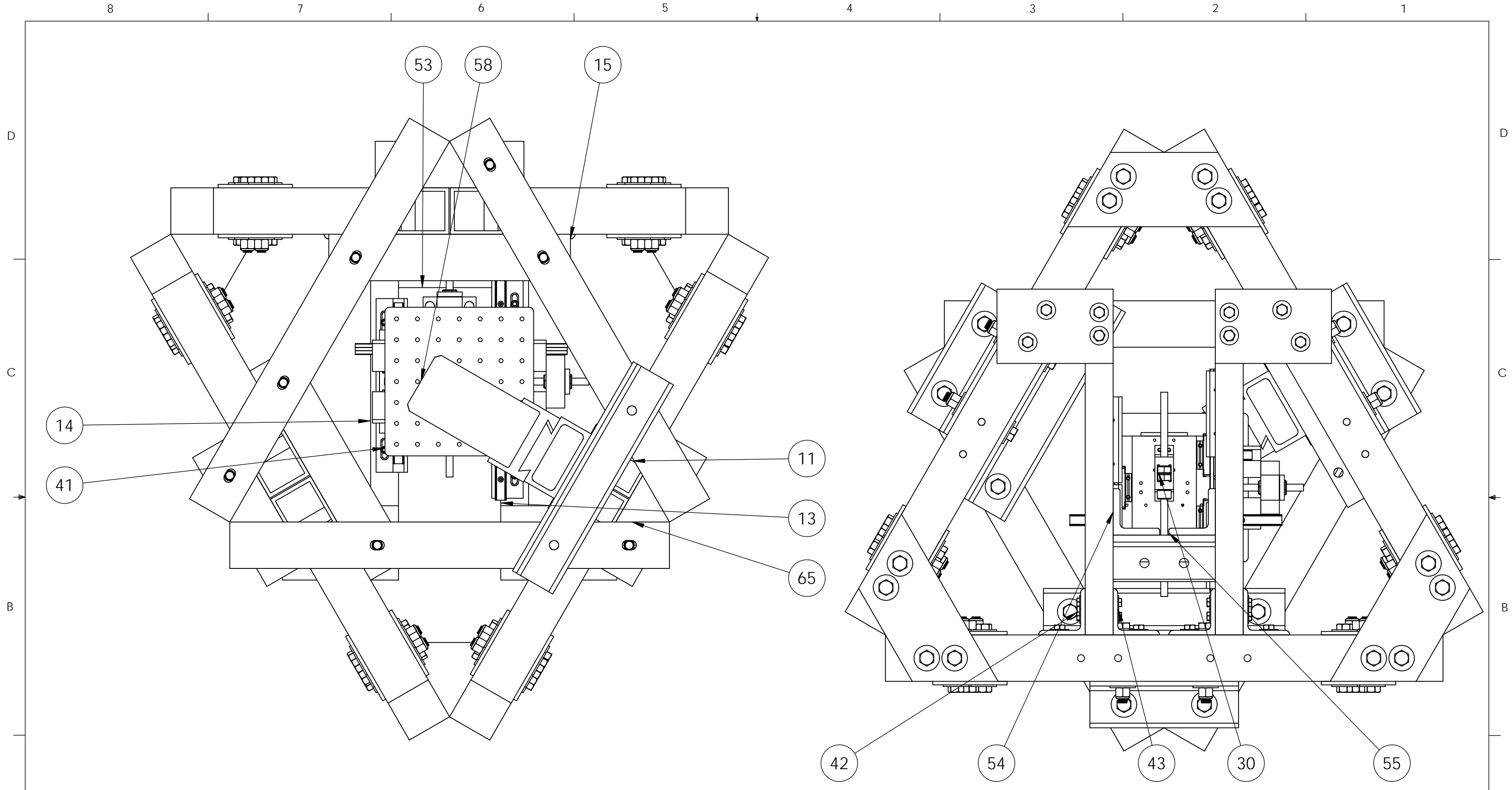


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		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			FullAssembly - Final Design		
SIZE	DWG. NO.			REV	
B					
SCALE: 1:5	WEIGHT:			SHEET 1 OF 4	





		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			FullAssembly - Final Design		
SIZE	DWG. NO.			REV	
B					
SCALE: 1:5	WEIGHT:			SHEET 2 OF 4	

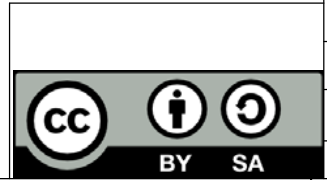


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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
		APPLICATION			
		DO NOT SCALE DRAWING			
			TITLE:		
			FullAssembly - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:5	WEIGHT:	SHEET 3 OF 4			

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BaseMember - Final Design		3
2	BasePlate - Final Design		3
3	98026A033		128
4	92620A714		46
5	97135A250		64
6	SidePlate - Final Design		12
7	SideMember - Final Design		6
8	TopInsidePlate - Final Design		1
9	TopOutsidePlate - Final Design		3
10	91257A727		12
11	p75x2p125Sleeve		18
12	91257A728		6
13	LeftRailSupport - Final Design		1
14	RightRailSupport - Final Design		1
15	RailFrameAttachmentAngle - Final Design		4
16	RailFrameAttachmentPlate - Final Design		4
17	ShortBearingRailClampV2 - FinalDesign		4
18	ShortPushPlate - FinalDesign		10
19	12 in - EGR15U		1
20	220mm - EGR15U		2
21	BearingBlockMountPlate - FinalDesign		1
22	Block_EGW15CCZ0HHIHI		6
23	End_Seal_EG15HHIHI		12
24	HG15_34310002HHIHI		6
25	Bolt_EG15HHIHI		24
26	HG15_PlugScrewHHIHI		6
27	SingleHolePushPlate - FinalDesign		2
28	TopStageNutMount		2
29	Acme_375x10Nut		8
30	9713K72		2
31	90128A840		2
32	TopTable - FinalDesign		1
33	TopShortBearingRailClampV2 - FinalDesign		2
34	12 in TEST- EGR15U		1
35	TopShortBearingRailClampV2 - Left - FinalDesign		2

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
36	RailSupportMountBolt - BaseSupport		4
37	92620A655		24
38	98026A031		24
39	RailSupportMountBolt - BaseSupportV2		4
40	RailClampMountPlate		4
41	91251A442		8
42	92620A563		16
43	98026A029		32
44	94895A805		16
45	RailSupportMountBolt - RailMountSupport		4
46	LeadscrewThrustBearingMount		1
47	94669A084		2
48	18inAcmeLeadscrew		2
49	ThrustBearingPushPlate		2
50	6680K11		4
51	16x2mmSpacer		2
52	LeadscrewThrustBearingMount - BottomStage		1
53	BottomStageMountAngle1		1
54	BottomStageMountAngle2		1
55	BottomStageMountAngle3		1
56	RailSupportMountBolt - LeadScrewSupport		2
57	TopInsideAngleZMount - Final Design		1
58	Spindle Motor Mount		1
59	TopInsideZMountv2		1
60	Spindle Base		1
61	Spindle Gib Mount		1
62	SpindleColumn		1
63	Copy of Copy of TopMember - Final Design^FullAssembly - Final Design		1
64	Copy of TopMemberSideB - Final Design^FullAssembly - Final Design		1
65	TopMemberSideC - Final Design		1
66	Copy of Copy of TopInsidePlate - Final Design^FullAssembly - Final Design		1

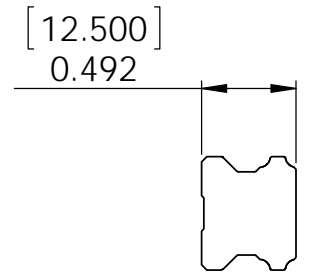
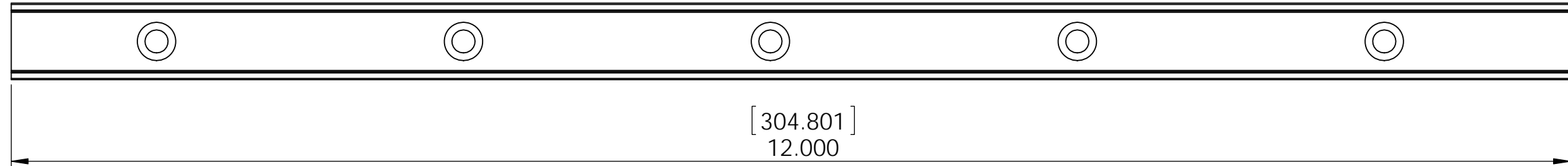
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DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		DRAWN	LELAND 5/3/12
INTERPRET GEOMETRIC TOLERANCING PER:		CHECKED	
MATERIAL		ENG APPR.	
FINISH		MFG APPR.	
NEXT ASSY	USED ON	Q.A.	
APPLICATION		COMMENTS: Part descriptions are either descriptions listed in part files, or are McMaster-Carr part numbers. Only some fasteners are included.	
DO NOT SCALE DRAWING		TITLE: FullAssembly - Final Design	
		SIZE	DWG. NO.
		B	
		SCALE: 1:5	WEIGHT:
		SHEET 4 OF 4	



8 7 6 5 4 3 2 1

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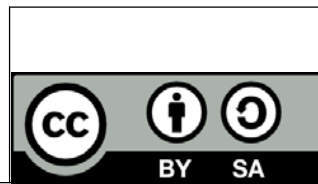
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE		
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		TOLERANCES:	CHECKED			TITLE:	
		FRACTIONAL ±	ENG APPR.			12 in - EGR15U	
		ANGULAR: MACH ± BEND ±	MFG APPR.			SIZE	DWG. NO.
		TWO PLACE DECIMAL ±	Q.A.			B	REV
		THREE PLACE DECIMAL ±	COMMENTS:	Cut rail to roughly 12". Note that sides of rail are hardened - difficult to cut. Make 2x			
		INTERPRET GEOMETRIC TOLERANCING PER:	FINISH	SCALE: 1:1			
		MATERIAL	DO NOT SCALE DRAWING	WEIGHT:			
NEXT ASSY	USED ON			SHEET 1 OF 1			
APPLICATION							

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

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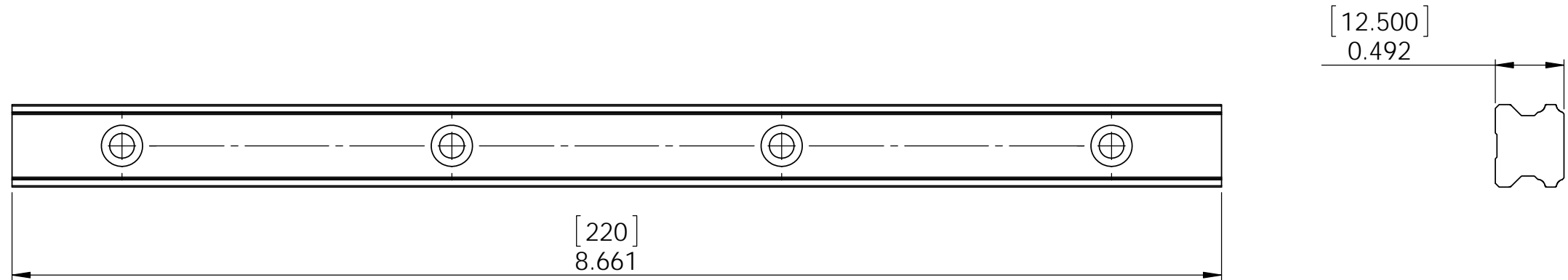
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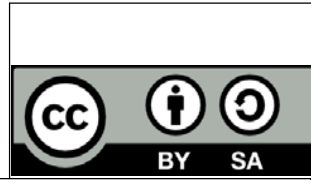
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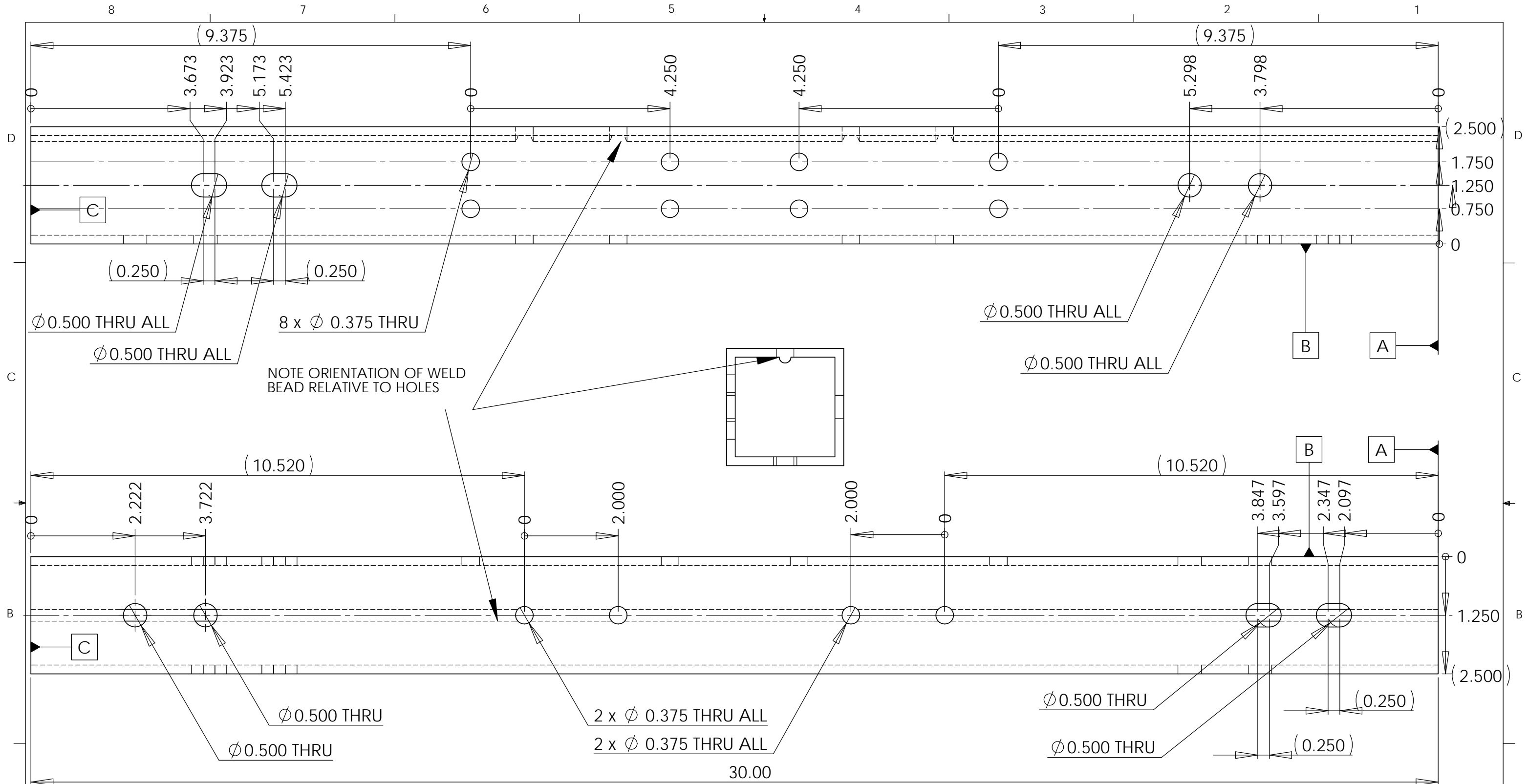
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		UNLESS OTHERWISE SPECIFIED:						
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		TOLERANCES:			CHECKED			
		FRACTIONAL \pm			ENG APPR.			
		ANGULAR: MACH \pm BEND \pm			MFG APPR.			
		TWO PLACE DECIMAL \pm			Q.A.			SIZE DWG. NO. REV B
		THREE PLACE DECIMAL \pm			COMMENTS: Pre-cut size - 220mm long. No machining required.			
		INTERPRET GEOMETRIC TOLERANCING PER:						
		MATERIAL						SCALE: 1:1 WEIGHT: SHEET 1 OF 1
		FINISH						
NEXT ASSY		USED ON		APPLICATION		DO NOT SCALE DRAWING		

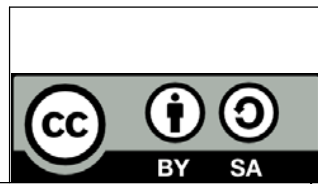


8 7 6 5 4 3 2 1



MAKE 1 COPY OF PART WITH SET OF 8 .375" HOLES, BUT NO .375" HOLES ON TOP OF PART. MAKE 2 COPIES WITH .375 HOLES ON TOP OF PART, BUT WITHOUT 8 X .375 HOLE PATTERN.

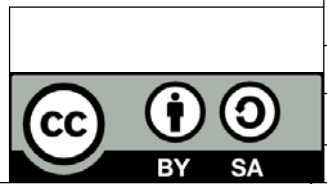
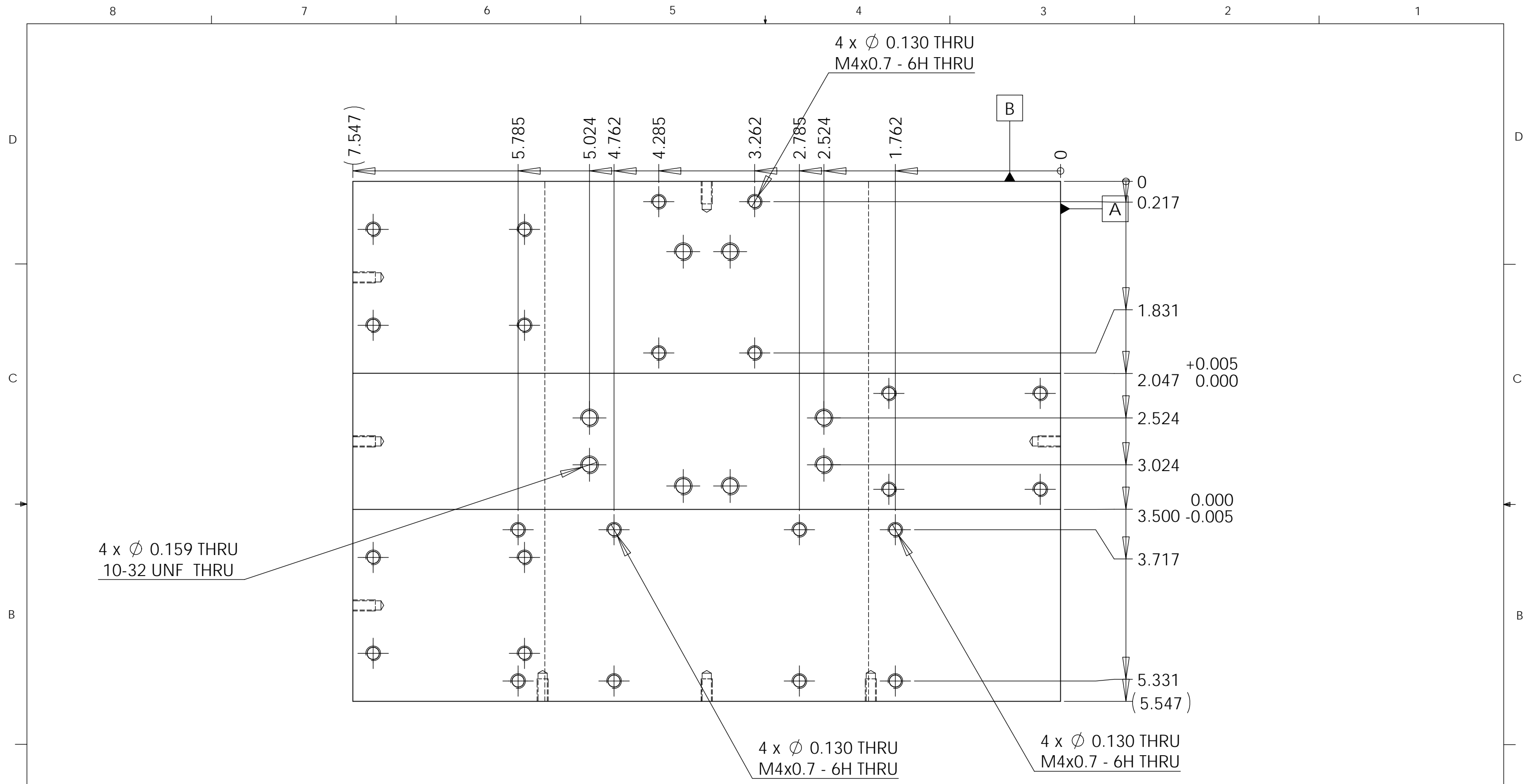
NOTE ORIENTATION OF WELD BEAD RELATIVE TO HOLES



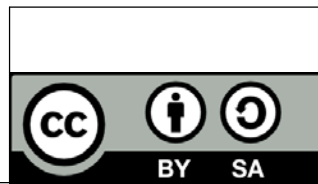
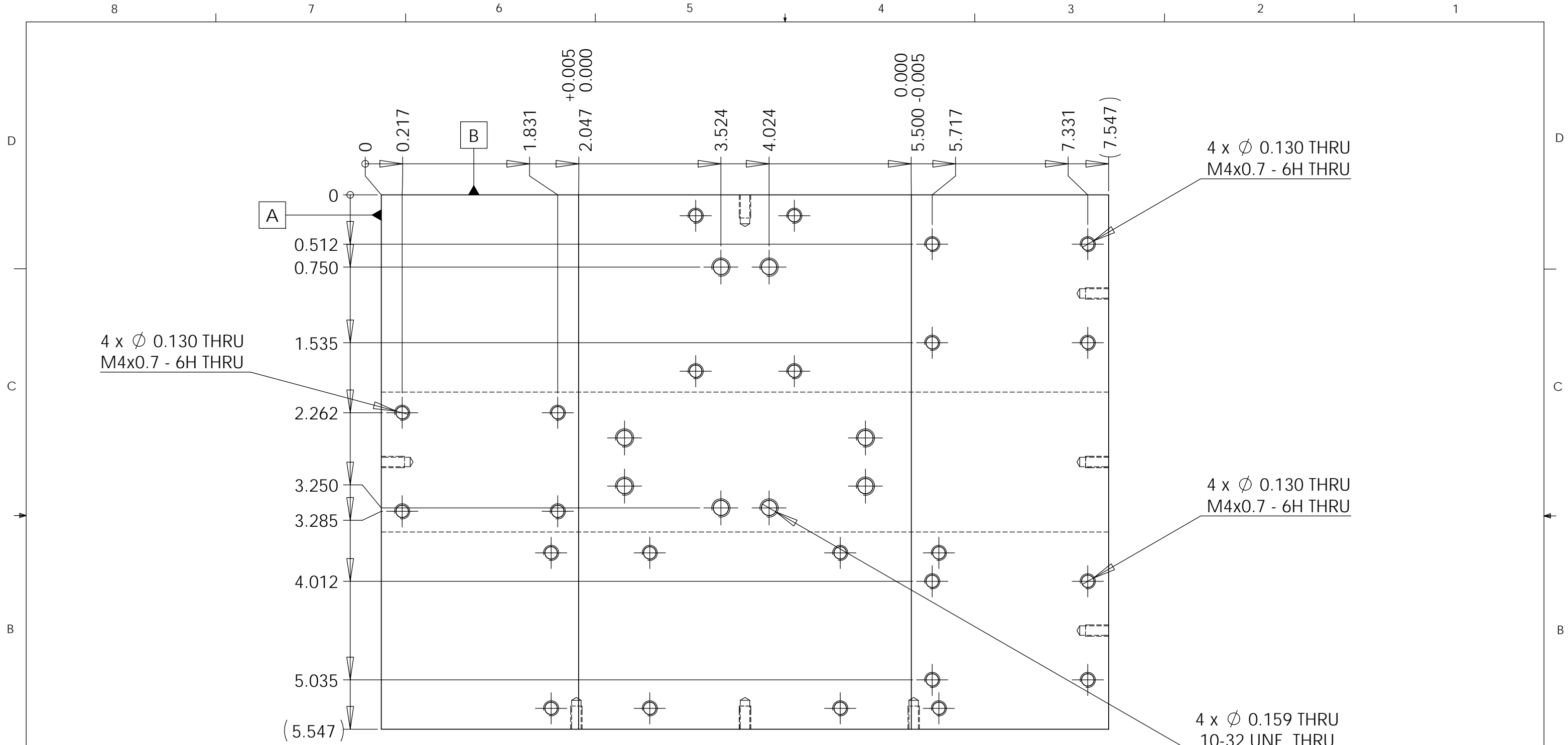
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		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS: Make 3x according to instructions (see note)	
		INTERPRET GEOMETRIC TOLERANCING PER:		TITLE: BaseMember - Final Design	
		MATERIAL		SIZE	DWG. NO.
		FINISH		B	
NEXT ASSY	USED ON	DO NOT SCALE DRAWING		SCALE: 1:2	WEIGHT:
				SHEET 1 OF 1	

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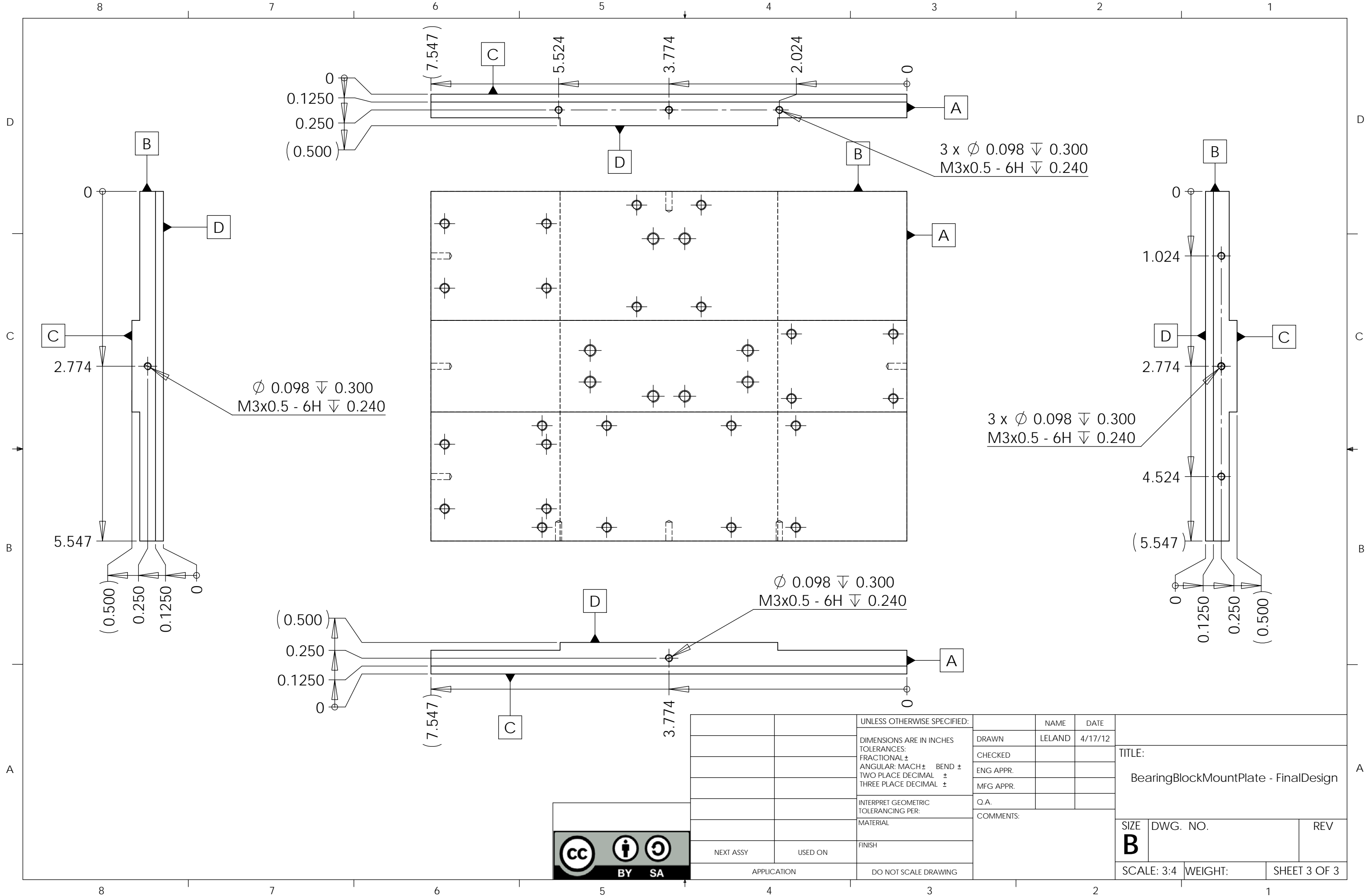
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		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	Make 1x
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
		TITLE:		BearingBlockMountPlate - FinalDesign	
SIZE	DWG. NO.	REV			
B					
SCALE: 1:1	WEIGHT:	SHEET 1 OF 3			

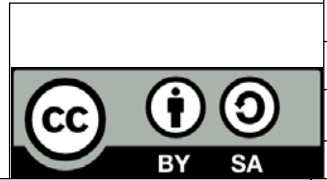


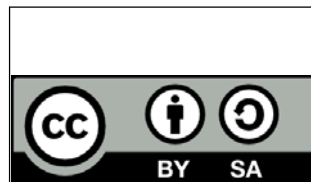
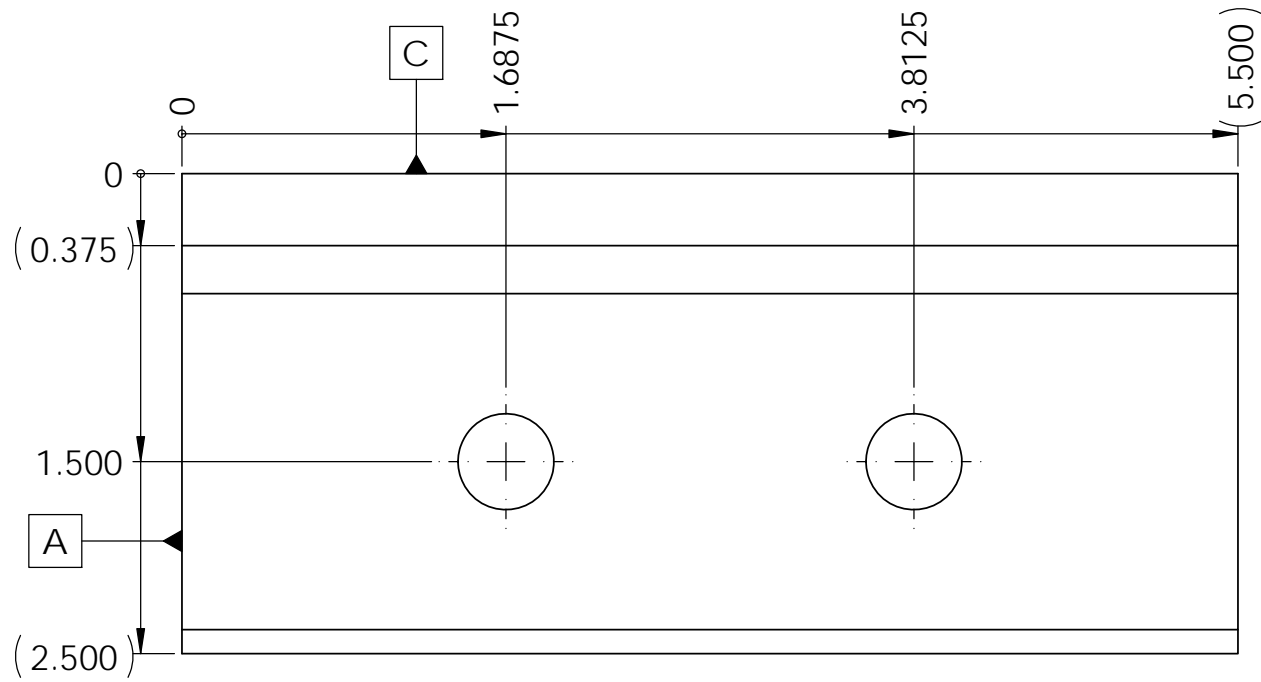
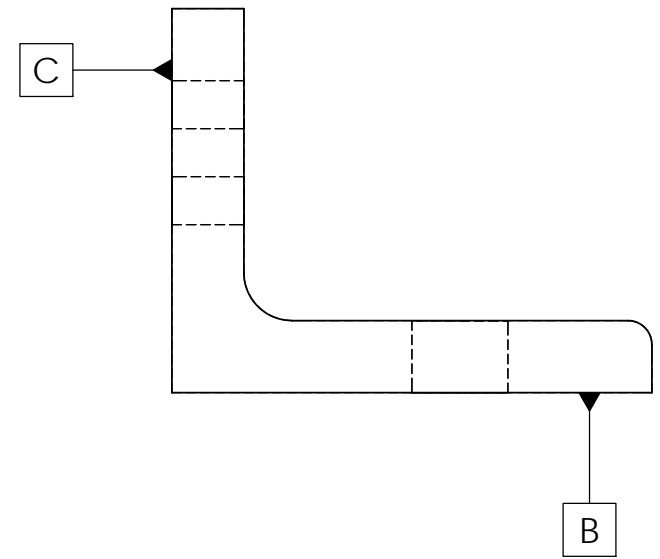
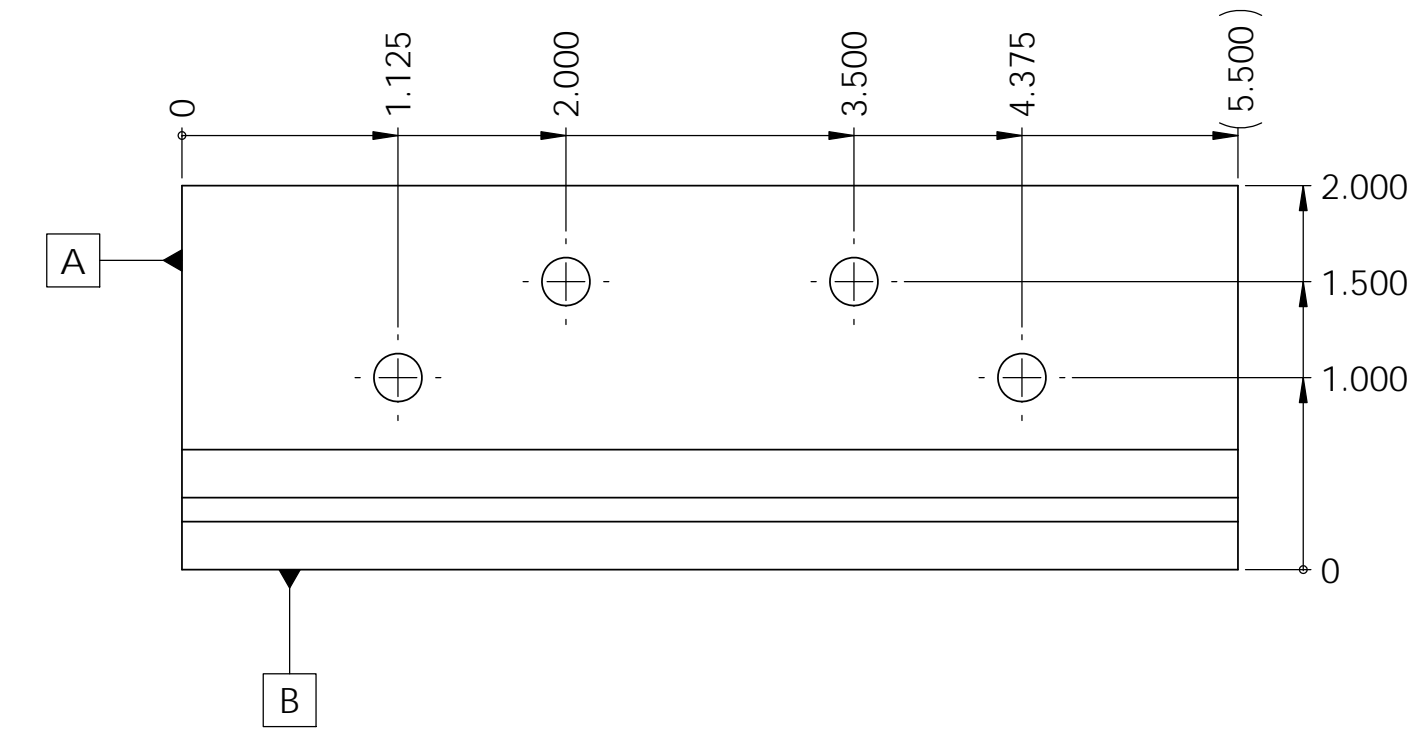
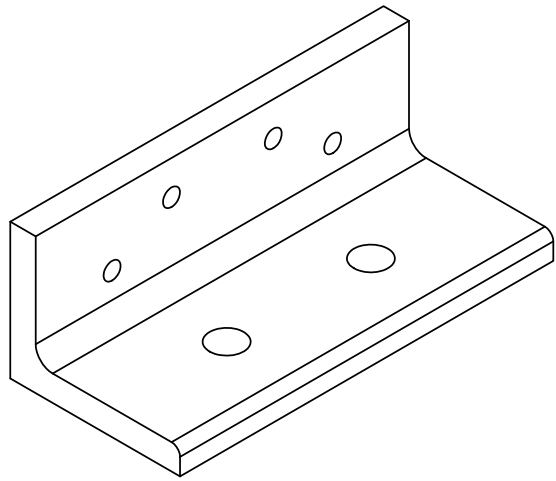
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		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:		
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			BearingBlockMountPlate - FinalDesign		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:1	WEIGHT:	SHEET 2 OF 3			



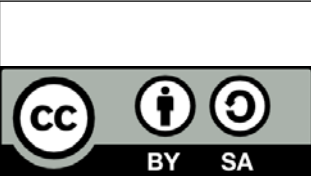
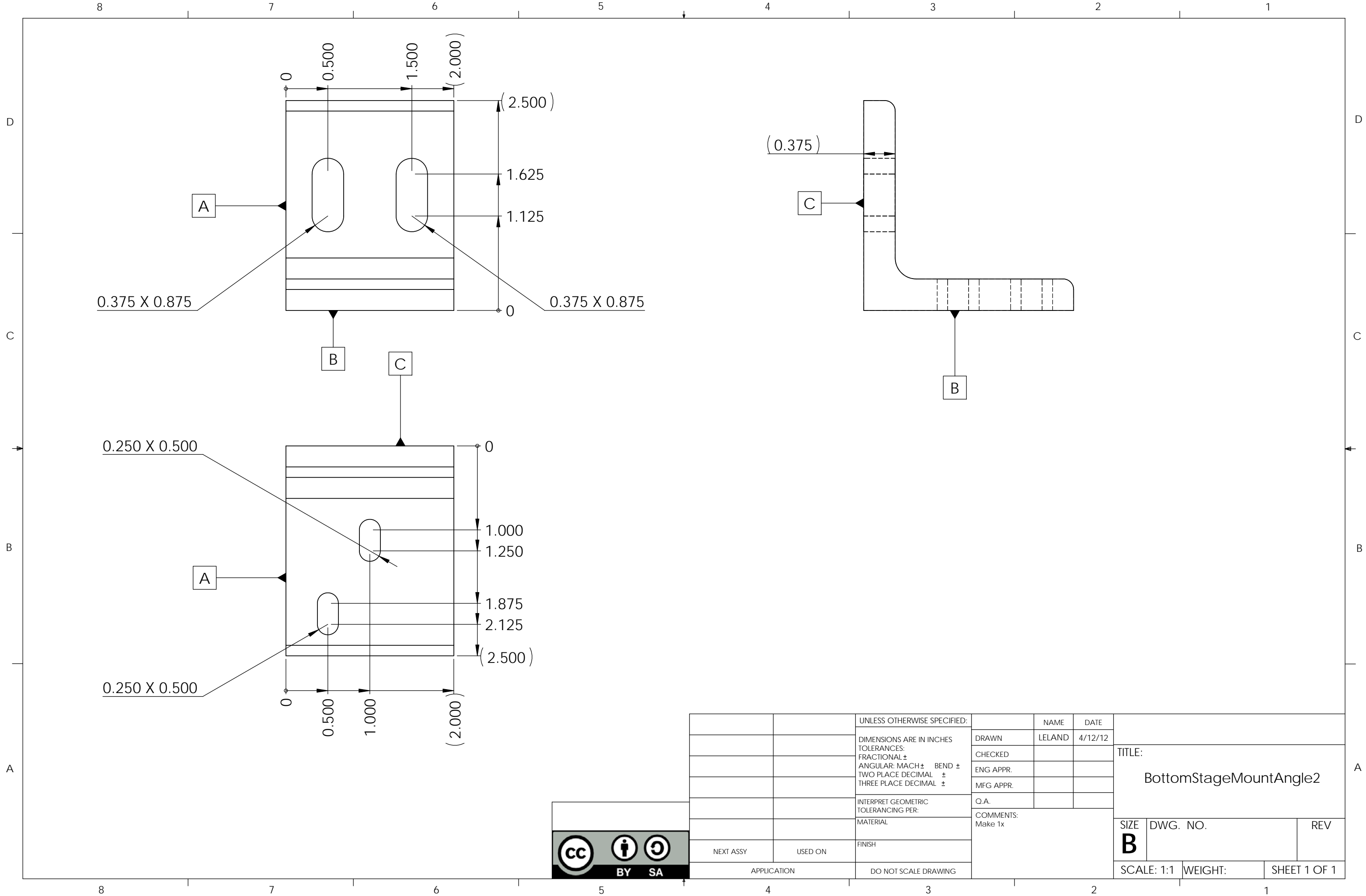
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TOLERANCES:		CHECKED	
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ANGULAR: MACH \pm BEND \pm		MFG APPR.	
TWO PLACE DECIMAL \pm		Q.A.	
THREE PLACE DECIMAL \pm		COMMENTS:	
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL			
FINISH			
NEXT ASSY	USED ON		
APPLICATION	DO NOT SCALE DRAWING		

TITLE:		
BearingBlockMountPlate - FinalDesign		
SIZE	DWG. NO.	REV
B		
SCALE: 3:4	WEIGHT:	SHEET 3 OF 3

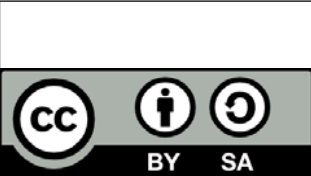
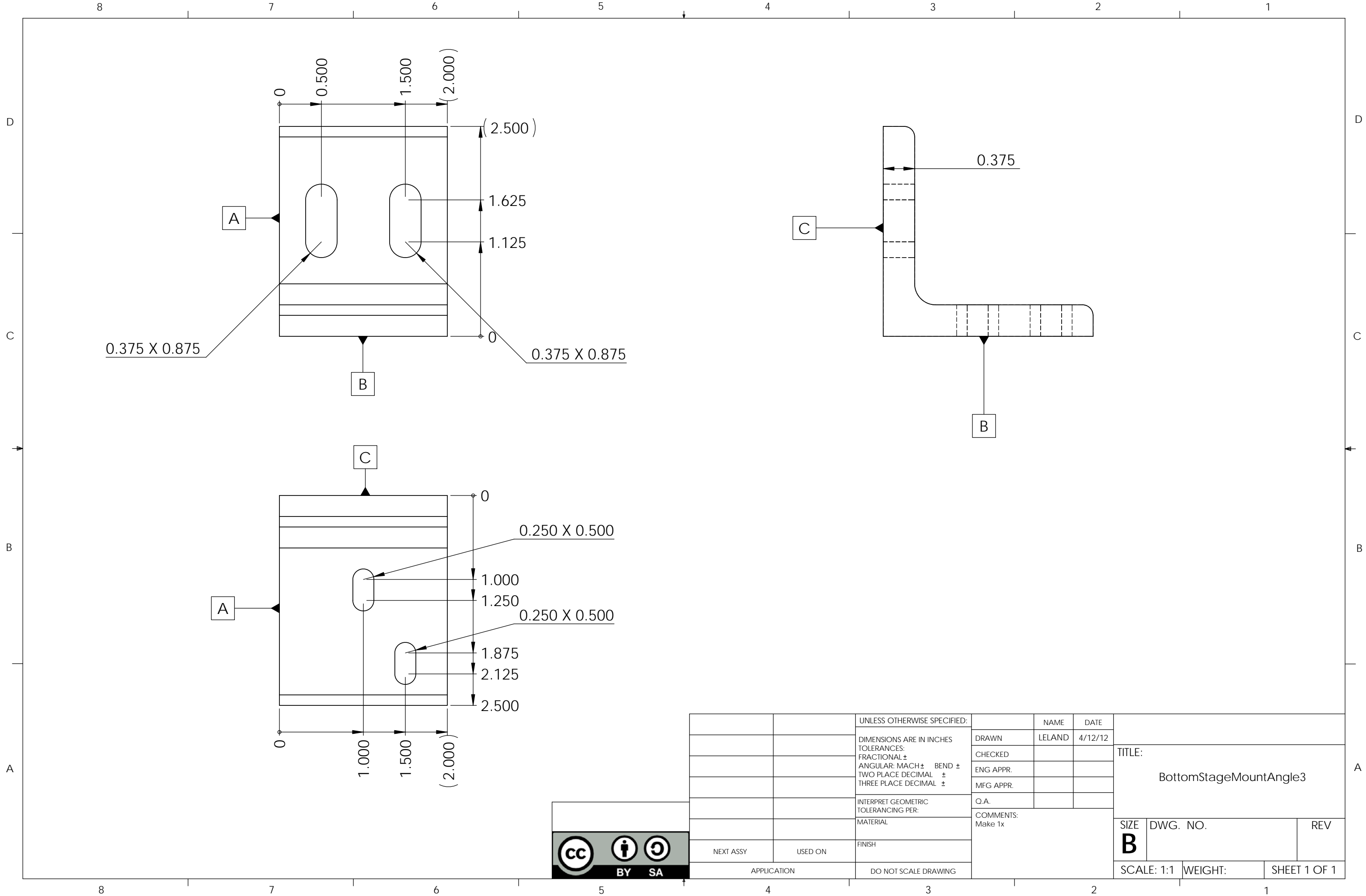




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		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:	Make 1x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			BottomStageMountAngle1		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1			



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/12/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL ±	ENG APPR.			BottomStageMountAngle2
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 1x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE DWG. NO. REV
		MATERIAL				B
NEXT ASSY	USED ON	FINISH				SCALE: 1:1 WEIGHT: SHEET 1 OF 1
		DO NOT SCALE DRAWING				



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/12/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL ±	ENG APPR.			BottomStageMountAngle3
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 1x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE DWG. NO. REV
		MATERIAL				B
NEXT ASSY	USED ON	FINISH				SCALE: 1:1 WEIGHT: SHEET 1 OF 1
		DO NOT SCALE DRAWING				

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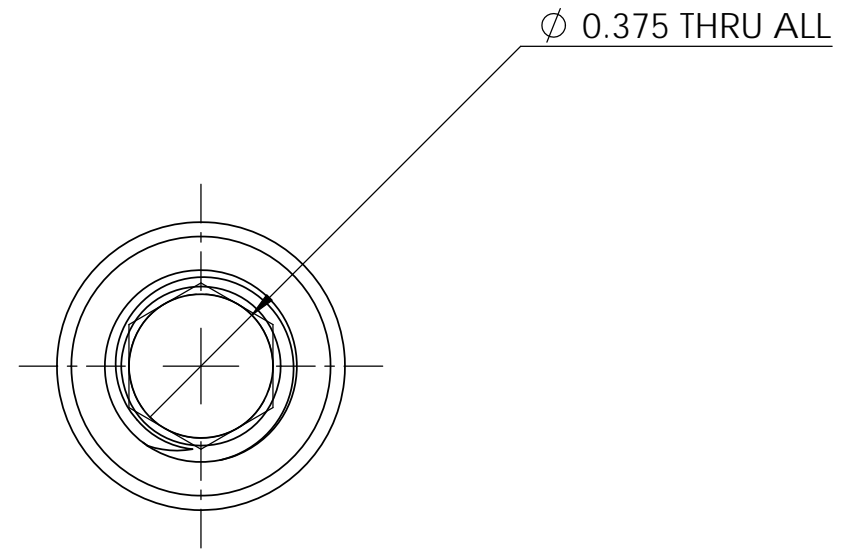
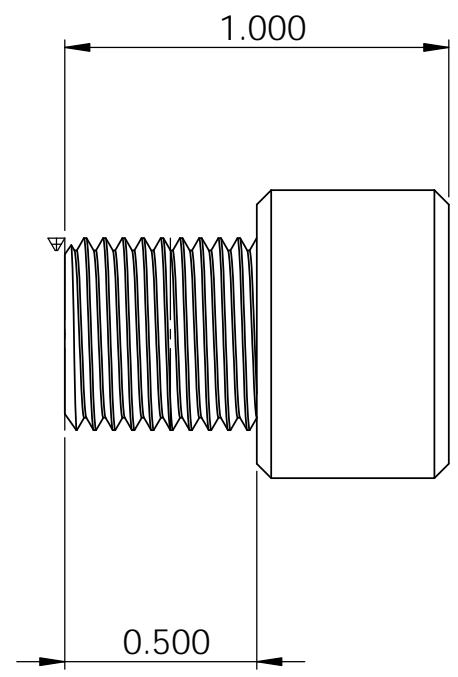
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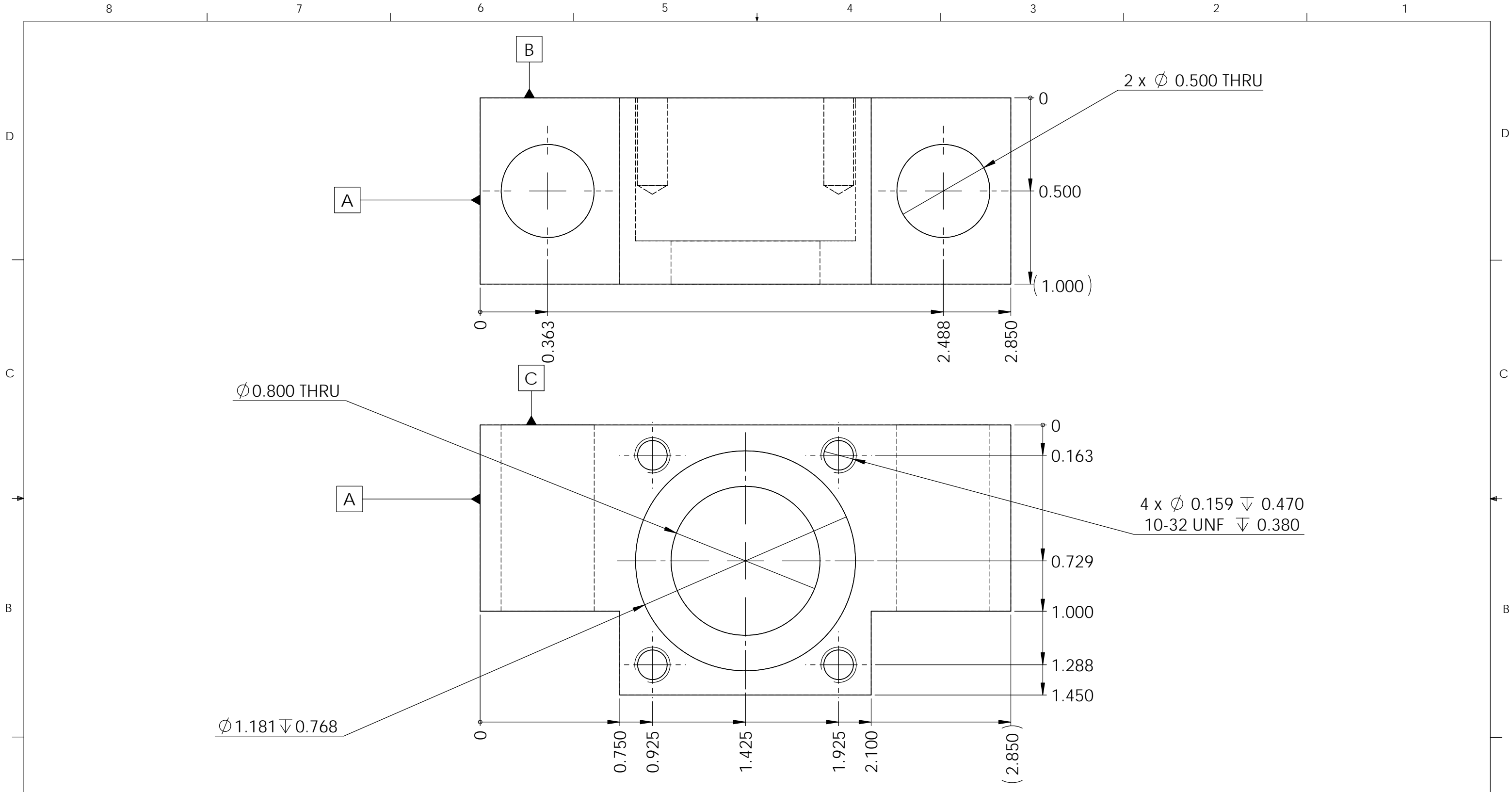


DRILL HOLE THROUGH CENTER OF .5 - 20 SHCS. MAY DRILL SLIGHTLY OVERSIZE TO ALLOW CLEARANCE FOR LEAD SCREW.

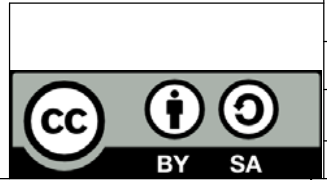
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		ANGULAR: MACH ± BEND ±		MFG APPR.			
		TWO PLACE DECIMAL ±		Q.A.			SIZE
		THREE PLACE DECIMAL ±		COMMENTS:	Make 2x		DWG. NO.
		INTERPRET GEOMETRIC TOLERANCING PER:					REV
		MATERIAL					
		FINISH					
NEXT ASSY	USED ON	APPLICATION					
		DO NOT SCALE DRAWING					
						SCALE: 2:1	WEIGHT:
						SHEET 1 OF 1	



8 7 6 5 4 3 2 1



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS: Make 1x. Part is similar to LeadscrewThrustBearingMount	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON			SIZE	DWG. NO.
APPLICATION		DO NOT SCALE DRAWING		B	REV
				SCALE: 2:1	WEIGHT:
				SHEET 1 OF 1	



8 7 6 5 4 3 2 1

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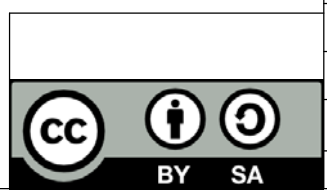
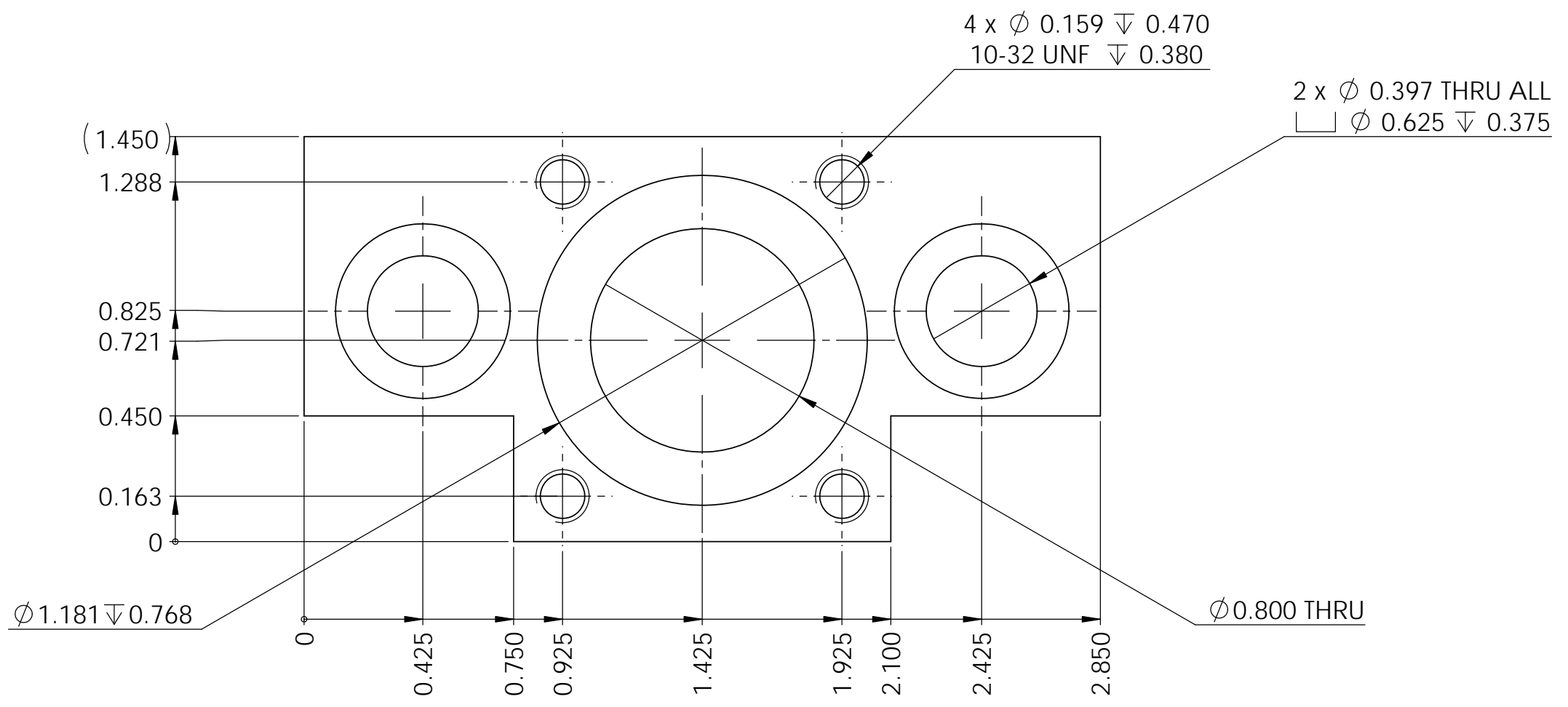
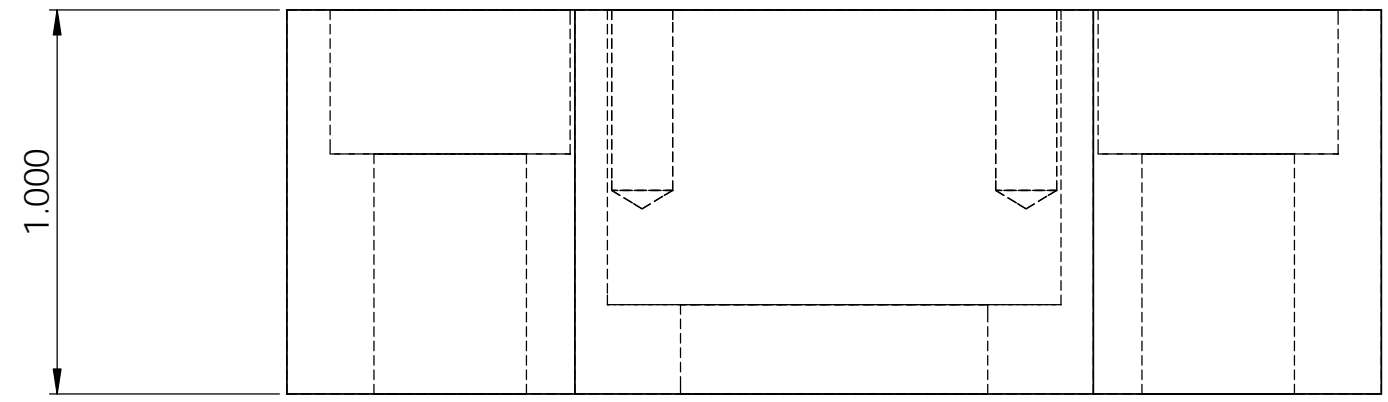
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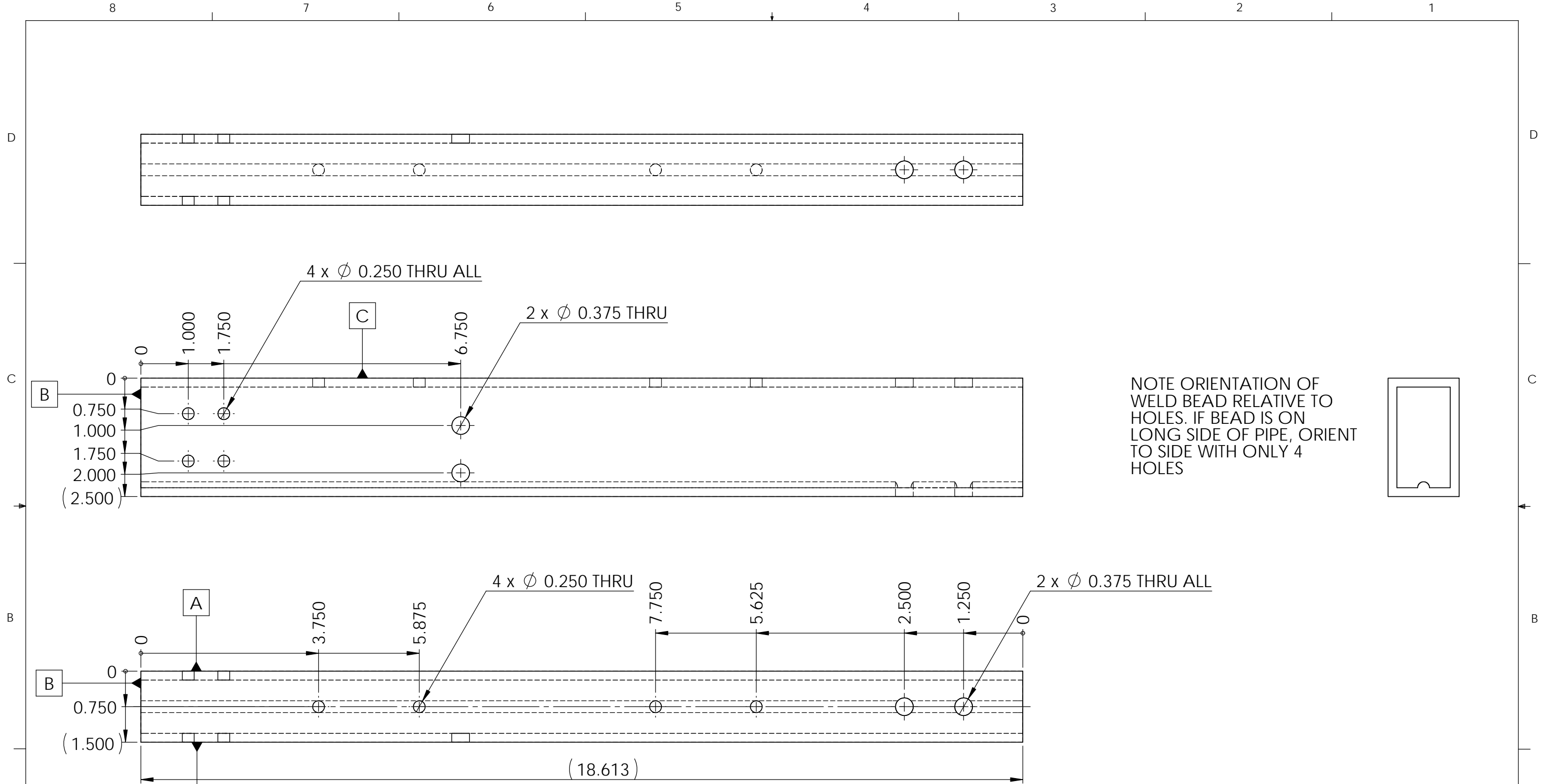
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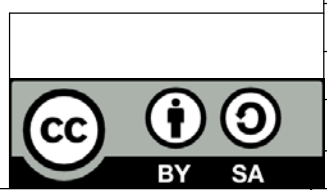
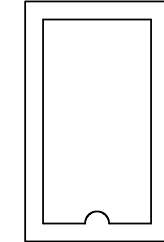


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		FRACTIONAL \pm		ENG APPR.	
		ANGULAR: MACH \pm BEND \pm		MFG APPR.	
		TWO PLACE DECIMAL \pm		Q.A.	
		THREE PLACE DECIMAL \pm		COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:		Make 1x. Part is similar to LeadscrewThrustBearingMount - BottomStage	
		MATERIAL		SIZE	DWG. NO.
		FINISH		B	
NEXT ASSY	USED ON	DO NOT SCALE DRAWING		SCALE: 2:1	WEIGHT:
				SHEET 1 OF 1	
				REV	

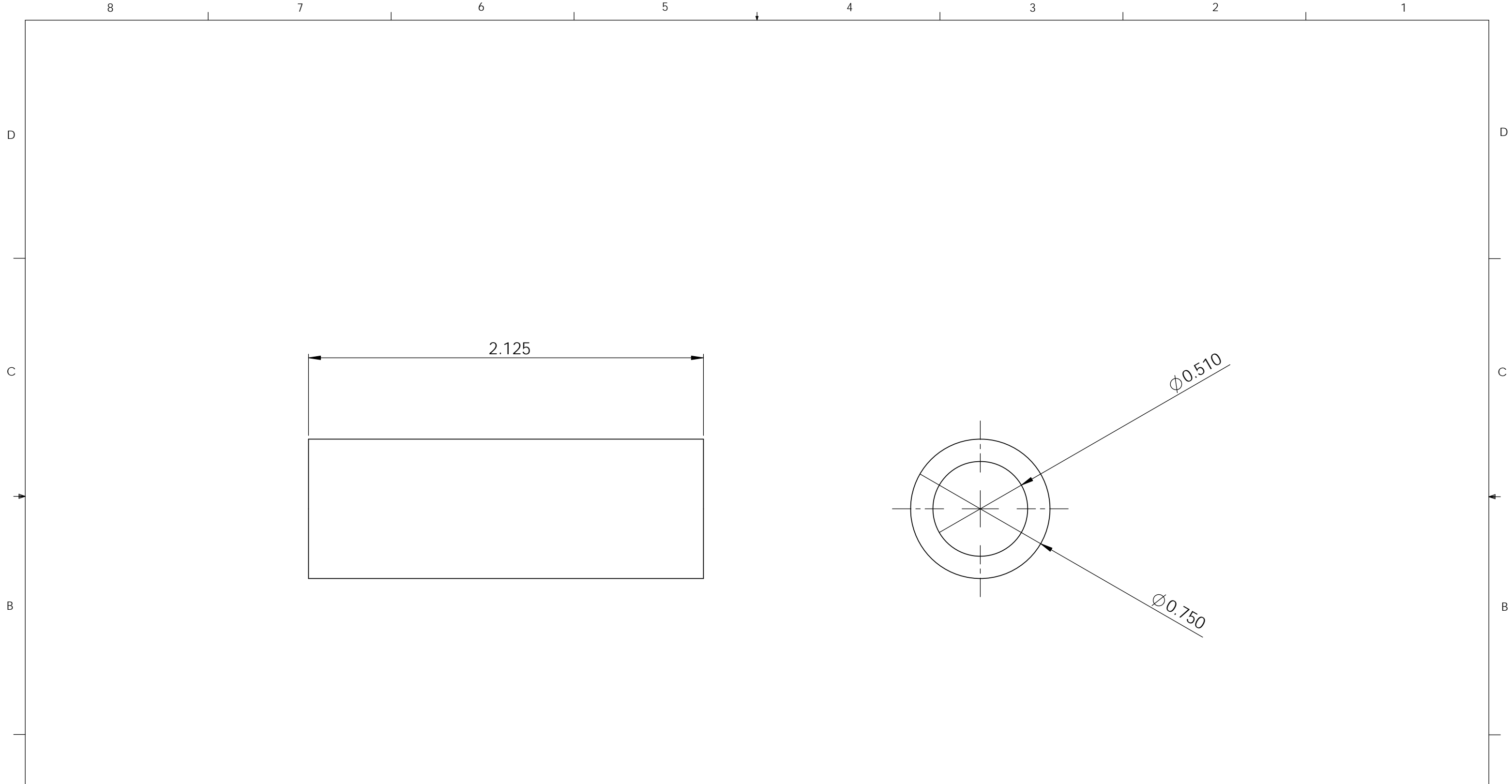
8 7 6 5 4 3 2 1



NOTE ORIENTATION OF WELD BEAD RELATIVE TO HOLES. IF BEAD IS ON LONG SIDE OF PIPE, ORIENT TO SIDE WITH ONLY 4 HOLES



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/6/12
		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	Make 1x
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			LeftRailSupport - Final Design		
SIZE	DWG. NO.			REV	
B					
SCALE: 1:5		WEIGHT:		SHEET 1 OF 1	



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE		
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND	5/3/12	TITLE: p75x2p125Sleeve
		TOLERANCES:		CHECKED			
		FRACTIONAL \pm		ENG APPR.			
		ANGULAR: MACH \pm BEND \pm		MFG APPR.			
		TWO PLACE DECIMAL \pm		Q.A.			SIZE B
		THREE PLACE DECIMAL \pm		COMMENTS: Make 18x			
		INTERPRET GEOMETRIC TOLERANCING PER:					REV
		MATERIAL					
		FINISH					
NEXT ASSY	USED ON	APPLICATION		DO NOT SCALE DRAWING		SCALE: 2:1	WEIGHT:
							SHEET 1 OF 1



8 7 6 5 4 3 2 1

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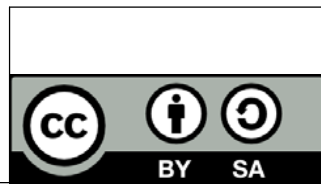
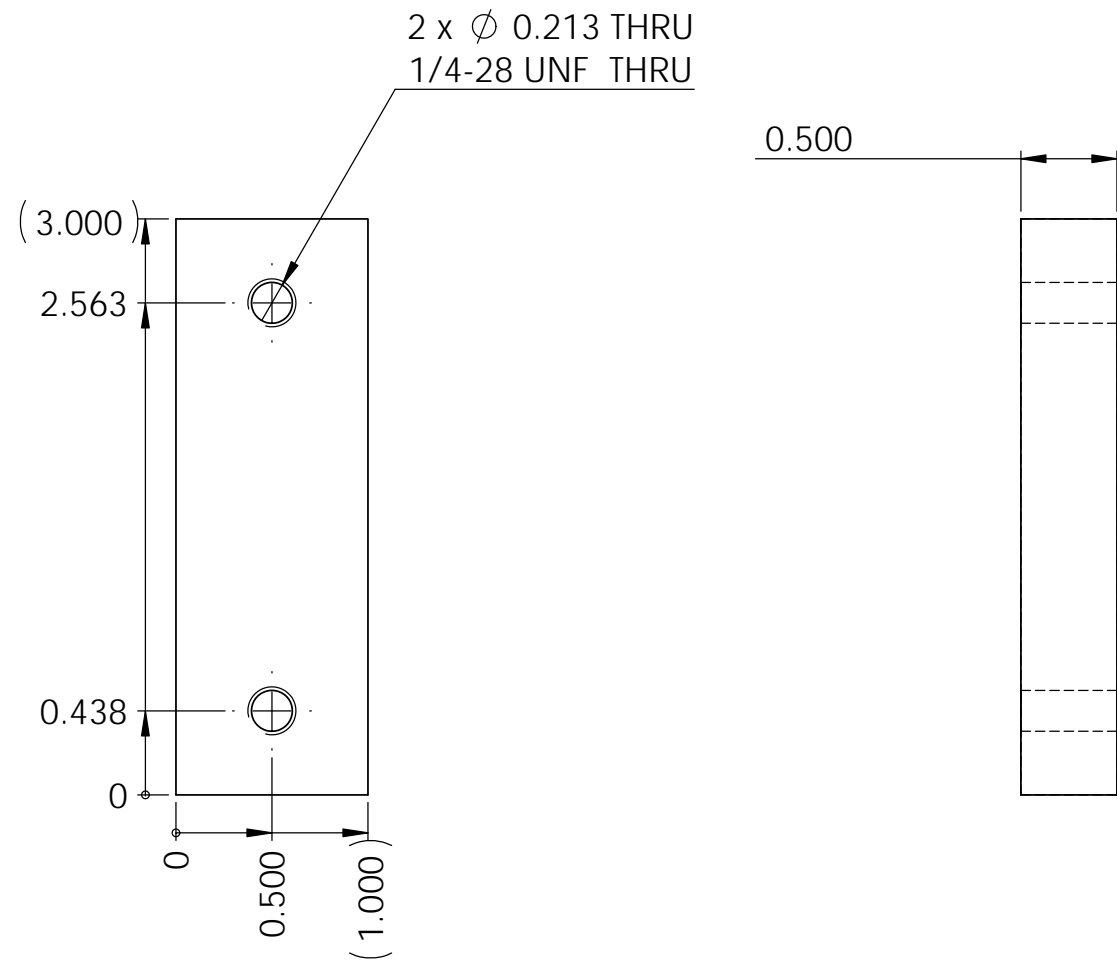
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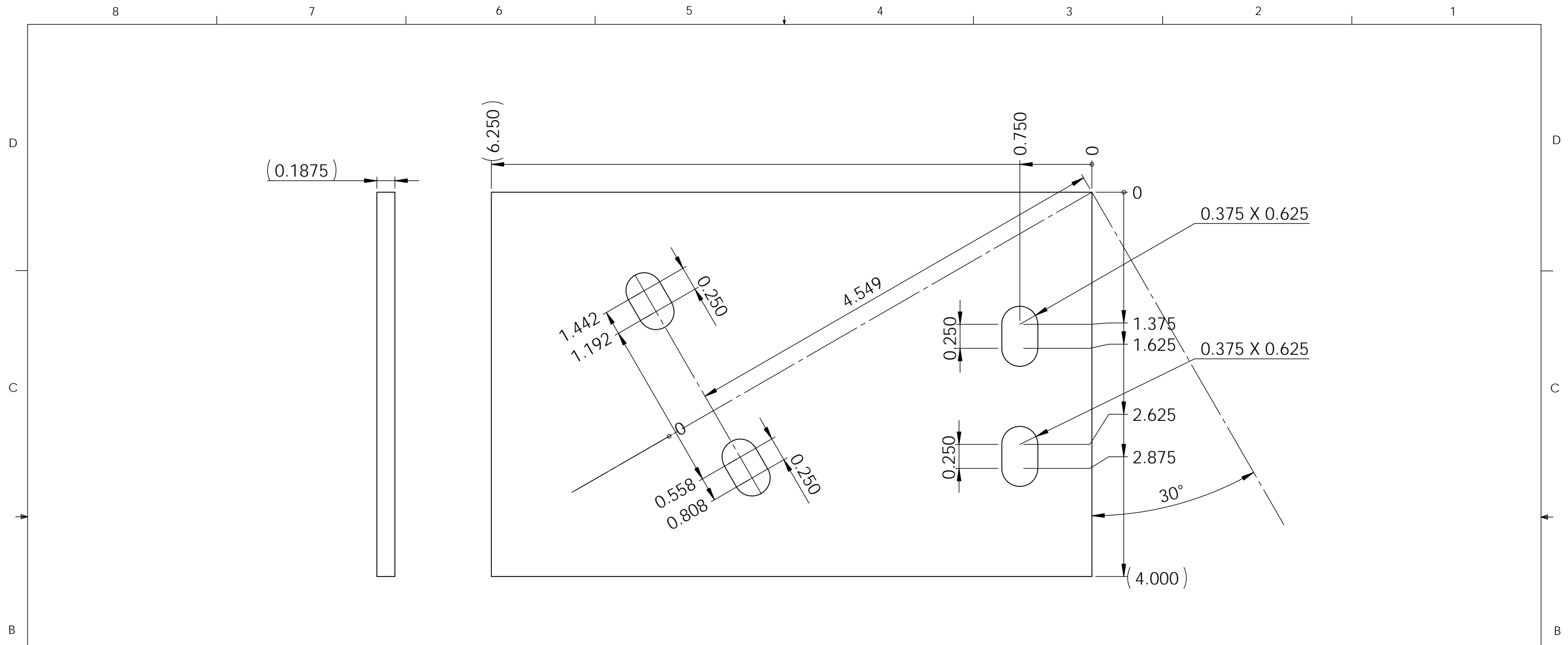
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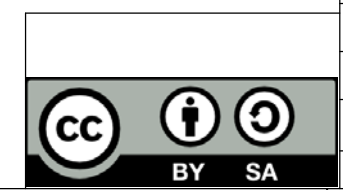


		UNLESS OTHERWISE SPECIFIED:		NAME	DATE			
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/6/12	TITLE: RailClampMountPlate		
		TOLERANCES:	CHECKED					
		FRACTIONAL \pm	ENG APPR.					
		ANGULAR: MACH \pm BEND \pm	MFG APPR.					
		TWO PLACE DECIMAL \pm	Q.A.			SIZE	DWG. NO.	REV
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 4x		B		
		INTERPRET GEOMETRIC TOLERANCING PER:				SCALE: 1:1	WEIGHT:	SHEET 1 OF 1
		MATERIAL						
NEXT ASSY	USED ON	FINISH						
		DO NOT SCALE DRAWING						

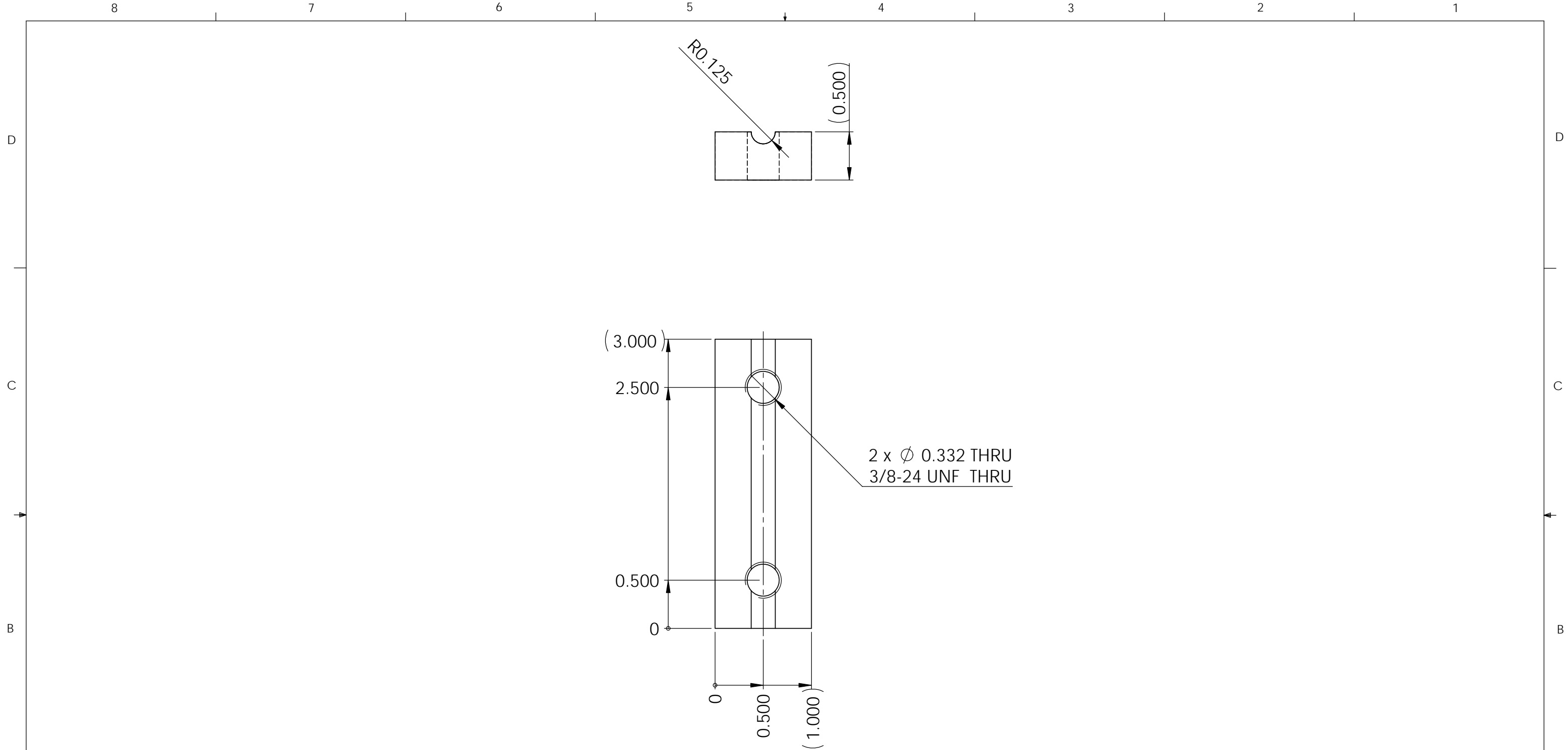
8 7 6 5 4 3 2 1



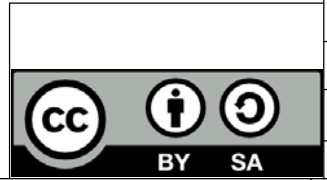
ANGLE MEASUREMENT AND ACCOMPANYING CONSTRUCTION LINES ARE FOR USE WITH MANUAL ROTARY TABLE. ORIGIN OF PLATE SHOULD BE SET AT CENTER OF ROTARY TABLE, AND TABLE SHOULD BE ROTATED 30 DEG. TO CUT ANGLED SLOTS.



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/6/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL ±	ENG APPR.			RailFrameAttachmentPlate - Final Design
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 4x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE
		MATERIAL				DWG. NO.
		FINISH				REV
NEXT ASSY	USED ON					
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:2
						WEIGHT:
						SHEET 1 OF 1



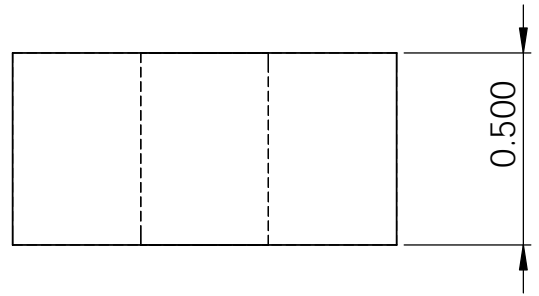
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE		
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND	4/6/12	TITLE: RailSupportMountBolt - BaseSupport
		TOLERANCES:		CHECKED			
		FRACTIONAL ±		ENG APPR.			
		ANGULAR: MACH ± BEND ±		MFG APPR.			
		TWO PLACE DECIMAL ±		Q.A.			SIZE DWG. NO. REV B
		THREE PLACE DECIMAL ±		COMMENTS:	Make 4x		
		INTERPRET GEOMETRIC TOLERANCING PER:					SCALE: 1:1 WEIGHT: SHEET 1 OF 1
		MATERIAL					
		FINISH					
NEXT ASSY	USED ON	APPLICATION		DO NOT SCALE DRAWING			



8 7 6 5 4 3 2 1

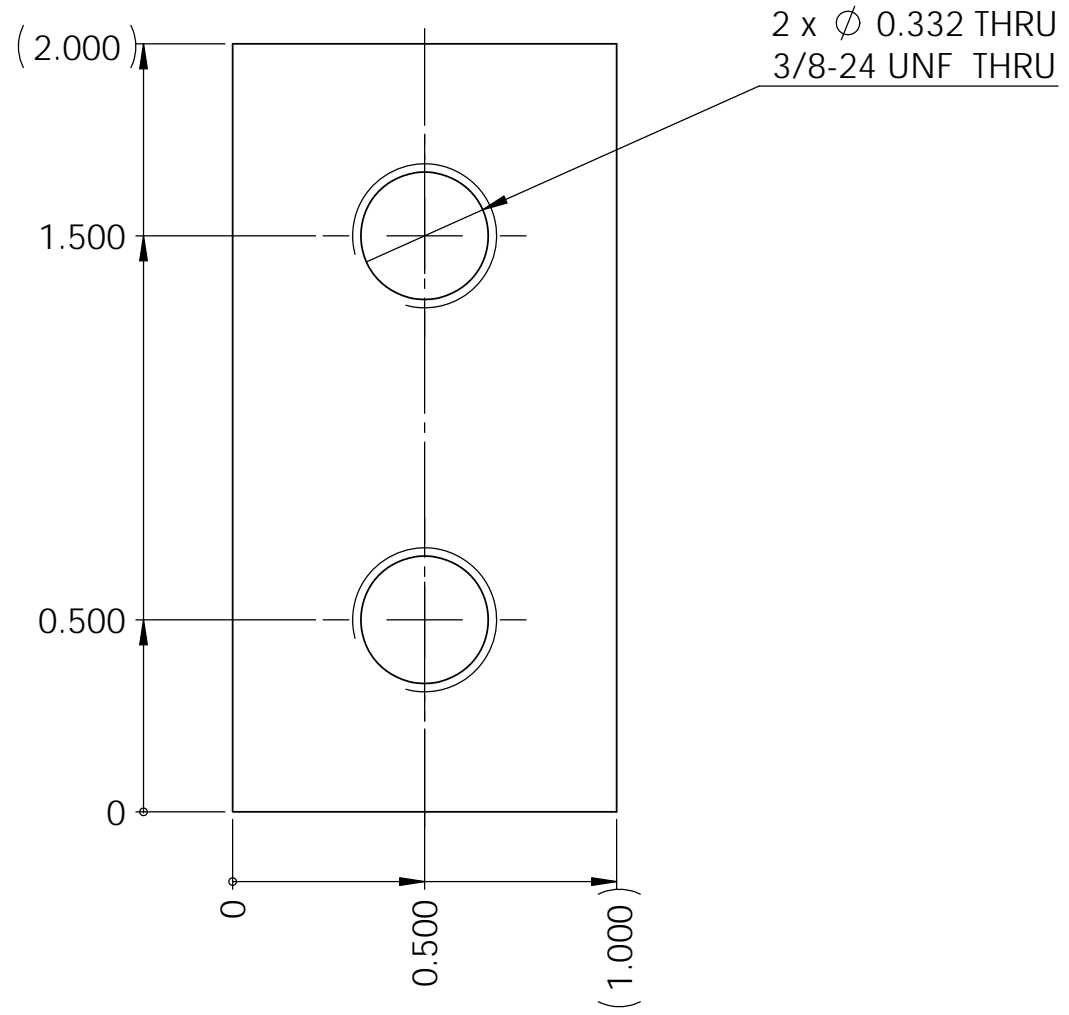
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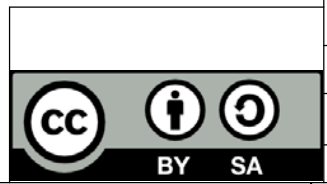


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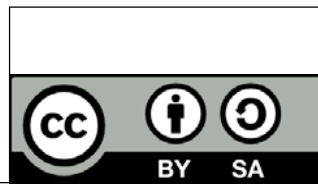
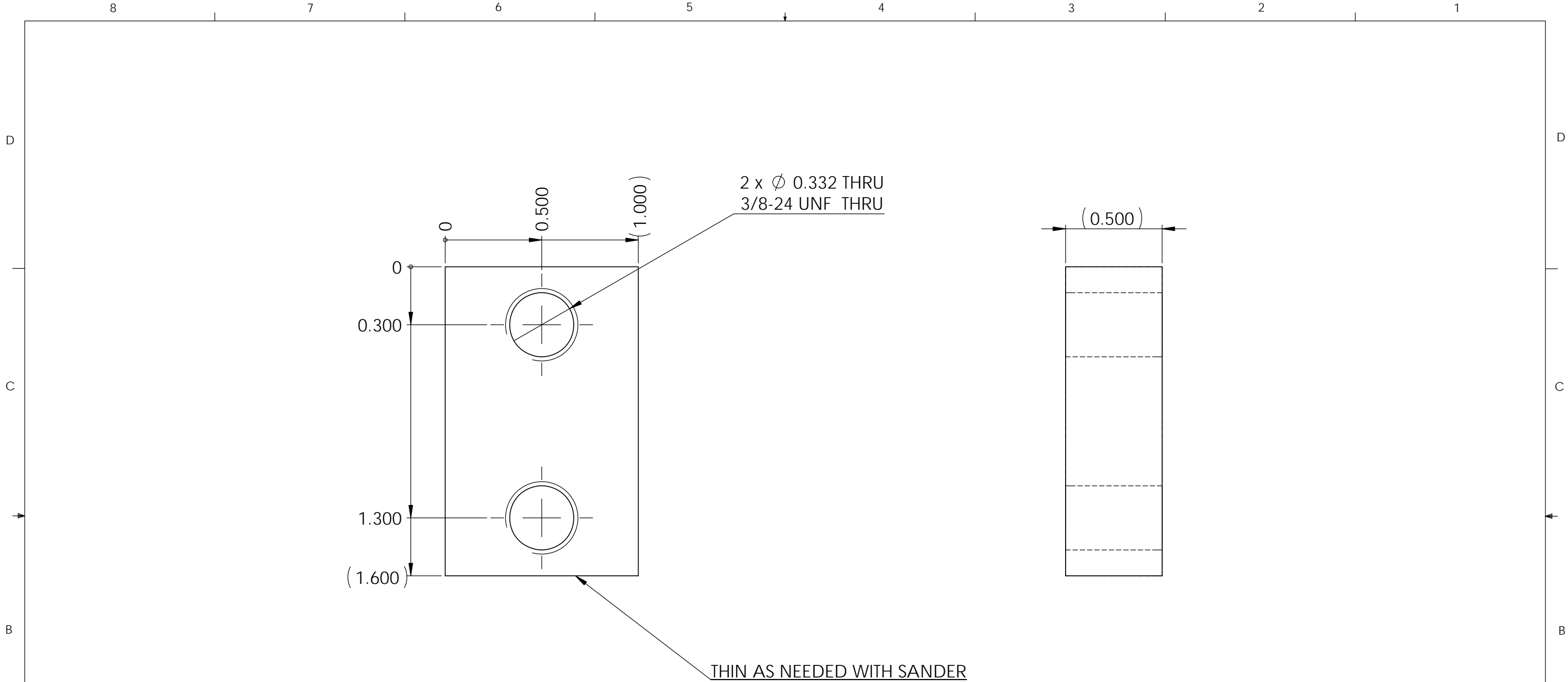
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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/6/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL ±	ENG APPR.			RailSupportMountBolt - BaseSupportV2
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 4x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE
		MATERIAL				DWG. NO.
		FINISH				REV
NEXT ASSY	USED ON					
	APPLICATION	DO NOT SCALE DRAWING				SCALE: 2:1
						WEIGHT:
						SHEET 1 OF 1

8 7 6 5 4 3 2 1

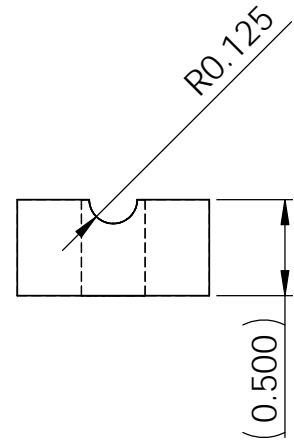


		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/10/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL ±	ENG APPR.			RailSupportMountBolt - LeadScrewSupport
		ANGULAR: MACH ± BEND ±	MFG APPR.			
		TWO PLACE DECIMAL ±	Q.A.			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 2x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE
		MATERIAL				DWG. NO.
		FINISH				REV
NEXT ASSY	USED ON					
APPLICATION		DO NOT SCALE DRAWING				SCALE: 2:1
						WEIGHT:
						SHEET 1 OF 1

8 7 6 5 4 3 2 1

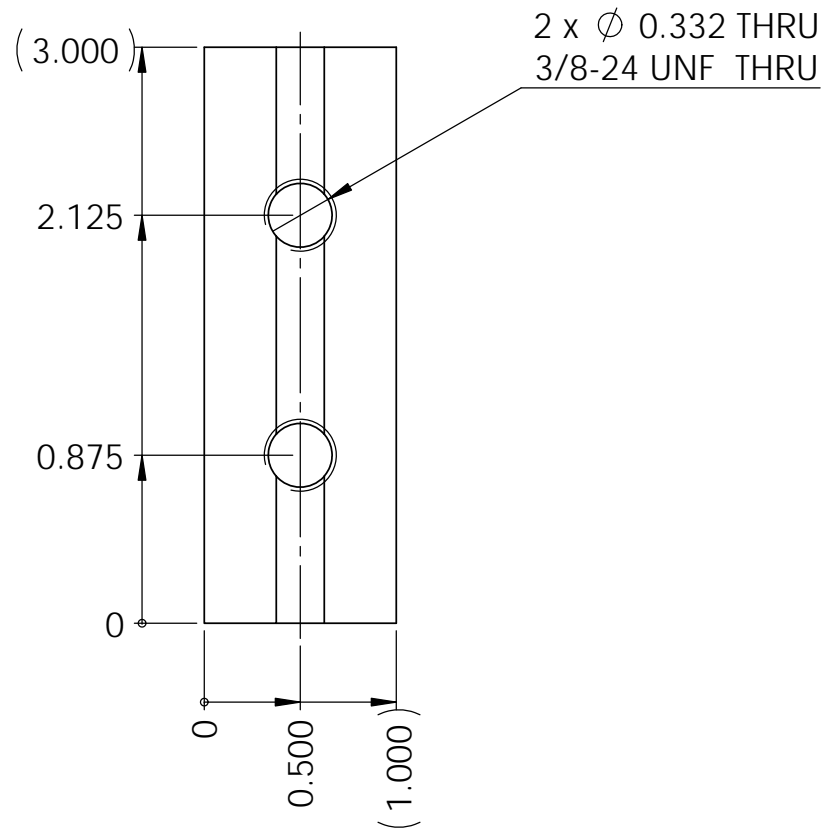
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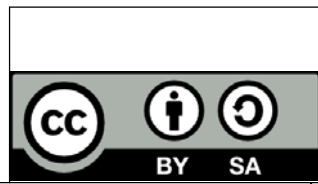


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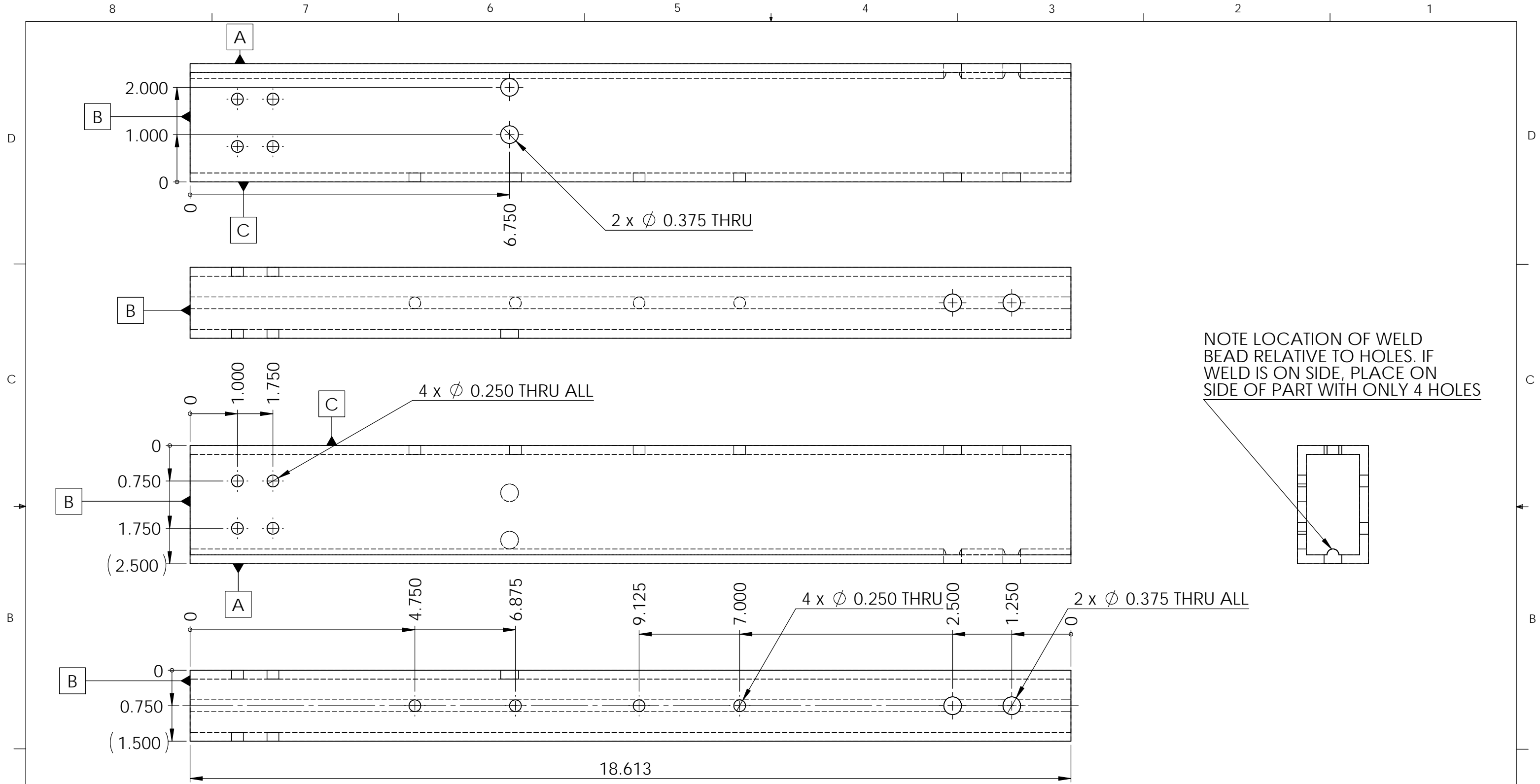
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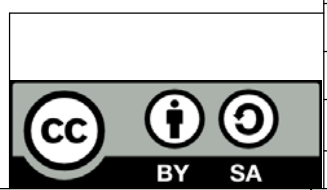
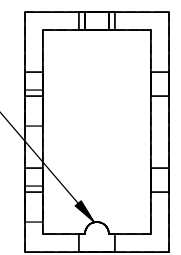


		UNLESS OTHERWISE SPECIFIED:		NAME	DATE			
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/6/12	TITLE: RailSupportMountBolt - RailMountSupport		
		TOLERANCES:	CHECKED					
		FRACTIONAL \pm	ENG APPR.					
		ANGULAR: MACH \pm BEND \pm	MFG APPR.					
		TWO PLACE DECIMAL \pm	Q.A.			SIZE	DWG. NO.	REV
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 4x		B		
		INTERPRET GEOMETRIC TOLERANCING PER:				SCALE: 1:1	WEIGHT:	SHEET 1 OF 1
		MATERIAL						
		FINISH						
NEXT ASSY	USED ON							
APPLICATION		DO NOT SCALE DRAWING						

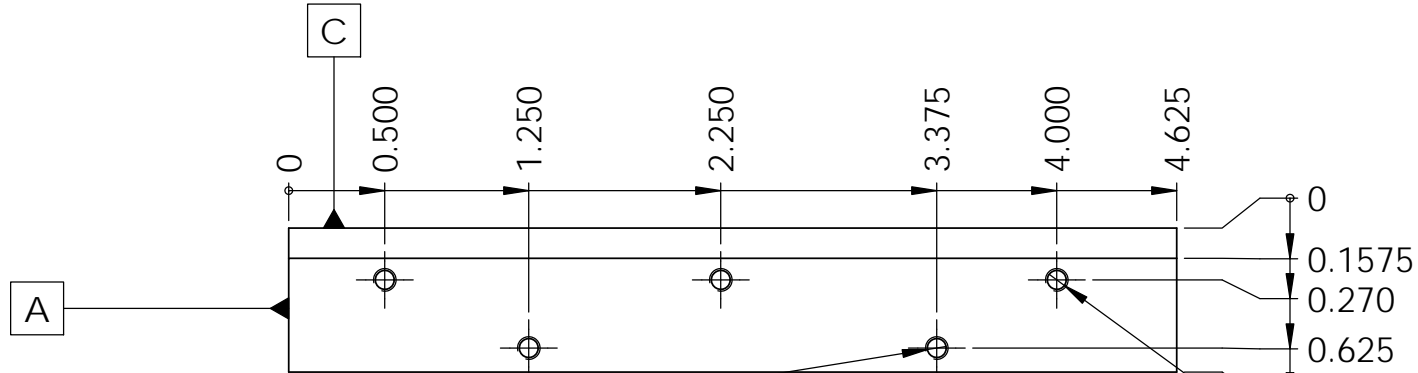
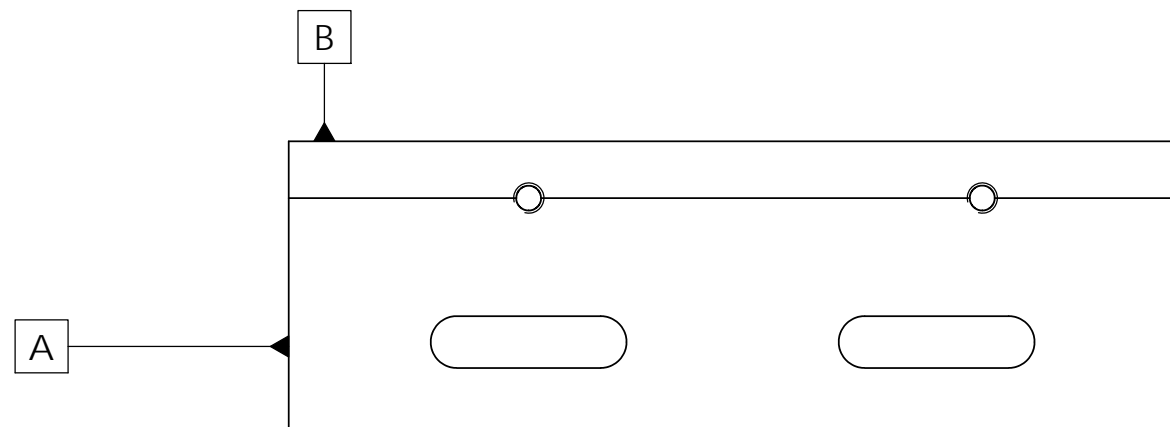
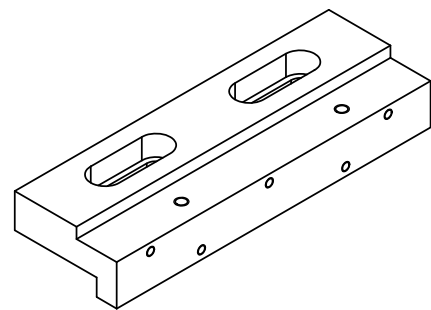
8 7 6 5 4 3 2 1



NOTE LOCATION OF WELD BEAD RELATIVE TO HOLES. IF WELD IS ON SIDE, PLACE ON SIDE OF PART WITH ONLY 4 HOLES.

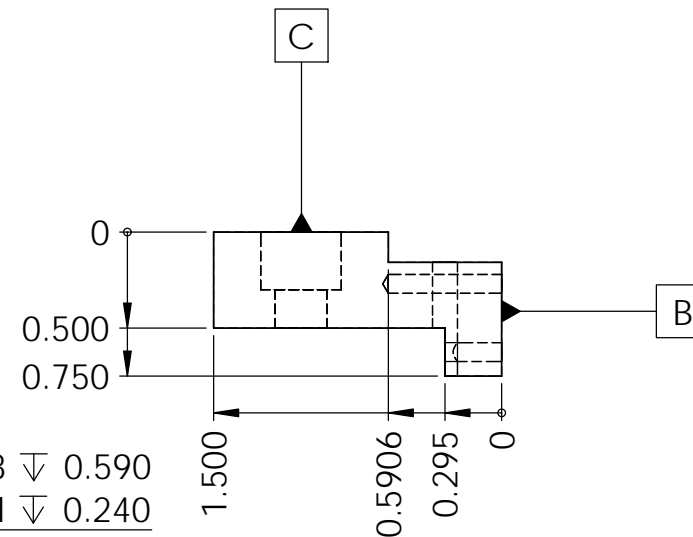


		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/6/12
		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:		Make 1x	
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
		TITLE:		RightRailSupport - Final Design	
SIZE	DWG. NO.	REV			
B					
SCALE: 1:5	WEIGHT:	SHEET 1 OF 1			

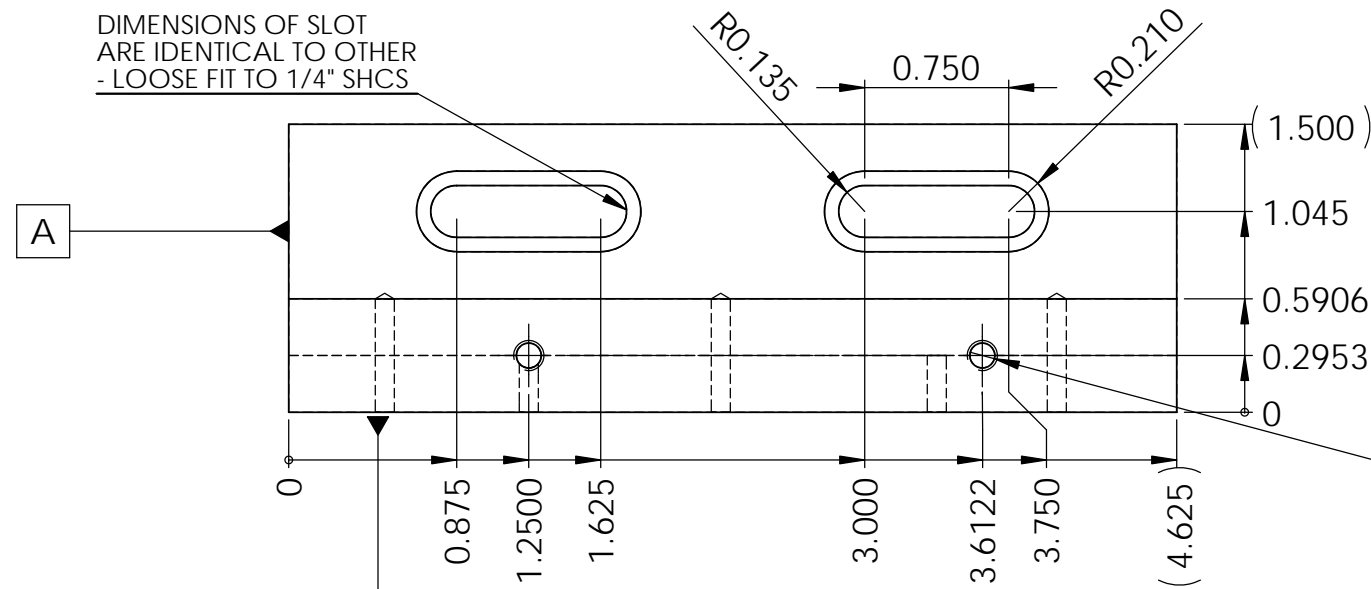


2 x \varnothing 0.098 THRU
M3x0.5 - 6H THRU

3 x \varnothing 0.098 ∇ 0.590
M3x0.5 - 6H ∇ 0.240



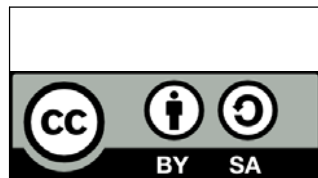
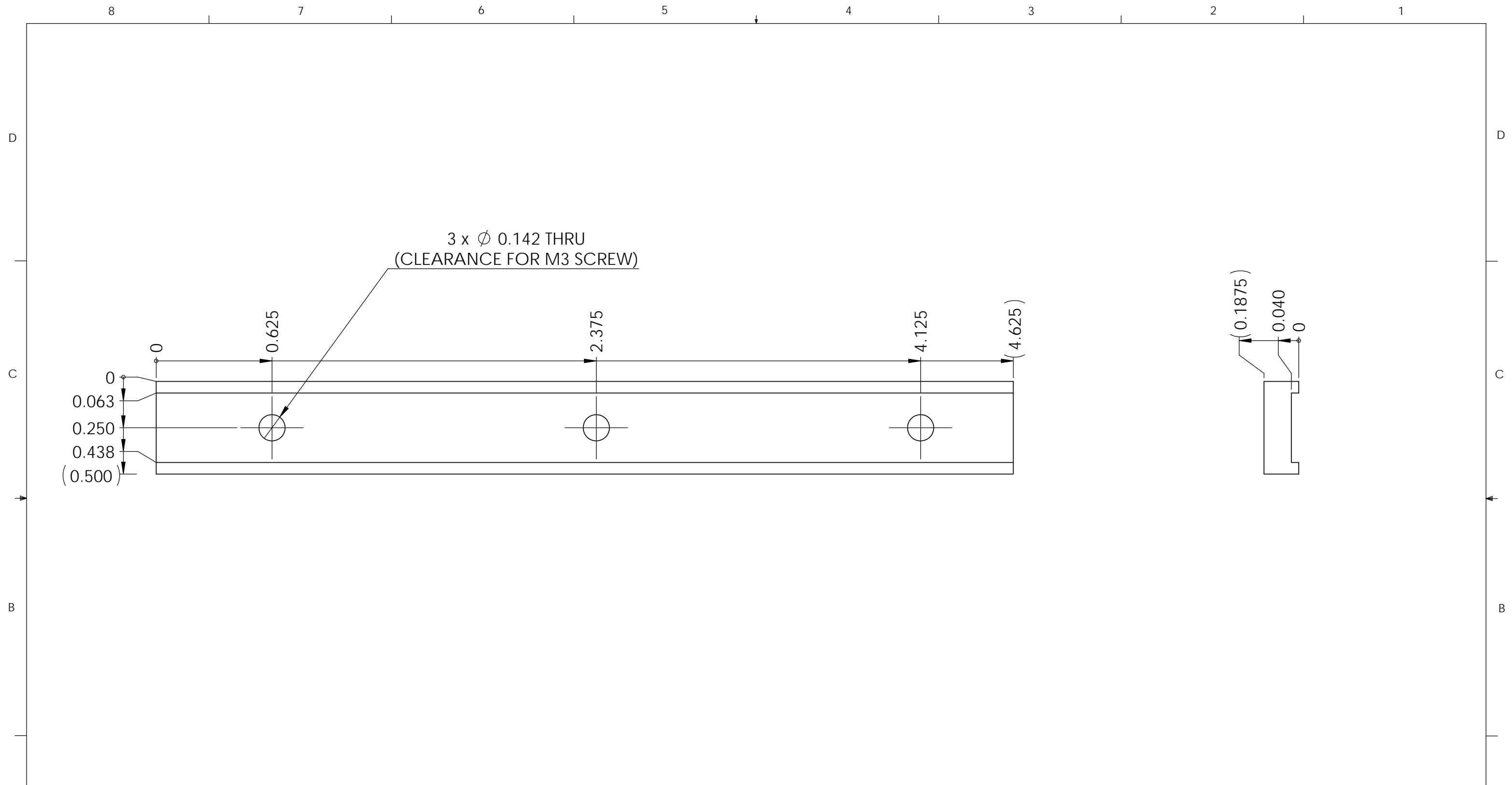
DIMENSIONS OF SLOT
ARE IDENTICAL TO OTHER
- LOOSE FIT TO 1/4" SHCS



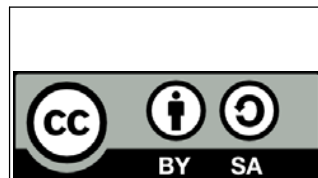
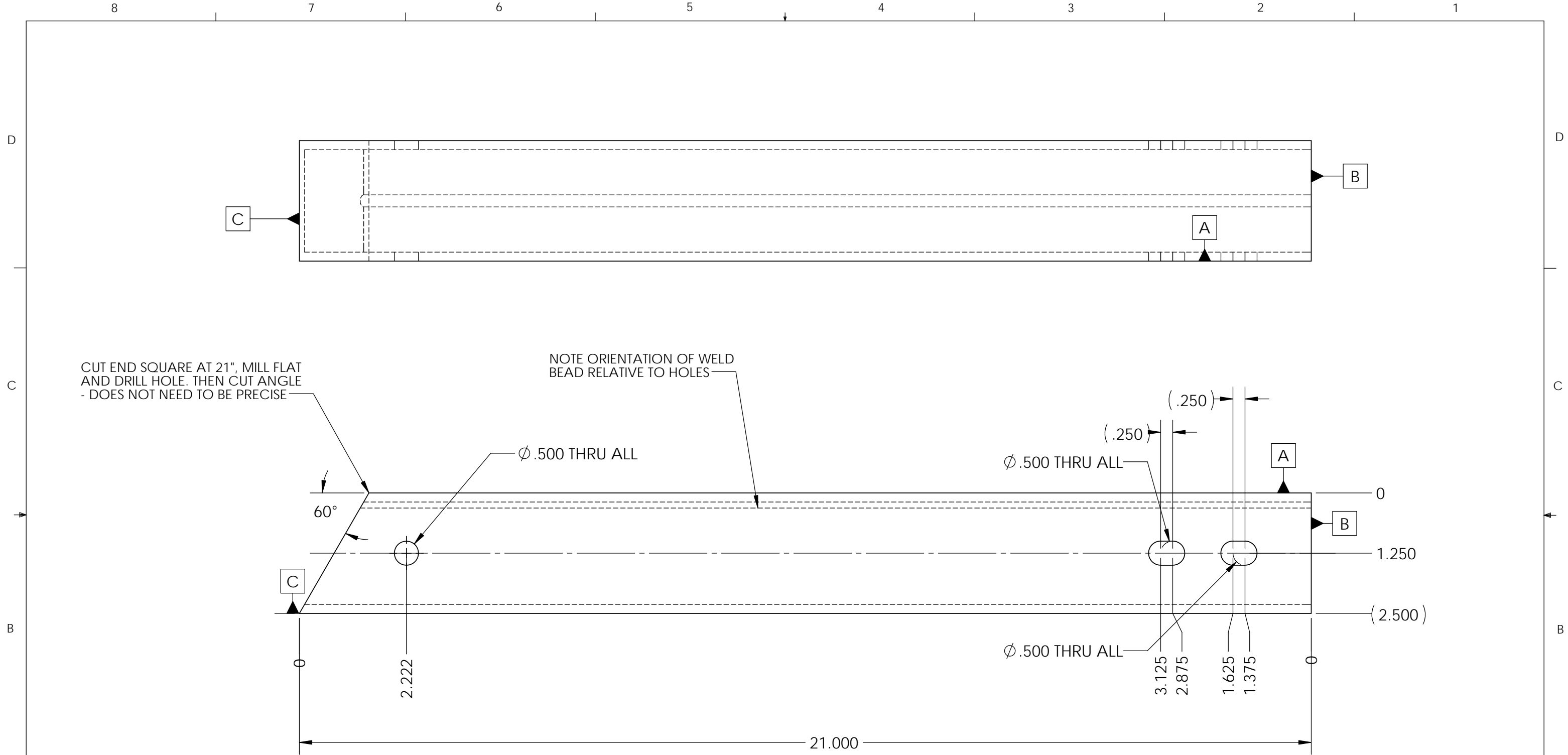
2 x \varnothing 0.130 THRU ALL
M4x0.7 - 6H THRU ALL



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/10/12
		TOLERANCES:		CHECKED	
		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:		Make 4x	
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE: ShortBearingRailClampV2 - FinalDesign					
SIZE	DWG. NO.			REV	
B					
SCALE: 1:1		WEIGHT:		SHEET 1 OF 1	



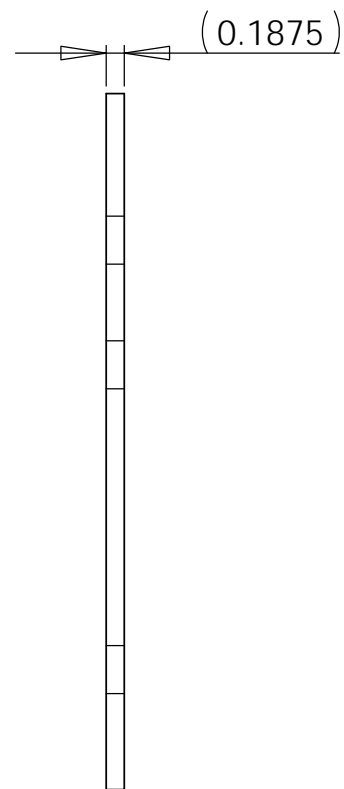
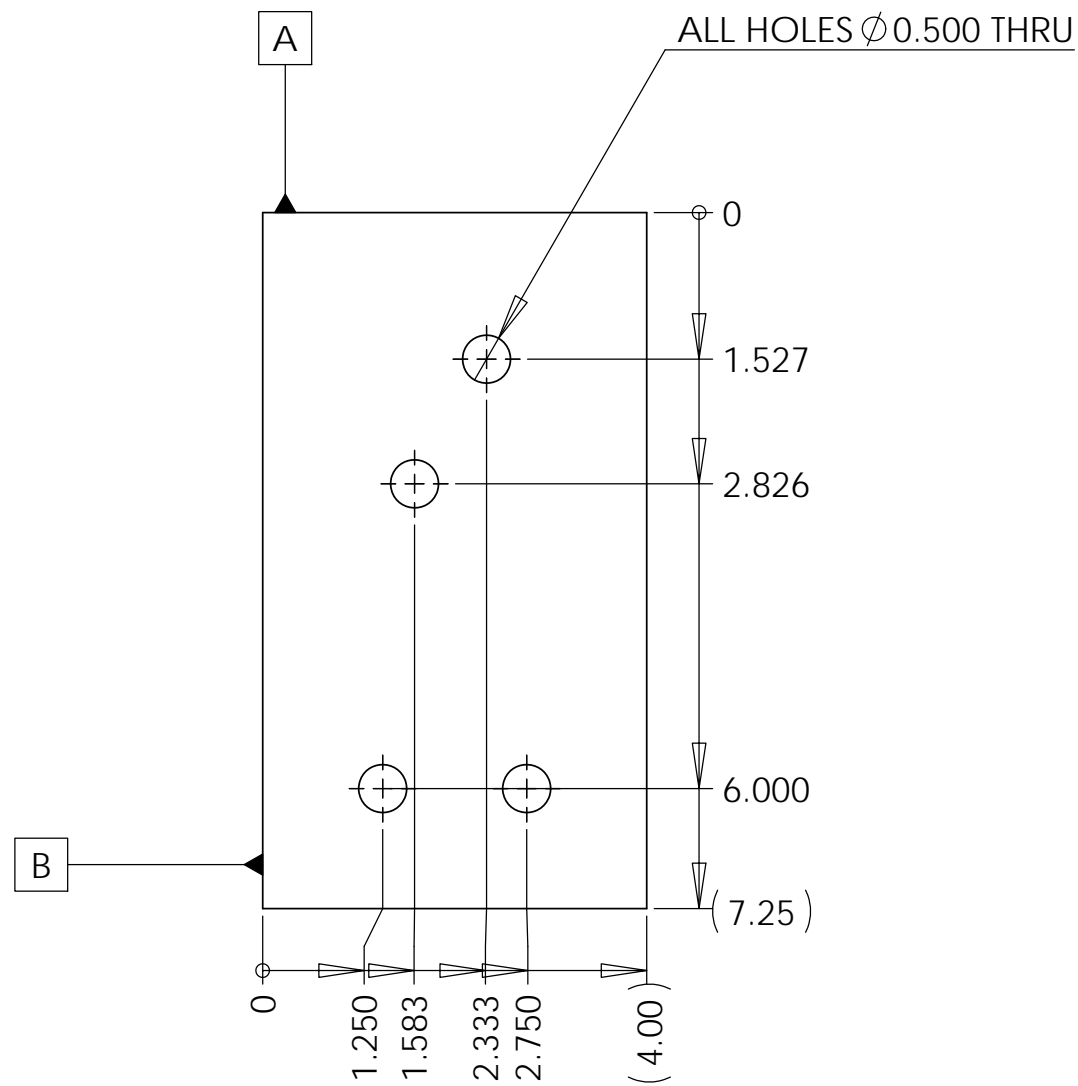
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE			
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/10/12	TITLE: ShortPushPlate - FinalDesign		
		TOLERANCES:	CHECKED					
		FRACTIONAL ±	ENG APPR.					
		ANGULAR: MACH ± BEND ±	MFG APPR.					
		TWO PLACE DECIMAL ±	Q.A.			SIZE	DWG. NO.	REV
		THREE PLACE DECIMAL ±	COMMENTS:	Make 10x		B		
		INTERPRET GEOMETRIC TOLERANCING PER:				SCALE: 2:1	WEIGHT:	SHEET 1 OF 1
		MATERIAL						
		FINISH						
NEXT ASSY	USED ON							
APPLICATION		DO NOT SCALE DRAWING						



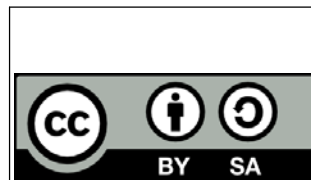
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: SideMember - Final Design			
		DIMENSIONS ARE IN INCHES	DRAWN	Leland	3/12/12				
		TOLERANCES:	CHECKED						
		FRACTIONAL ±	ENG APPR.						
		ANGULAR: MACH ± BEND ±	MFG APPR.			SIZE	DWG. NO.	REV	
		TWO PLACE DECIMAL ±	Q.A.			B			
		THREE PLACE DECIMAL ±	COMMENTS:	Make 6x			SCALE: 1:2	WEIGHT:	SHEET 1 OF 1
		INTERPRET GEOMETRIC TOLERANCING PER:							
		MATERIAL							
		FINISH							
NEXT ASSY	USED ON								
APPLICATION		DO NOT SCALE DRAWING							

8 7 6 5 4 3 2 1

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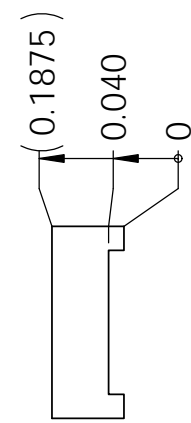
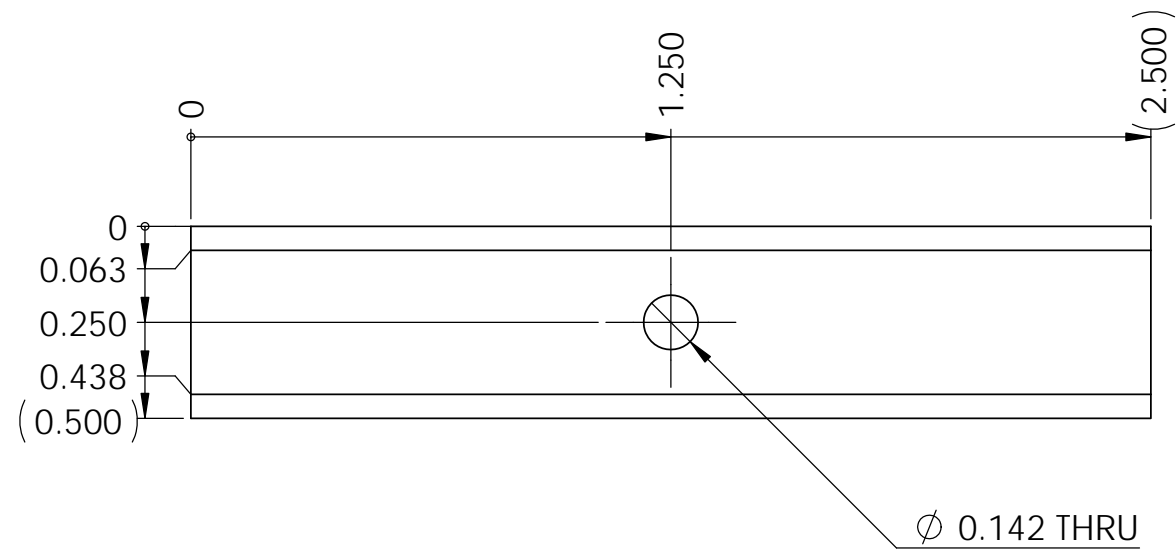


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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	3/12/12
		TOLERANCES:	CHECKED		
		FRACTIONAL \pm	ENG APPR.		
		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 12x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
			TITLE: SidePlate - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1			

8 7 6 5 4 3 2 1



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/12/12	
		TOLERANCES:	CHECKED			TITLE:
		FRACTIONAL \pm	ENG APPR.			SingleHolePushPlate - FinalDesign
		ANGULAR: MACH \pm BEND \pm	MFG APPR.			
		TWO PLACE DECIMAL \pm	Q.A.			
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 2x		
		INTERPRET GEOMETRIC TOLERANCING PER:				SIZE
		MATERIAL				DWG. NO.
		FINISH				REV
NEXT ASSY	USED ON					
APPLICATION		DO NOT SCALE DRAWING				SCALE: 2:1
						WEIGHT:
						SHEET 1 OF 1

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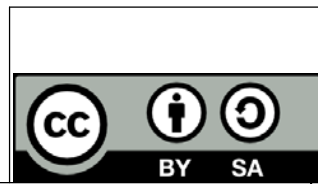
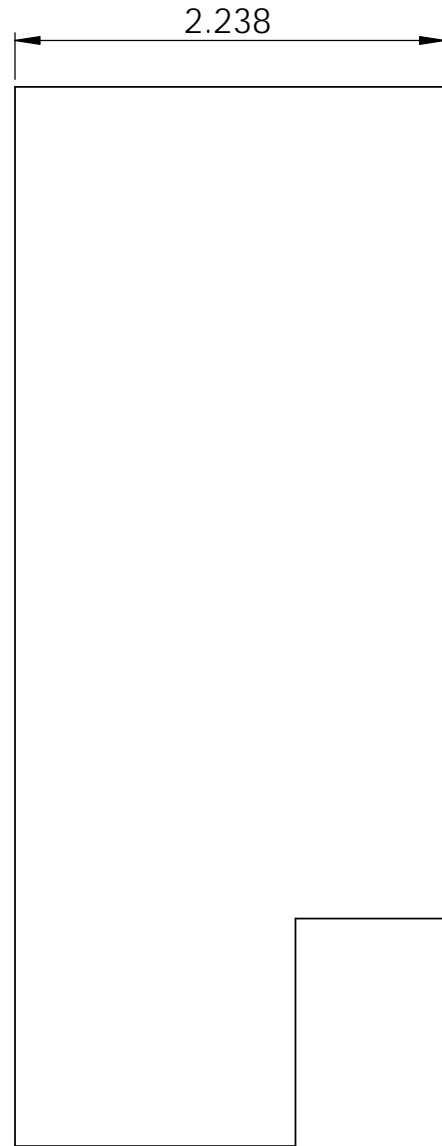
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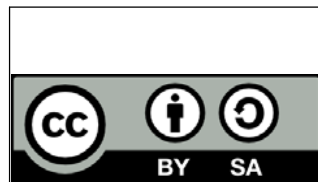
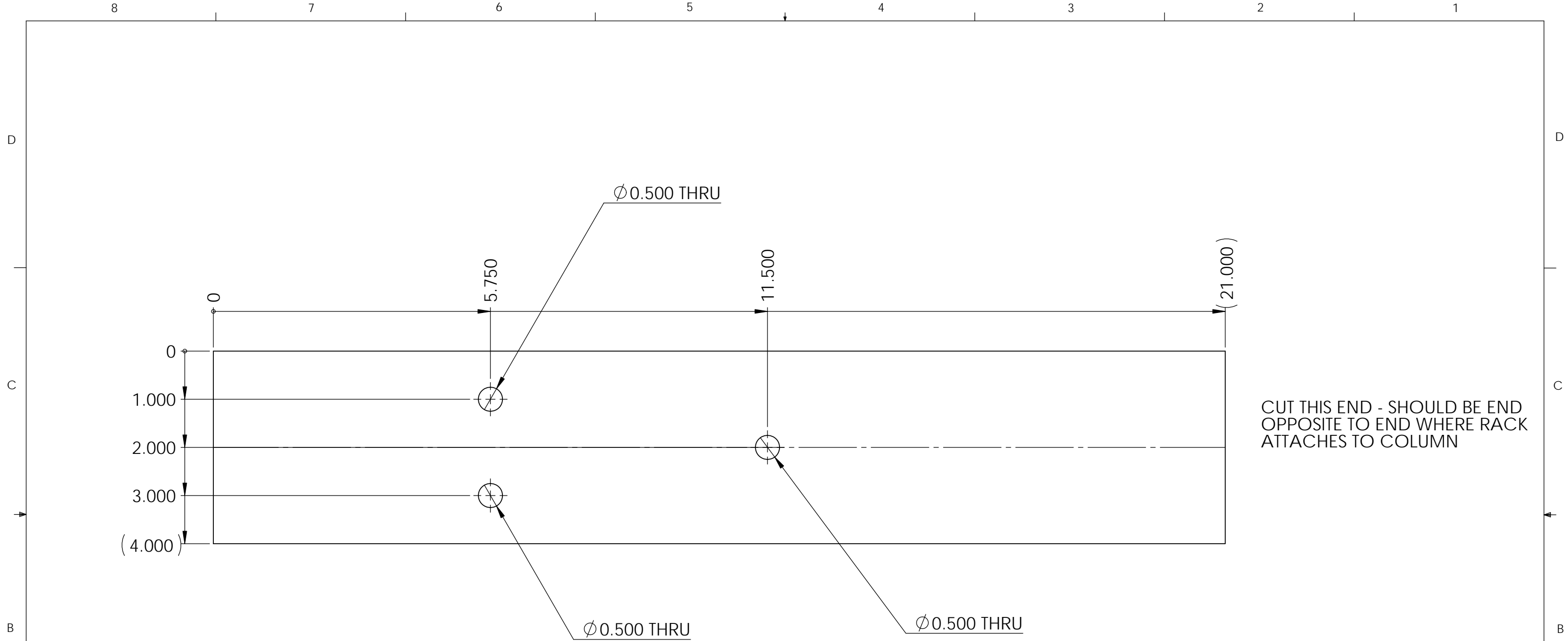
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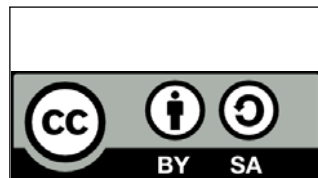
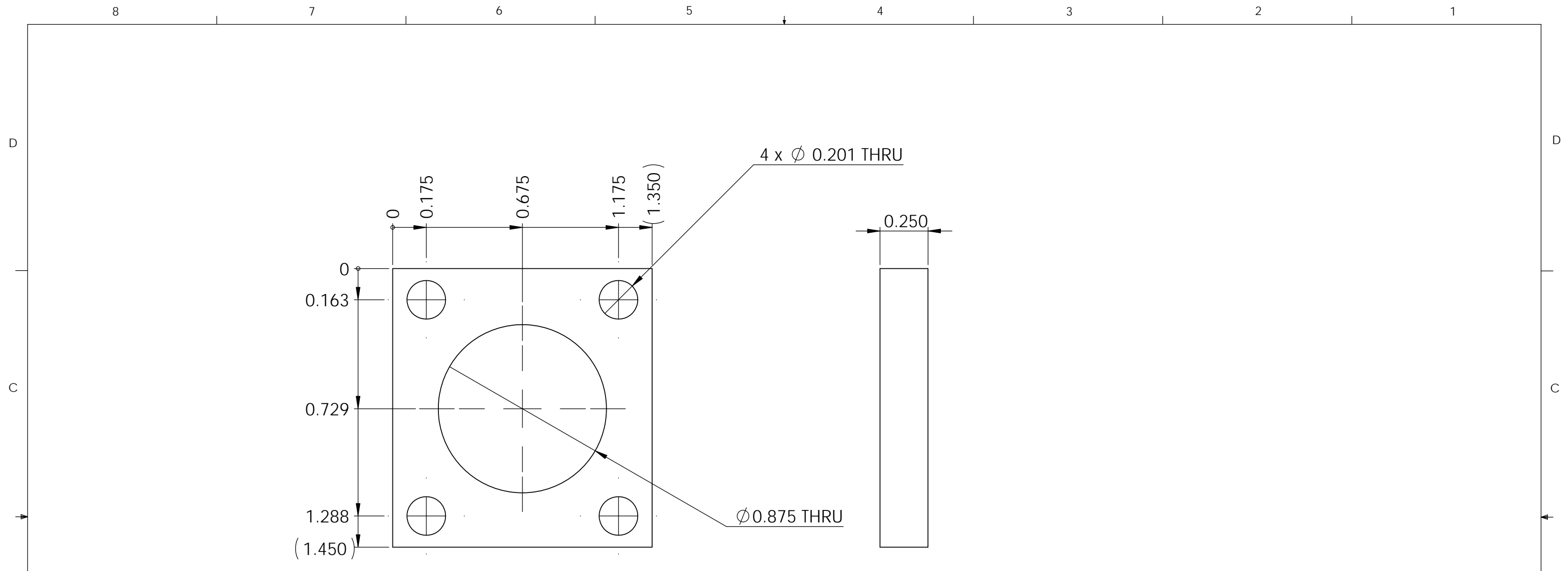


		UNLESS OTHERWISE SPECIFIED:		NAME	DATE			
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	5/3/12	TITLE: Spindle Gib Mount		
		TOLERANCES:	CHECKED					
		FRACTIONAL ±	ENG APPR.					
		ANGULAR: MACH ± BEND ±	MFG APPR.					
		TWO PLACE DECIMAL ±						
		THREE PLACE DECIMAL ±						
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.					
		MATERIAL	COMMENTS: Make 1x. Cut existing gib mount to specified thickness. Purchase appropriate fasteners (M8 x 50)			SIZE	DWG. NO.	REV
NEXT ASSY	USED ON	FINISH				B		
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

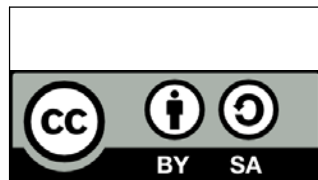
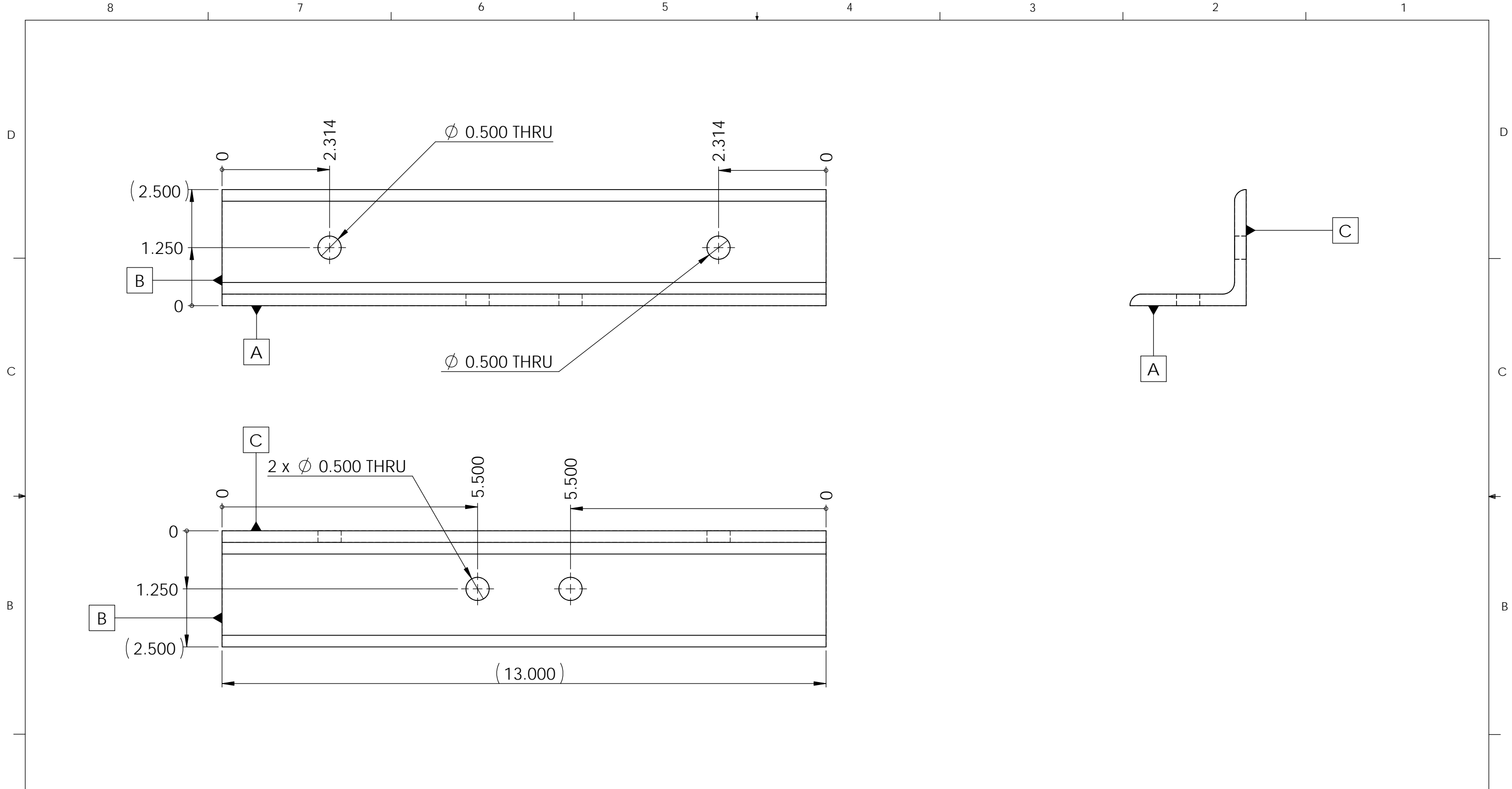
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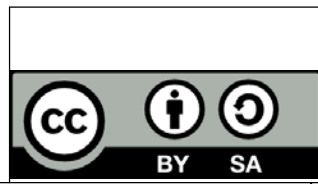
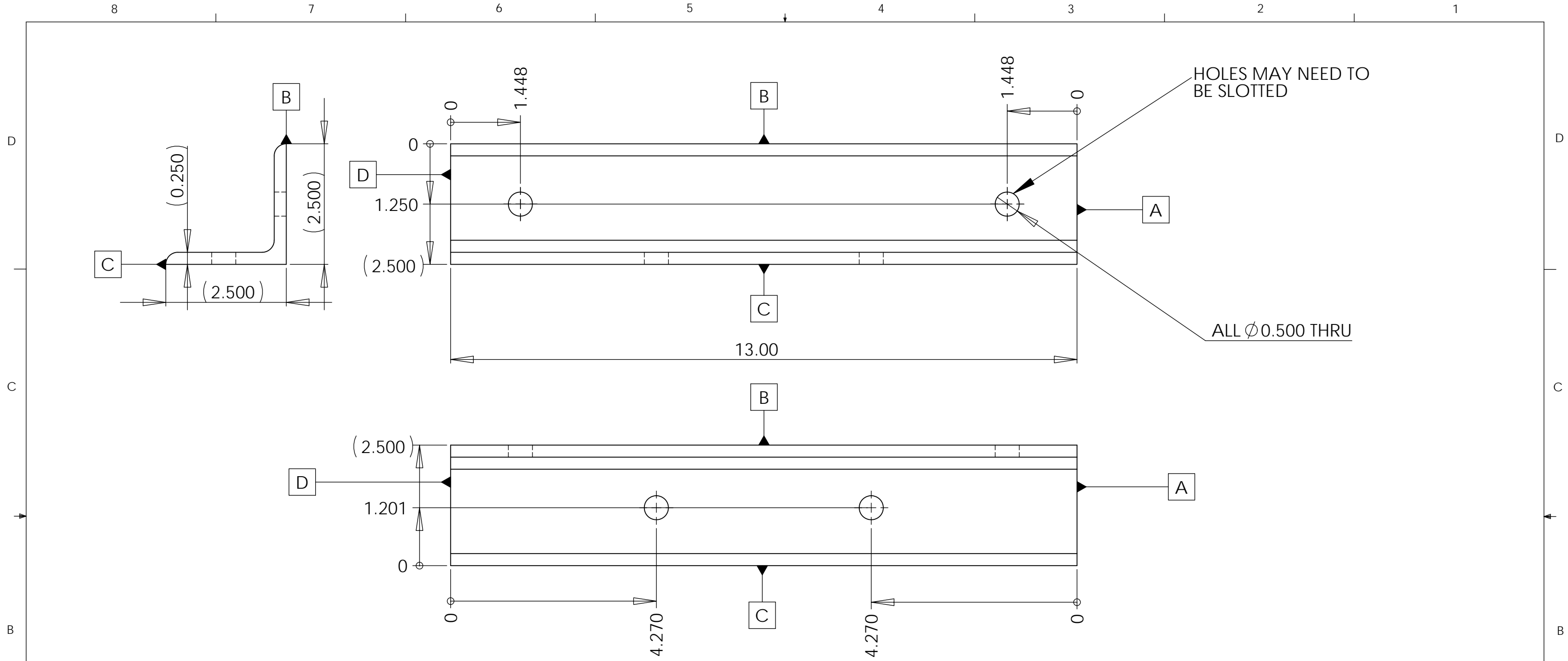
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE		
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/6/12	TITLE:	
		TOLERANCES:	CHECKED			SpindleColumn	
		FRACTIONAL \pm	ENG APPR.			SIZE	DWG. NO.
		ANGULAR: MACH \pm BEND \pm	MFG APPR.			B	REV
		TWO PLACE DECIMAL \pm	Q.A.			SCALE: 1:2 WEIGHT: SHEET 1 OF 1	
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 1x			
		INTERPRET GEOMETRIC TOLERANCING PER:	MATERIAL				
NEXT ASSY	USED ON	FINISH					
APPLICATION		DO NOT SCALE DRAWING					



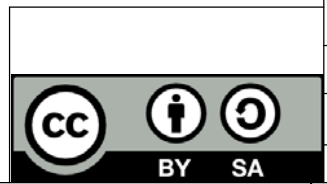
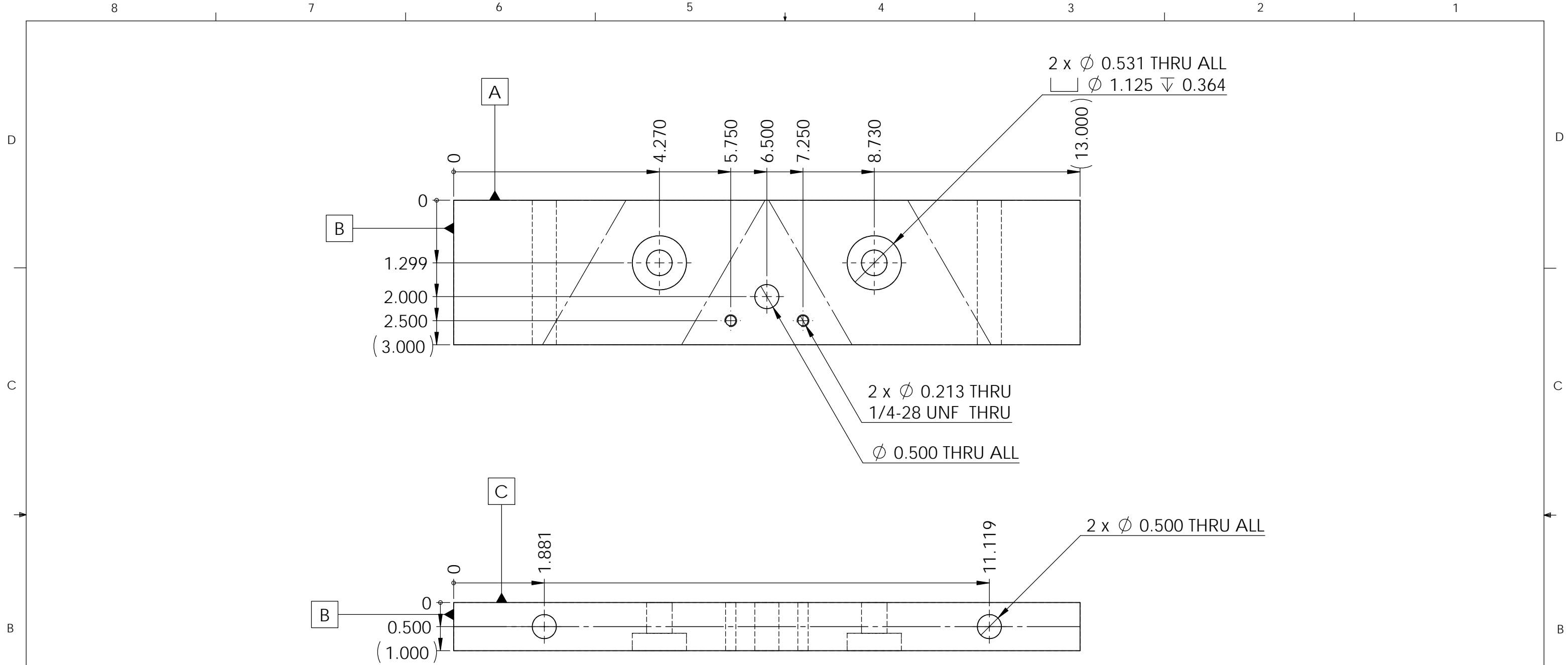
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		FRACTIONAL \pm	ENG APPR.					
		ANGULAR: MACH \pm BEND \pm	MFG APPR.					
		TWO PLACE DECIMAL \pm	Q.A.			SIZE	DWG. NO.	REV
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 2x		B		
		INTERPRET GEOMETRIC TOLERANCING PER:				SCALE: 2:1	WEIGHT:	SHEET 1 OF 1
		MATERIAL						
		FINISH						
NEXT ASSY	USED ON							
APPLICATION		DO NOT SCALE DRAWING						



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	4/4/12
		TOLERANCES:	CHECKED		
		FRACTIONAL \pm	ENG APPR.		
		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 1x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
			TITLE:		
			TopInsideAngleZMount - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1			

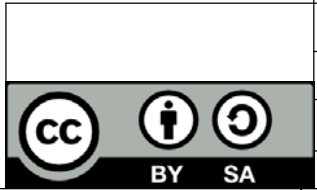
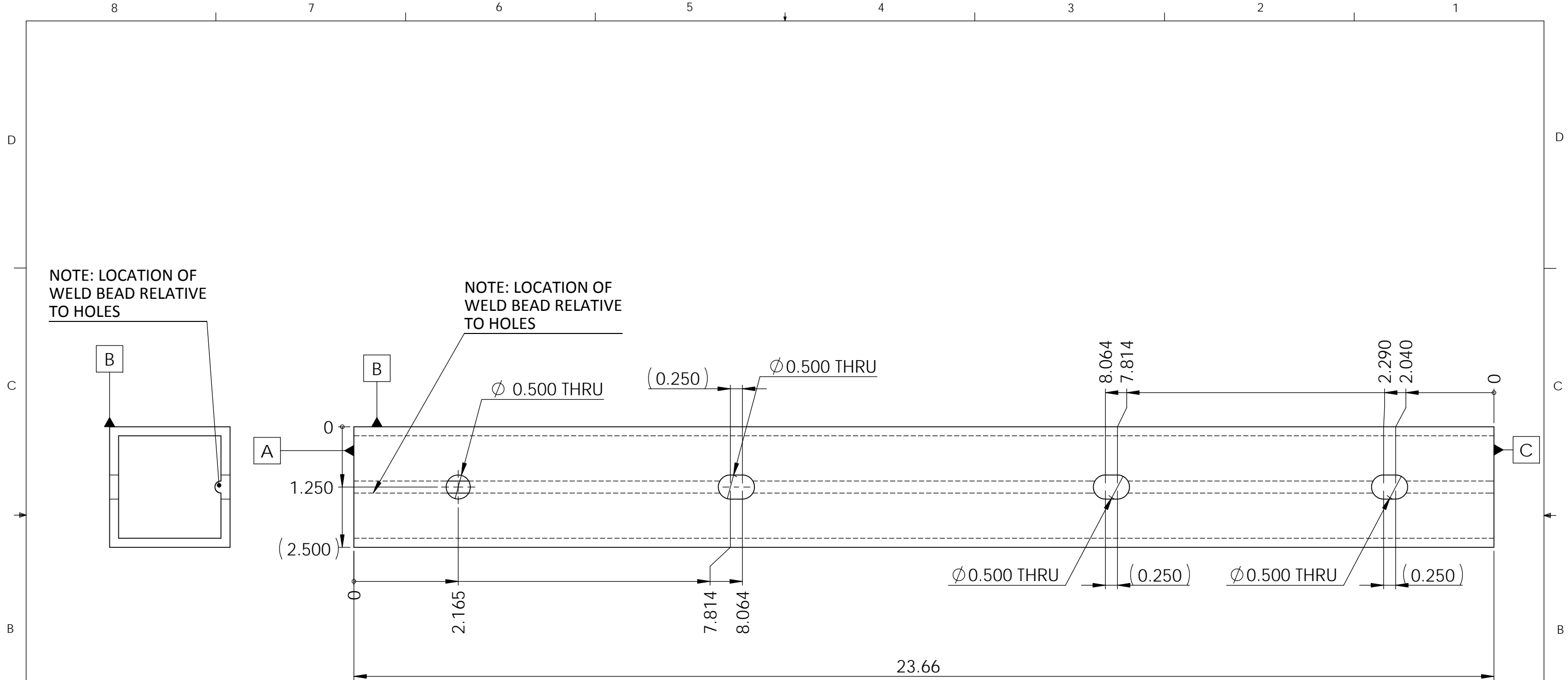


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		TOLERANCES:		CHECKED	
		FRACTIONAL \pm		ENG APPR.	
		ANGULAR: MACH \pm BEND \pm		MFG APPR.	
		TWO PLACE DECIMAL \pm		Q.A.	
		THREE PLACE DECIMAL \pm		COMMENTS:	Make 2x
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			TopInsidePlate - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1			

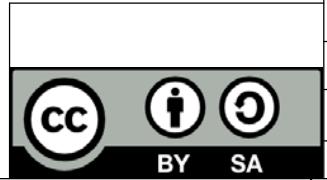
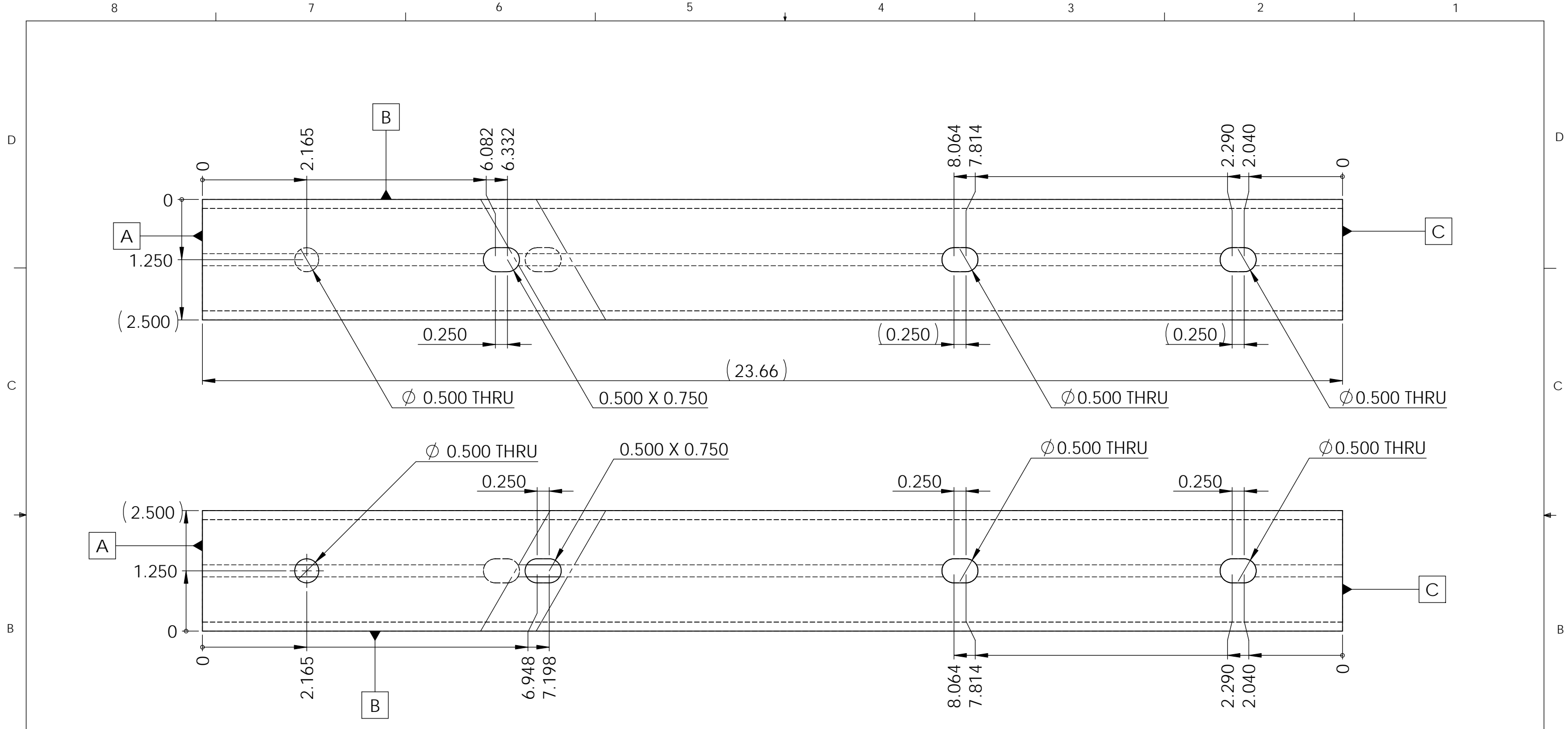


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		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:	Make 1x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
		APPLICATION			
		DO NOT SCALE DRAWING			

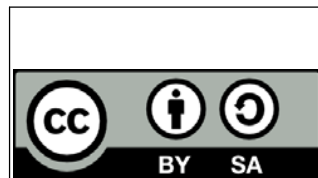
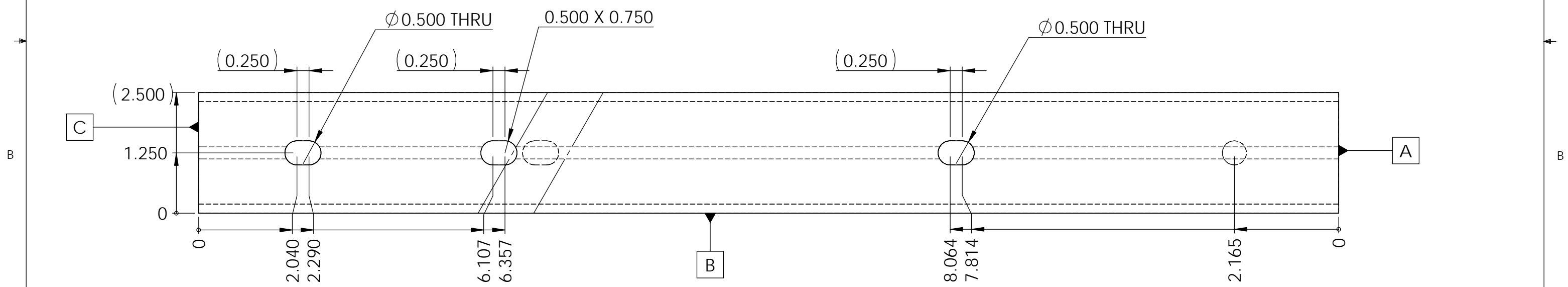
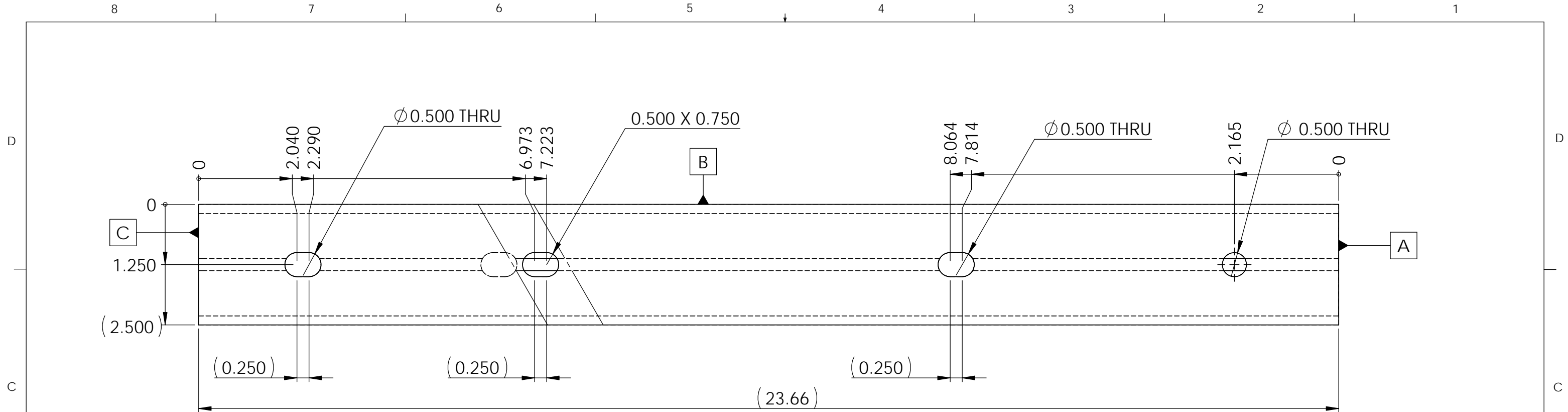
TITLE:		
TopInsideZMountv2		
SIZE	DWG. NO.	REV
B		
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES	DRAWN	LELAND	3/12/12
		TOLERANCES:	CHECKED		
		FRACTIONAL \pm	ENG APPR.		
		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 1x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			TopMember - Final Design		
SIZE	DWG. NO.	REV			
B		1			
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1			



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/4/12
		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS:	Make 1x
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
		TITLE:		TopMemberSideB - Final Design	
SIZE	DWG. NO.	REV			
B					
SCALE: 1:5		WEIGHT:		SHEET 1 OF 1	

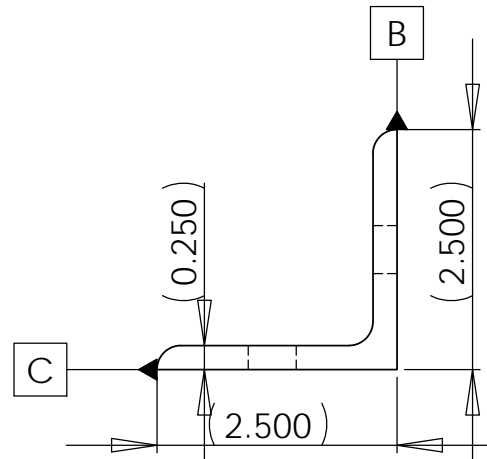


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		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		
		TWO PLACE DECIMAL ±	Q.A.		
		THREE PLACE DECIMAL ±	COMMENTS:	Make 1x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON				
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			TopMemberSideC - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:5	WEIGHT:	SHEET 1 OF 1			

8 7 6 5 4 3 2 1

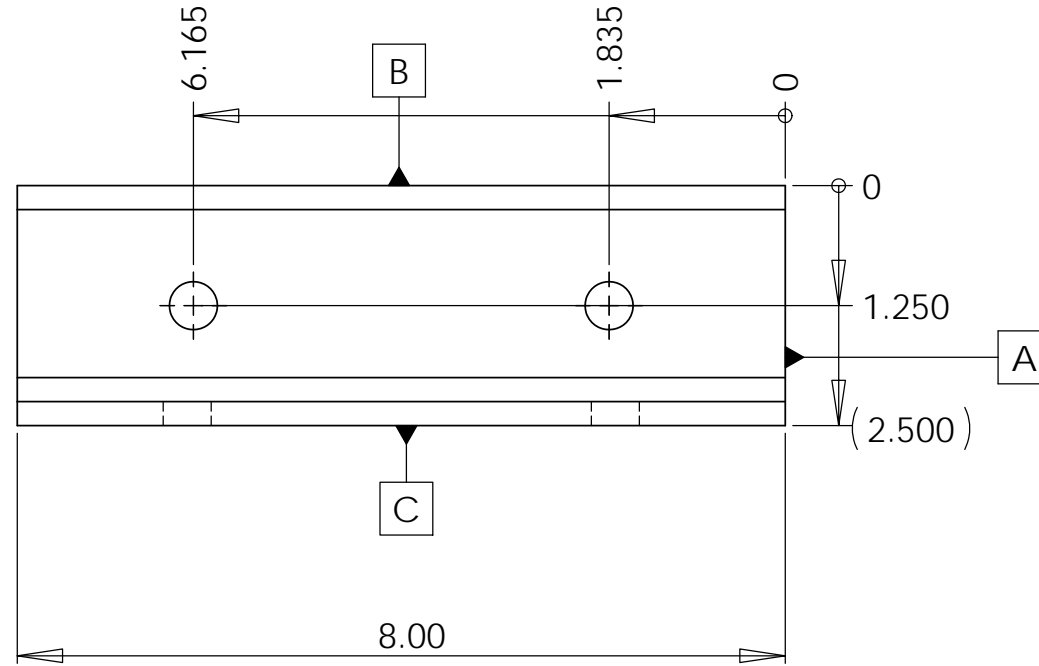
D

D

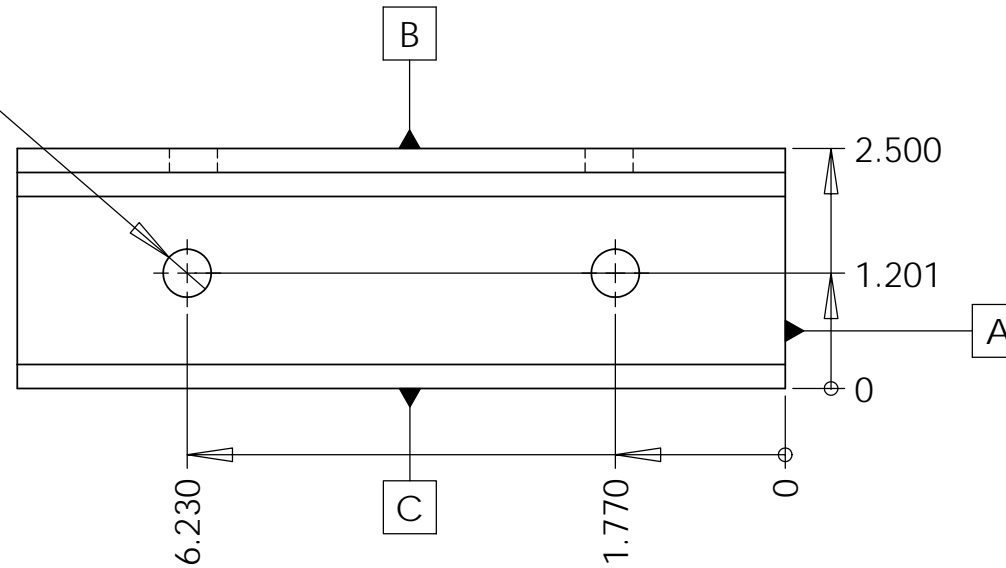


C

C



ALL HOLES ϕ 0.500 THRU

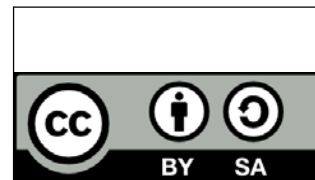


B

B

A

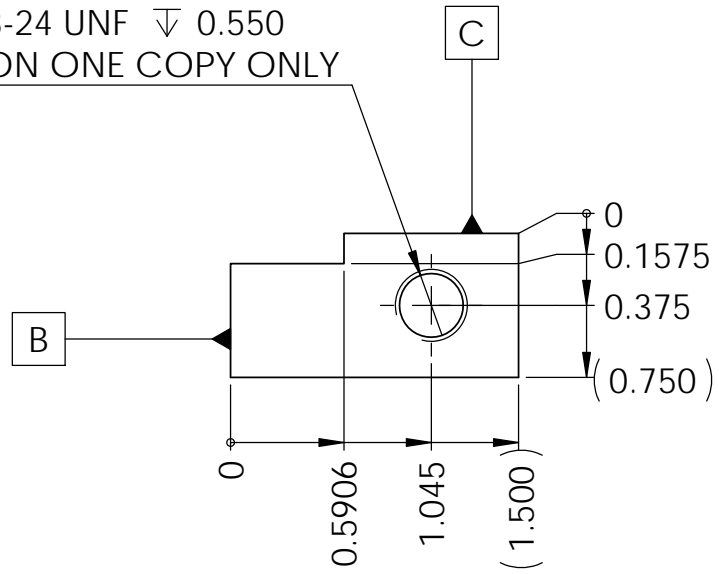
A



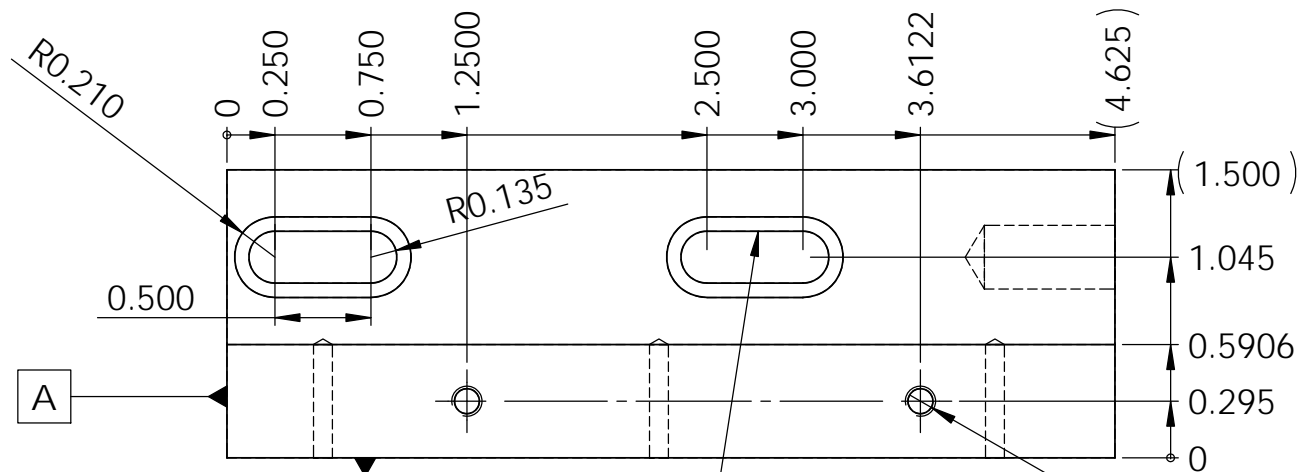
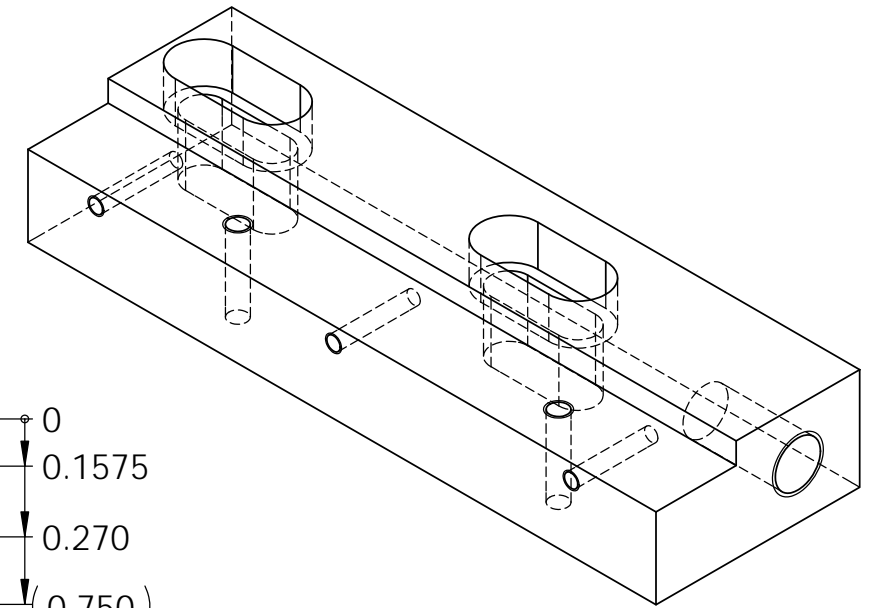
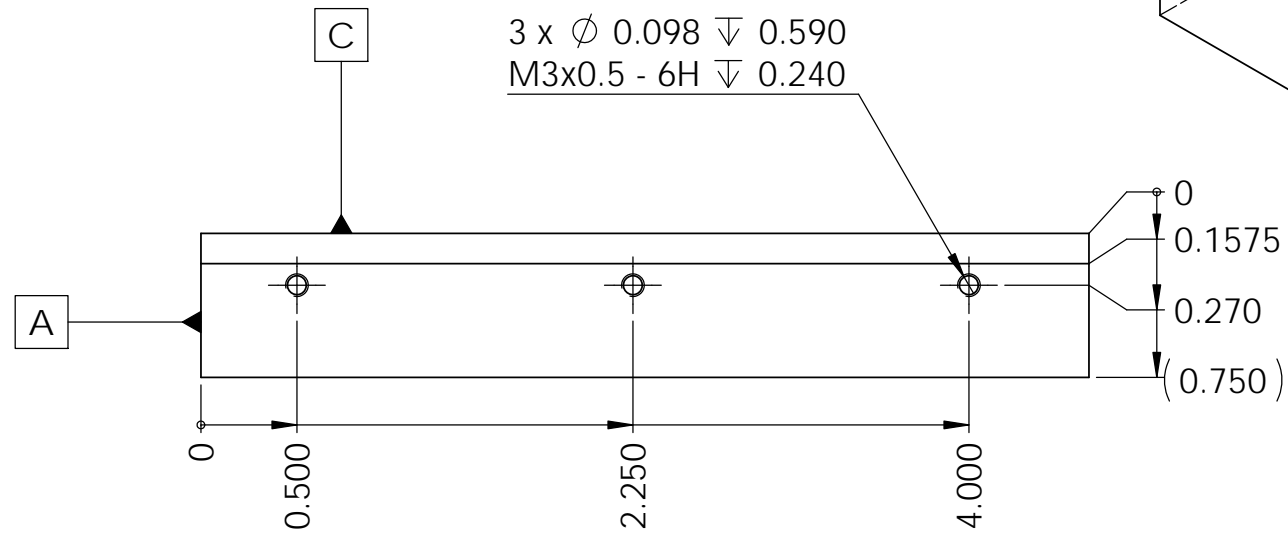
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		FRACTIONAL \pm	ENG APPR.		
		ANGULAR: MACH \pm BEND \pm	MFG APPR.		
		TWO PLACE DECIMAL \pm	Q.A.		
		THREE PLACE DECIMAL \pm	COMMENTS:	Make 3x	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON	APPLICATION	DO NOT SCALE DRAWING		
			TITLE:		
			TopOutsidePlate - Final Design		
SIZE	DWG. NO.	REV			
B					
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1			

8 7 6 5 4 3 2 1

ϕ 0.332 ∇ 0.680
 3/8-24 UNF ∇ 0.550
 HOLE ON ONE COPY ONLY



3 x ϕ 0.098 ∇ 0.590
 M3x0.5 - 6H ∇ 0.240

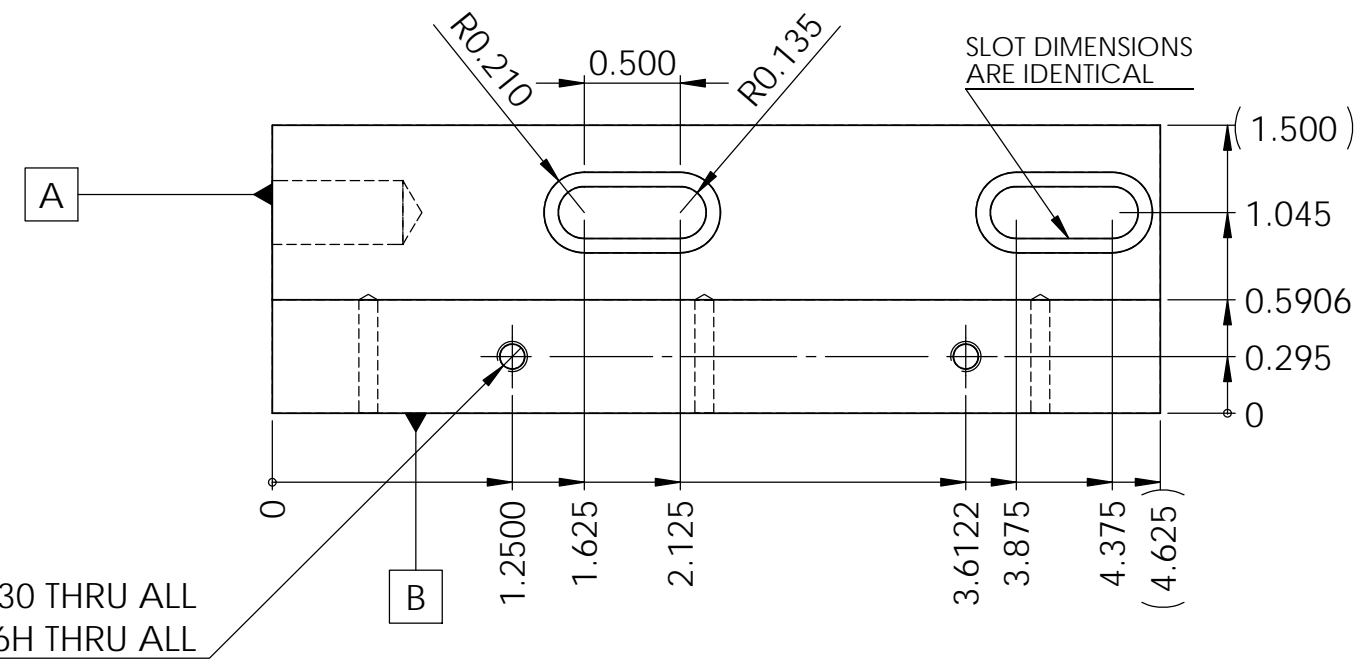
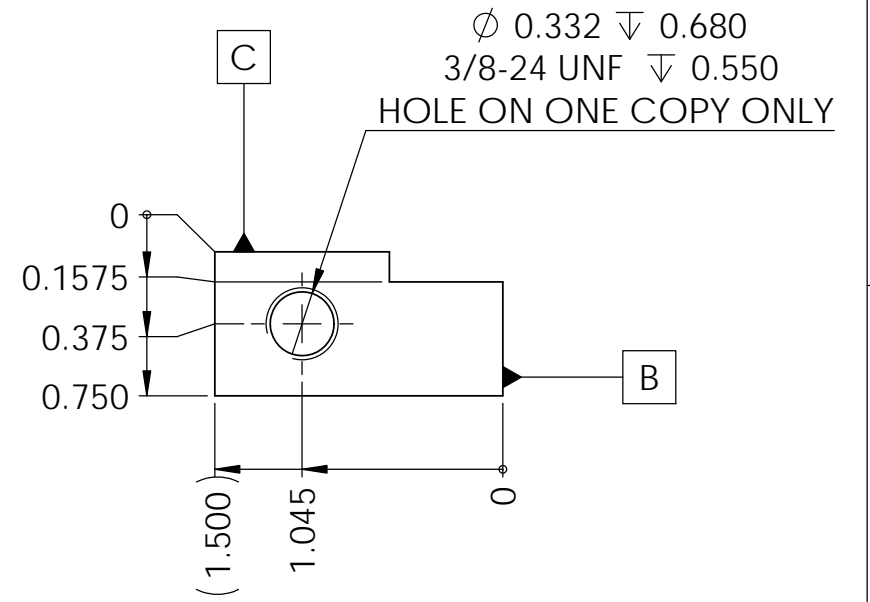
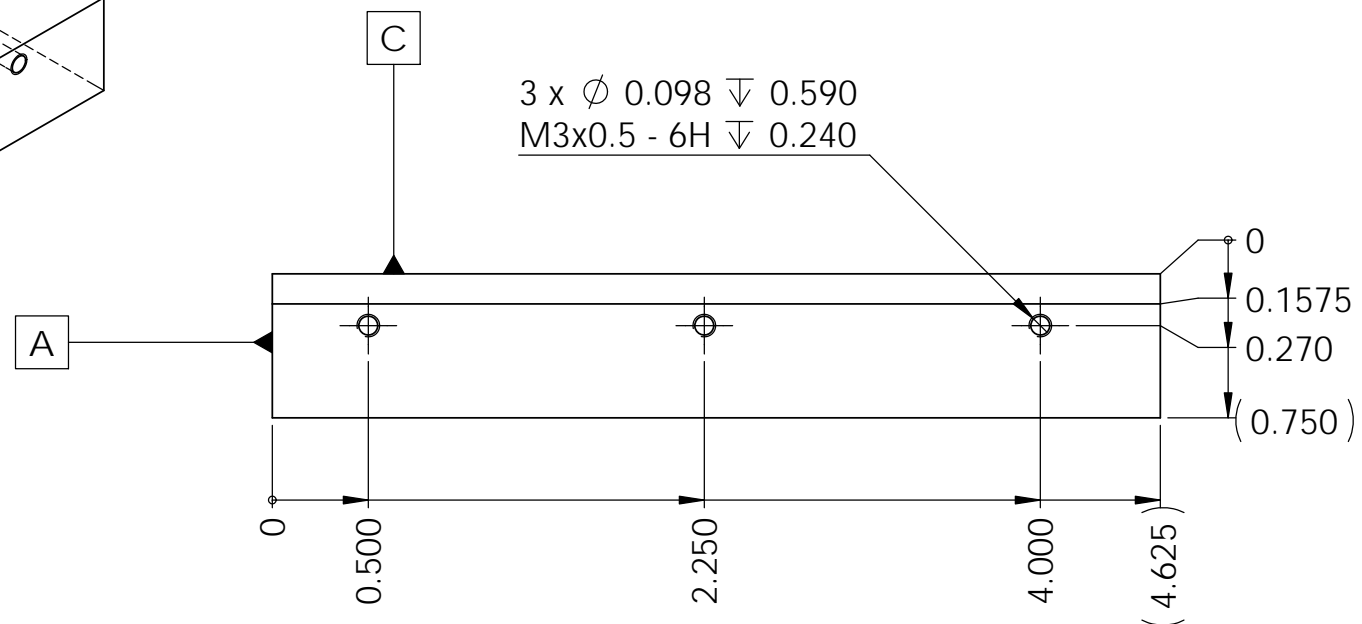
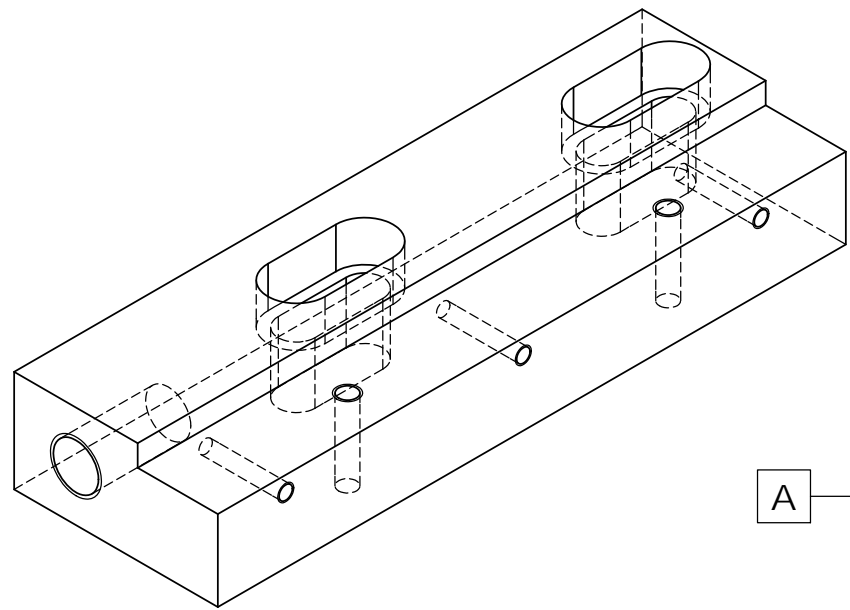


DIMENSIONS OF SLOTS ARE IDENTICAL

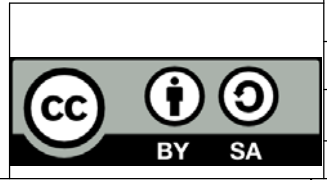
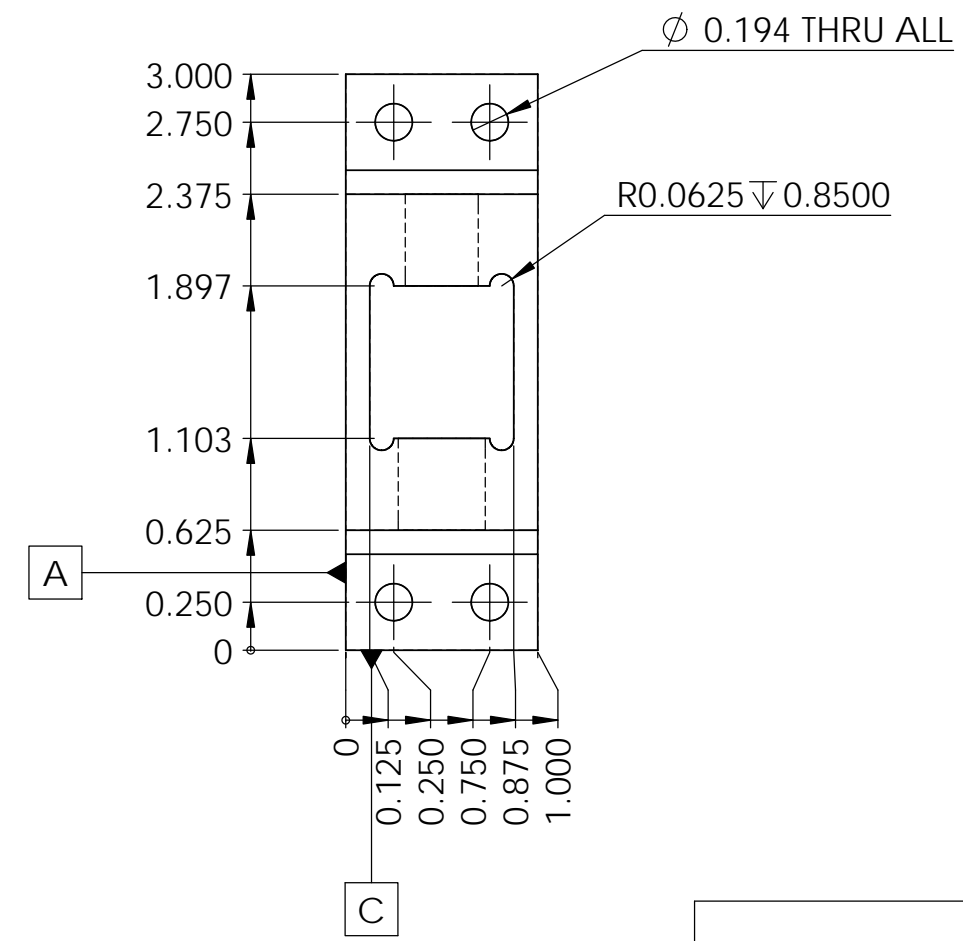
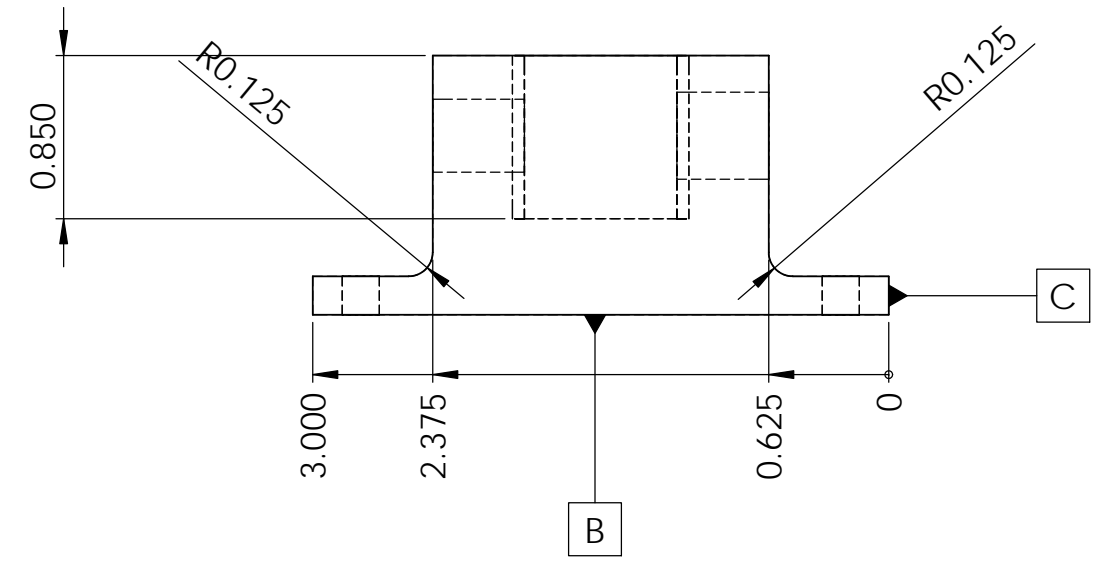
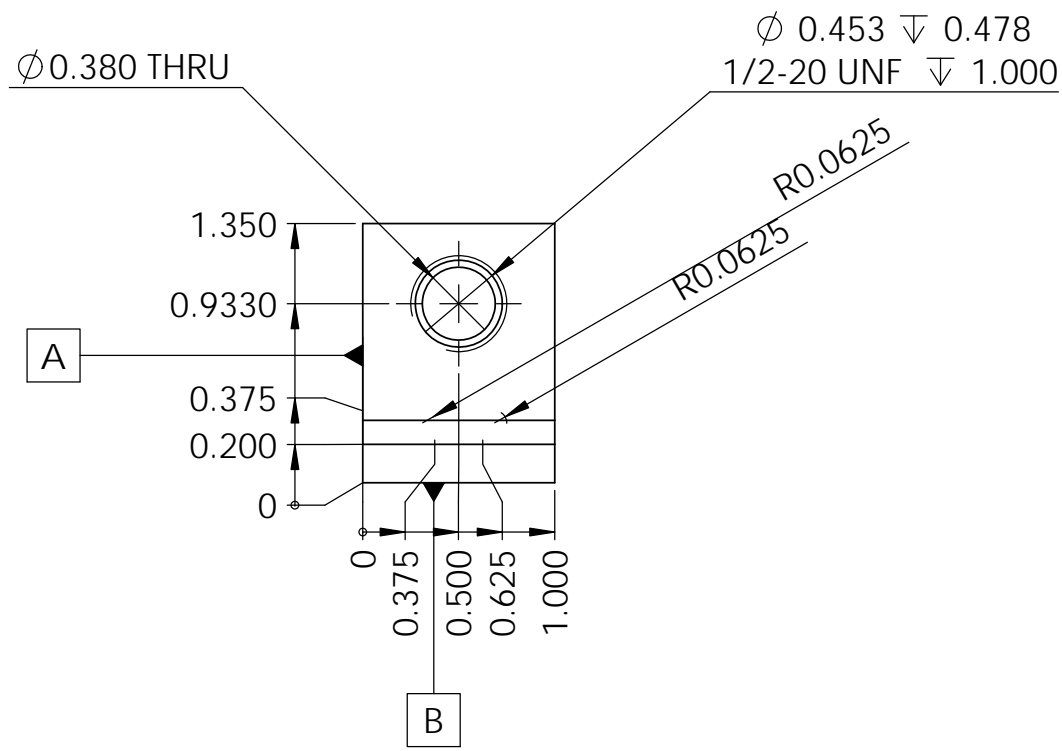
2 x ϕ 0.130 THRU ALL
 M4x0.7 - 6H THRU ALL

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/10/12
		TOLERANCES:		CHECKED	
		FRACTIONAL \pm		ENG APPR.	
		ANGULAR: MACH \pm BEND \pm		MFG APPR.	
		TWO PLACE DECIMAL \pm		Q.A.	
		THREE PLACE DECIMAL \pm		COMMENTS: Make 2x. Observe differences between parts (detailed above)	
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
		FINISH			
NEXT ASSY	USED ON			TITLE: TopShortBearingRailClampV2 - FinalDesign	
APPLICATION		DO NOT SCALE DRAWING		SIZE	DWG. NO.
				B	
				SCALE: 1:1	WEIGHT:
				REV	
				SHEET 1 OF 1	

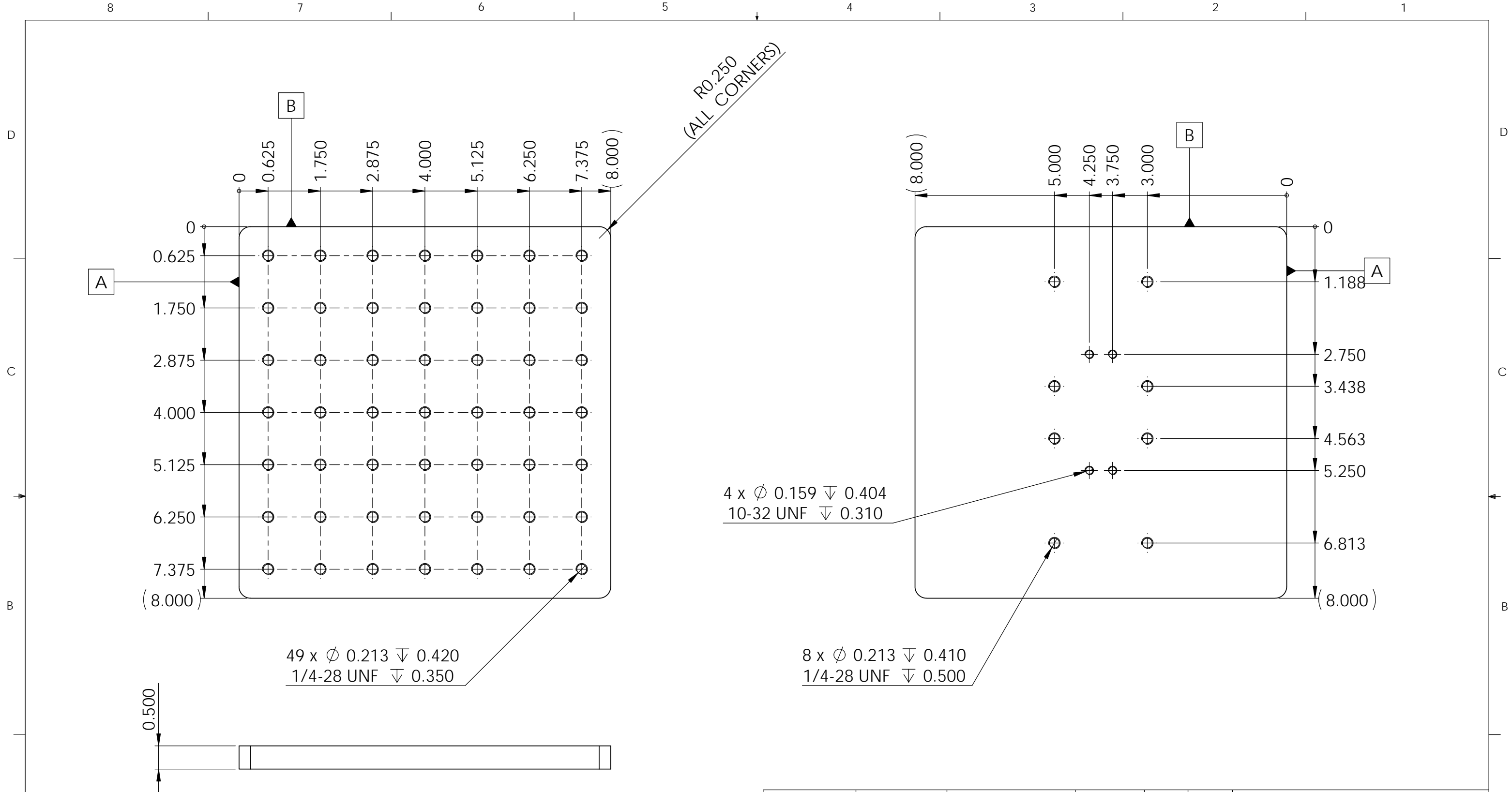




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		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/10/12
		TOLERANCES:		CHECKED	
		FRACTIONAL ±		ENG APPR.	
		ANGULAR: MACH ± BEND ±		MFG APPR.	
		TWO PLACE DECIMAL ±		Q.A.	
		THREE PLACE DECIMAL ±		COMMENTS: Make 2x. Observe differences between parts (detailed above)	
		INTERPRET GEOMETRIC TOLERANCING PER:		TITLE: TopShortBearingRailClampV2 - Left - FinalDesign	
		MATERIAL			
NEXT ASSY	USED ON	FINISH		SIZE	DWG. NO.
APPLICATION		DO NOT SCALE DRAWING		B	REV
				SCALE: 1:1	WEIGHT:
				SHEET 1 OF 1	



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL \pm ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm		DRAWN	LELAND 4/12/12
		INTERPRET GEOMETRIC TOLERANCING PER:		CHECKED	
		MATERIAL		ENG APPR.	
NEXT ASSY	USED ON	FINISH		MFG APPR.	
APPLICATION		DO NOT SCALE DRAWING		Q.A.	
				COMMENTS: Make 2x	
				TITLE: TopStageNutMount	
		SIZE	DWG. NO.	REV	
		B			
		SCALE: 1:1	WEIGHT:	SHEET 1 OF 1	



R0.250
(ALL CORNERS)

49 x \varnothing 0.213 ∇ 0.420
1/4-28 UNF ∇ 0.350

4 x \varnothing 0.159 ∇ 0.404
10-32 UNF ∇ 0.310

8 x \varnothing 0.213 ∇ 0.410
1/4-28 UNF ∇ 0.500

0.500

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES		DRAWN	LELAND 4/21/12
		TOLERANCES:		CHECKED	
		FRACTIONAL \pm		ENG APPR.	
		ANGULAR: MACH \pm BEND \pm		MFG APPR.	
		TWO PLACE DECIMAL \pm		Q.A.	
		THREE PLACE DECIMAL \pm		COMMENTS:	Make 1x
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			
TITLE:			TopTable - FinalDesign		
SIZE	DWG. NO.		REV		
B					
SCALE: 1:2		WEIGHT:		SHEET 1 OF 1	

