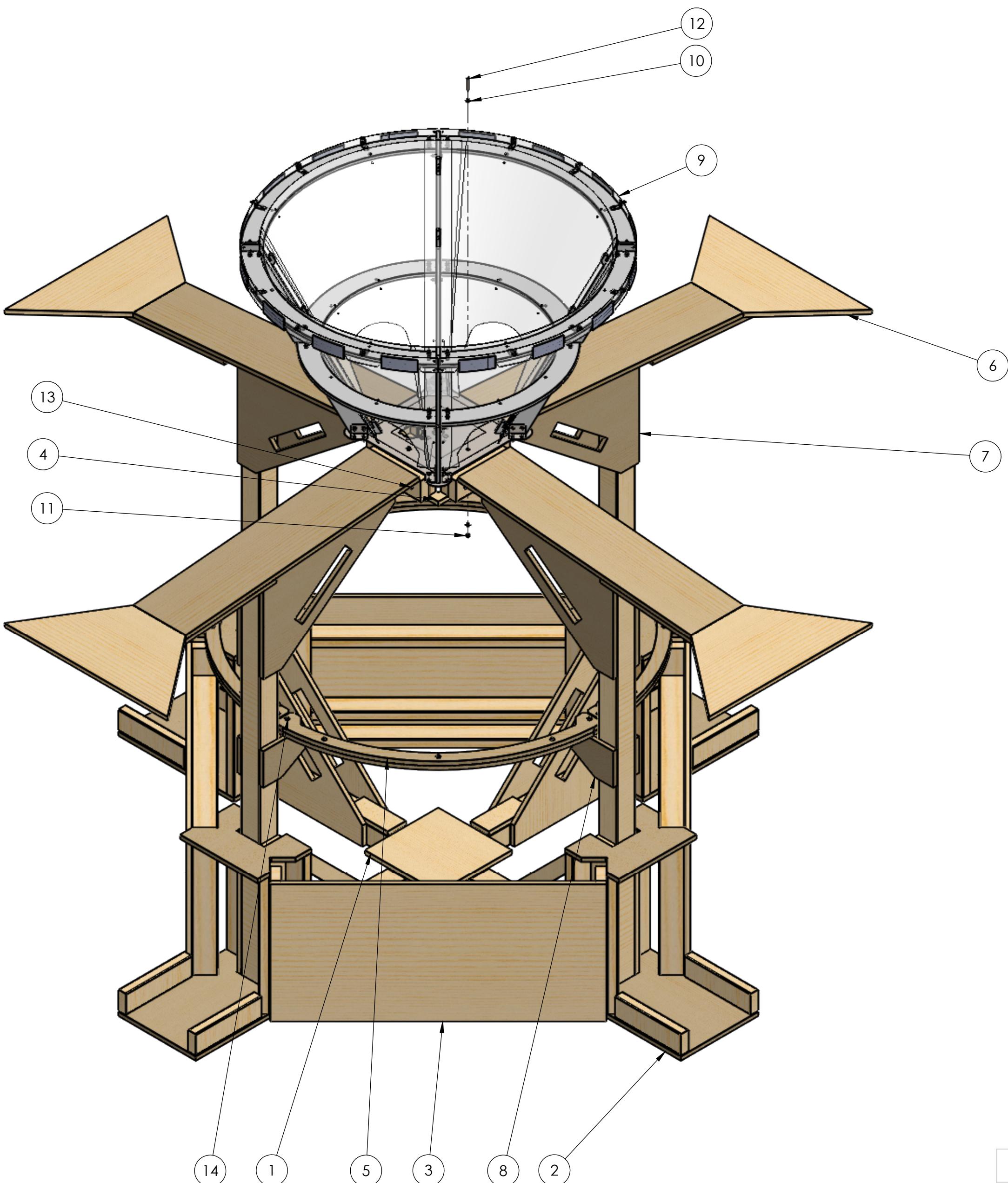


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Hardware Needed:
 #8 x 2" Long Screw - Qty 48
 #8 x 2.5" Long Screw - Qty 64
 Optional, but recommended: Safety Edging such as pool noodles or baby proofing

ITEM NO.	PART NUMBER	DESCRIPTION	
1	TE-22110	HUB - Complex Build - Base Assembly	1
2	TE-22120	HUB - Complex Build - Lower Exit Assembly	4
3	TE-22130	HUB - Complex Build - Fender Face Assembly	4
4	TE-22140-AM	HUB - Complex Build - Connection Box Assembly for AndyMark Upper Hub (AM-4671)	1
5	TE-22150	HUB - Complex Build - Lower Hub Ring Assembly	4
6	TE-22160	HUB - Complex Build - Upper Exit Assembly	4
7	TE-22170	HUB - Complex Build - Leg Assembly	4
8	TE-22180	HUB - Complex Build - Lower Hub Ring to Leg Assembly	4
9	AM-4671	AndyMark Production Upper Hub	1
10	washer_flat_.25	Flat Washer for 1/4" Screw	40
11	nylock_.25_20	Steel Nylon-Insert Locknut, 1/4"-20	20
12	hex_.25_20_2	Steel Hex Head Bolt 1/4"-20 x 2" long, fully threaded	4
13	hex_.25_20_3.5_partial	Steel Hex Head Bolt, 1/4"-20 x 3.5", partially threaded	8
14	hex.25_20_5.5	Steel Hex Head Bolt, 1/4"-20 x 5.5", partially threaded	8

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DRAWN	KAMC	1/4/2022
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COMMENTS:		
REMOVE ALL BURRS AND SHARP EDGES.		
DO NOT SCALE DRAWING		
TITLE: HUB - Complex Build - Full Hub Assembly with AndyMark Upper Hub AM-4671		
SIZE	DWG. NO.	REV
C	TE-22100-AM	
SCALE: 1:12		SHEET 1 OF 7

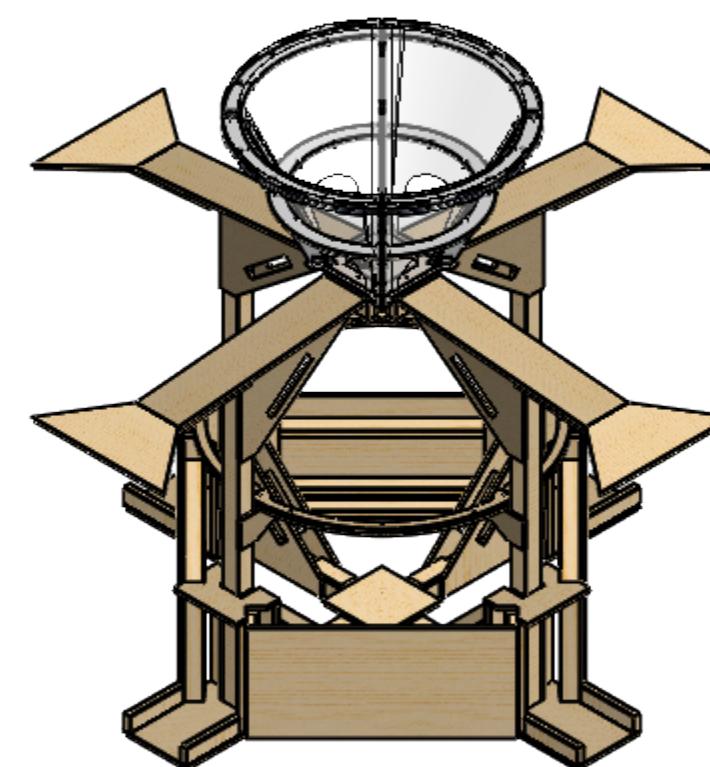
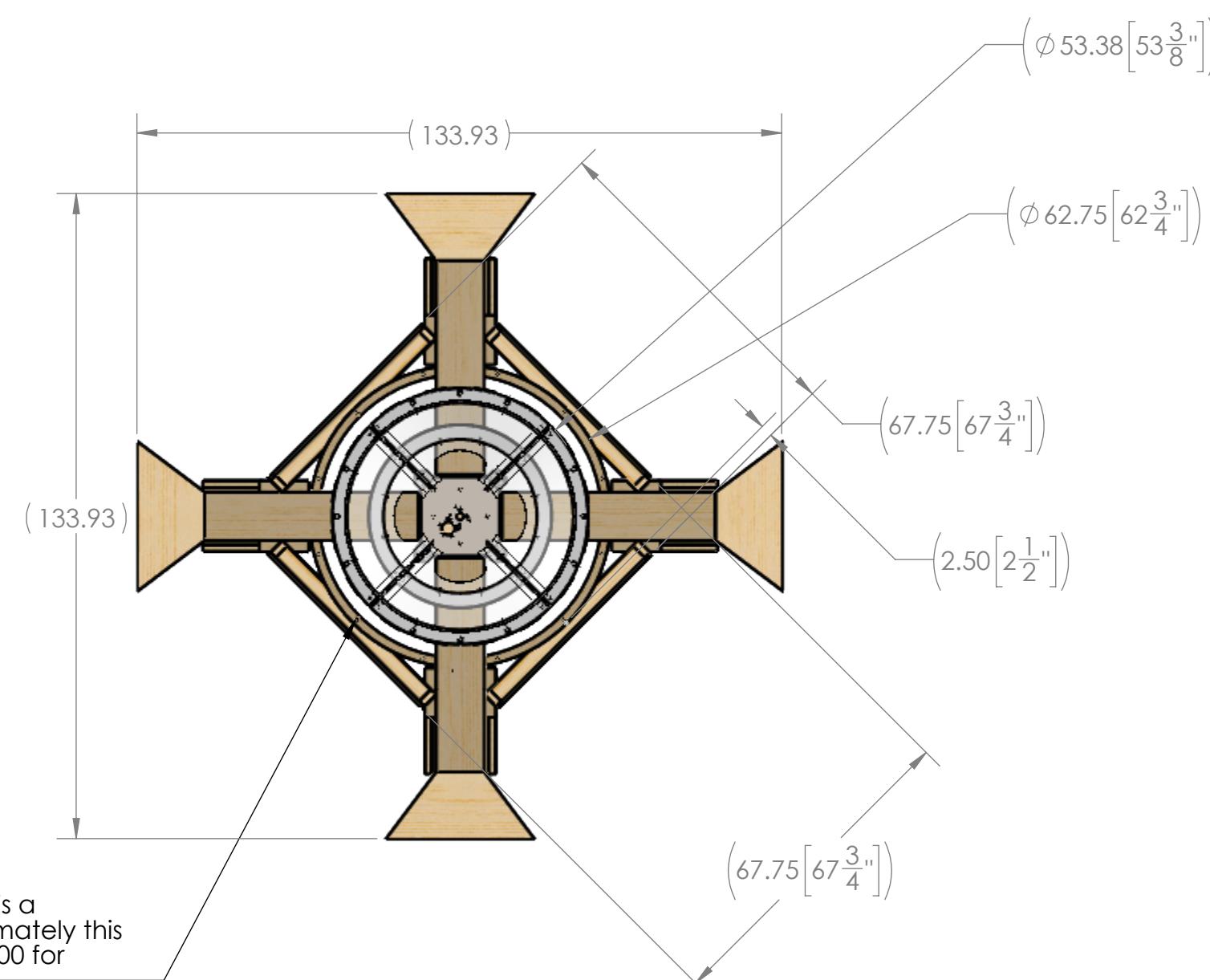
Note:

- If you are planning to disassemble frequently, you may want to consider using bolted connections instead of screws. It is helpful to consider ceiling height and ability to move assembly through doors before fastening sub-assemblies together.
- Bolts spec'd as partially threaded can be replaced with fully threaded bolt of the same length.
- TE-22190 can be replaced with TE-22190-AMActive (if pairing with AndyMark's Motorized Agitator AM-4674) or TE-22190-AMPassive (if pairing with AndyMark's Passive Agitator AM-4673).

FIRST ROBOTICS COMPETITION SOLIDWORKS Modeling Solutions Partner

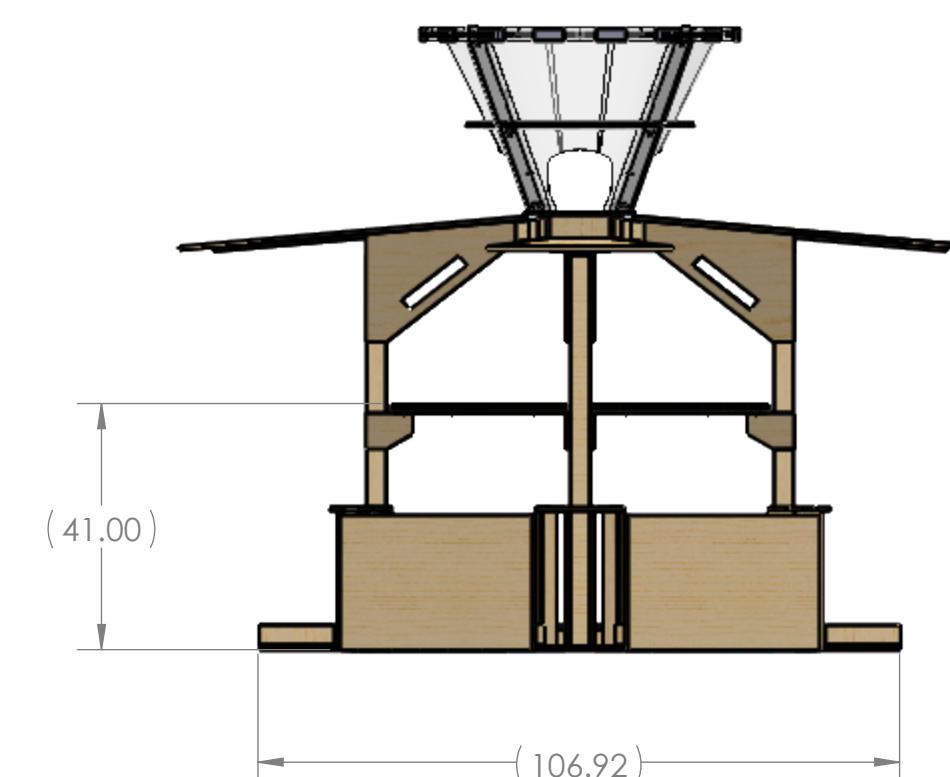
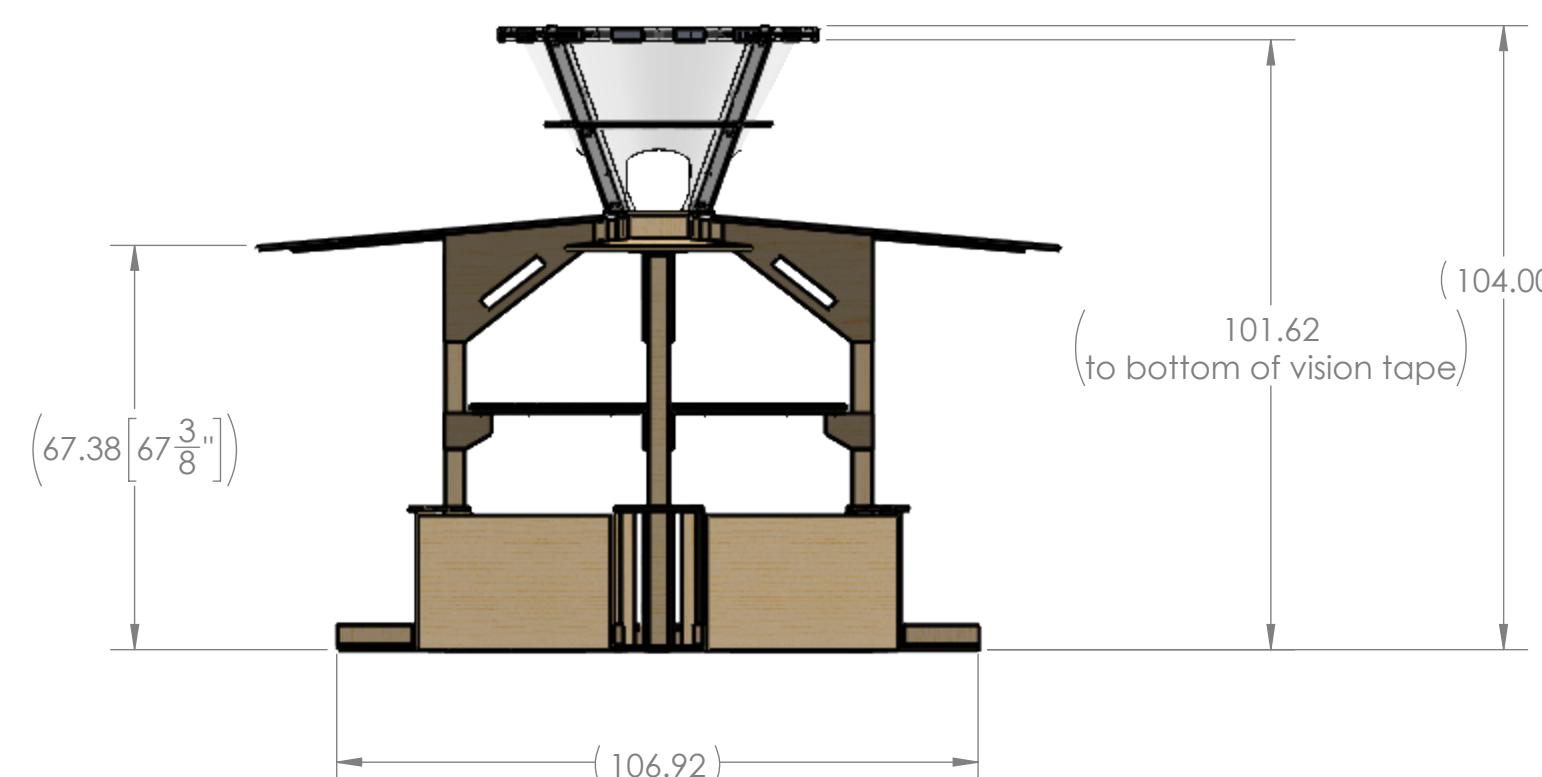
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DRAWN	KAMC	1/4/2022	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

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ROBOTICS
COMPETITION**  **SOLIDWORKS**
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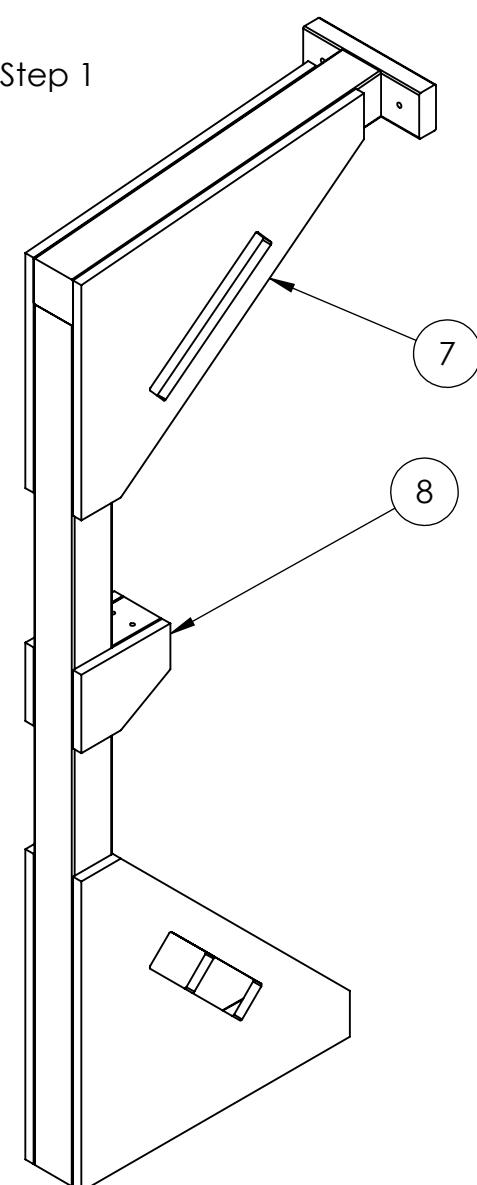
TITLE: HUB - Complex Build - Full Hub Assembly with AndyMark Upper Hub AM-4671

SIZE DWG. NO. REV

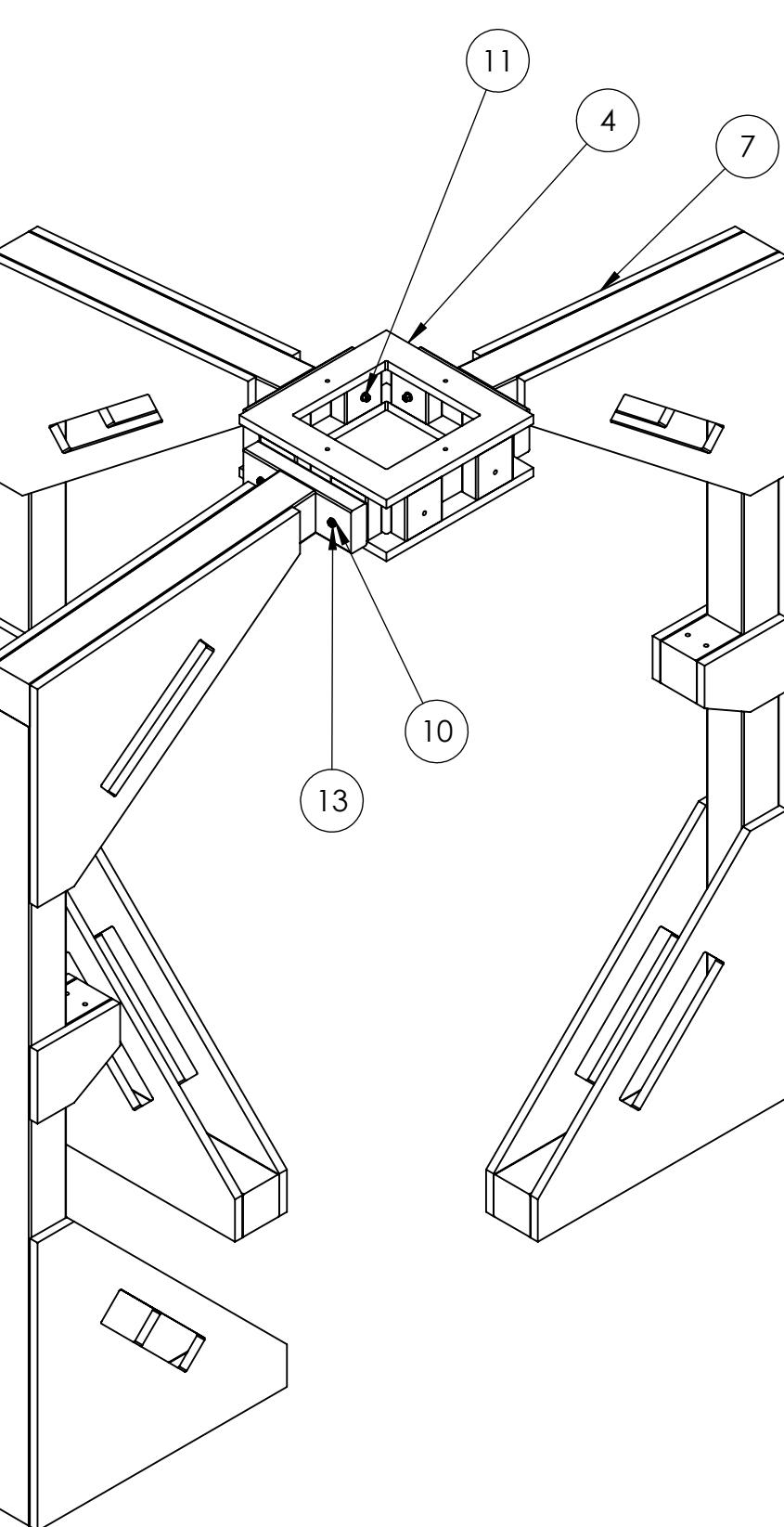
C TE-22100-AM

SCALE: 1:32 SHEET 2 OF 7

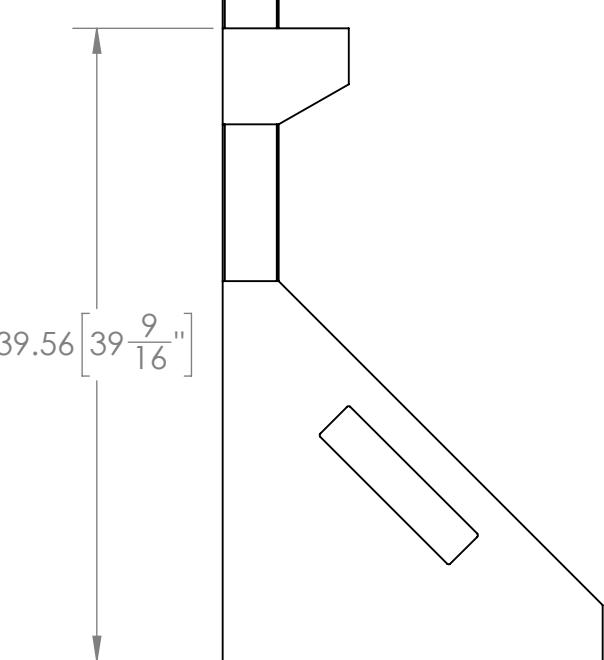
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Step 1

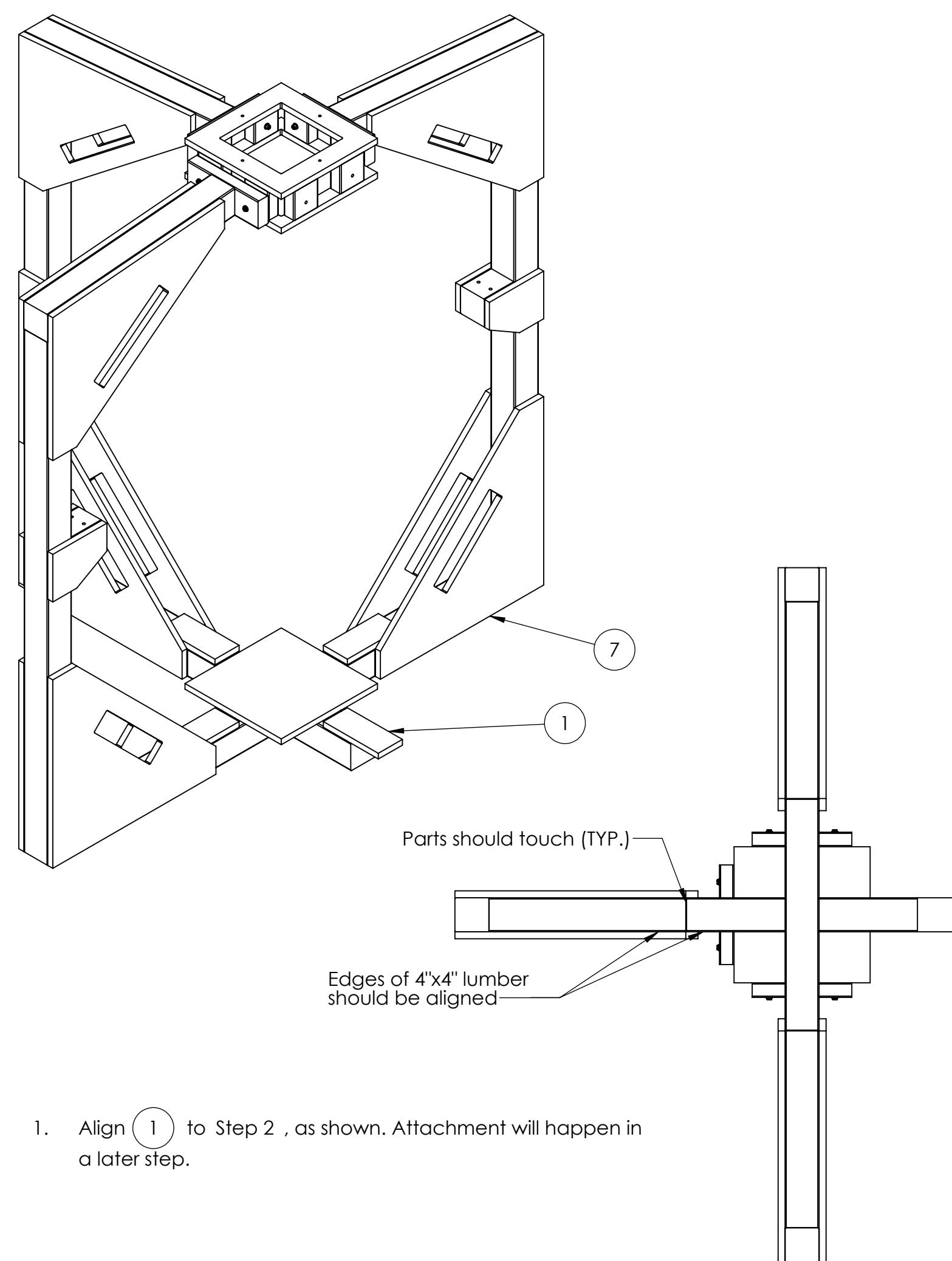


1. Align 3x assemblies from Step 1 to 4, as shown.
2. Loosely connect using 2x 13, 4x 10, and 2x 11 per 7. Hardware will be tightened in a later step.



1. Align 8 to 7, as shown.
2. Connect using 2.5" long screws. It is recommended to use 8x screws, 4x into each side.
3. Repeat 3x, for a total of 4x sub-assemblies.

Step 3



1. Align 1 to Step 2, as shown. Attachment will happen in a later step.

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			DRAWN	KAMC	1/4/2022
DIMENSIONS ARE IN INCHES					
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$					
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$					
PROPRIETARY AND CONFIDENTIAL					
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MATERIAL/FINISH:					
COMMENTS:					
REMOVE ALL BURRS AND SHARP EDGES.					
DO NOT SCALE DRAWING					

FIRST ROBOTICS COMPETITION DS SOLIDWORKS Modeling Solutions Partner

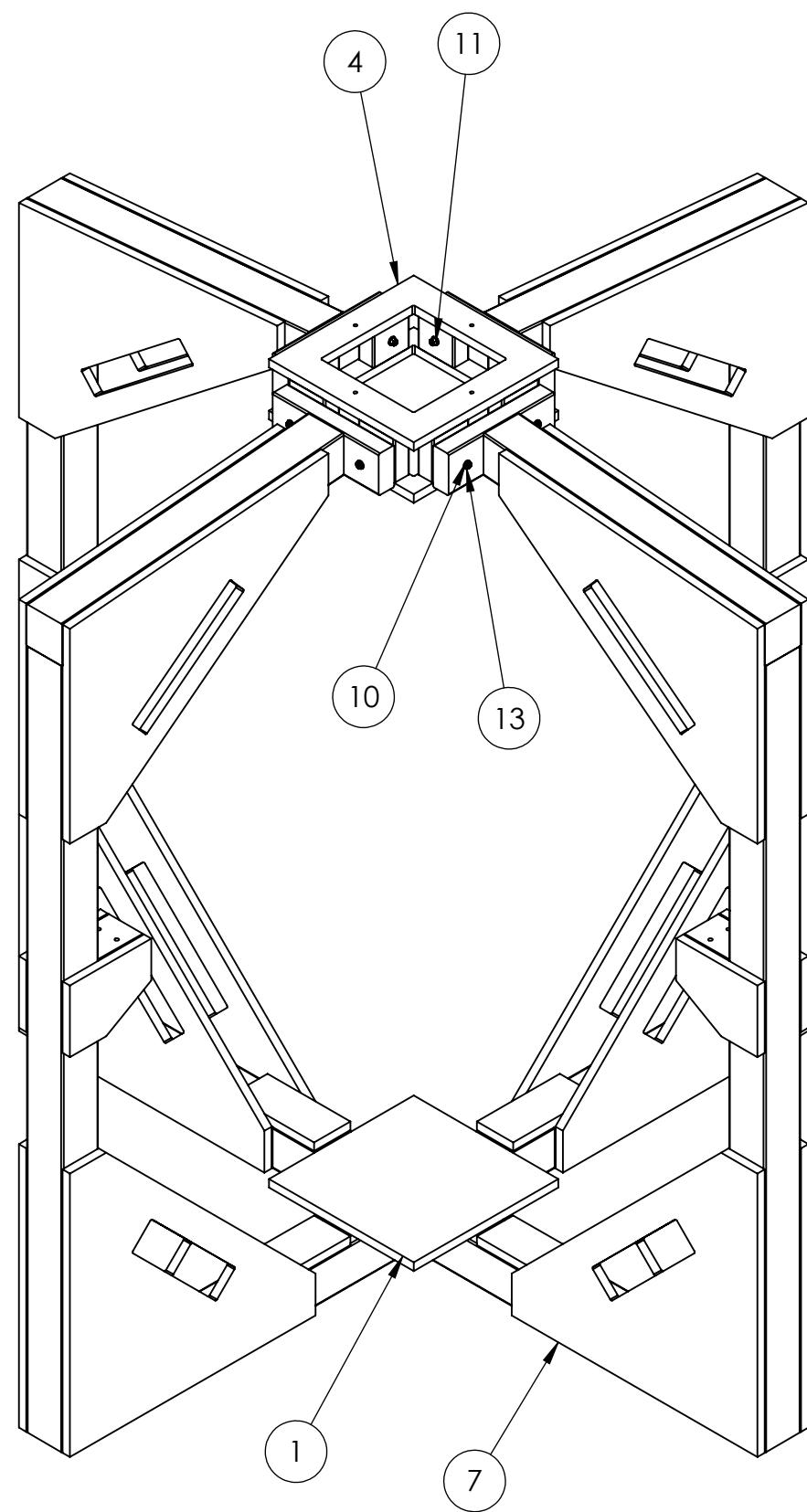
TITLE: HUB - Complex Build - Full Hub Assembly with AndyMark Upper Hub AM-4671

SIZE DWG. NO. REV

C TE-22100-AM

SCALE: 1:12 SHEET 3 OF 7

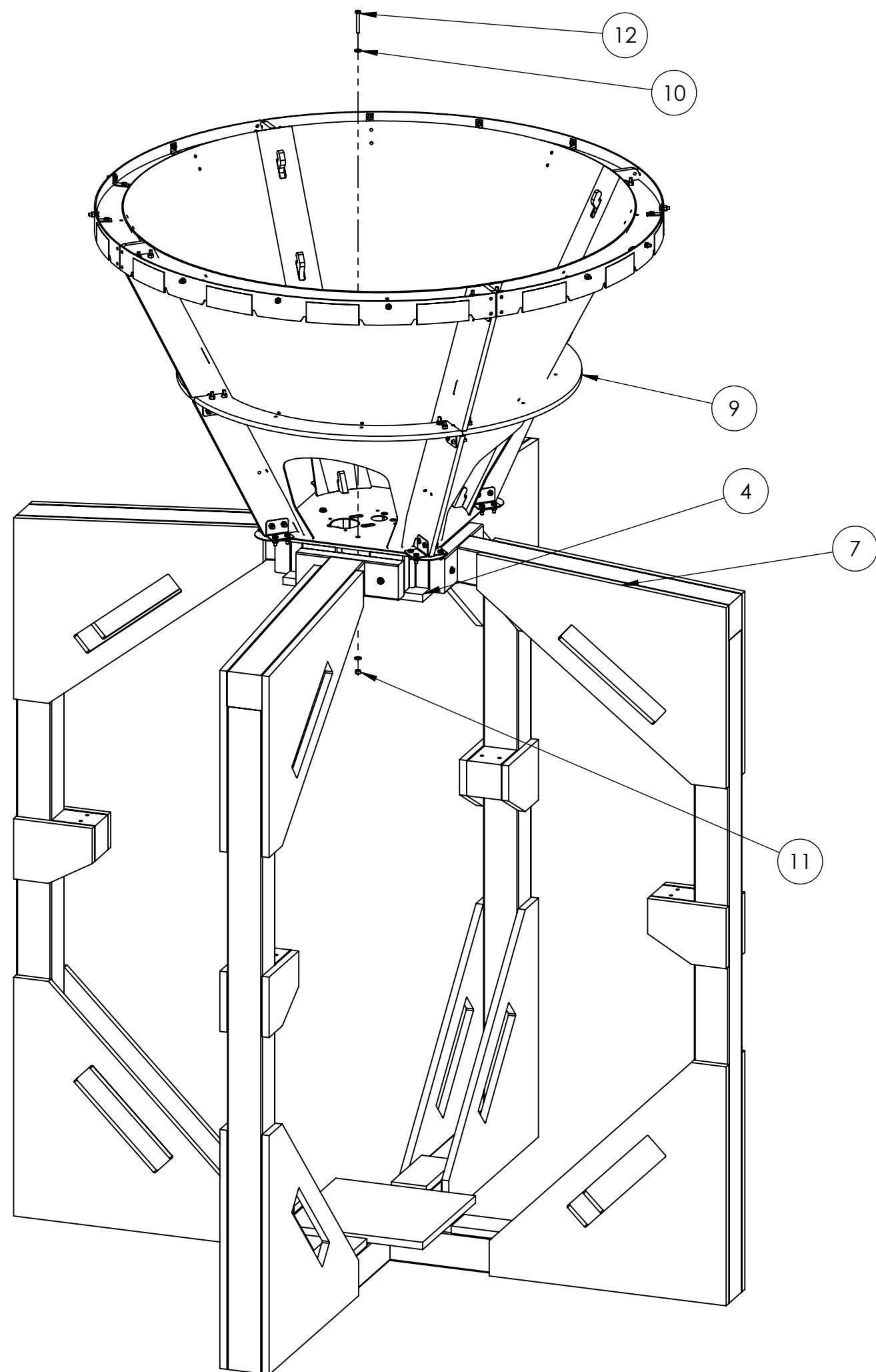
Step 4



1. Add remaining Step 1 assembly to Step 3, as shown. Ensure the plywood from ① sits on top of the 4"x4" lumber of ⑦.
Note: Attachment between ⑦ and ① will occur in a later step.
2. Connect ⑦ to ④ using 2x ⑬, 4x ⑩, and 2x ⑪. Ensure connection is tight.
3. Tighten hardware installed in Step 2.

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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
	C	TE-22100-AM	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.		SCALE: 1:12	SHEET 4 OF 7
DO NOT SCALE DRAWING			

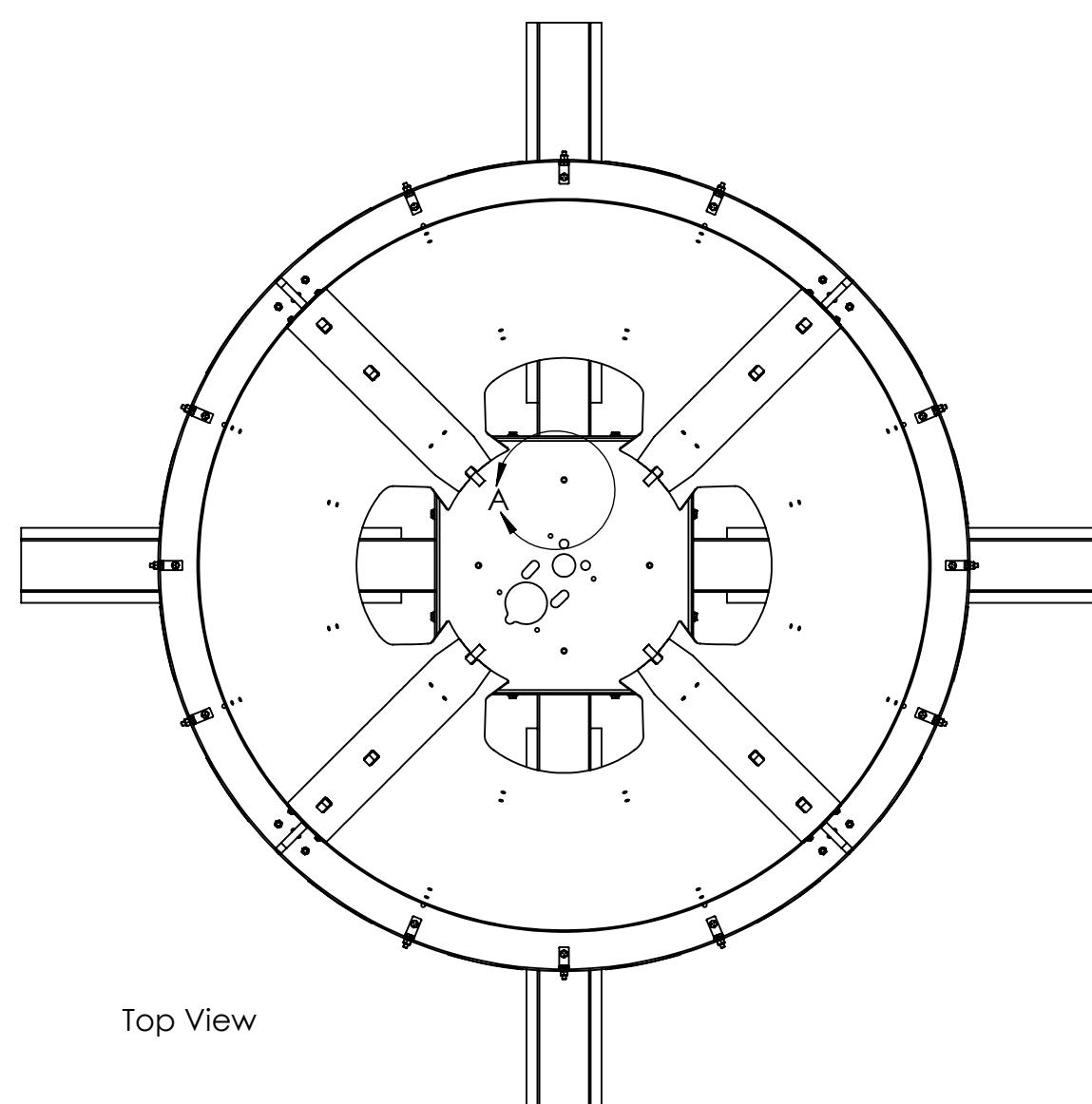
Step 5



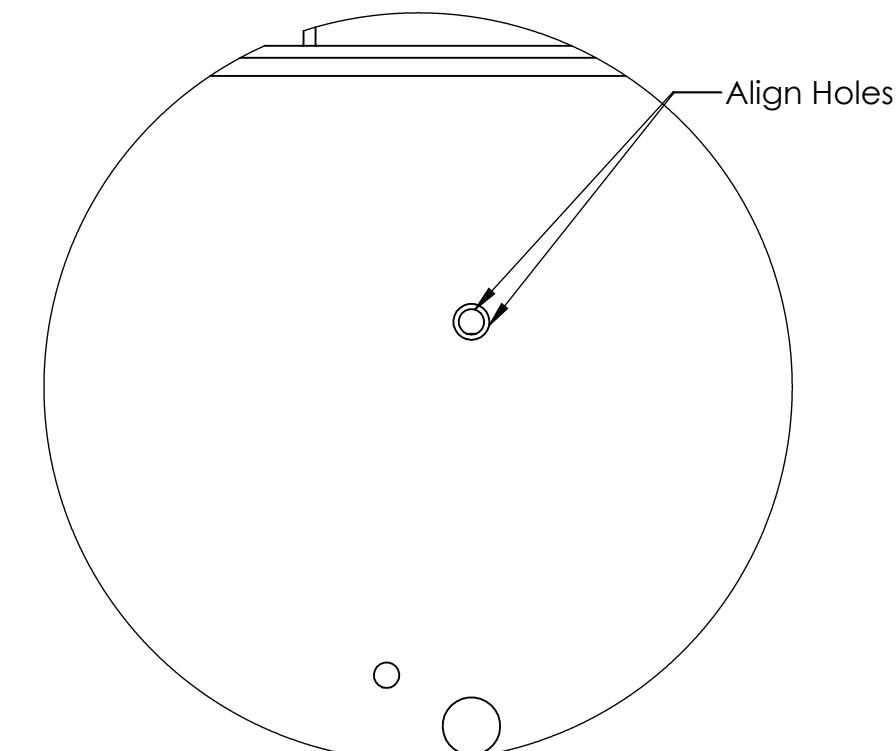
1. Align (9) atop Step 4, as shown.

Note: Ensure there are multiple people to lift (9) into place. Consider resting (9) atop (7), if needed. If an agitator such as AM-4673 or AM-4674 has been installed prior to this step, be mindful of any parts extending beyond the baseplate of (9). Installation of AM-4673 or AM-4674 can be done after (9) is connected to (4).

2. Connect (9) to (4) using 4x (12), 8x (10), and 4x (11).



Top View

DETAIL A
SCALE 1 : 2

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DIMENSIONS ARE IN INCHES		DRAWN	KAMC	1/4/2022
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$				
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$				
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MATERIAL/FINISH:				
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.				
DO NOT SCALE DRAWING				

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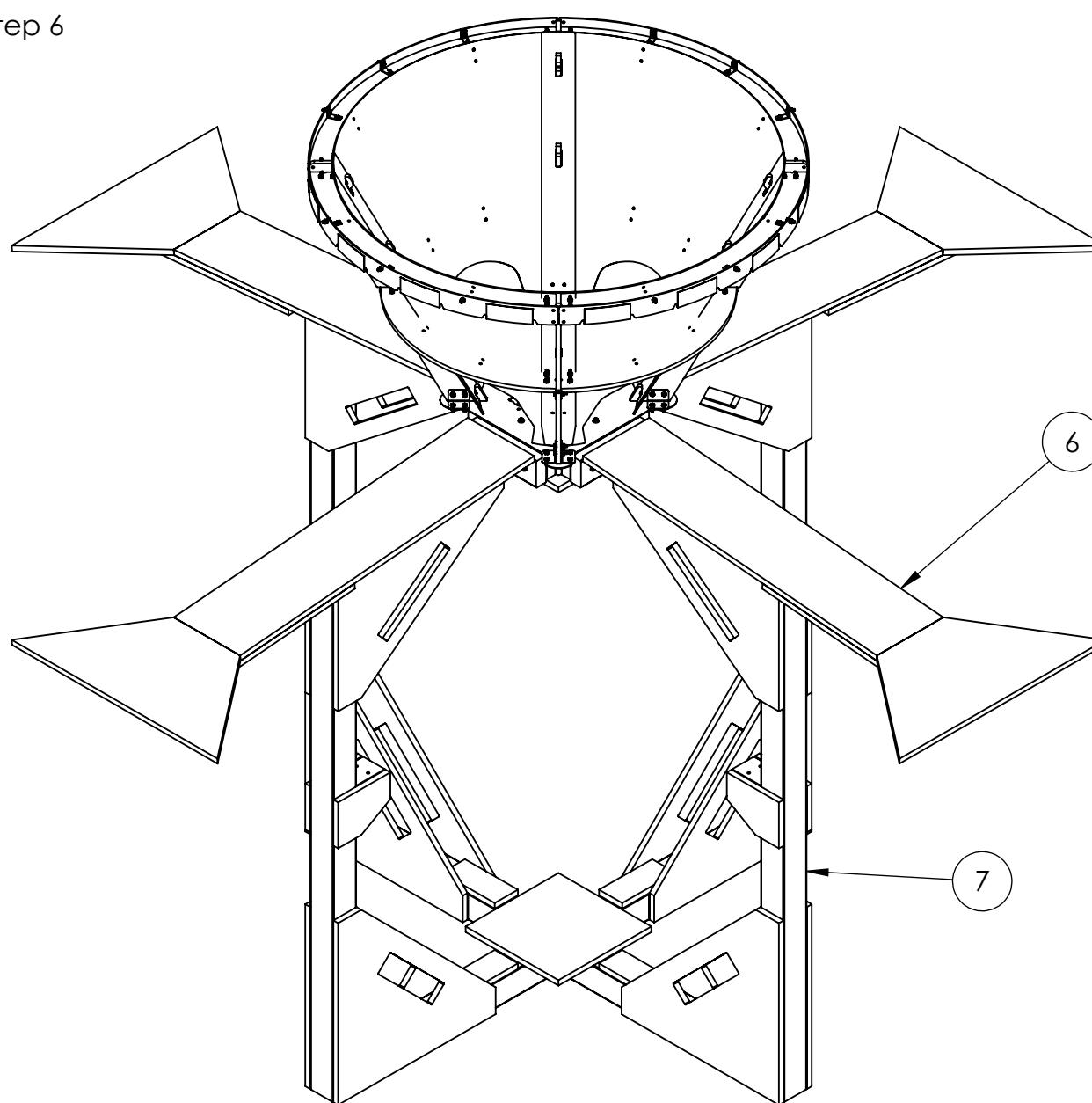
TITLE: HUB - Complex Build -
Full Hub Assembly with
AndyMark Upper Hub
AM-4671

SIZE DWG. NO. REV

C TE-22100-AM

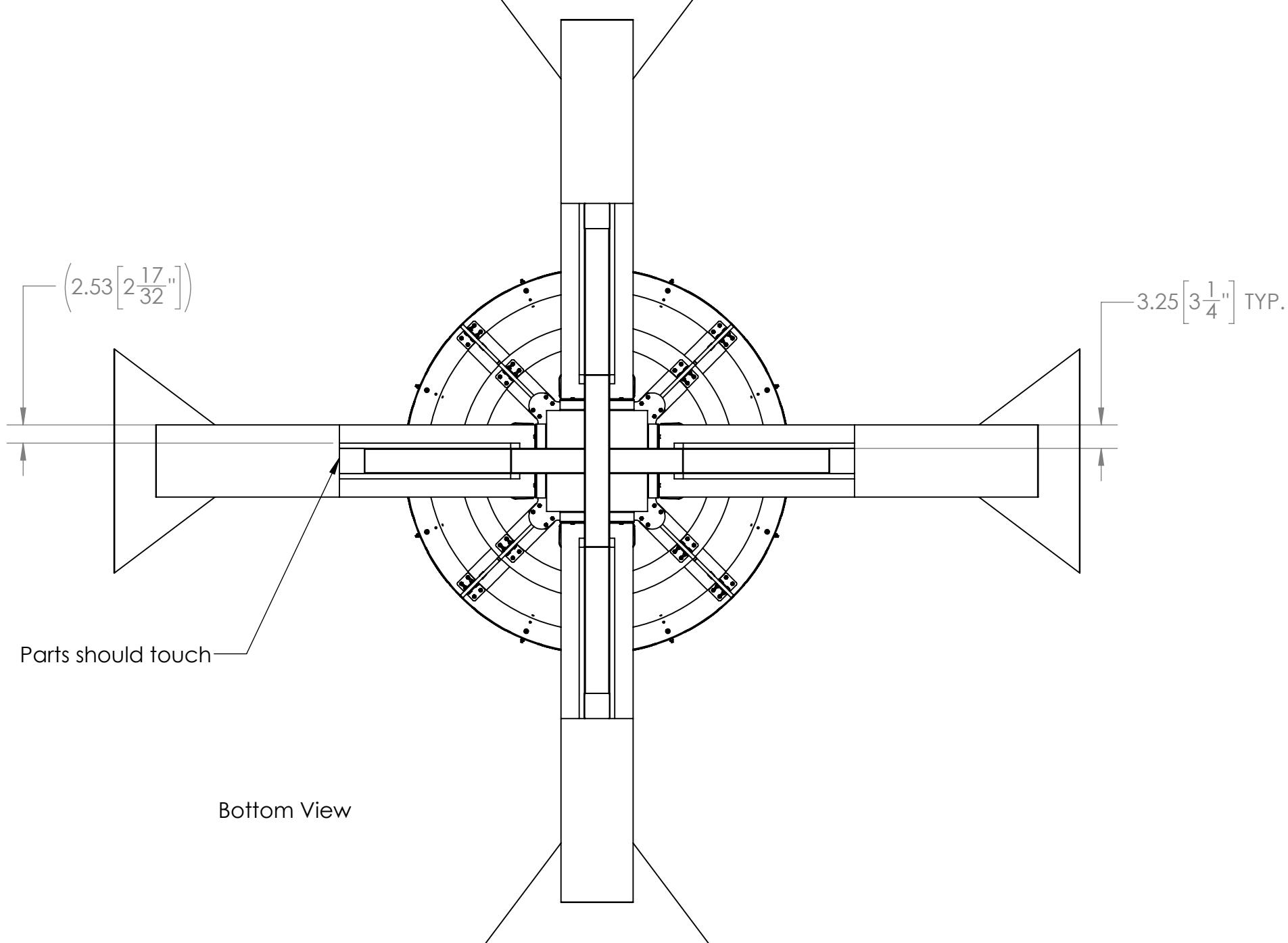
SCALE: 1:12 SHEET 5 OF 7

Step 6

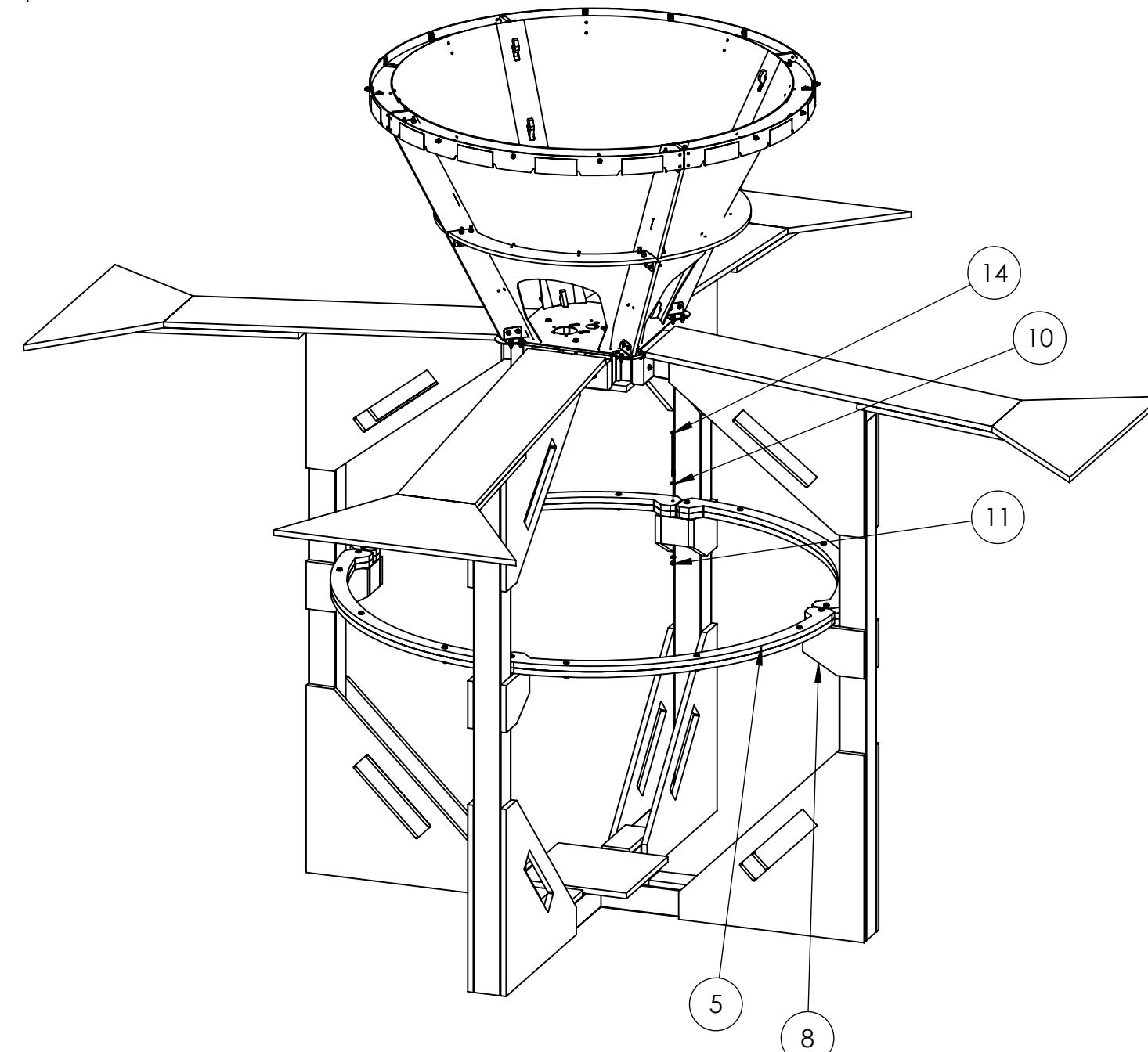


1. Align 4x (6) to Step 5, as shown.
2. Connect using 2" long screws. It is recommended to use 8x screws per (6).
3. Optional: It is recommended to install safety edging on (6) at this time. Safety edging could be pool noodles, baby proofing material, etc.

It is recommended to install safety edging on (6)

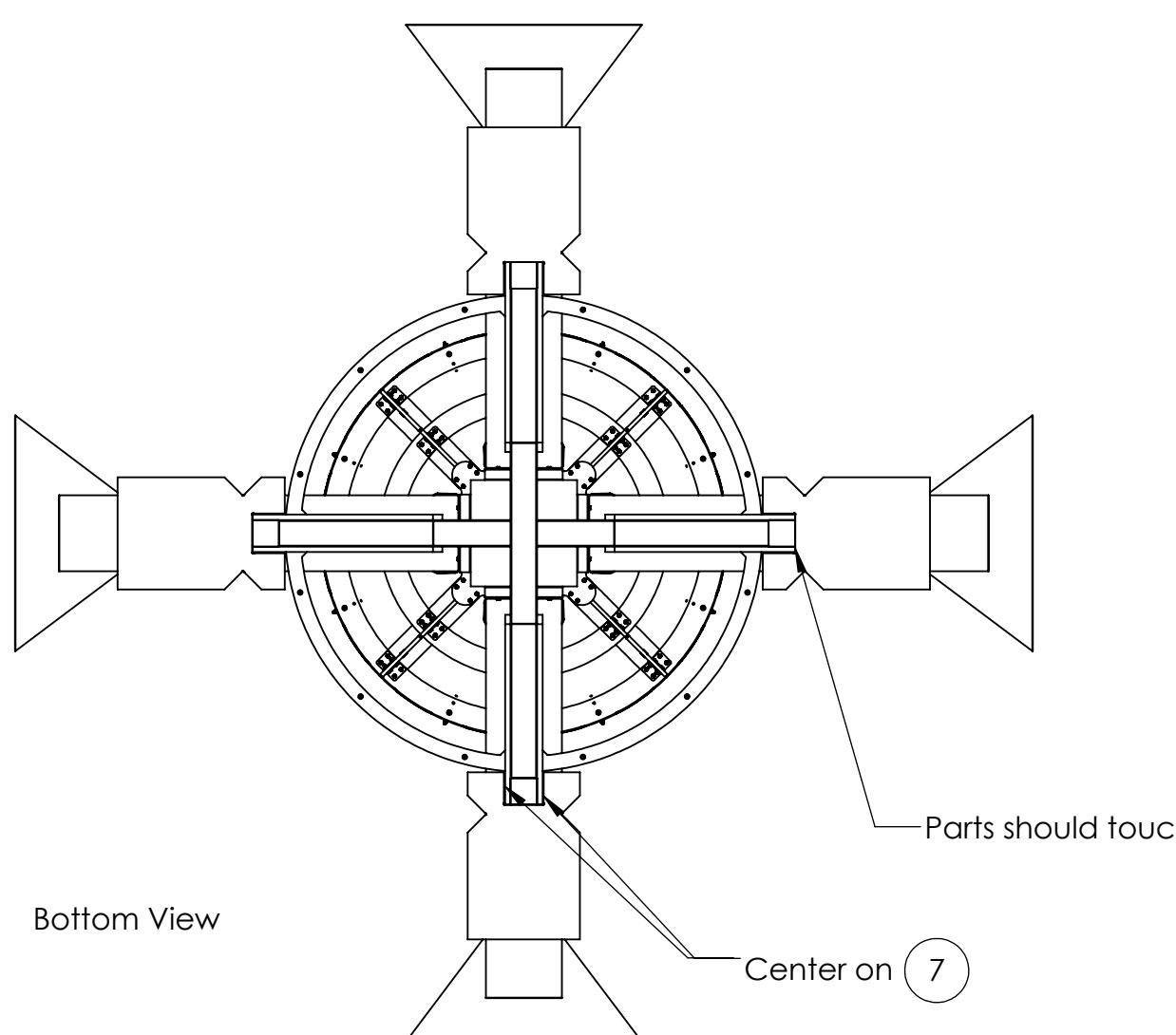
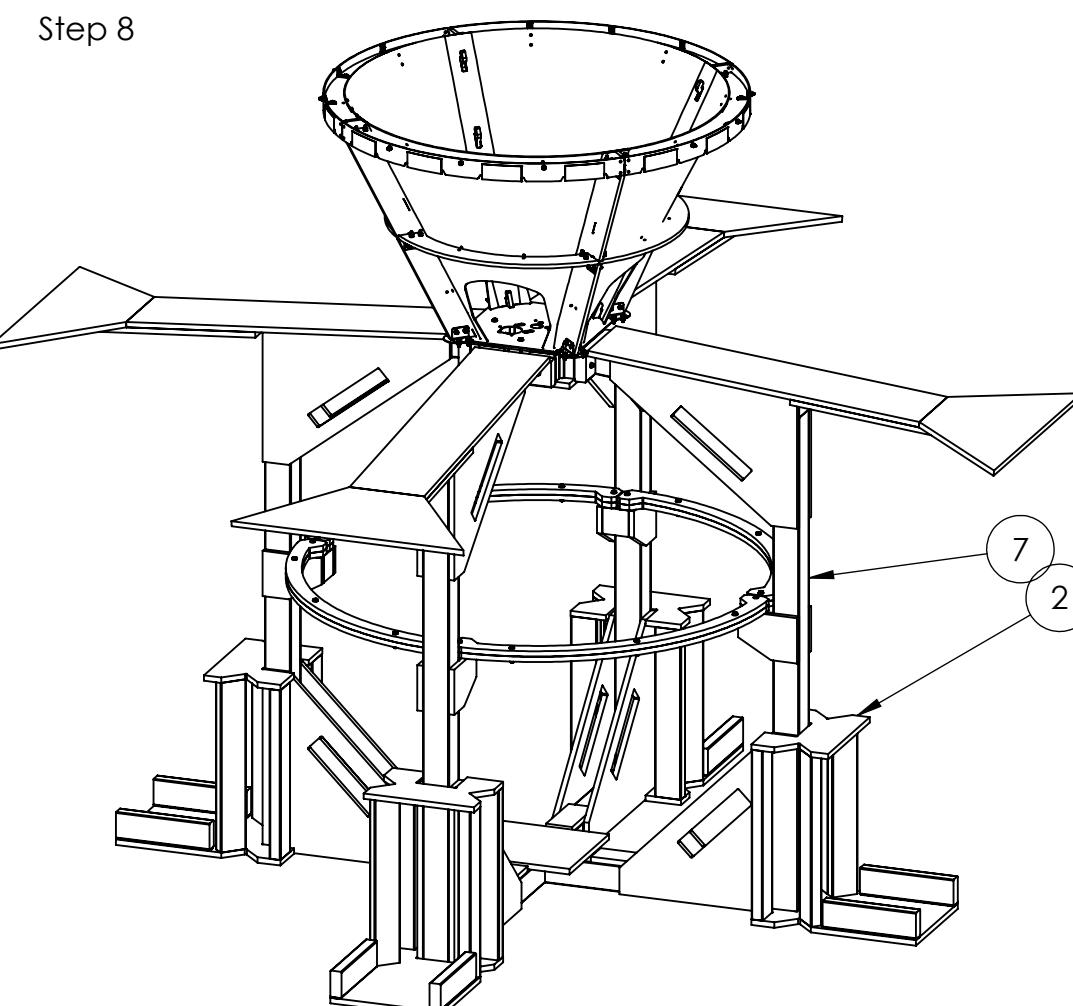


Step 7

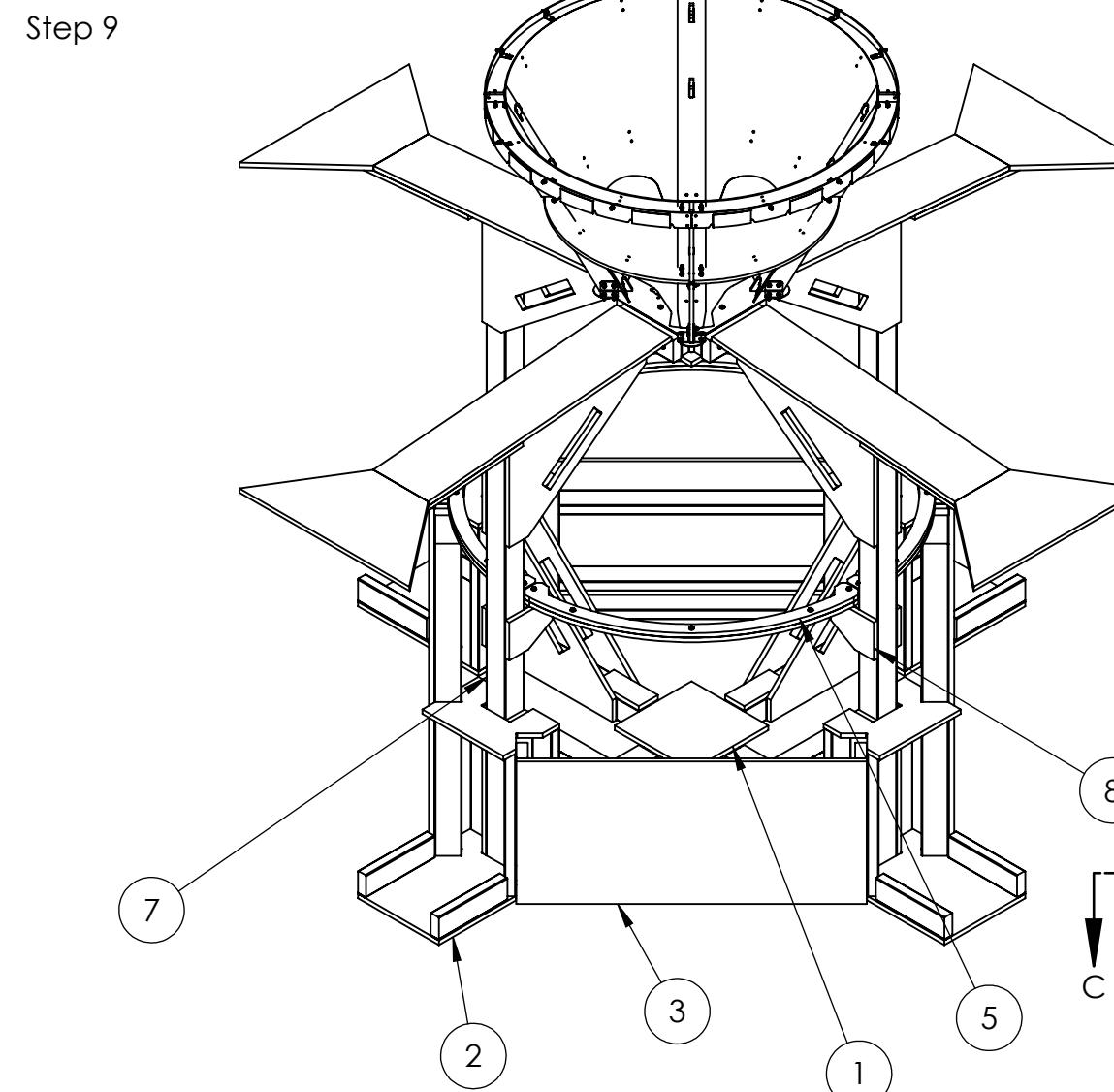


1. Align 4x (5) atop (8) (installed in Step 1 assemblies), as shown.
2. Loosely connect (5) to (8) using 2x (14), 4x (10), and 2x (11) per (8).

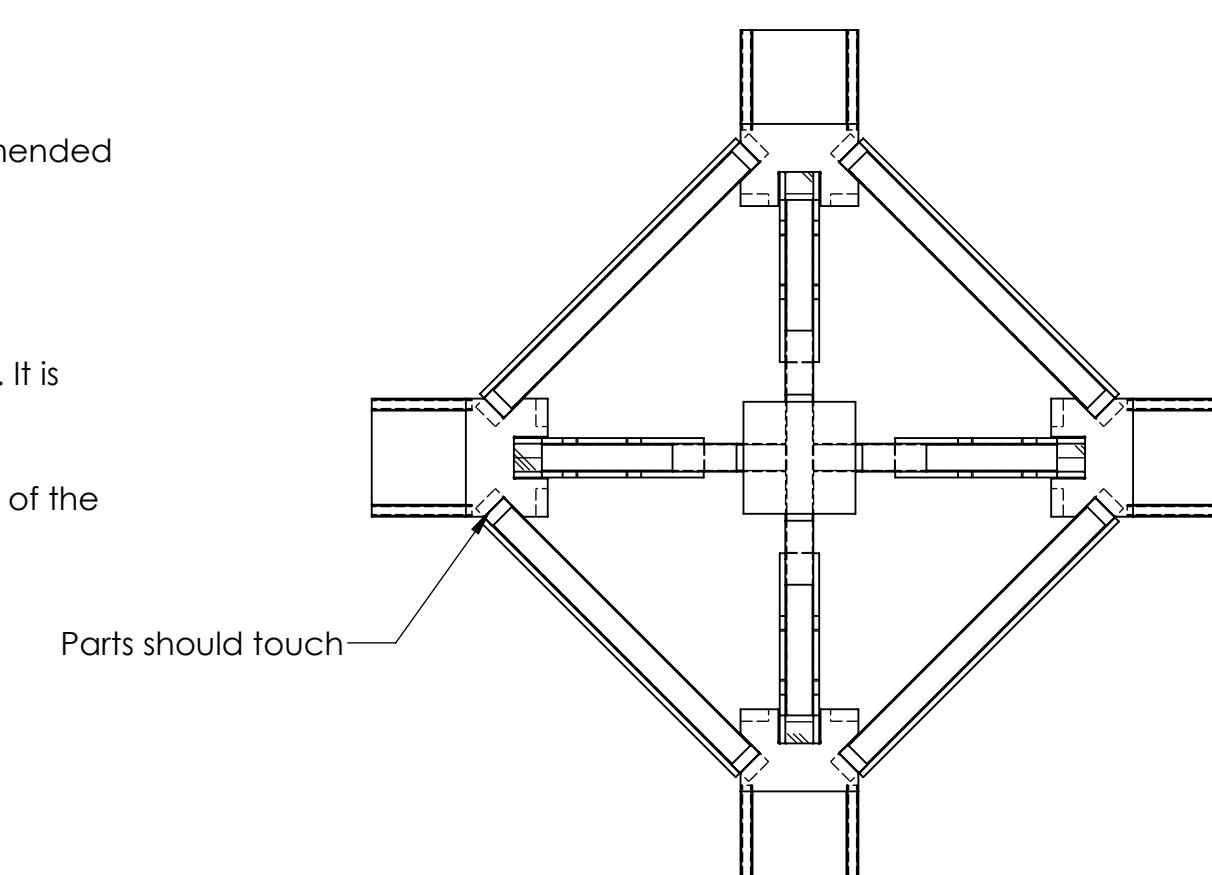
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COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			
FIRST ROBOTICS COMPETITION			
SOLIDWORKS Modeling Solutions Partner			
TITLE: HUB - Complex Build - Full Hub Assembly with AndyMark Upper Hub AM-4671			
SIZE	DWG. NO.	REV	
C	TE-22100-AM		
SCALE: 1:18	SHEET 6 OF 7		



1. Align 4x (2) to Step 7, as shown.
Connection will happen in a later step.



1. Add 4x (3) to Step 8, as shown.
 2. Connect (3) to (2) using 2.5" long screws. It is recommended to use 8x screws per (3), 4x per side.
 3. Tighten hardware between 4x (5) and 4x (8).
 4. Optional: Add 2" long screws to connect (1) to 4x (7). It is recommended to 4x screws per (7).
- Note: It is a best practice to avoid placing screws within 1" of the cut edge of 4"x4" lumber.



SECTION C-C
Hidden Lines Shown

UNLESS OTHERWISE SPECIFIED:			TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES			DRAWN	KAMC	1/4/2022
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$					
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$					
MATERIAL/FINISH:	PROPRIETARY AND CONFIDENTIAL				
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COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.				
DO NOT SCALE DRAWING					

FIRST ROBOTICS COMPETITION
SOLIDWORKS
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TITLE: HUB - Complex Build -
Full Hub Assembly with
AndyMark Upper Hub
AM-4671

SIZE DWG. NO. REV

C TE-22100-AM

SCALE: 1:24 SHEET 7 OF 7

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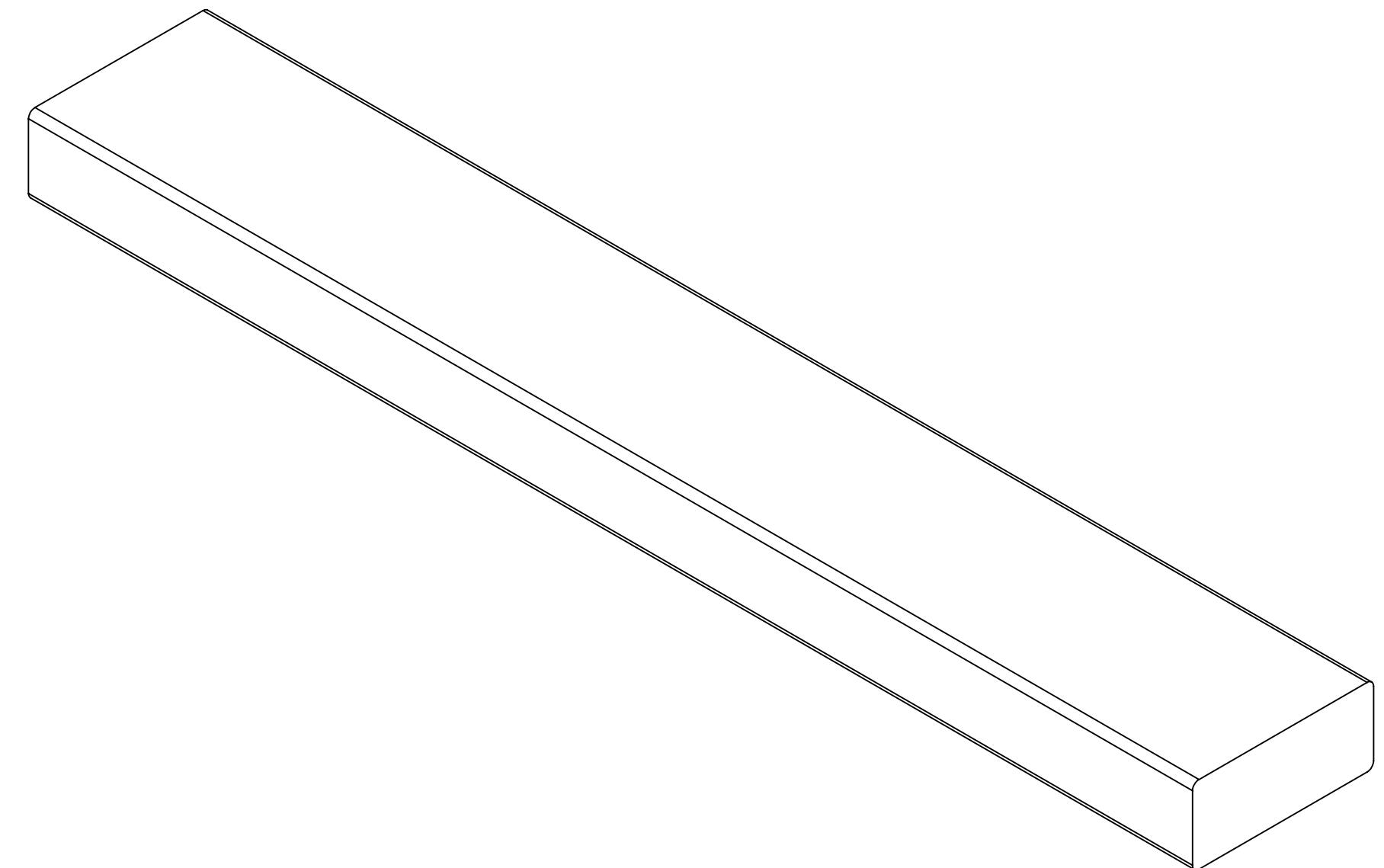
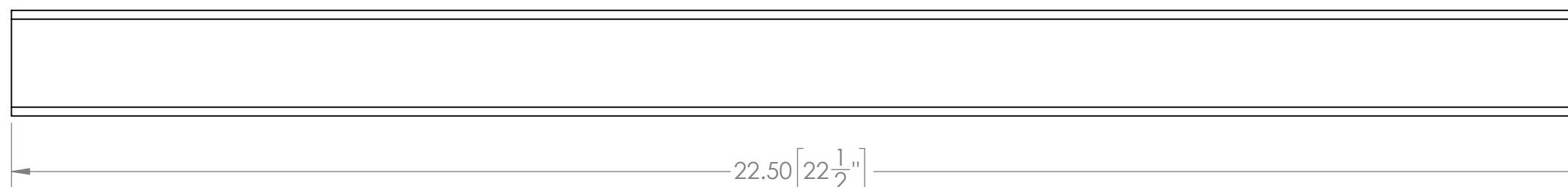
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$	DRAWN	KAMC	12/16/2021
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MATERIAL/FINISH: 2" x 4" Lumber	SIZE	DWG. NO.	REV
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.	C	TE-22101	
DO NOT SCALE DRAWING	SCALE: 1:2	SHEET 1 OF 1	

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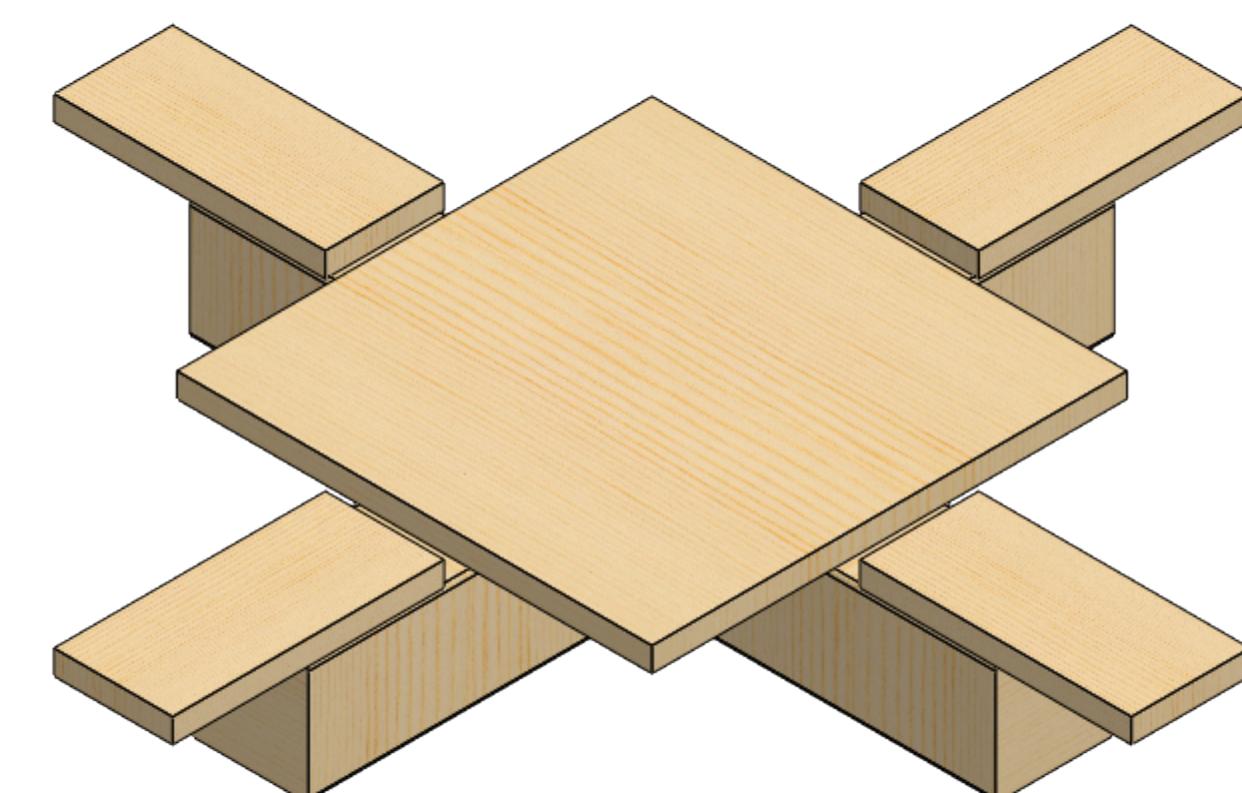
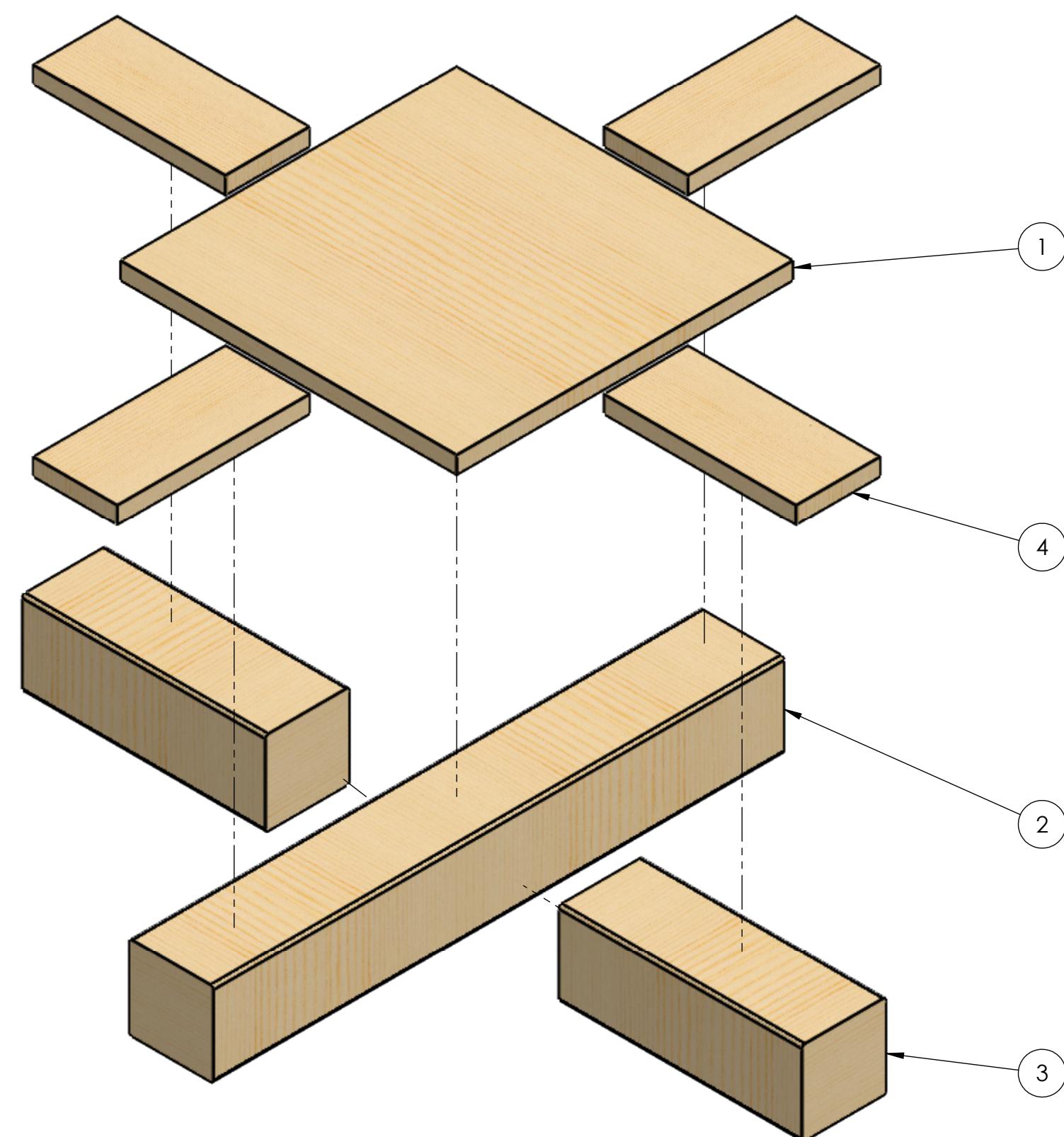
4

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Hardware Needed:
#8 x 2.5" Long Screw - Qty 32

ITEM NO.	PART NUMBER	DESCRIPTION	
1	TE-22111	Hub - Complex Build - Center Base Plate	1
2	TE-22112	HUB - Complex Build - Base Long 4x4	1
3	TE-22113	HUB - Complex Build - Base Short 4x4	2
4	TE-22114	HUB - Complex Build - Base to Leg Connection Plate	4

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/16/2021



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TITLE: HUB - Complex Build - Base Assembly

SIZE DWG. NO. REV

C TE-22110

SCALE: 1:4 SHEET 1 OF 3

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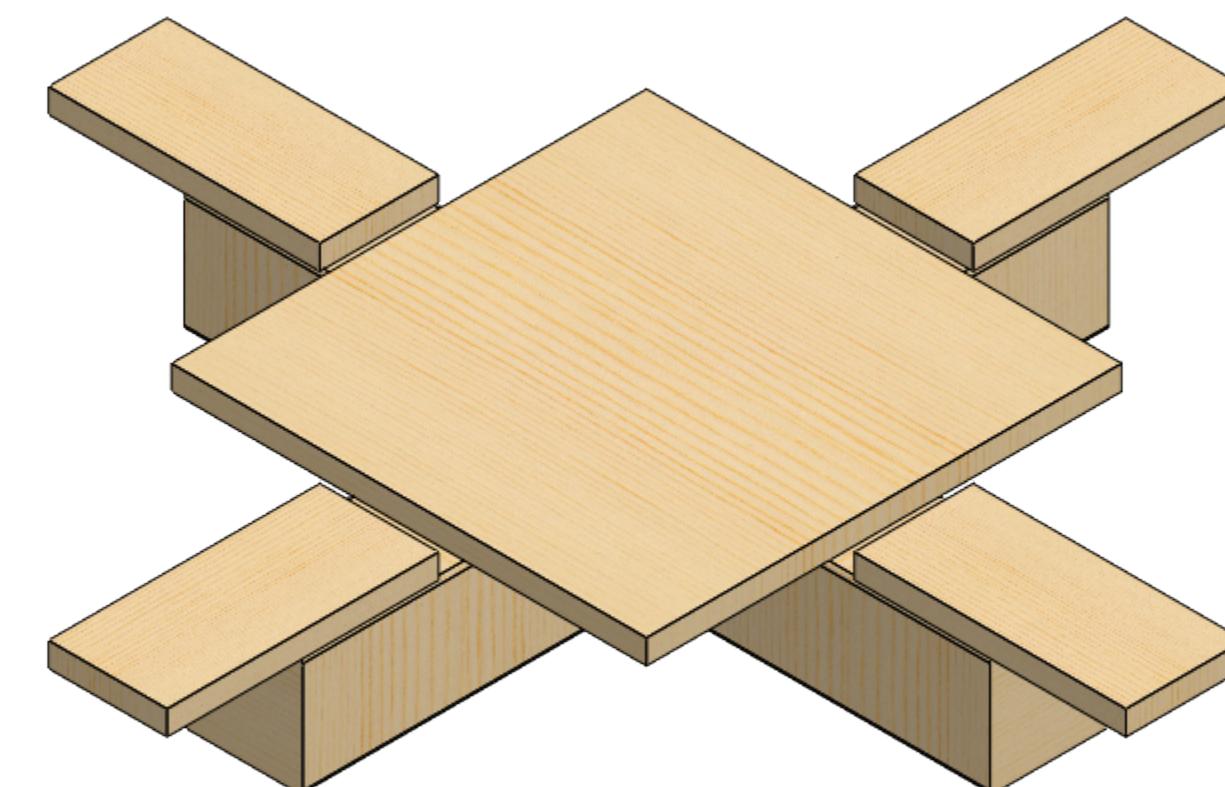
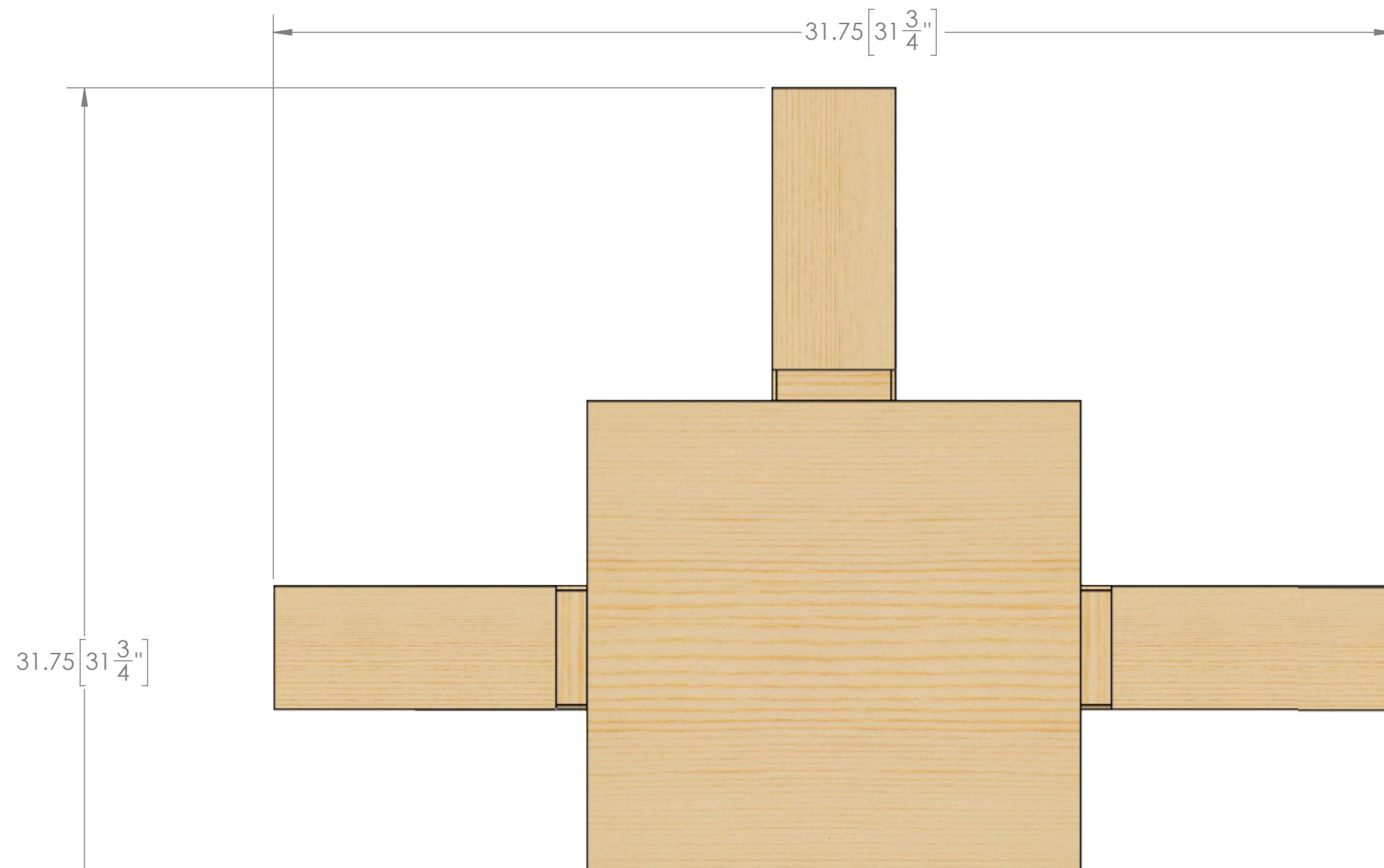
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FIRST
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TITLE:
HUB - Complex Build -
Base Assembly

SIZE DWG. NO. REV

C TE-22110

SCALE: 1:4 SHEET 2 OF 3

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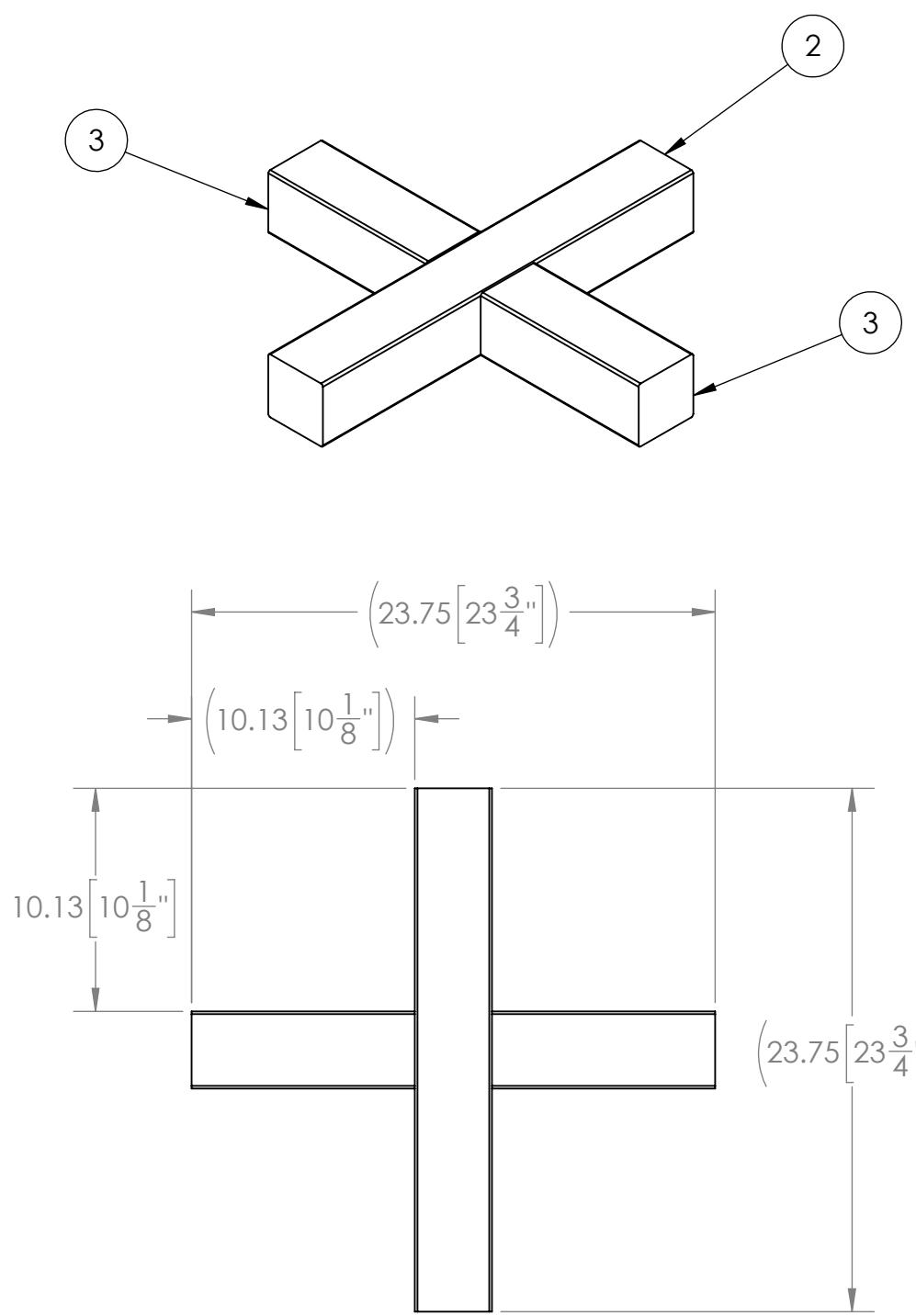
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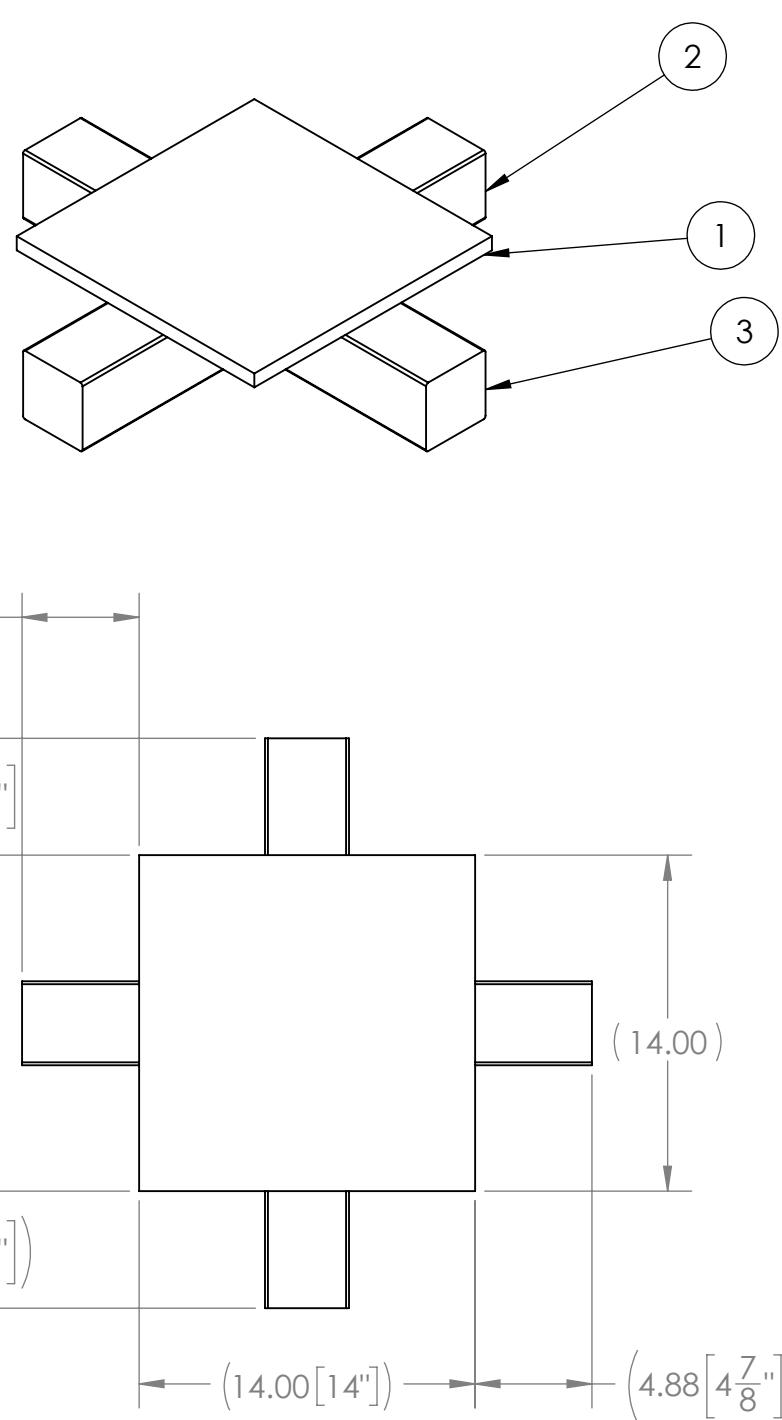
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Step 1



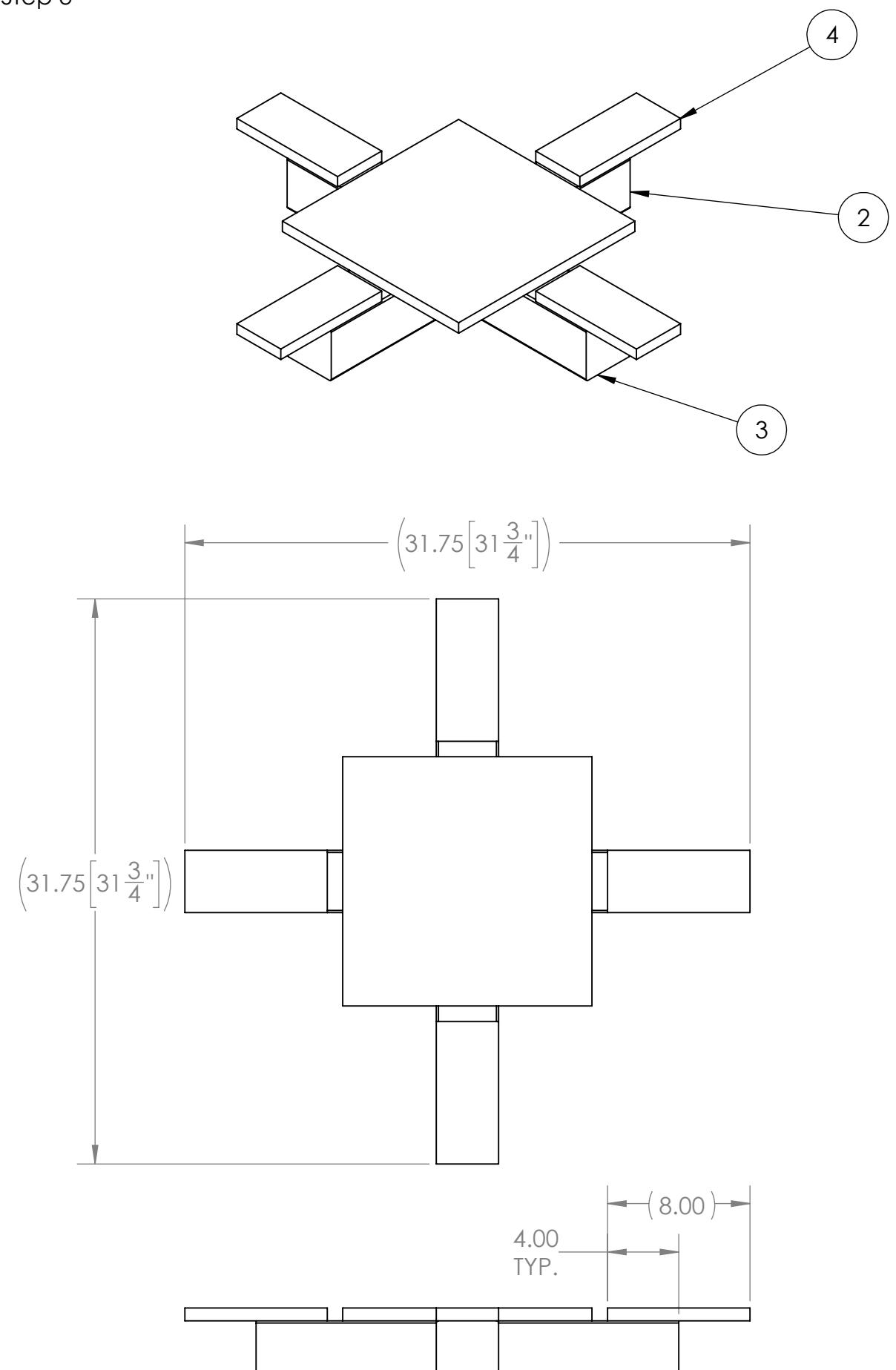
1. Align 2x (3) to (1) as shown. Attachment will happen in next step.

Step 2



1. Align (1) to Step 1, as shown.
 2. Connect using 2.5" long screws. It is recommended to use 4x screws into each (3) and 8x (2).
- Note: A best practice when screwing into a 4"x4" is to avoid placing a screw within 1" from the cut edge.

Step 3



1. Align a total of 4x (4) such that x2 are on (2) and x1 is on each (3), as shown.
2. Connect using 2.5" long screws. It is recommended to use 4x screws per (4).

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM _____ NAME _____ DATE _____

DRAWN KAMC 12/16/2021

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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.



TITLE:
HUB - Complex Build -
Base Assembly

SIZE DWG. NO. REV

C TE-22110

SCALE: 1:8 SHEET 3 OF 3

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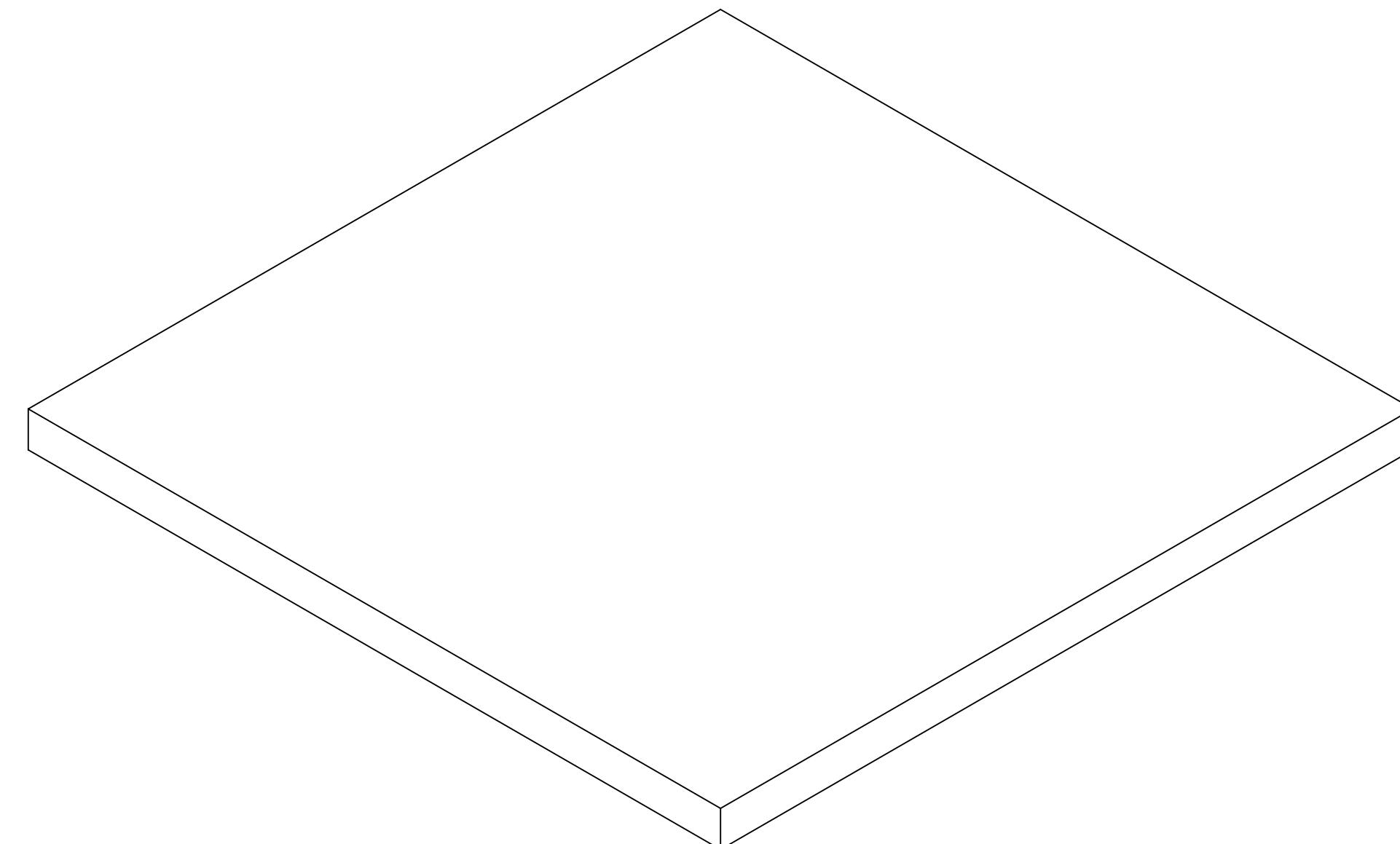
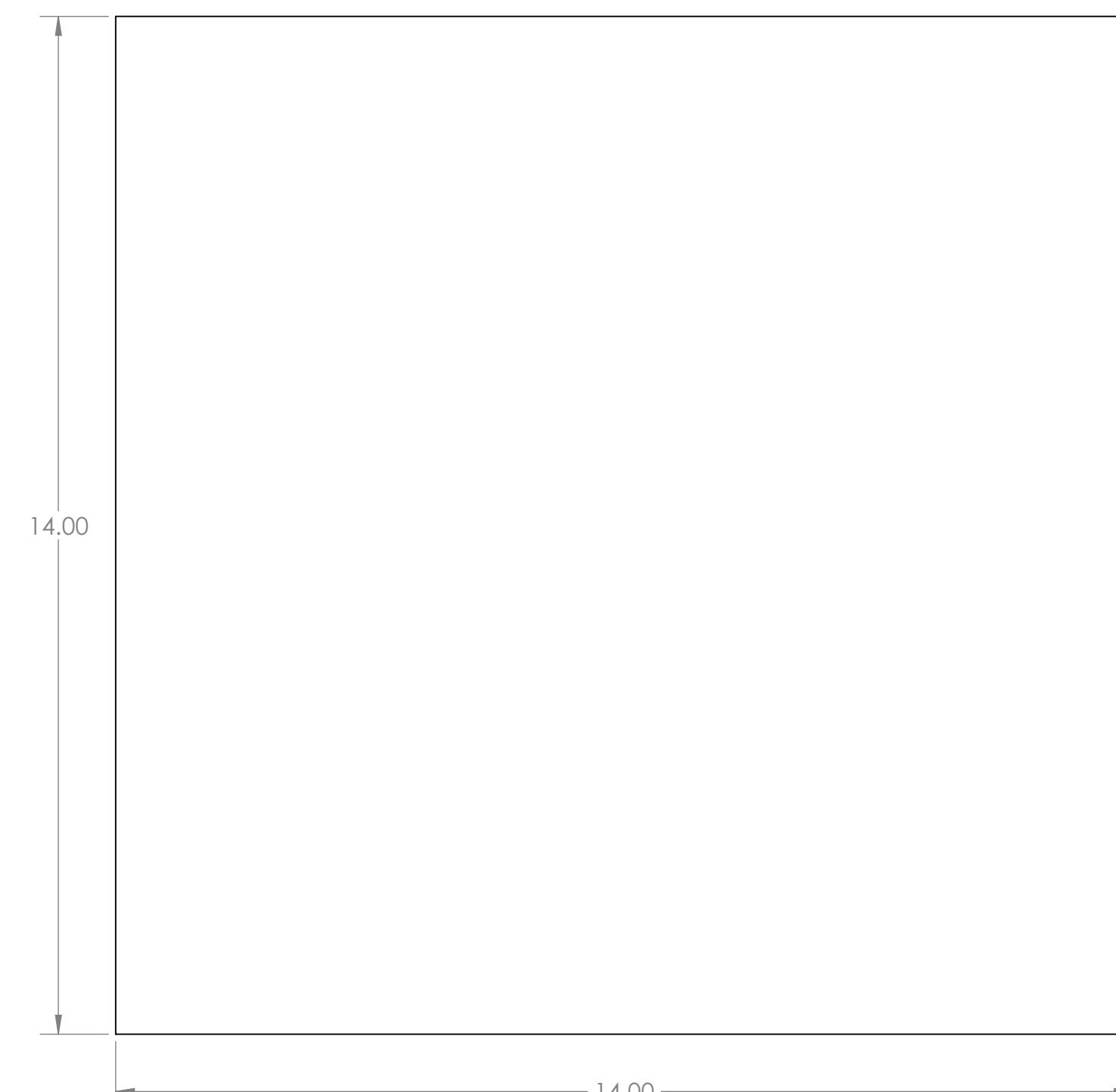
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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$
 ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
 TWO PLACE DECIMAL $\pm .13$
 THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

3/4" Plywood

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/16/2021



TITLE:

Hub - Complex Build -
Center Base Plate

SIZE DWG. NO. REV

C TE-22111

SCALE: 1:2 SHEET 1 OF 1

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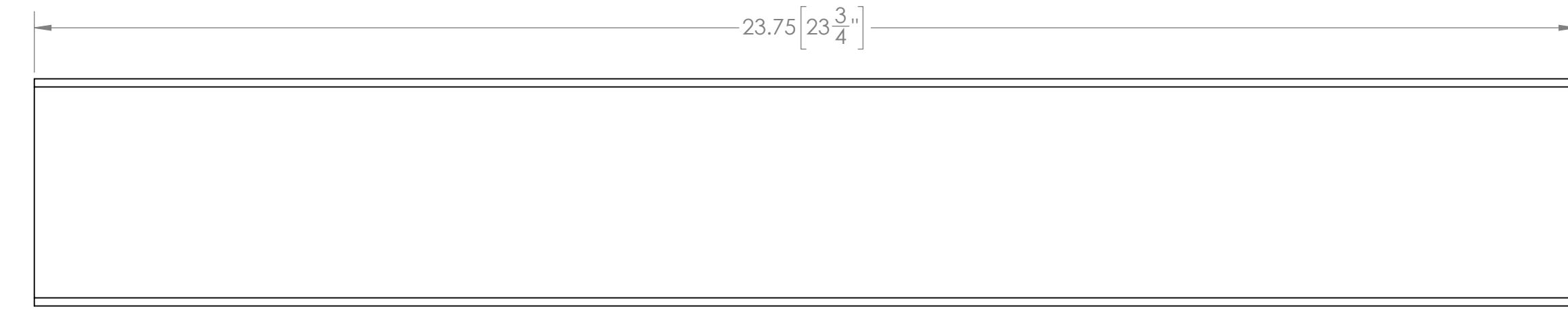
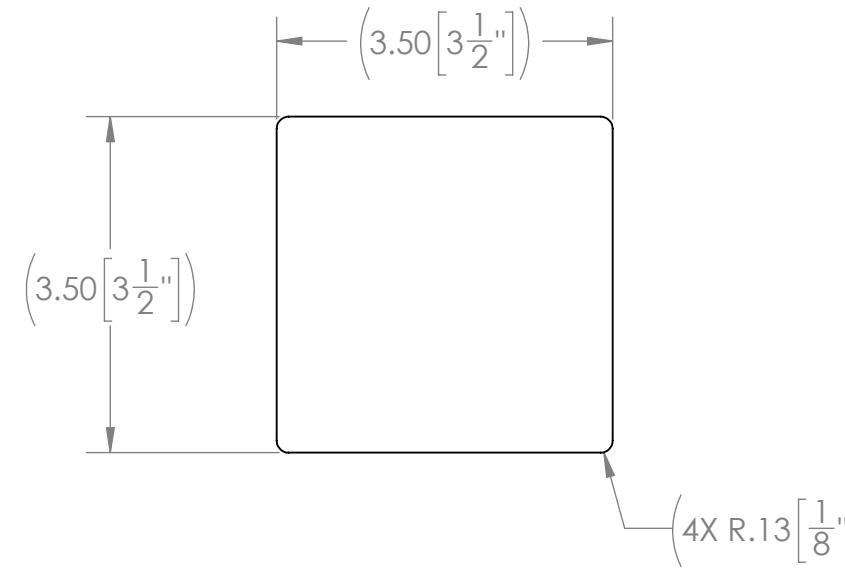
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	KAMC	12/16/2021
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$	PROPRIETARY AND CONFIDENTIAL		
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.		
MATERIAL/FINISH: 4" x 4" Lumber	SIZE	DWG. NO.	REV
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.	C	TE-22112	
DO NOT SCALE DRAWING	SCALE: 1:2	SHEET 1 OF 1	

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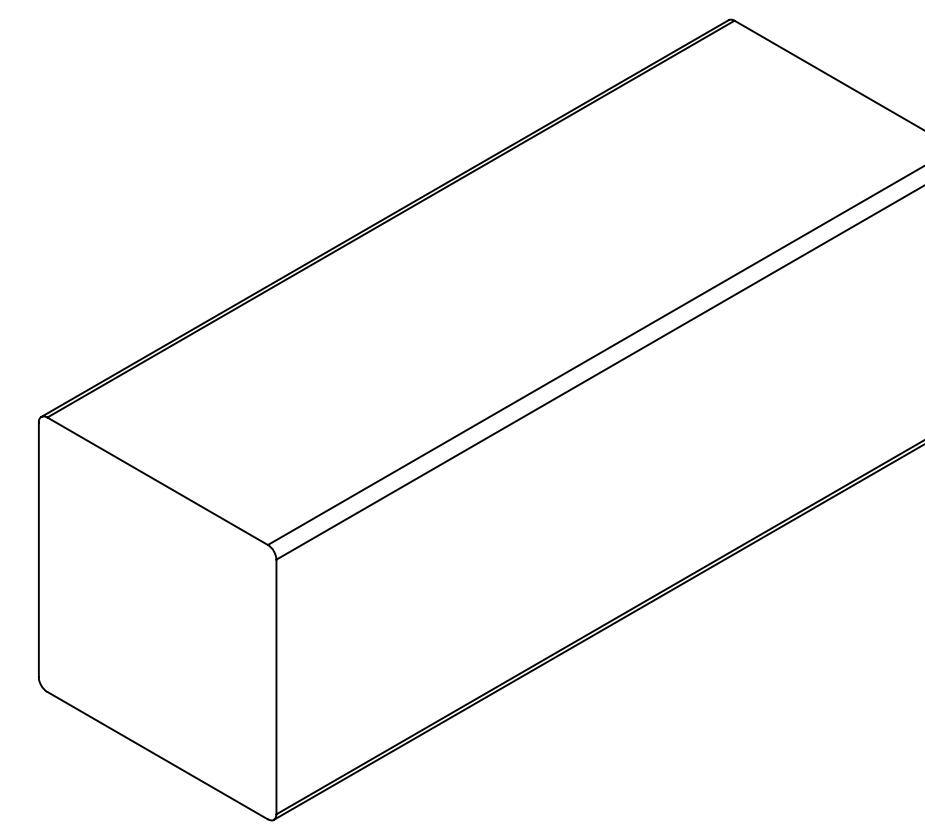
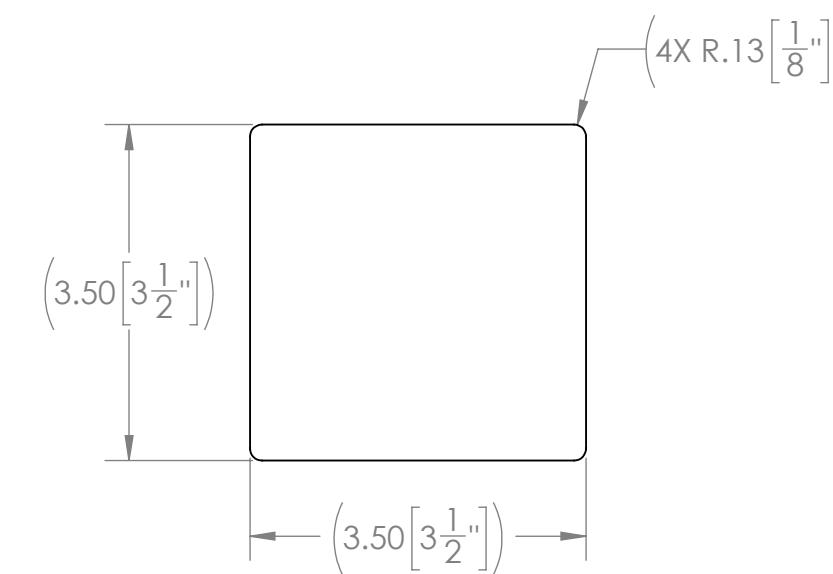
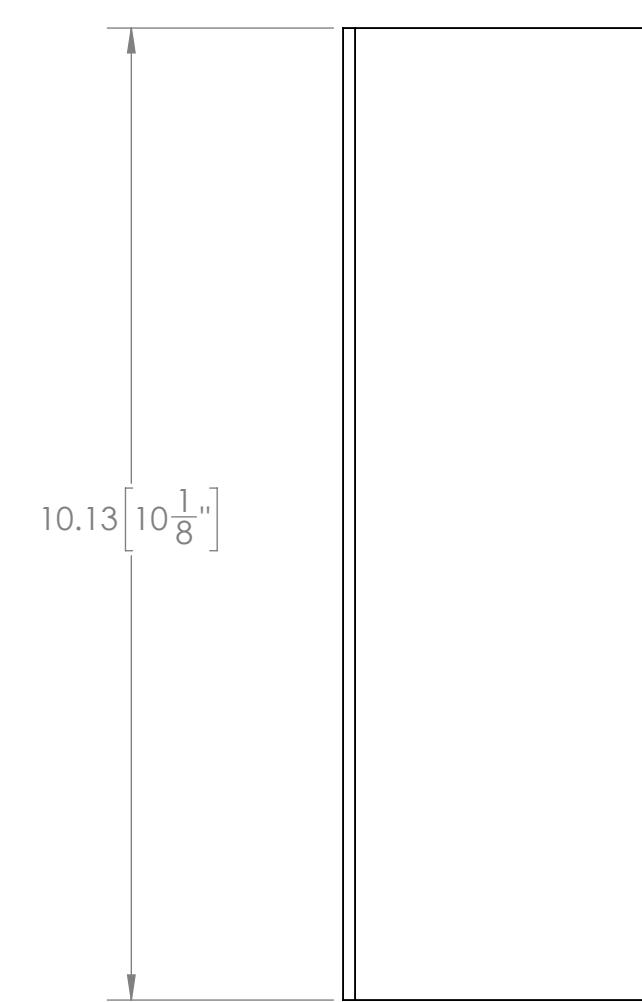
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$	DRAWN	KAMC	12/16/2021
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH: 4" x 4" Lumber	SIZE	DWG. NO.	REV
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.	C	TE-22113	
DO NOT SCALE DRAWING	SCALE: 1:2	SHEET 1 OF 1	

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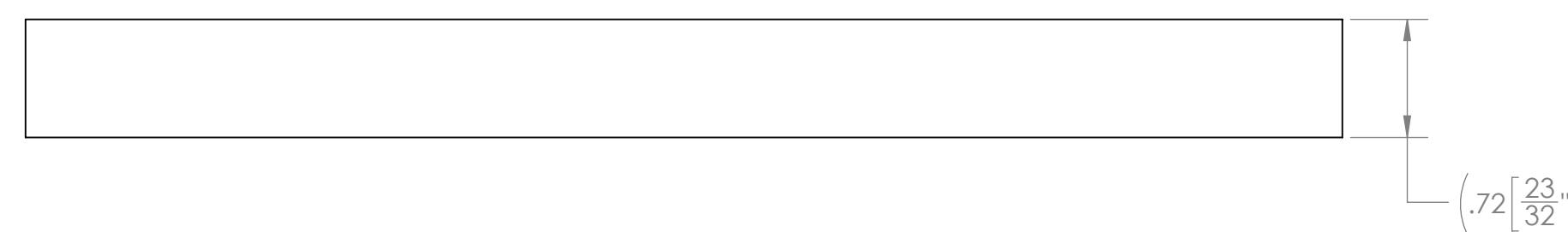
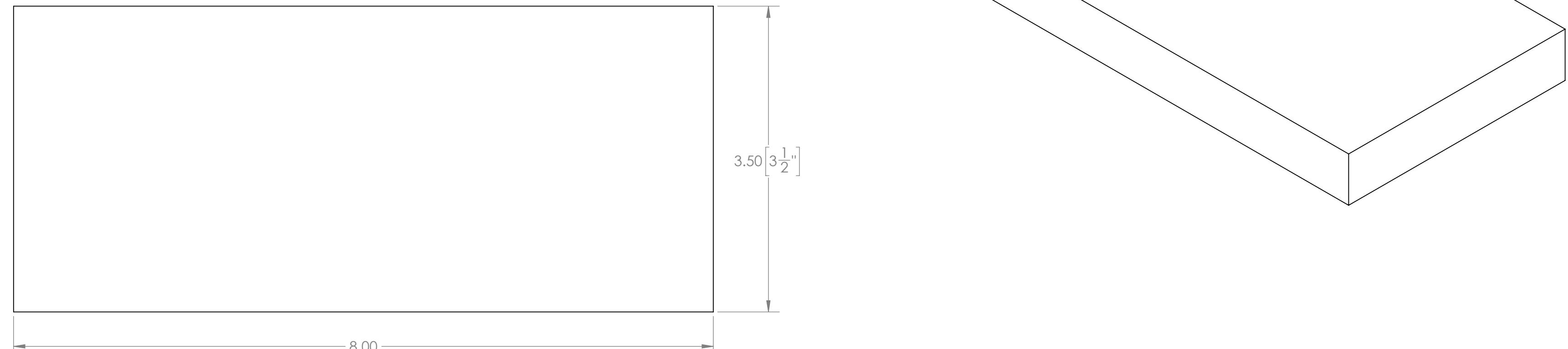
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$	DRAWN	KAMC	12/16/2021
PROPRIETARY AND CONFIDENTIAL			
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.			
MATERIAL/FINISH: 3/4" Plywood	SIZE	DWG. NO.	REV
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.	C	TE-22114	
DO NOT SCALE DRAWING	SCALE: 1:1	SHEET 1 OF 1	

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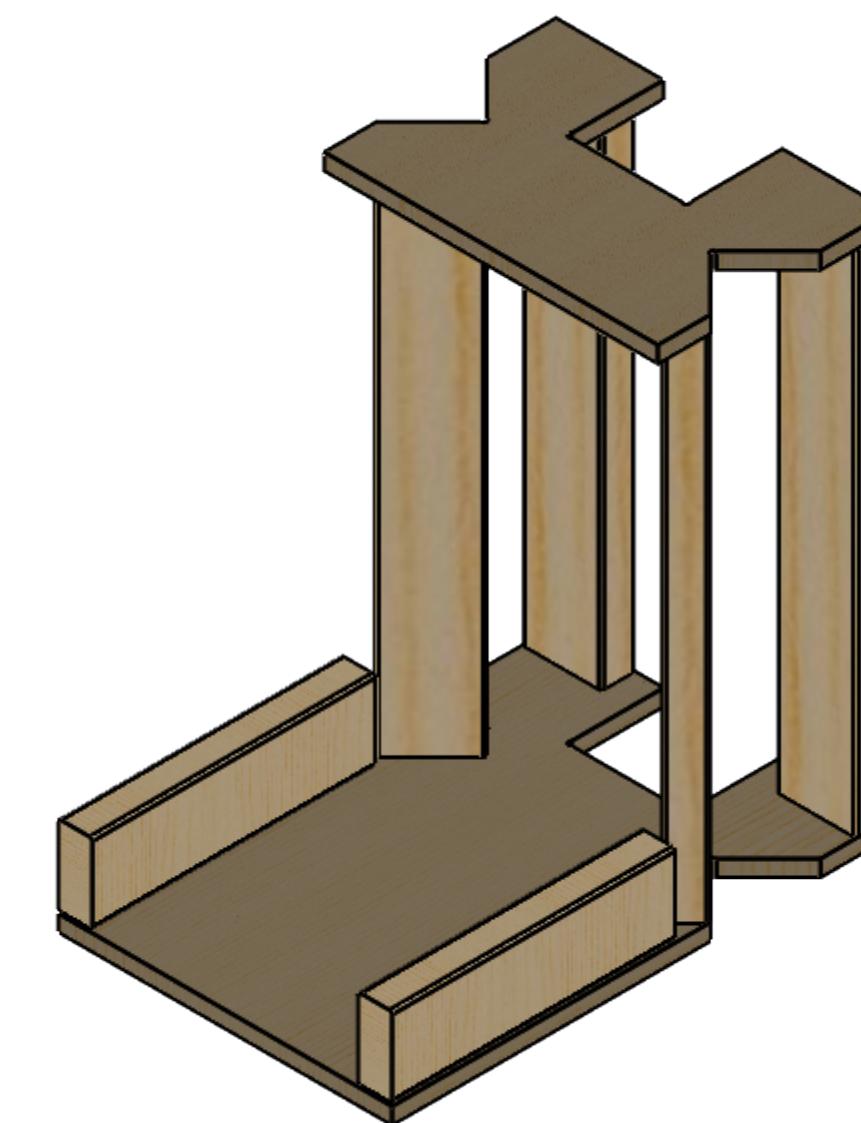
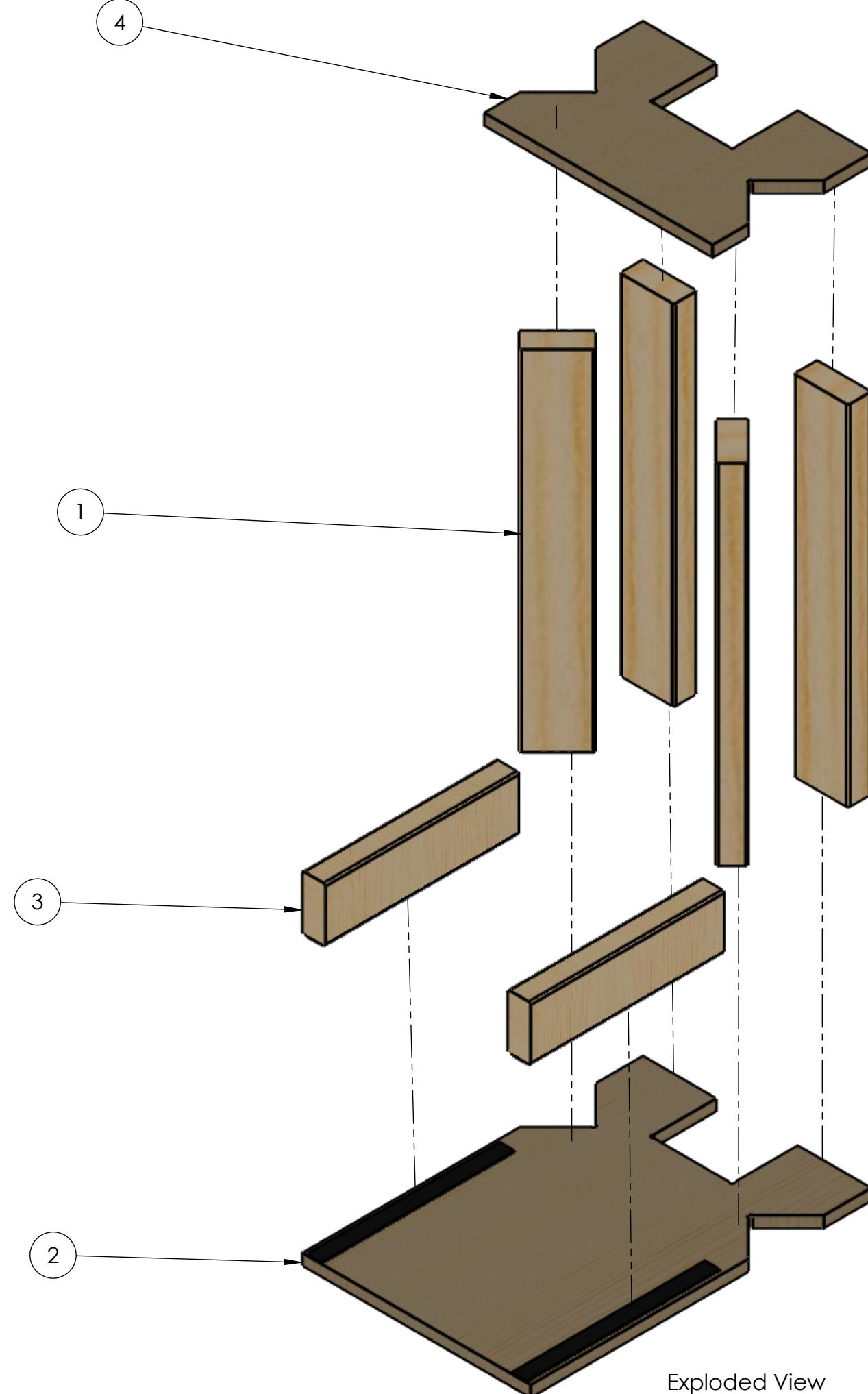
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Hardware Needed:
#8 x 2" Long Screw - Qty 16

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22101	HUB - Complex Build - Fender and Lower Exit Vertical 2x4	4
2	TE-22122	HUB - Complex Build - Lower Exit Bottom with Loop Assembly	1
3	TE-22124	HUB - Complex Build - Lower Exit Removable Edge with Hook Assembly	2
4	TE-22125	HUB - Complex Build - Lower Exit Top	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

PROPRIETARY AND CONFIDENTIAL
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COMMENTS:
REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

TEAM: **KAMC** DATE: **12/20/2021**
DRAWN: **KAMC** **FIRST ROBOTICS COMPETITION** **SOLIDWORKS**
Modeling Solutions Partner

TITLE: **HUB - Complex Build - Lower Exit Assembly**

SIZE: **C** DWG. NO.: **TE-22120** REV:

SCALE: 1:6 SHEET 1 OF 3

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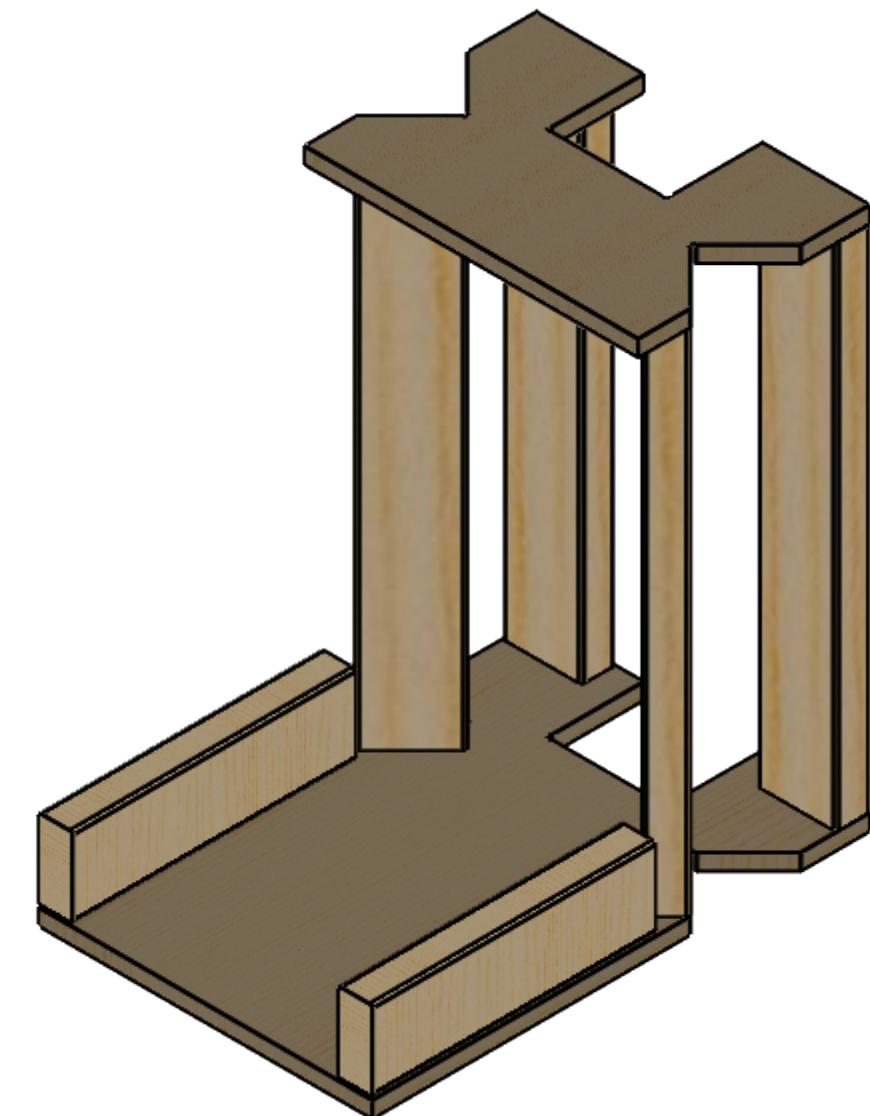
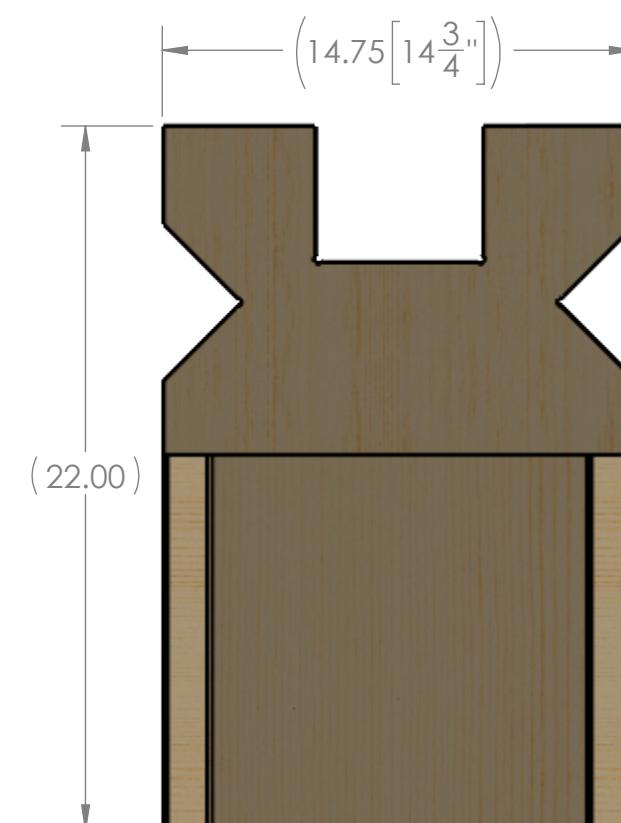
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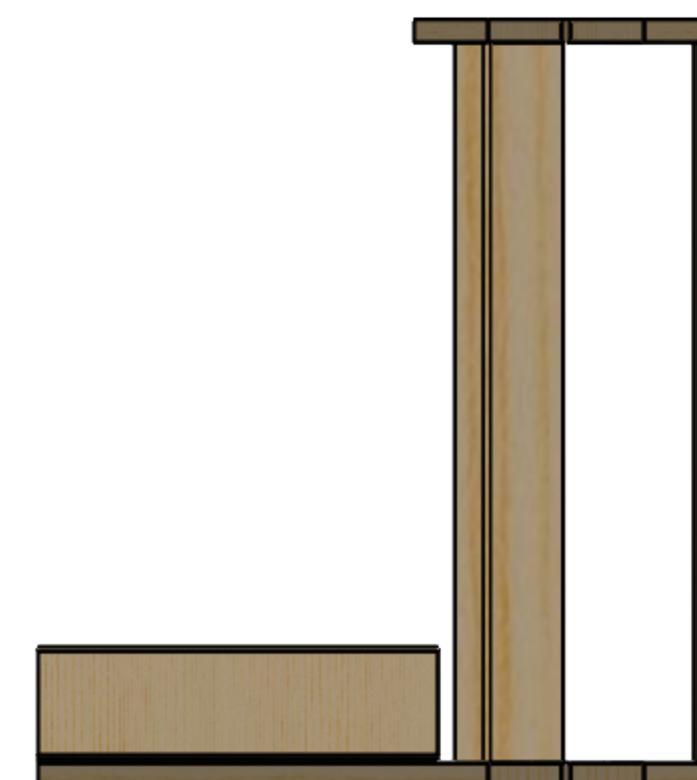
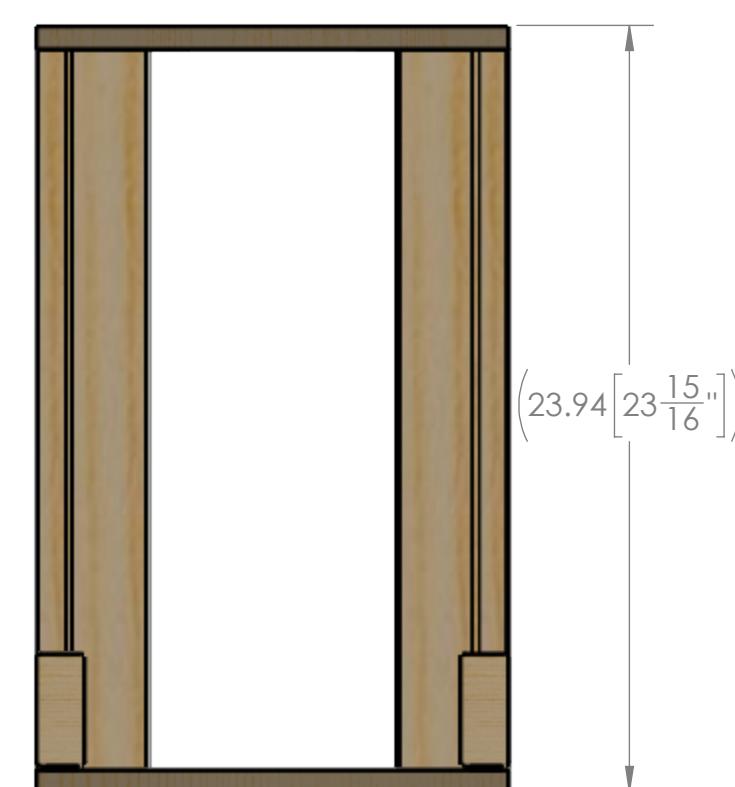
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DRAWN	KAMC	12/20/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
	C	TE-22120	
COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.		
DO NOT SCALE DRAWING	SCALE: 1:6	SHEET 2 OF 3	

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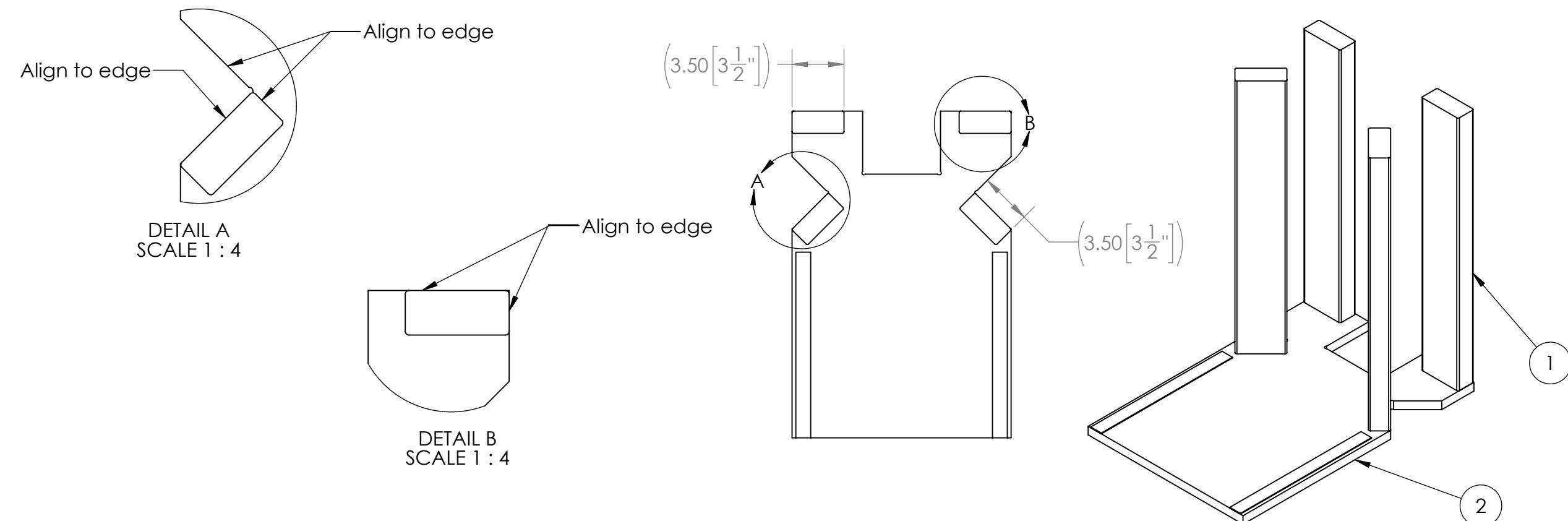
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Step 1

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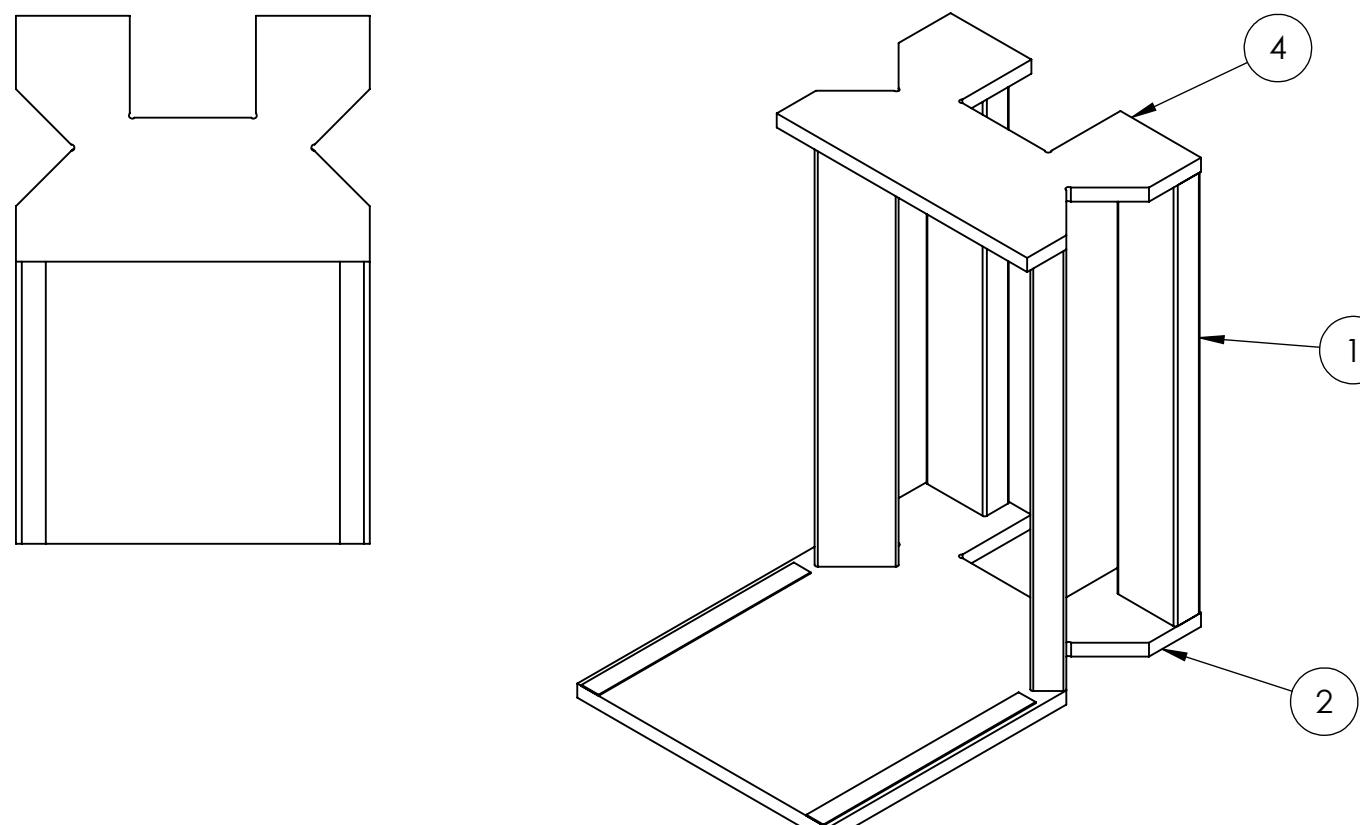
1. Align 4x (1) onto (2) as shown.
2. Secure (1) to (2) by using 2" long screws through the bottom of (1) into (2). It is recommended to use 2x screws into each (1).



Step 2

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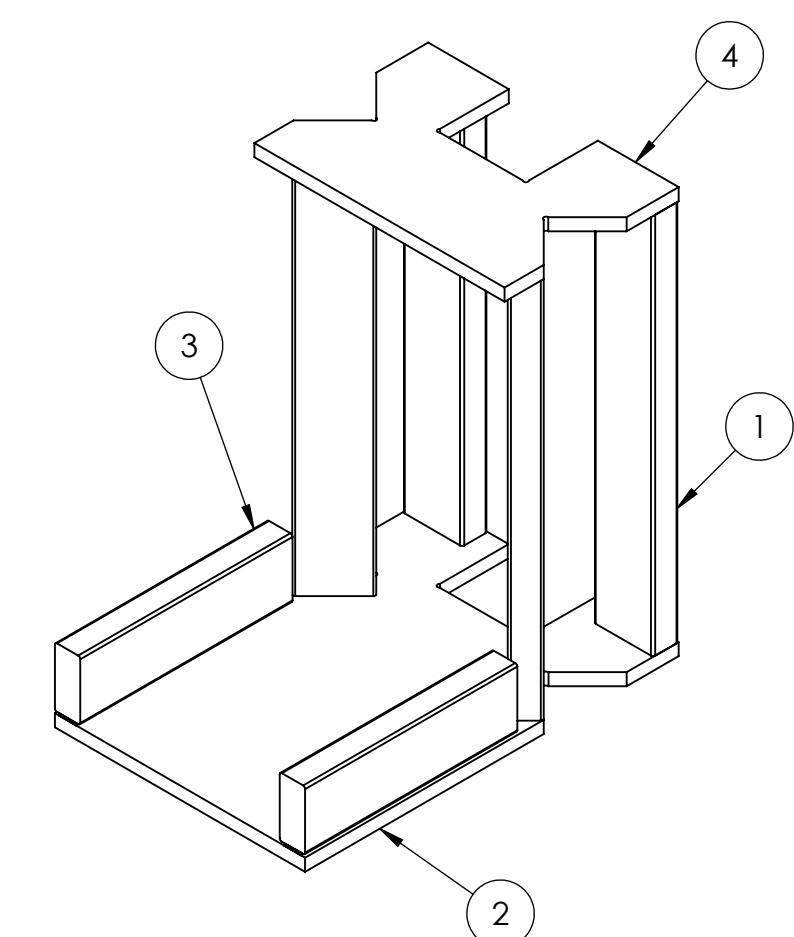
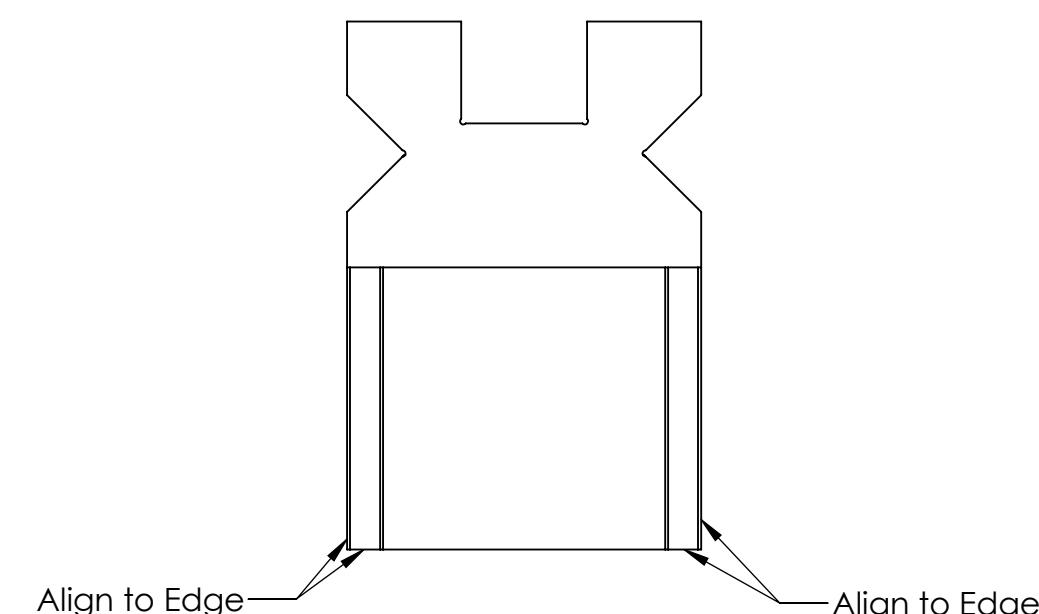
1. Add (4) to Step 1 by aligning (1) to (4) in the same manner as aligning (1) to (2) from Step 1.
2. Secure (4) to (1) by using 2" long screws through the top of (4) into (1). It is recommended to use x2 screws into each (1).



Step 3

A

1. Attach 2x (3) to (2) using the pre-installed Hook and Loop, as shown.



UNLESS OTHERWISE SPECIFIED:		TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES		DRAWN	KAMC	12/20/2021
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$				
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$				
MATERIAL/FINISH:	PROPRIETARY AND CONFIDENTIAL			
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.				
COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING				
SIZE		DWG. NO.	REV	
C		TE-22120		
SCALE: 1:8		SHEET 3 OF 3		

FIRST
ROBOTICS
COMPETITION

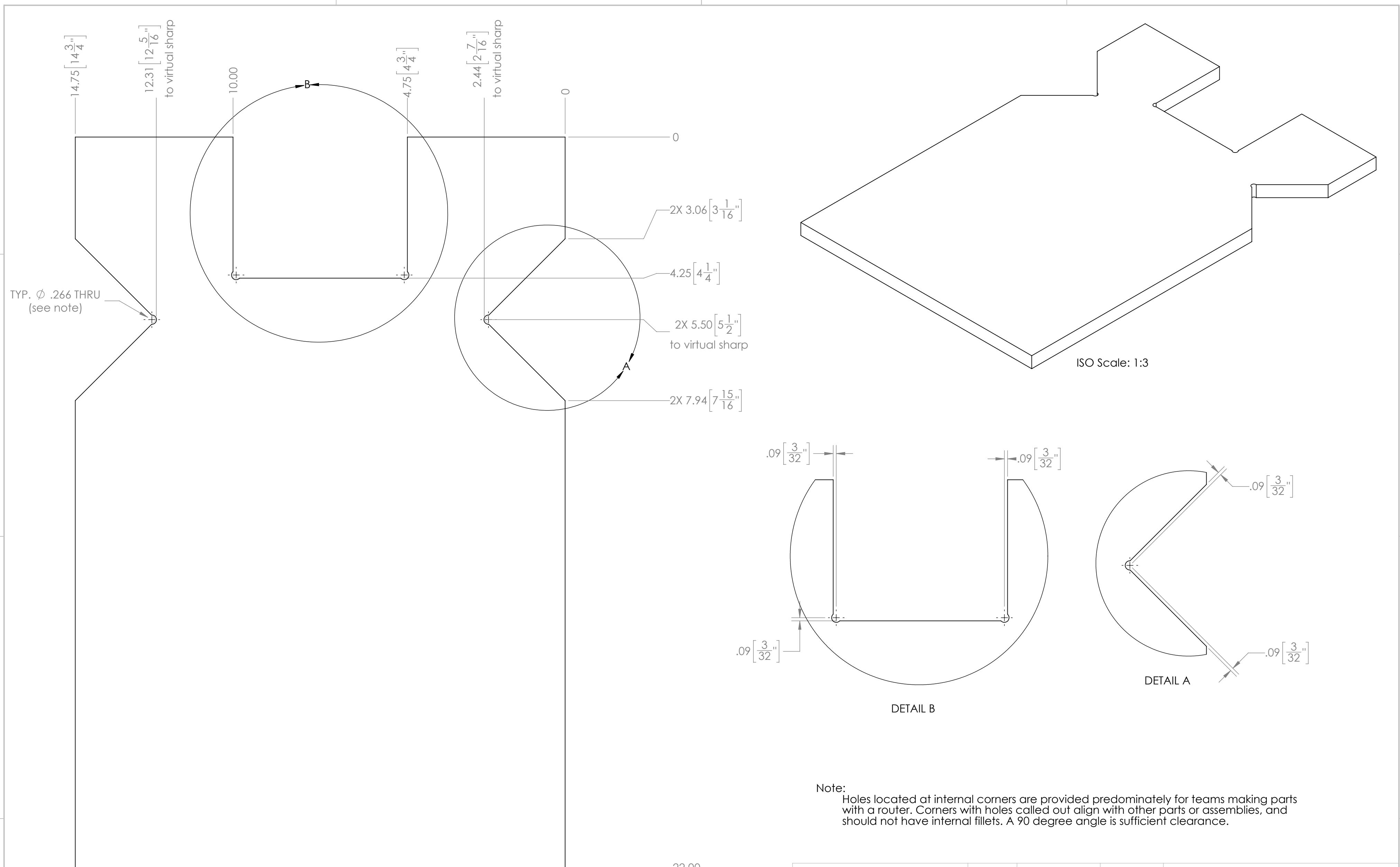
SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Lower Exit Assembly

SIZE DWG. NO. REV

C TE-22120

SCALE: 1:8 SHEET 3 OF 3



UNLESS OTHERWISE SPECIFIED:		TEAM	NAME	DATE
		DRAWN	KAMC	12/17/2021
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$		PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.		
MATERIAL/FINISH: 3/4" Plywood		COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.		
DO NOT SCALE DRAWING		TITLE: HUB - Complex Build - Lower Exit Bottom		
		SIZE	DWG. NO.	REV
		C	TE-22121	
		SCALE: 1:2		SHEET 1 OF 1

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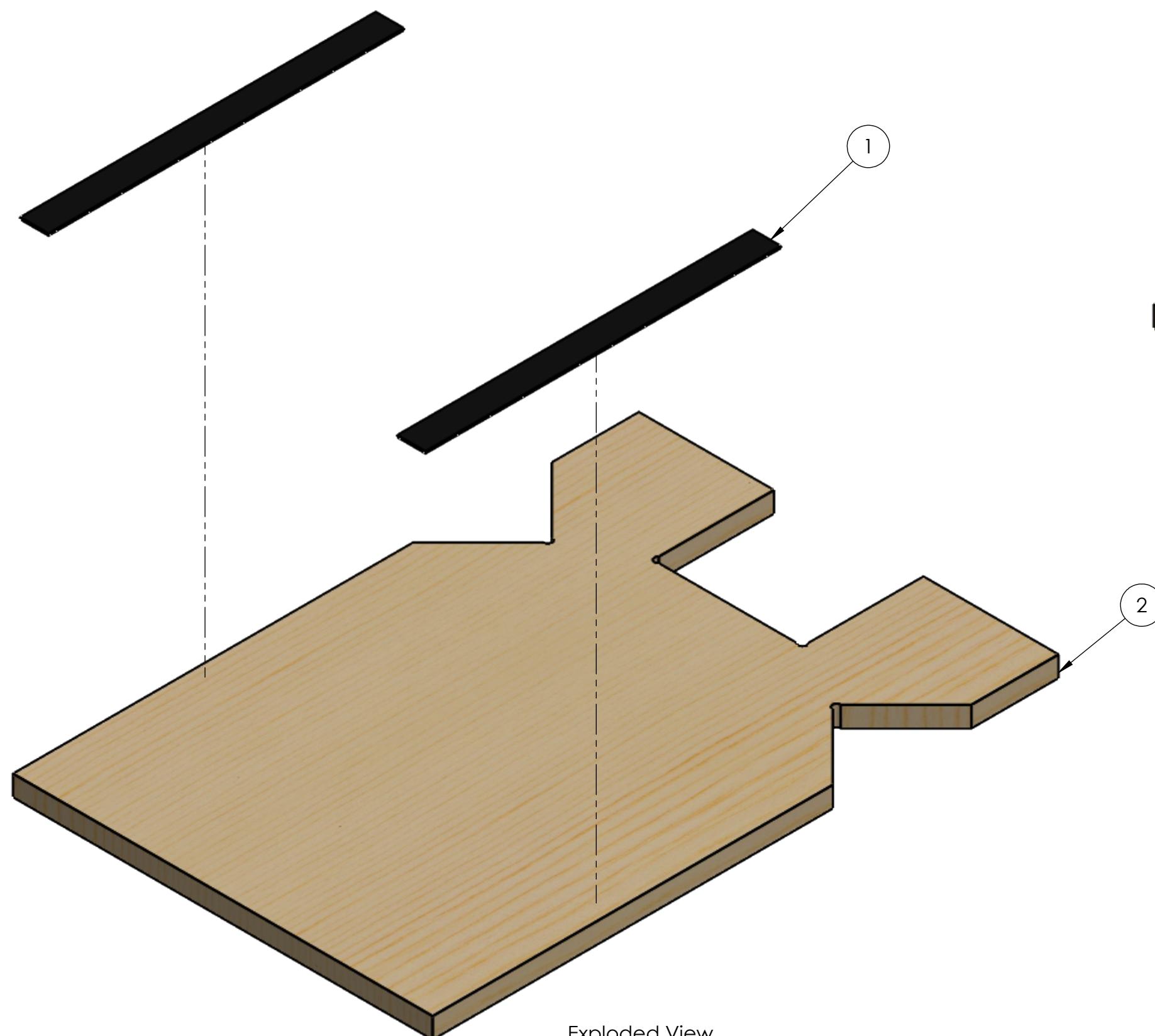
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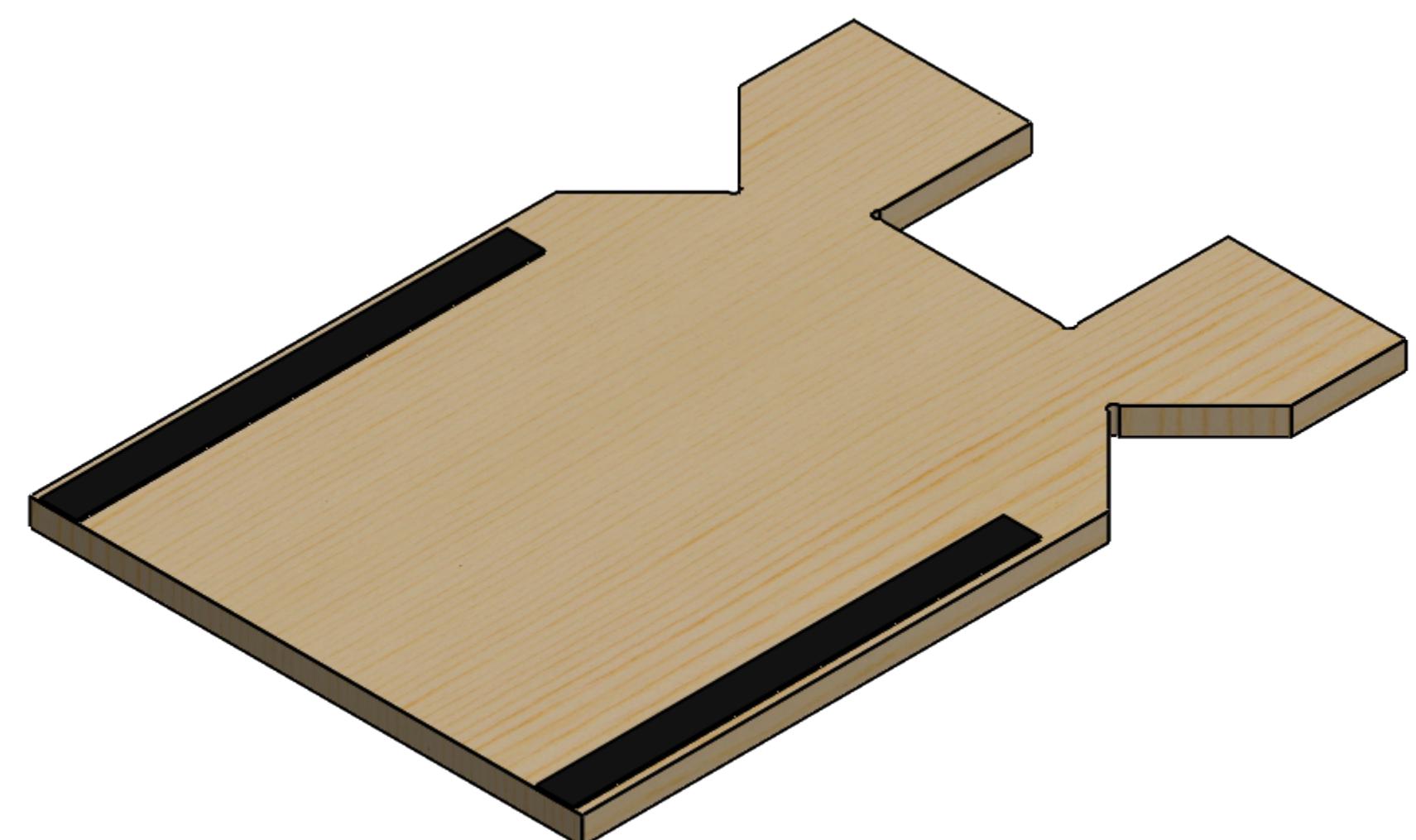
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Exploded View



Step 1

1. Attach (1) to (2) using adhesive backing. Align as shown on Sheet 2.
2. Optional: Use wood staples to connect (1) to (2).

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

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COMMENTS:
REMOVE ALL BURRS AND SHARP
EDGES.

DO NOT SCALE DRAWING

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Loop_1_12.5	1" x 12.5" Loop, Adhesive Backed	2
2	TE-22121	HUB - Complex Build - Lower Exit Bottom	1

Hardware Needed:
Optional: Wood Staples

TEAM NAME DATE
DRAWN KAMC 12/20/2021

FIRST ROBOTICS COMPETITION DS SOLIDWORKS
Modeling Solutions Partner

TITLE: HUB - Complex Build -
Lower Exit Bottom with
Loop Assembly

SIZE DWG. NO. REV
C TE-22122

SCALE: 1:3 SHEET 1 OF 2

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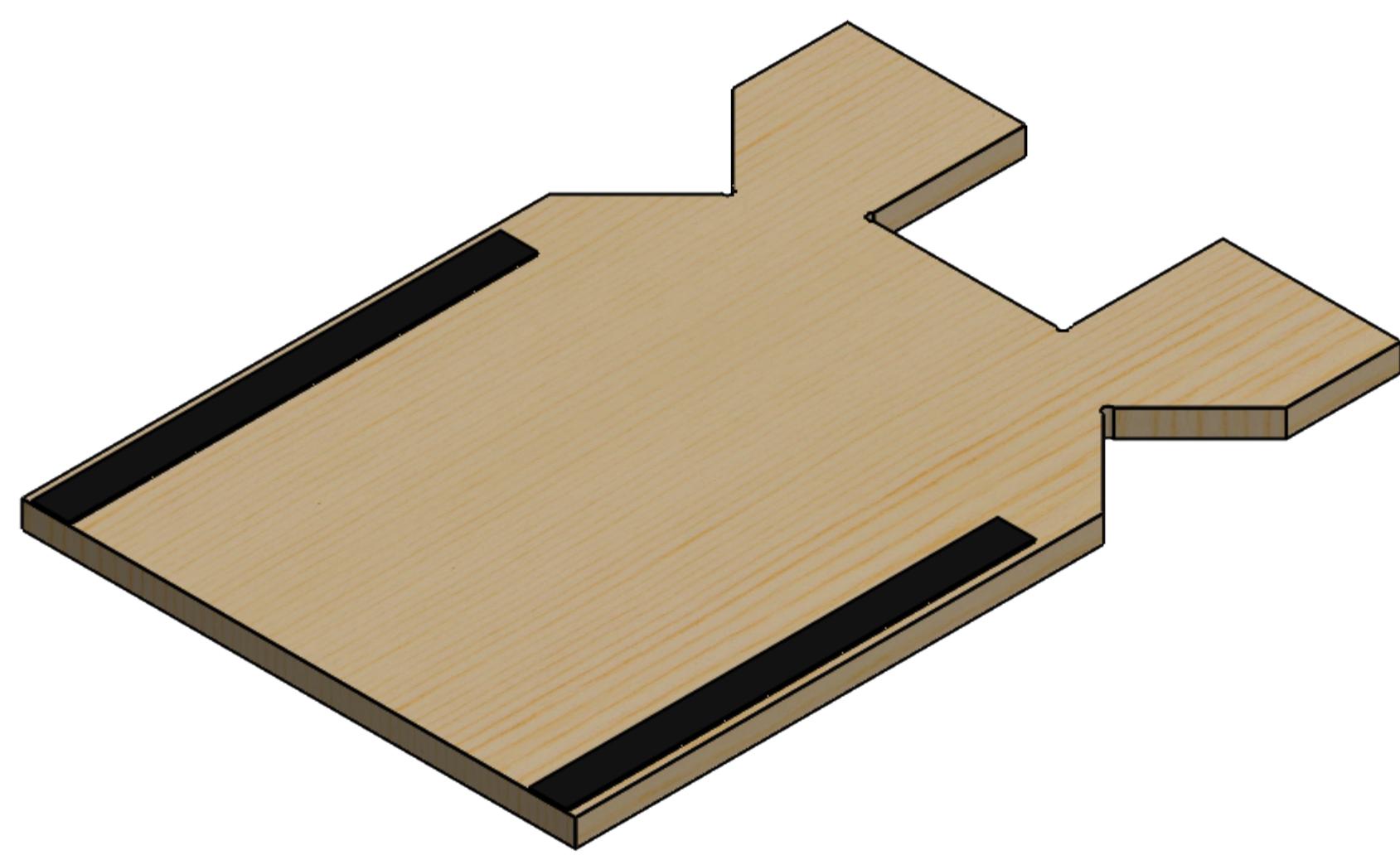
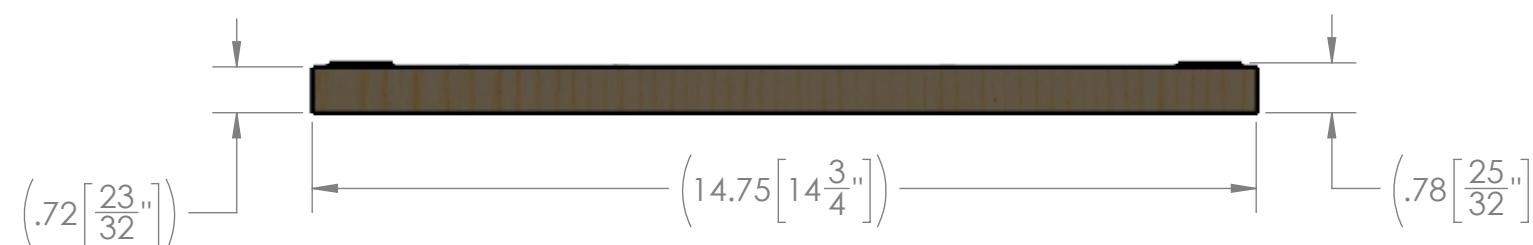
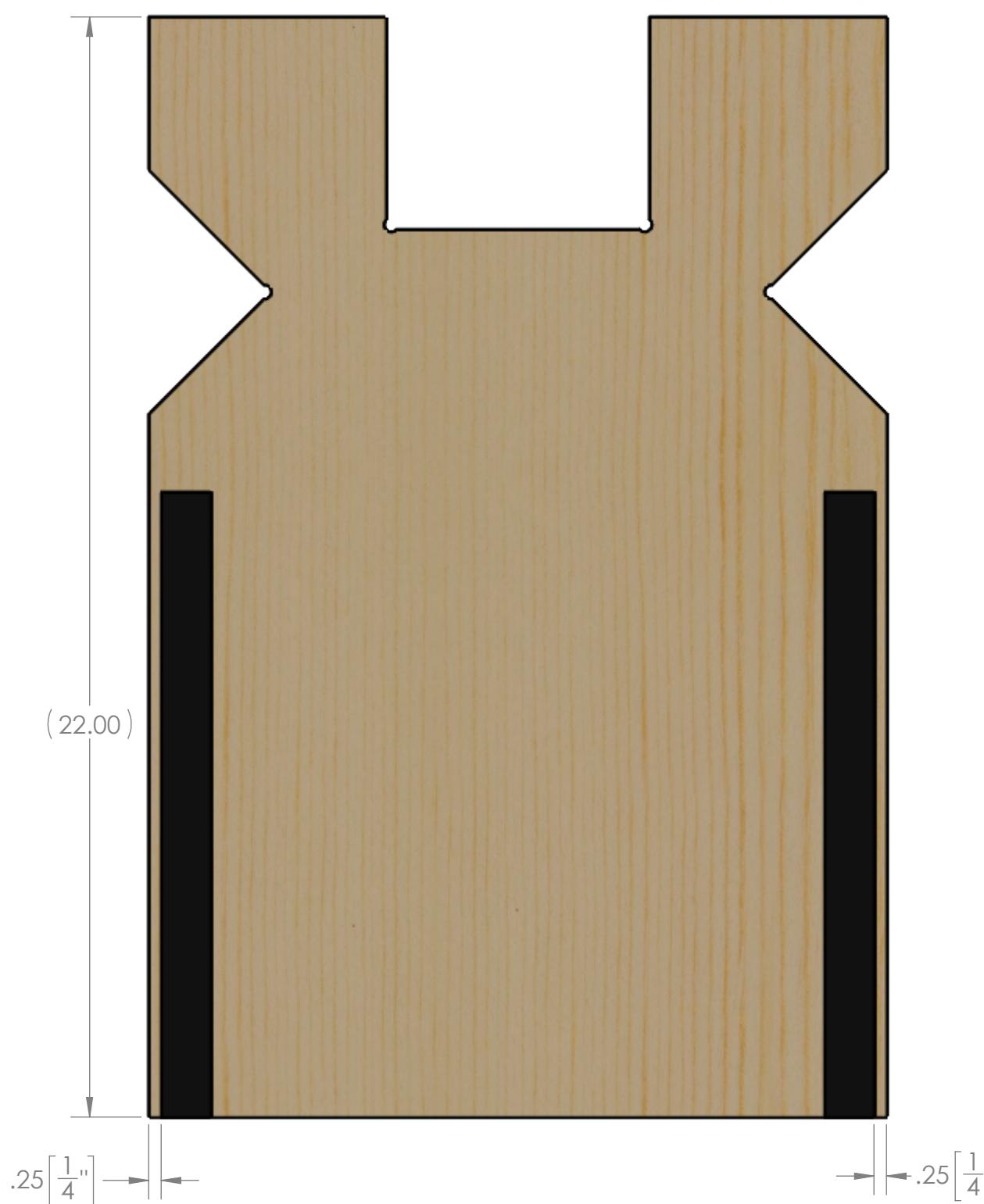
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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/20/2021



TITLE:

HUB - Complex Build -
Lower Exit Bottom with
Loop Assembly

SIZE DWG. NO. REV

C TE-22122

SCALE: 1:3 SHEET 2 OF 2

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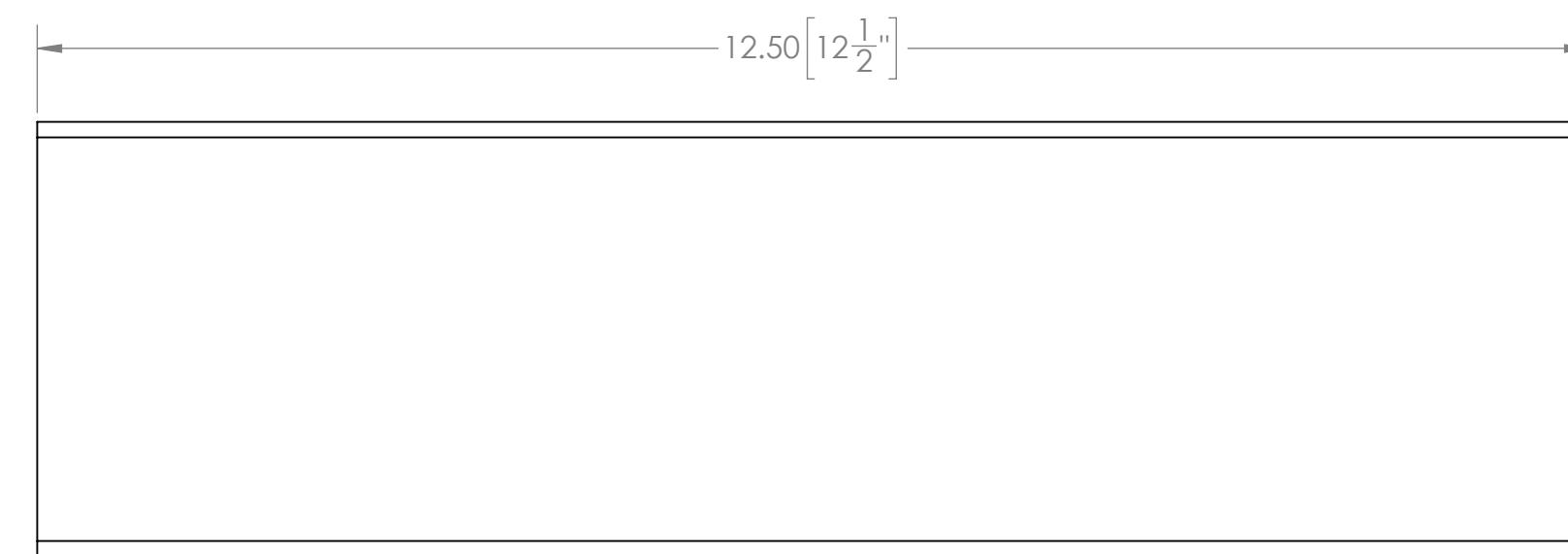
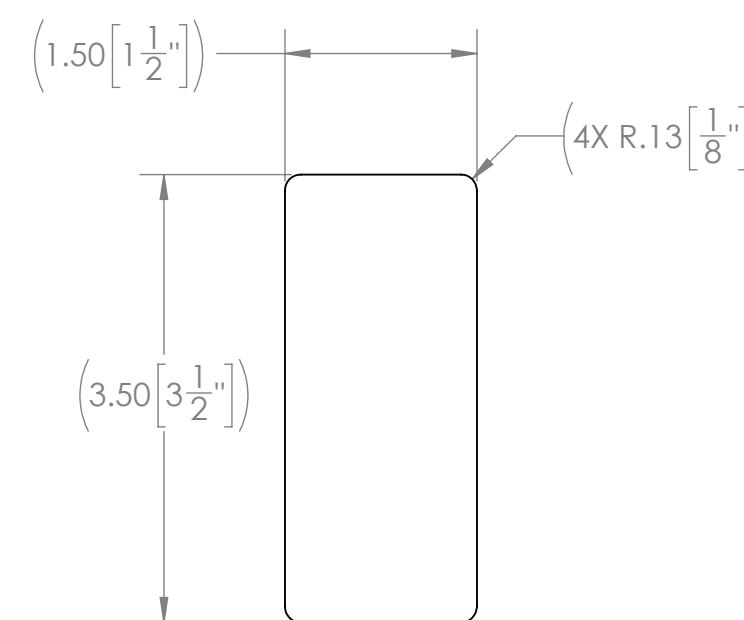
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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:
2" x 4" Lumber

DO NOT SCALE DRAWING

TEAM NAME DATE
DRAWN KAMC 12/17/2021

FIRST ROBOTICS COMPETITION
SOLIDWORKS Modeling Solutions Partner

TITLE: HUB - Complex Build -
Lower Exit Removable
Edge 2x4
SIZE DWG. NO. REV
C TE-22123

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PROHIBITED.

COMMENTS:
REMOVE ALL BURRS AND SHARP
EDGES.

SCALE: 2:3 SHEET 1 OF 1

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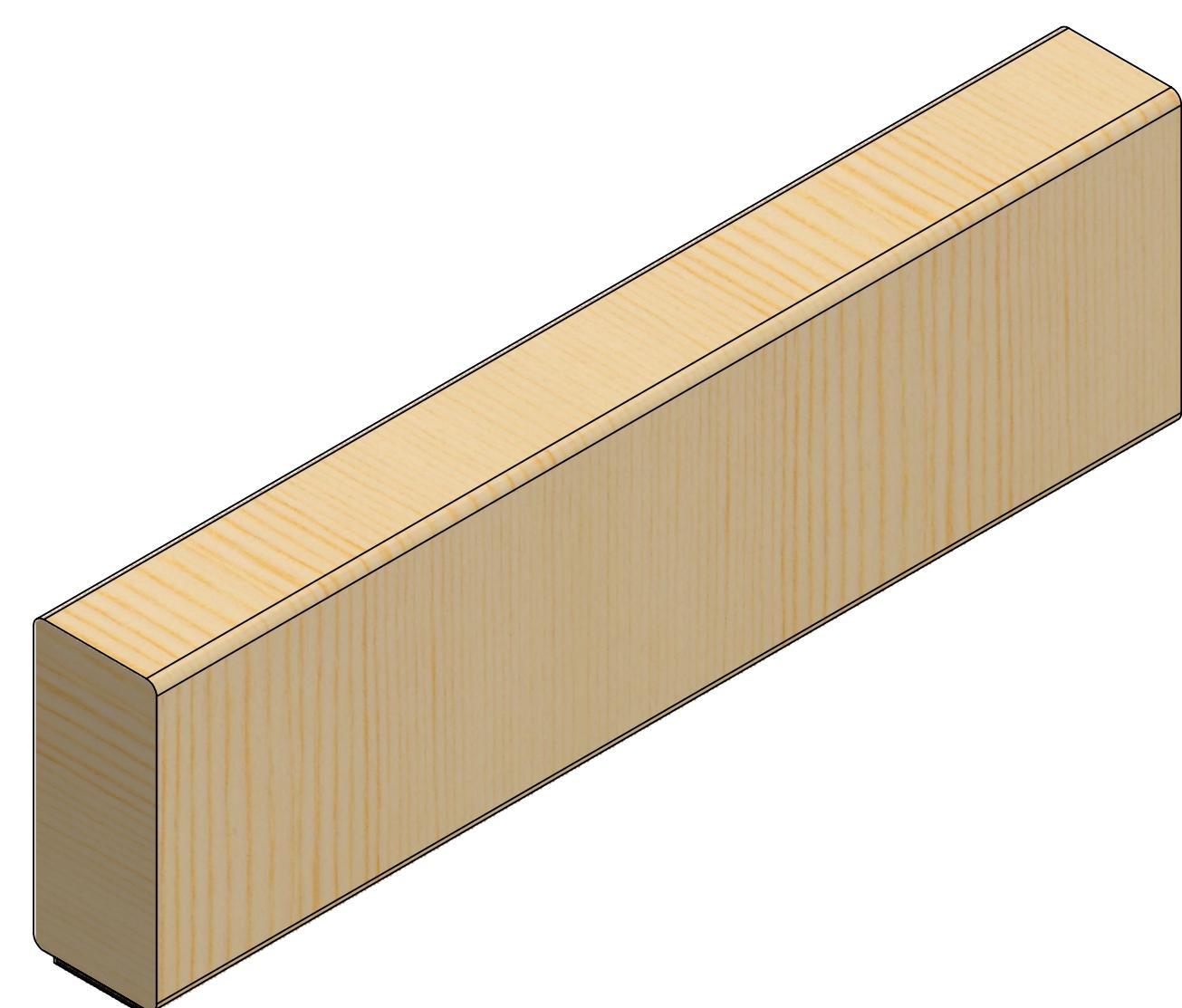
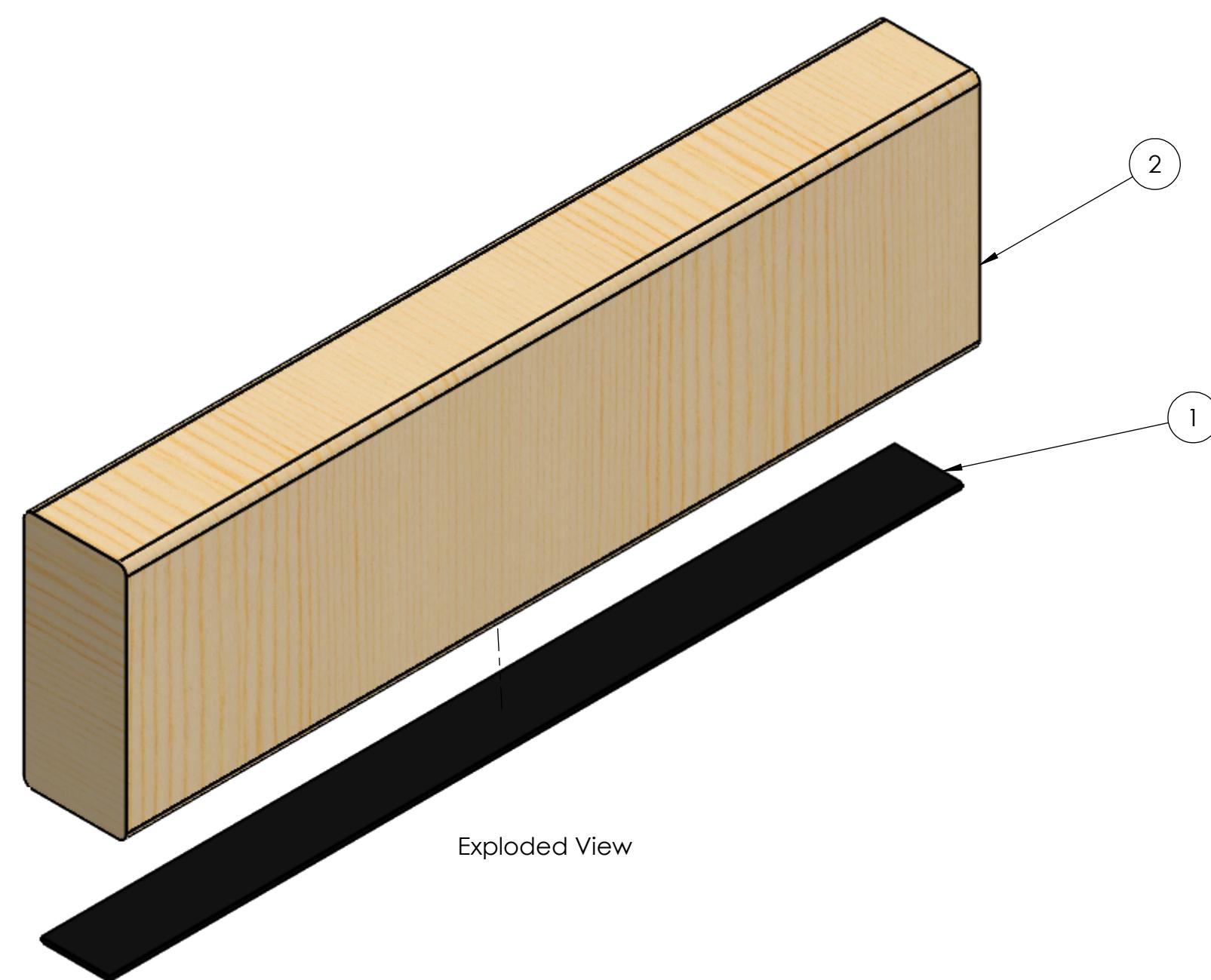
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Hardware Needed:
Optional: Wood Staples

Step 1

1. Attach (1) to (2) as shown using adhesive backing.
2. Optional: Use wood staples to connect (1) to (2).

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Hook_1_12.5	1" x 12.5" Hook, Adhesive Backed	1
2	TE-22123	HUB - Complex Build - Lower Exit Removable Edge 2x4	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

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COMMENTS:
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DO NOT SCALE DRAWING

TEAM NAME DATE
DRAWN KAMC 12/17/2021

FIRST ROBOTICS COMPETITION DS SOLIDWORKS
Modeling Solutions Partner

TITLE: HUB - Complex Build - Lower Exit Removable Edge with Hook Assembly

SIZE DWG. NO. REV

C TE-22124

SCALE: 2:3 SHEET 1 OF 2

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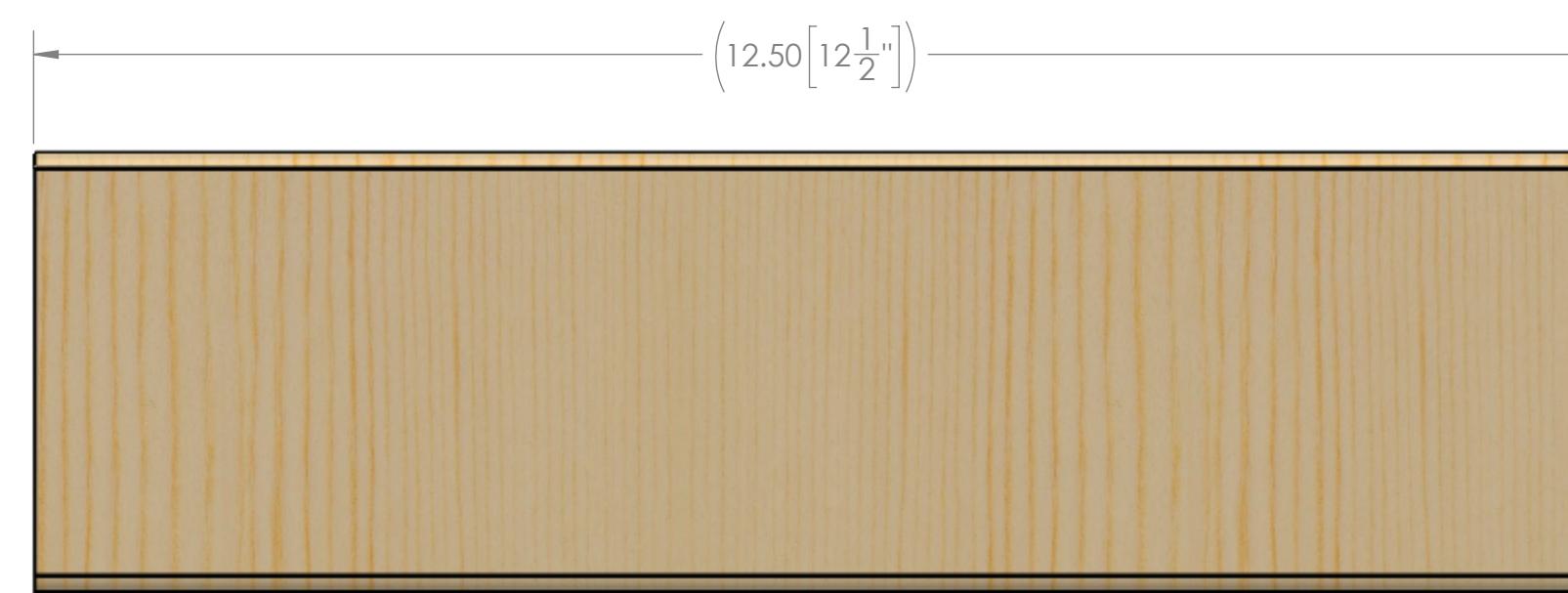
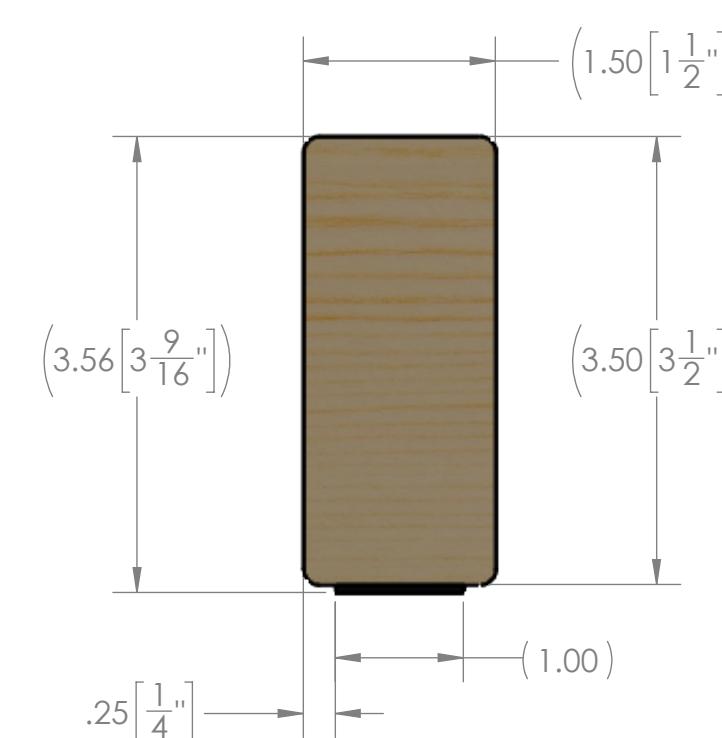
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
	C	TE-22124	
COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.		
DO NOT SCALE DRAWING	SCALE: 2:3	SHEET 2 OF 2	

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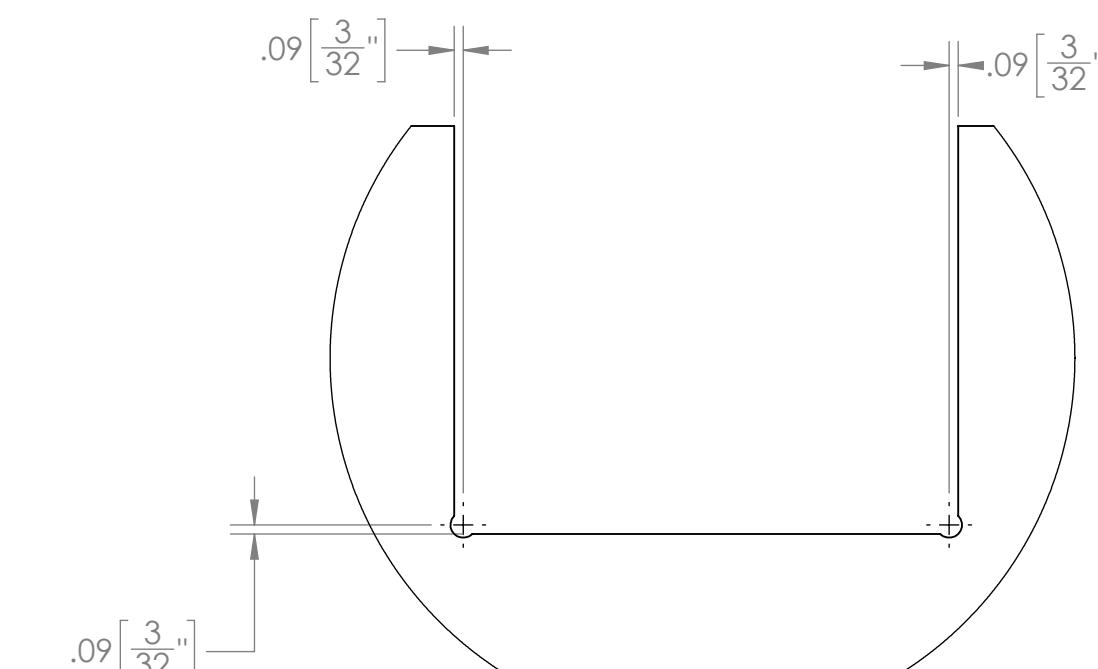
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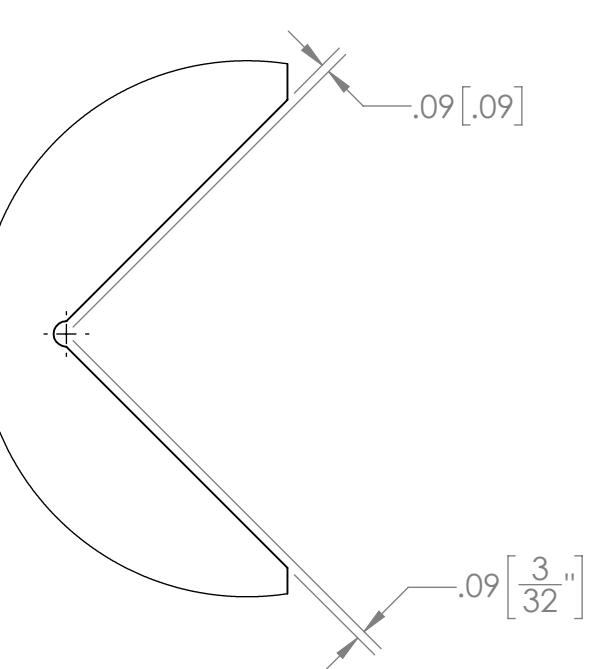
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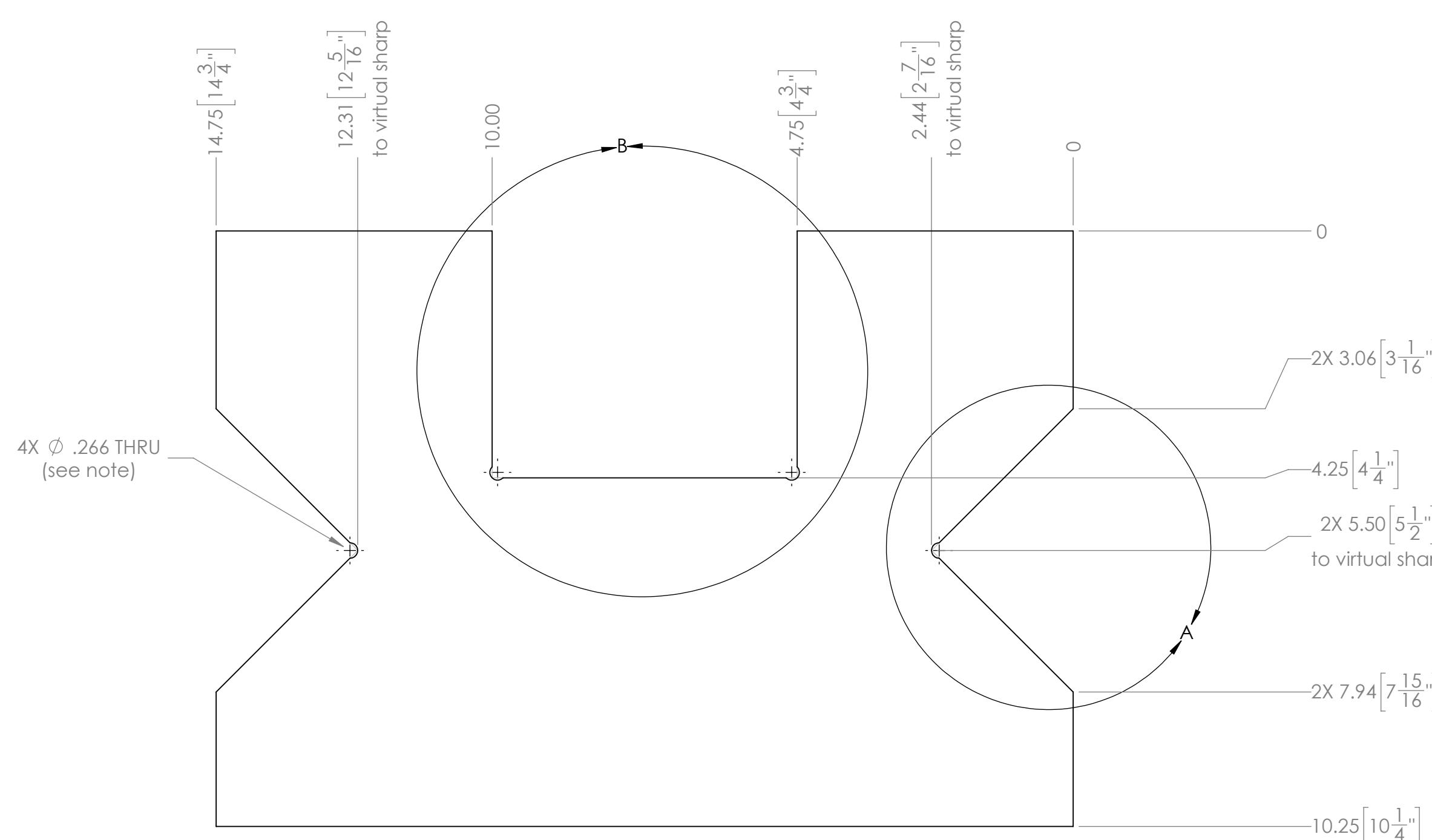
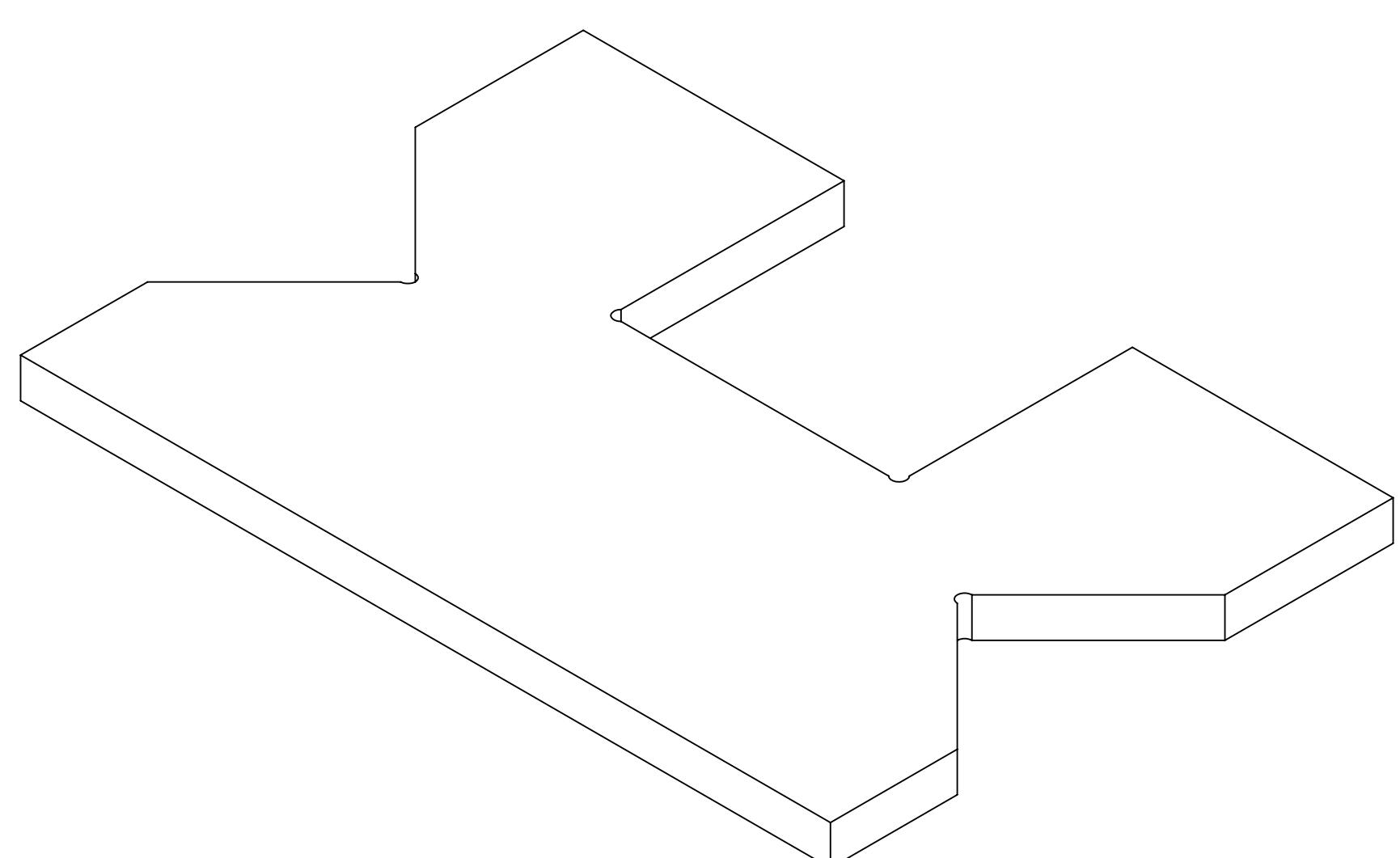
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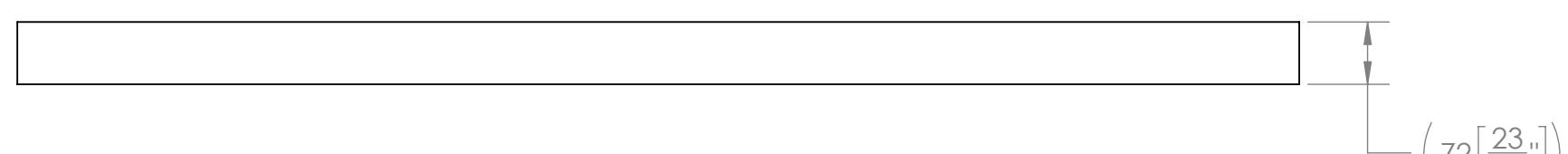
DETAIL B



DETAIL A



Note:
Holes located at internal corners are provided predominately for teams
making parts with a router. Corners with holes called out align with other
parts or assemblies, and should not have internal fillets. A 90 degree angle is
sufficient clearance.



UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	KAMC	12/17/2021
TOLERANCES:			
FRACTIONAL $\pm 1/16$			
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$			
TWO PLACE DECIMAL $\pm .13$			
THREE PLACE DECIMAL $\pm .125$			
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:			
3/4" Plywood			
COMMENTS:			
REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

 **FIRST**
ROBOTICS
COMPETITION  **SOLIDWORKS**
Modeling Solutions Partner

TITLE:
HUB - Complex Build - Lower Exit Top

SIZE DWG. NO. REV

C TE-22125

SCALE: 1:2 SHEET 1 OF 1

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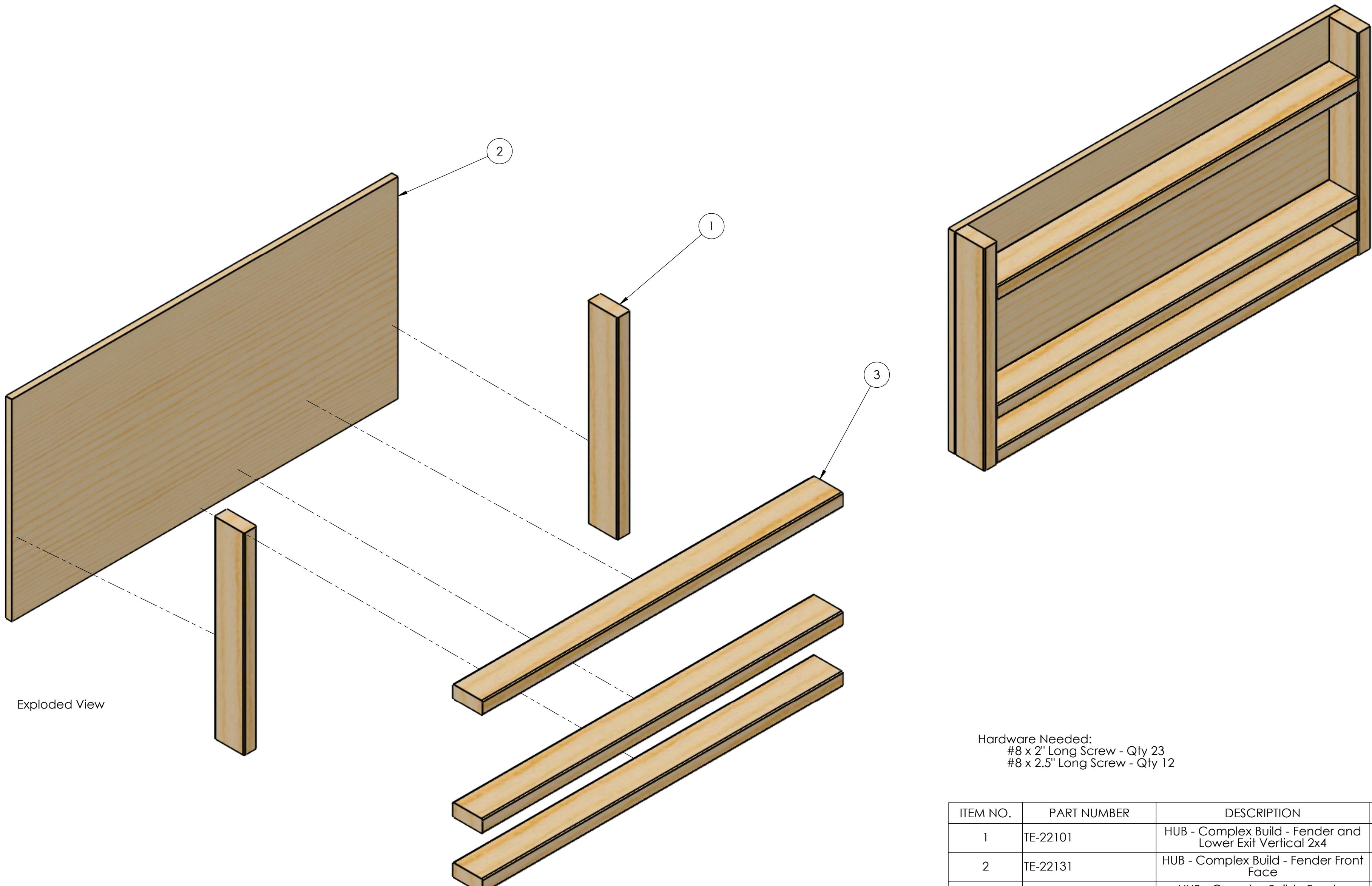
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Hardware Needed:
 #8 x 2" Long Screw - Qty 23
 #8 x 2.5" Long Screw - Qty 12

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22101	HUB - Complex Build - Fender and Lower Exit Vertical 2x4	2
2	TE-22131	HUB - Complex Build - Fender Front Face	1
3	TE-22132	HUB - Complex Build - Fender Horizontal 2x4	3

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			DRAWN	KAMC	12/20/2021
PROPRIETARY AND CONFIDENTIAL					
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COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.					
SIZE	DWG. NO.	REV			
C	TE-22130				
SCALE: 1:6			SHEET 1 OF 3		

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

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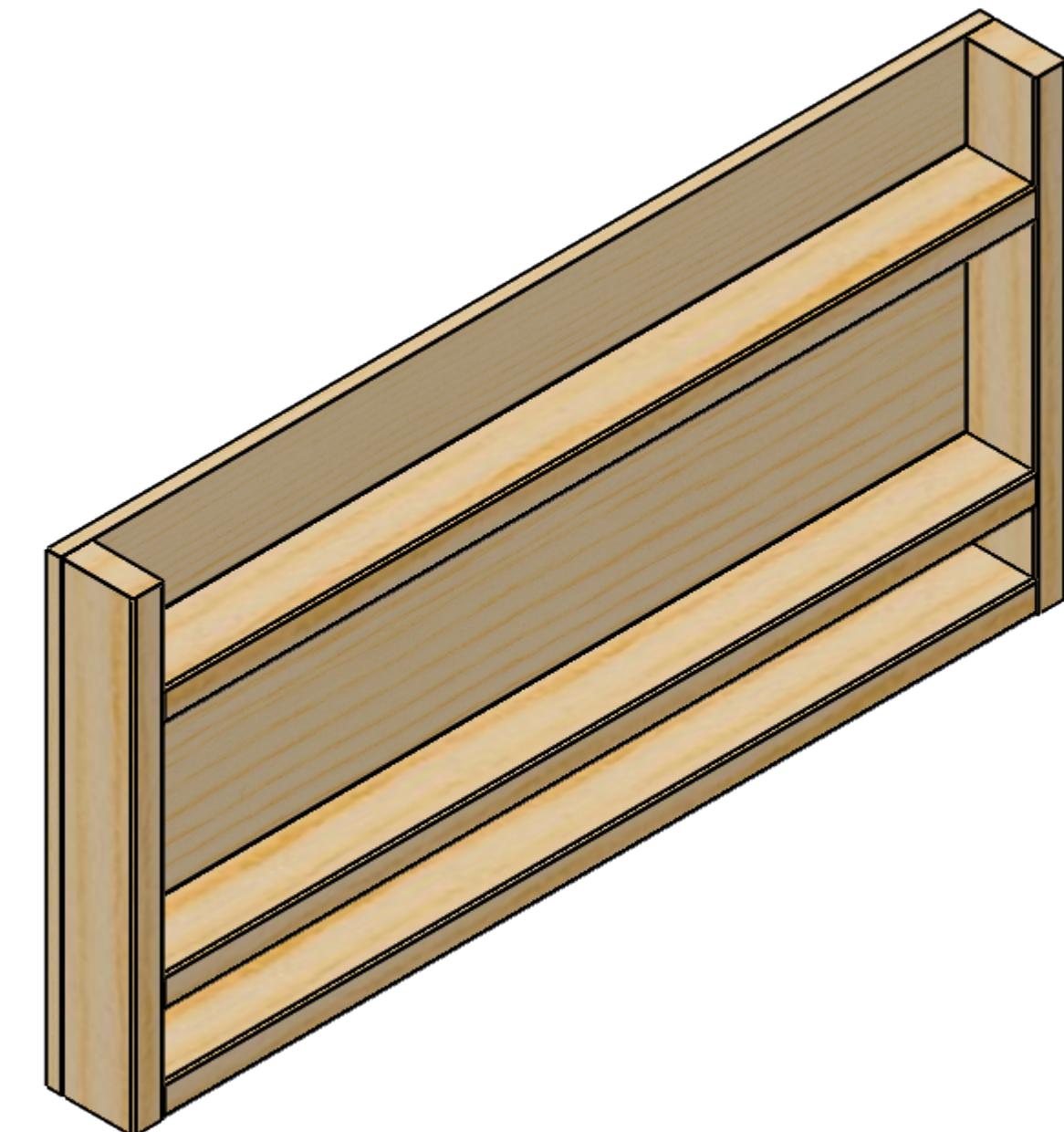
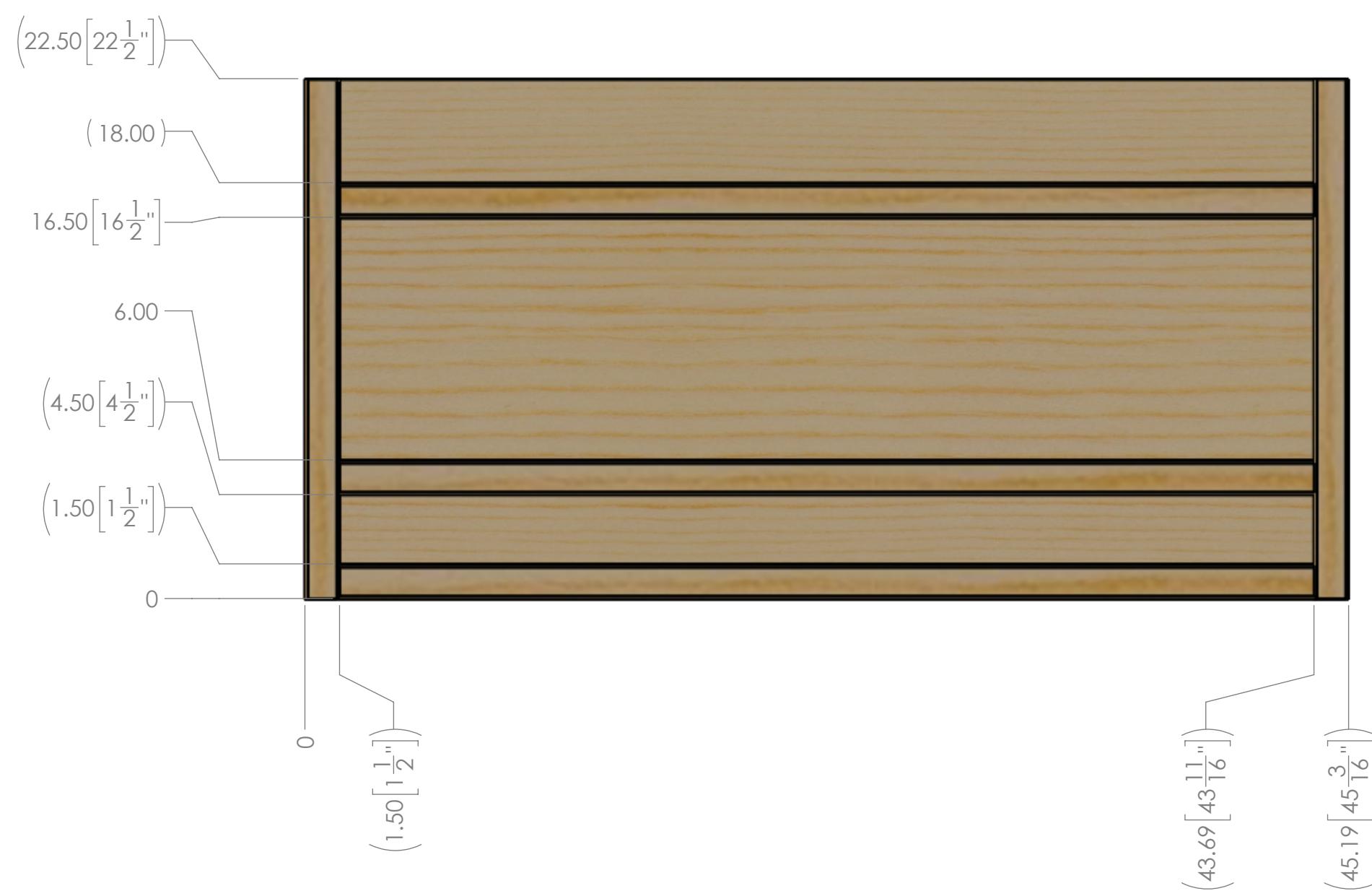
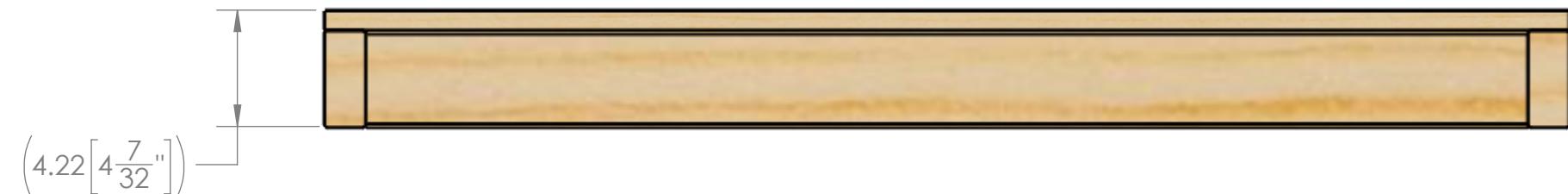
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PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Fender Face Assembly

SIZE DWG. NO. REV
C TE-22130

SCALE: 1:6 SHEET 2 OF 3

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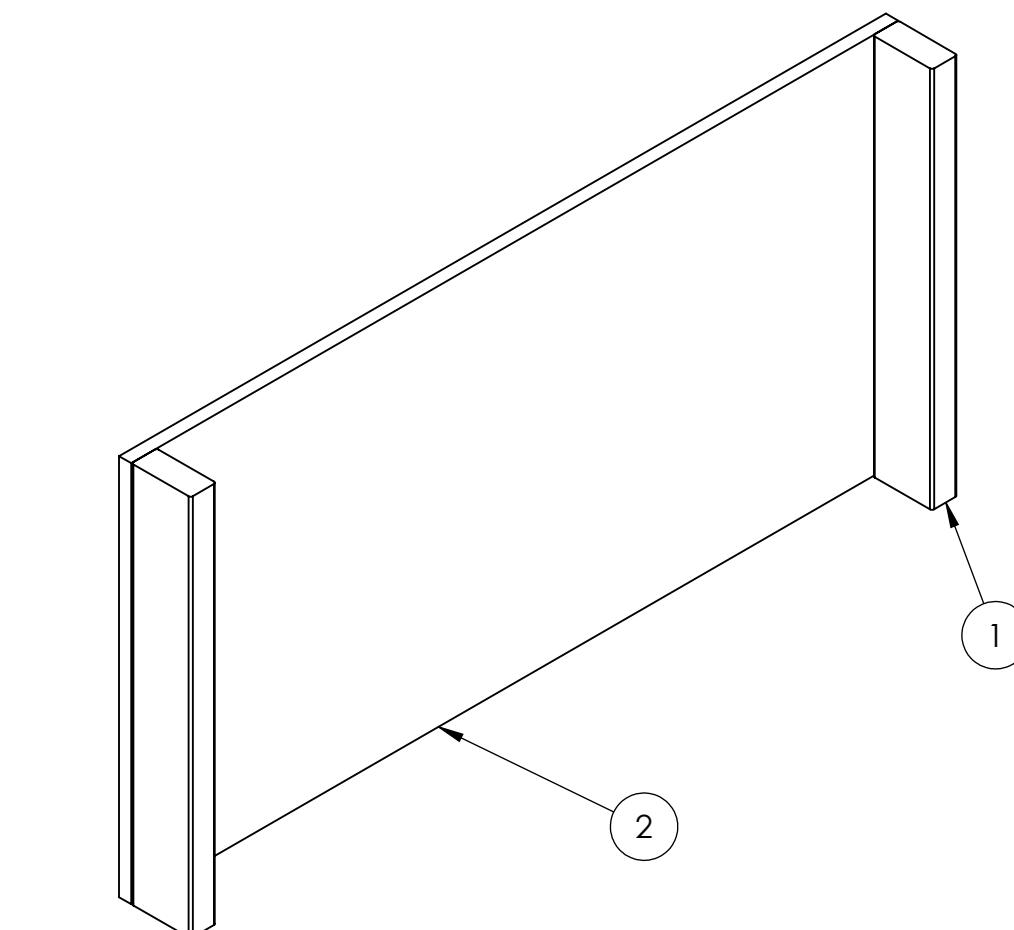
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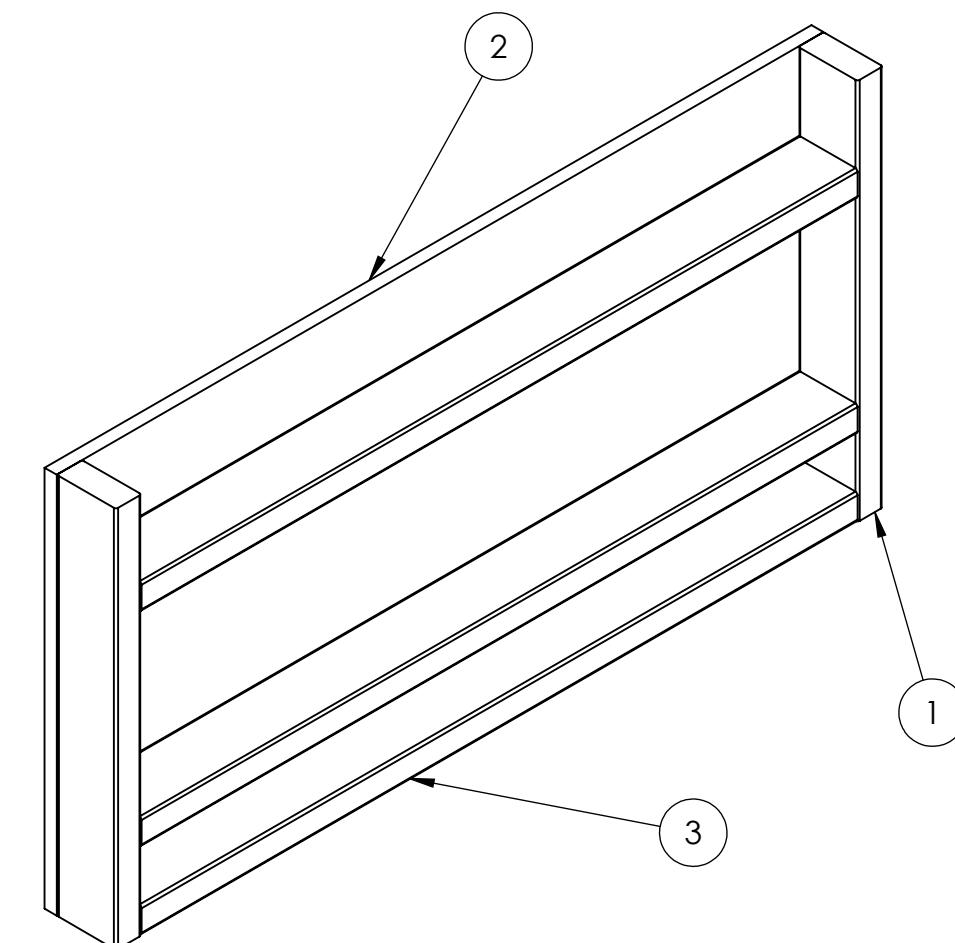
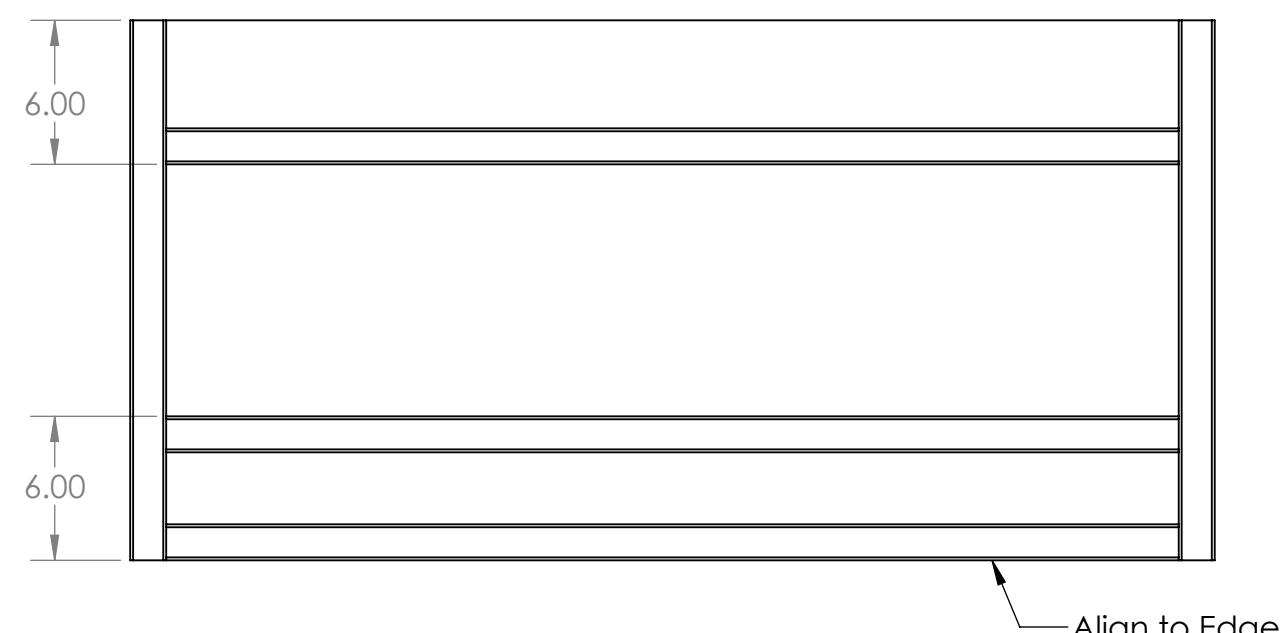
Step 1

1. Align 2x (1) to the edges of (2), as shown.
2. Connect using 2" long screws. It is recommended to use 4x screws into each (1).



Step 2

1. Align 3x (3) between both (1), and position on (2) as shown. If needed, trim (3) to ensure fit.
2. Secure each (3) to (1) using 2.5" long screws. It is recommended to use 2x screws into each end of (3).
3. Secure (3) to (2) using 2" long screws. It is recommended to use 5x screws into each (3).



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DRAWN	KAMC	12/20/2021	
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
	C	TE-22130	
COMMENTS:		SCALE: 1:8	
REMOVE ALL BURRS AND SHARP EDGES.		SHEET 3 OF 3	
DO NOT SCALE DRAWING			

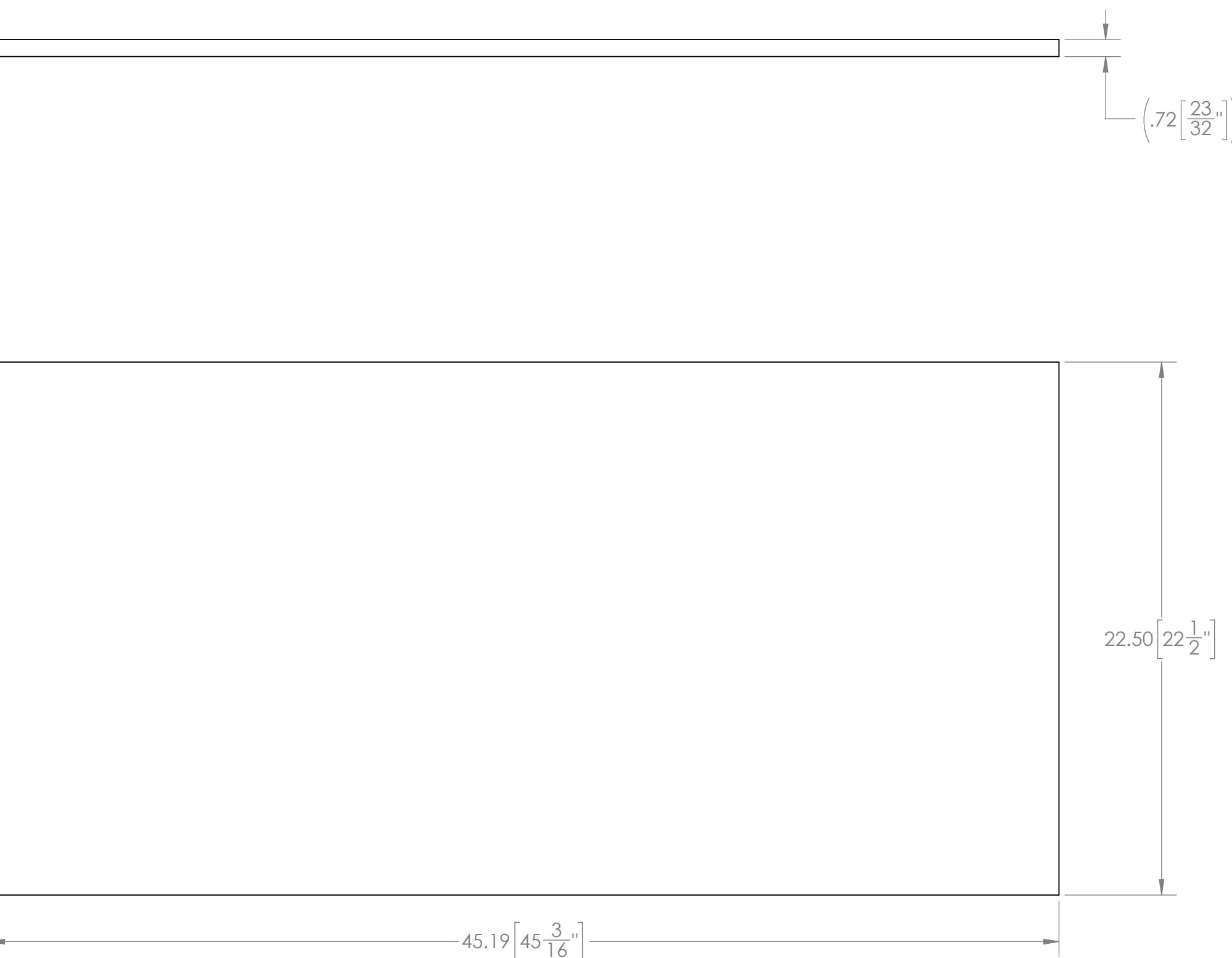
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/20/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
3/4" Plywood	C	TE-22131	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SCALE: 1:5	SHEET 1 OF 1	

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 **FIRST
ROBOTICS
COMPETITION**  **SOLIDWORKS**
Modeling Solutions Partner

TITLE:
**HUB - Complex Build -
Fender Front Face**

SIZE DWG. NO. REV
C TE-22131

SCALE: 1:5 SHEET 1 OF 1

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$42.19^{+.00}_{-.06} [42\frac{3}{16}^{+0}_{-1/16}]$

(4X R.13 [$\frac{1}{8}$])

(3.50 [$3\frac{1}{2}$ '])

(1.50 [$1\frac{1}{2}$ '])

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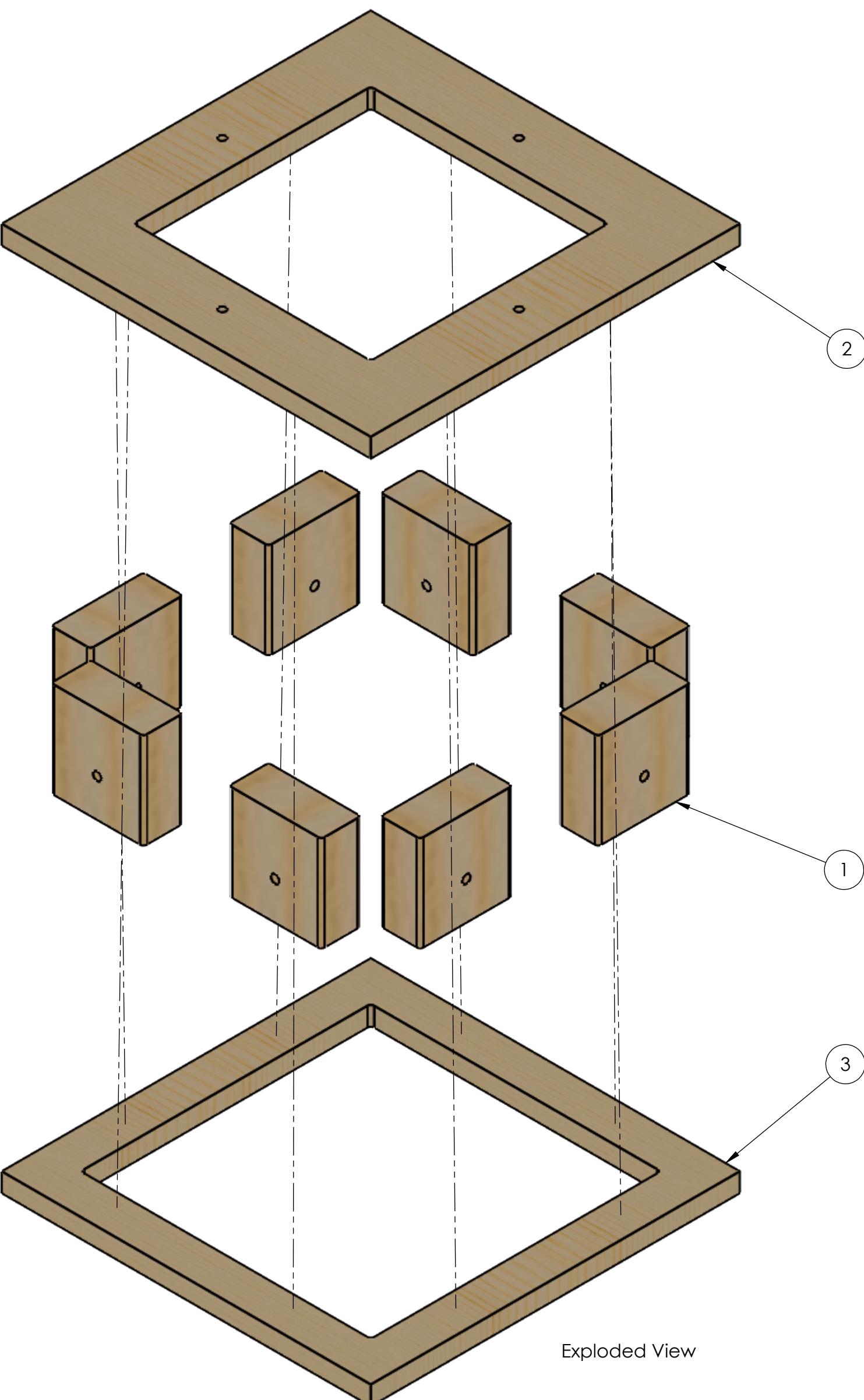
UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/20/2021	
PROPRIETARY AND CONFIDENTIAL			
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST®. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST® IS PROHIBITED.			
MATERIAL/FINISH:	SIZE	DWG. NO.	REV
2" x 4" Lumber	C	TE-22132	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SCALE: 1:4	SHEET 1 OF 1	

4

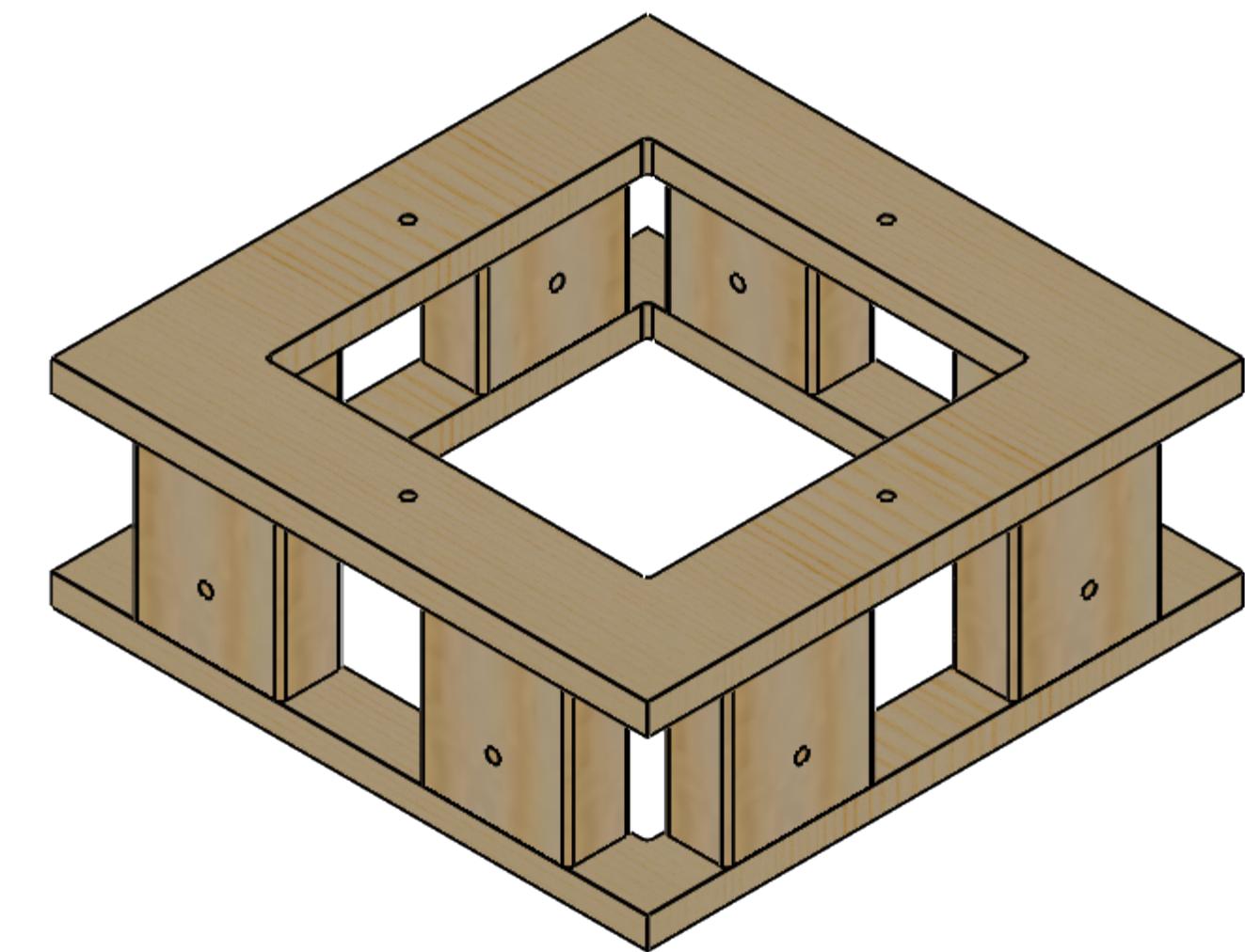
3

2

1



Exploded View



Note:
Use TE-22140 if NOT pairing with AndyMark Upper Hub (AM-4671).

Hardware Needed:
#8 x 2" Long Screw - Qty 32

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22141-AM	HUB - Complex Build - Connection Box 2x4 for AndyMark Upper Hub (AM-4671)	8
2	TE-22142	HUB - Complex Build - Connection Box Top	1
3	TE-22143	HUB - Complex Build - Connection Box Bottom	1

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			DRAWN	KAMC	12/20/2021
PROPRIETARY AND CONFIDENTIAL					
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COMMENTS:					
REMOVE ALL BURRS AND SHARP EDGES.					
DO NOT SCALE DRAWING					
			SOLIDWORKS	Modeling Solutions Partner	
			FIRST	ROBOTICS	COMPETITION
TITLE: HUB - Complex Build - Connection Box Assembly for AndyMark Upper Hub (AM-4671)					
SIZE	DWG. NO.	REV			
C	TE-22140-AM				
SCALE: 1:3			SHEET 1 OF 3		

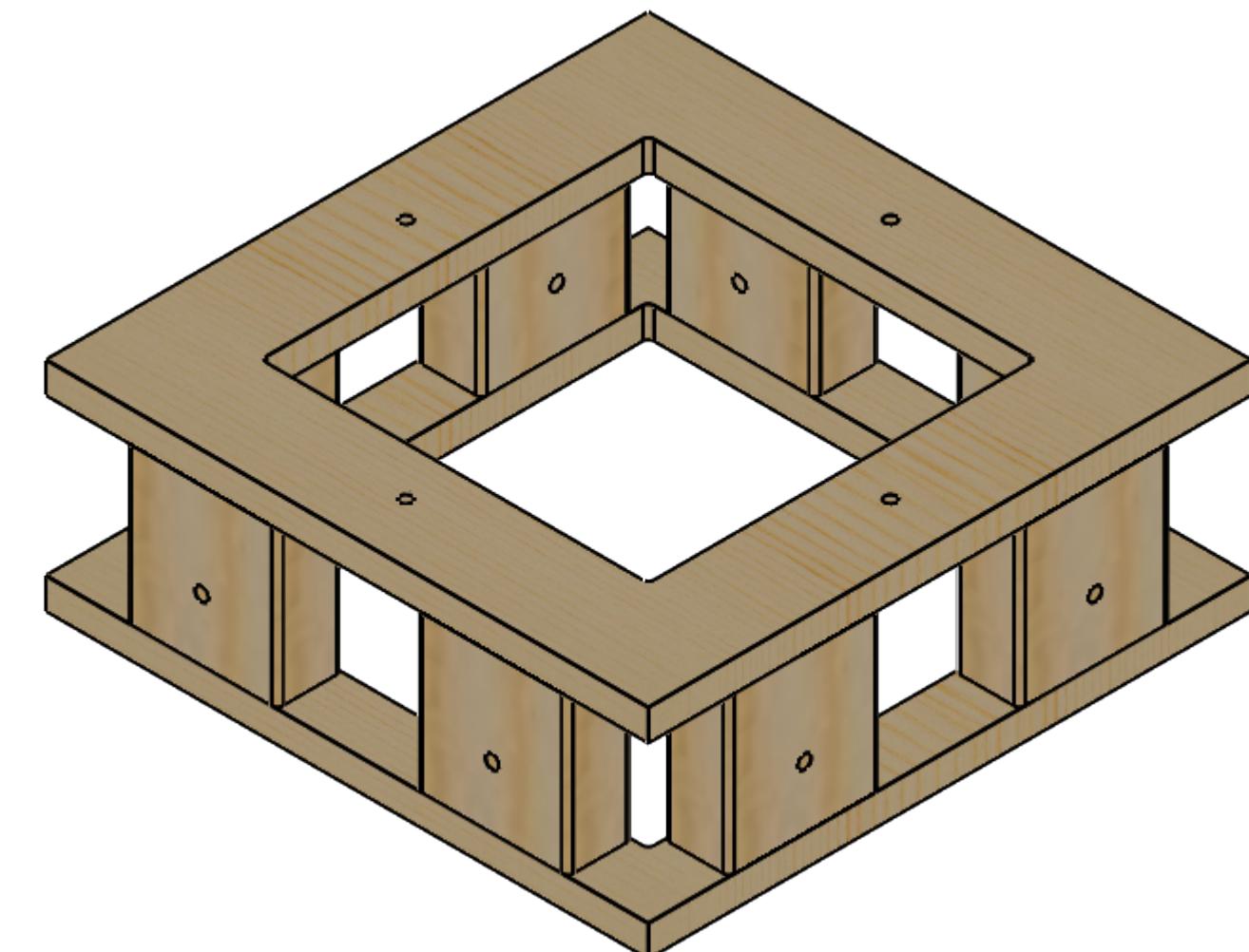
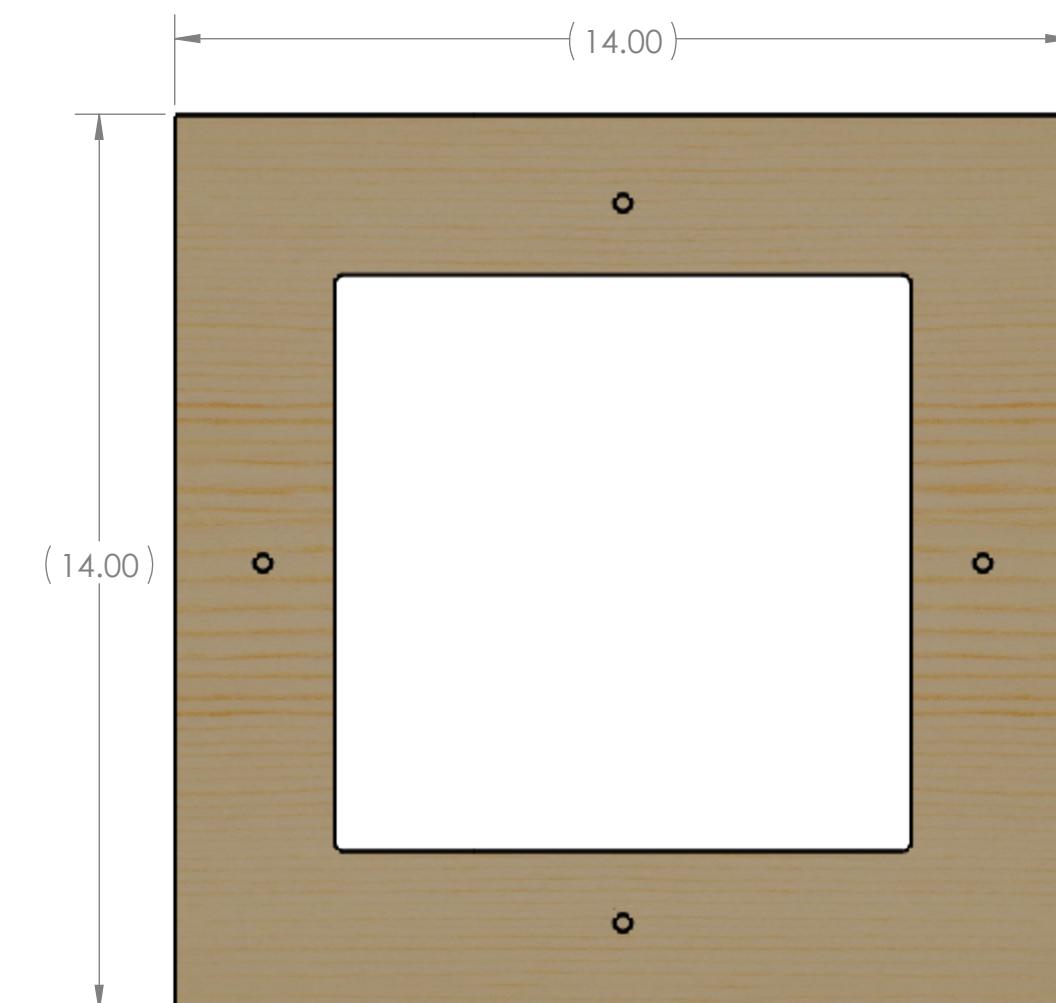
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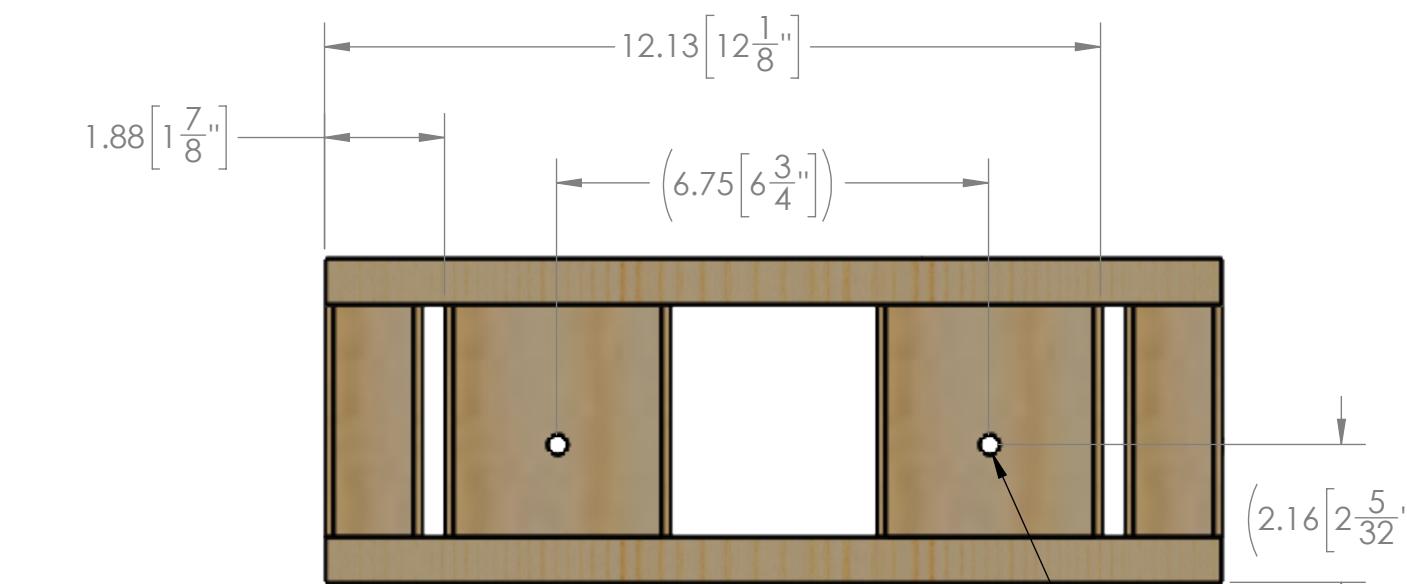
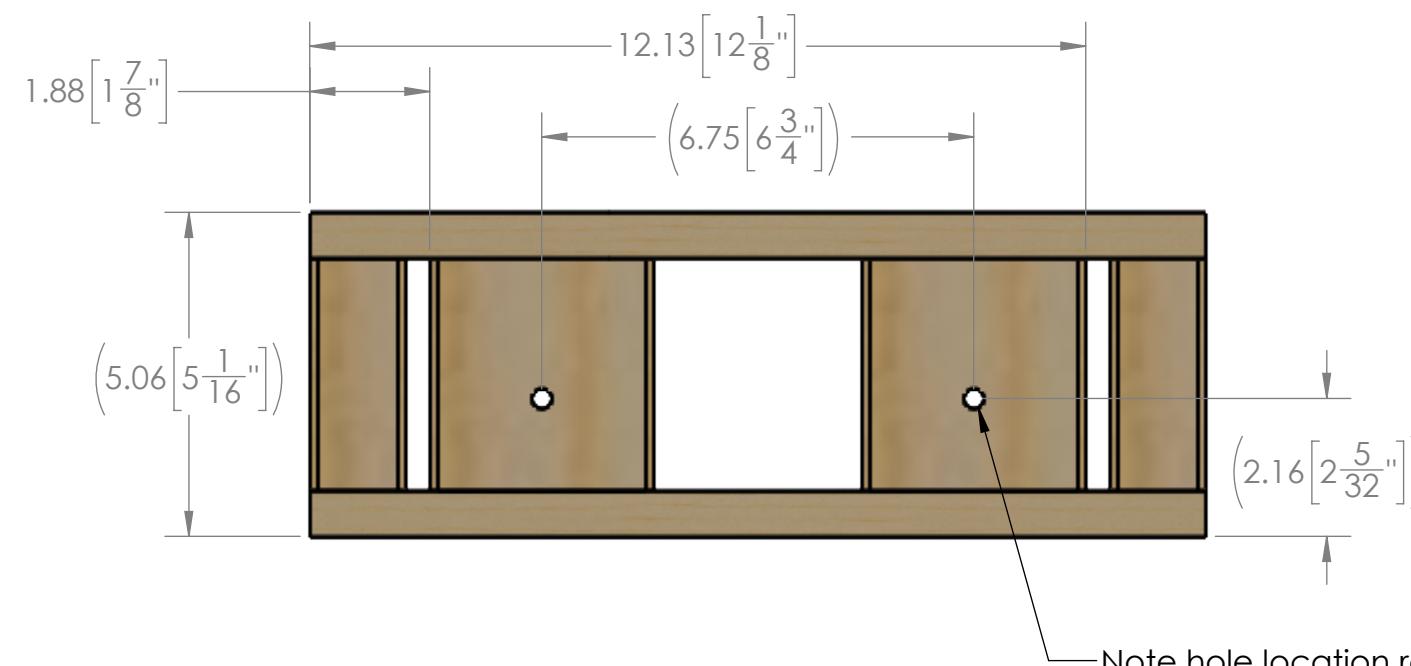
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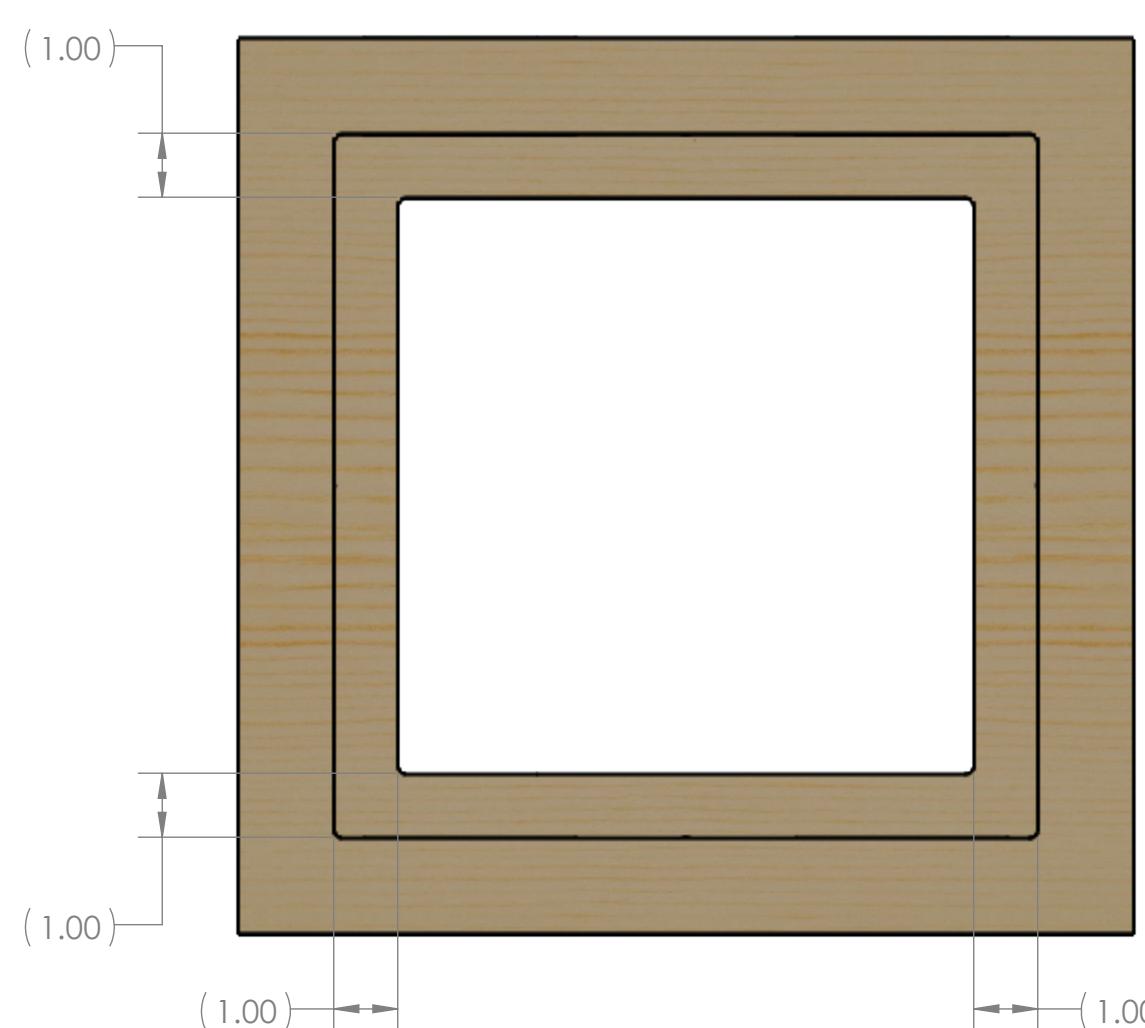
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/20/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Connection Box Assembly
for AndyMark Upper Hub
(AM-4671)

SIZE DWG. NO. REV

C TE-22140-AM

SCALE: 1:3 SHEET 2 OF 3

4

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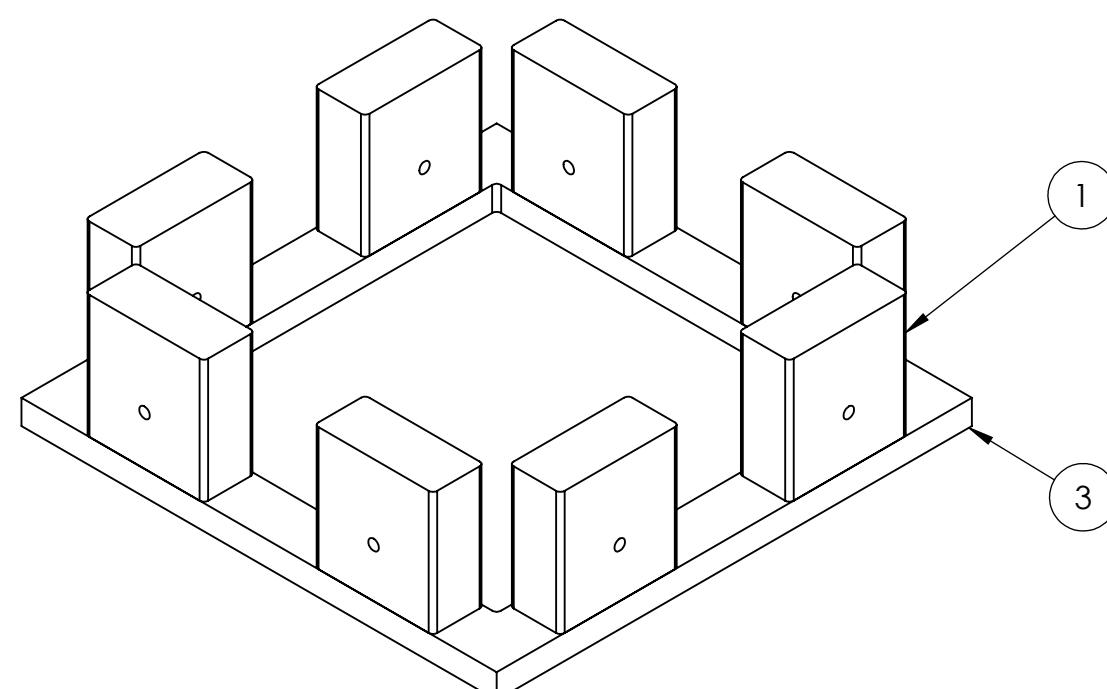
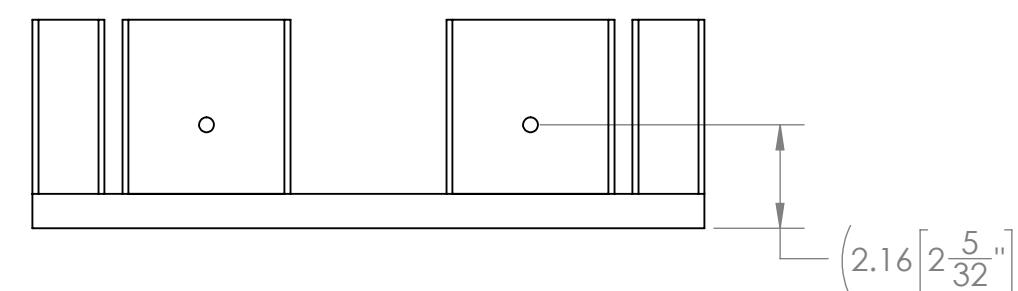
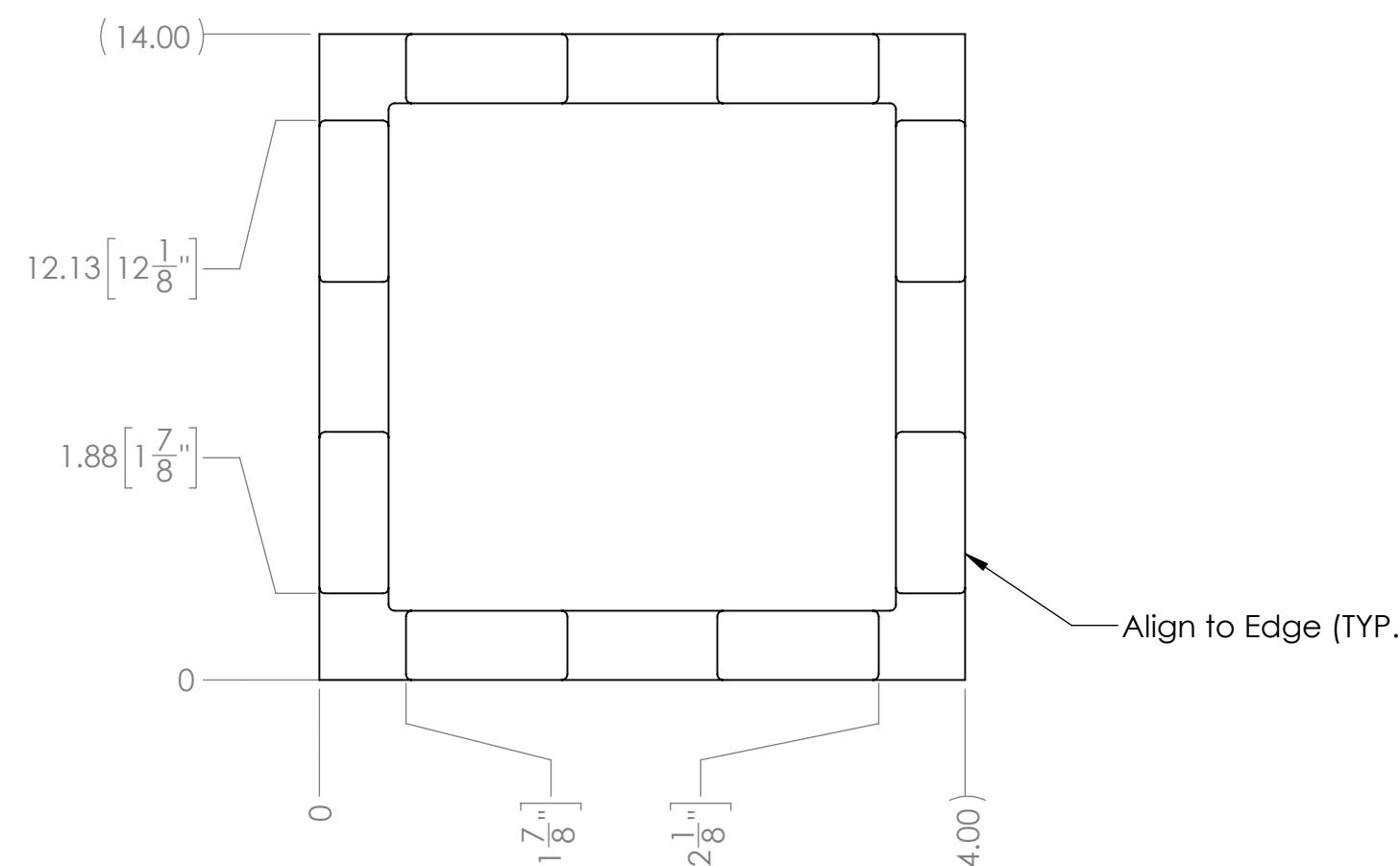
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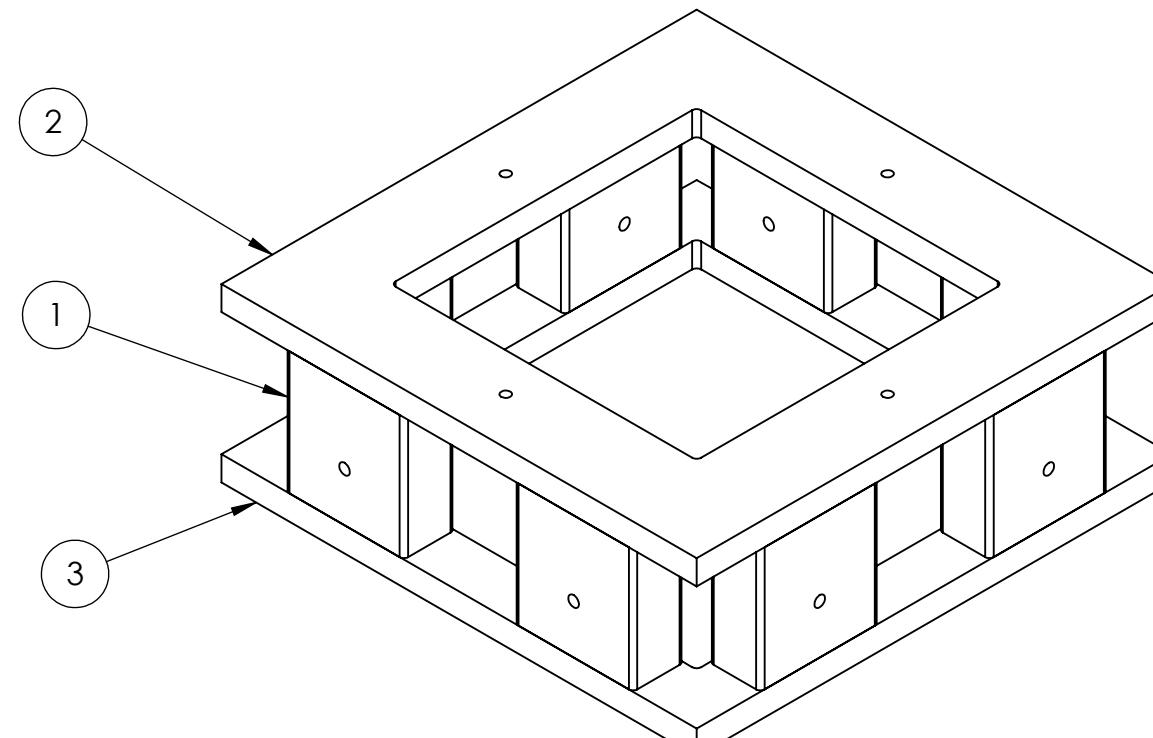
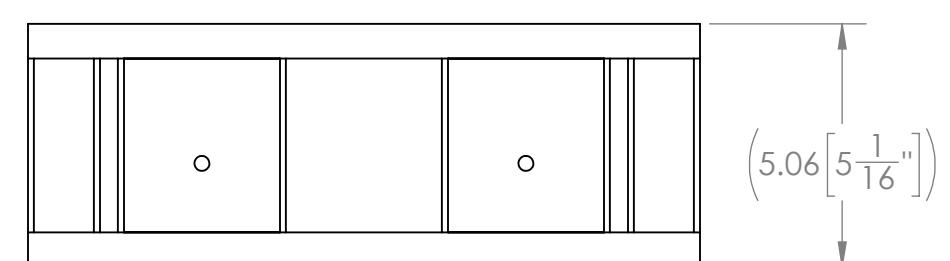
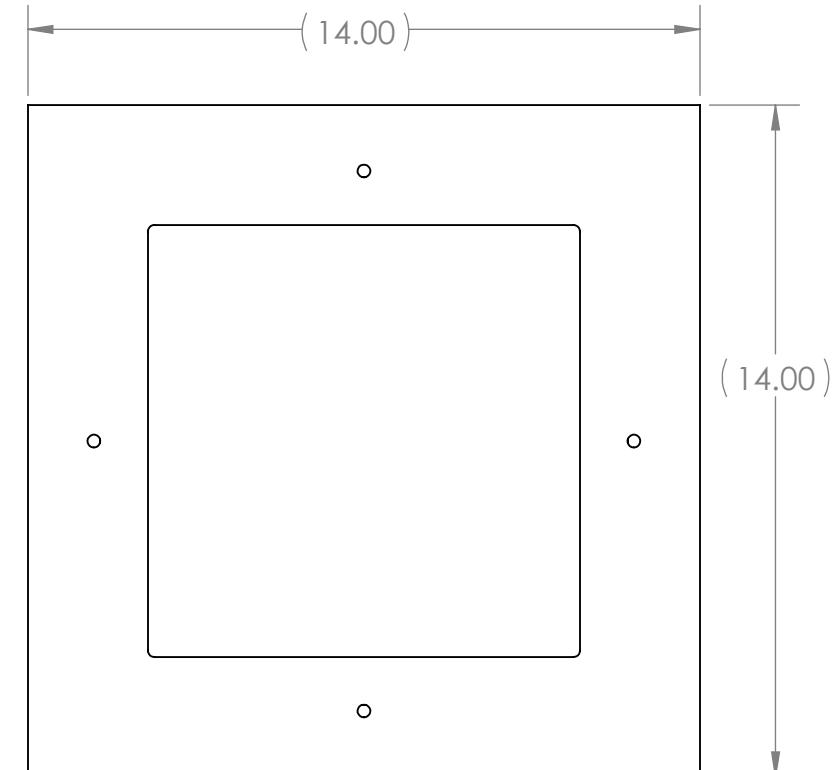
Step 1

1. Align 8x (1) on (3), as shown. Note hole location on (1).
2. Connect using 2" long screws. It is recommended to use 2x screws into each (1).



Step 2

1. Align (2) to Step 1 as shown.
2. Connect using 2" long screws. It is recommended to use 2x screws into each (1).



UNLESS OTHERWISE SPECIFIED:

TEAM _____ NAME _____ DATE _____

DRAWN KAMC 12/20/2021

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$

PROPRIETARY AND CONFIDENTIAL

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MATERIAL/FINISH:

COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

 FIRST ROBOTICS COMPETITION
SOLIDWORKS
Modeling Solutions Partner

TITLE: HUB - Complex Build - Connection Box Assembly for AndyMark Upper Hub (AM-4671)

SIZE DWG. NO. REV

C TE-22140-AM

SCALE: 1:4 SHEET 3 OF 3

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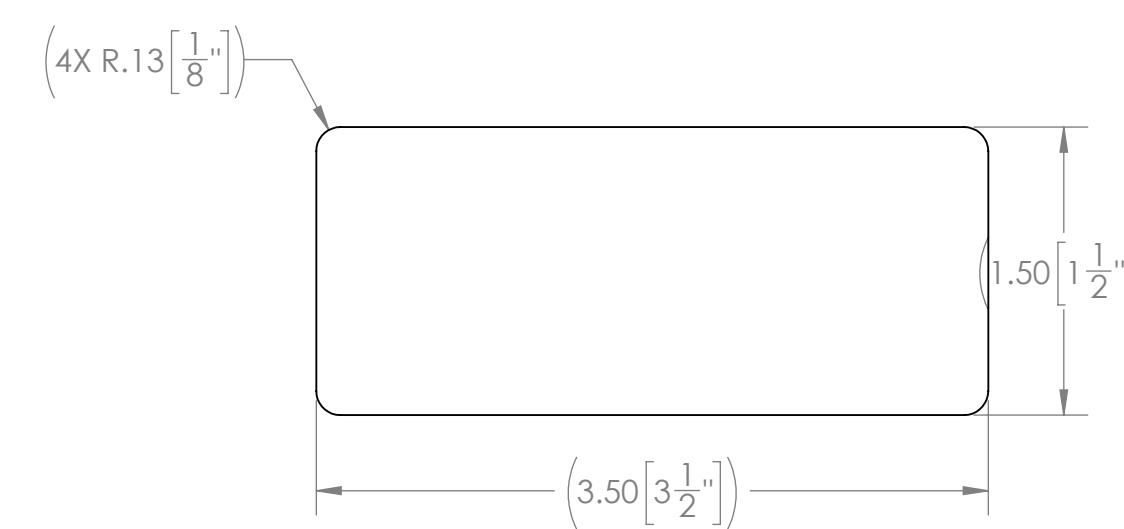
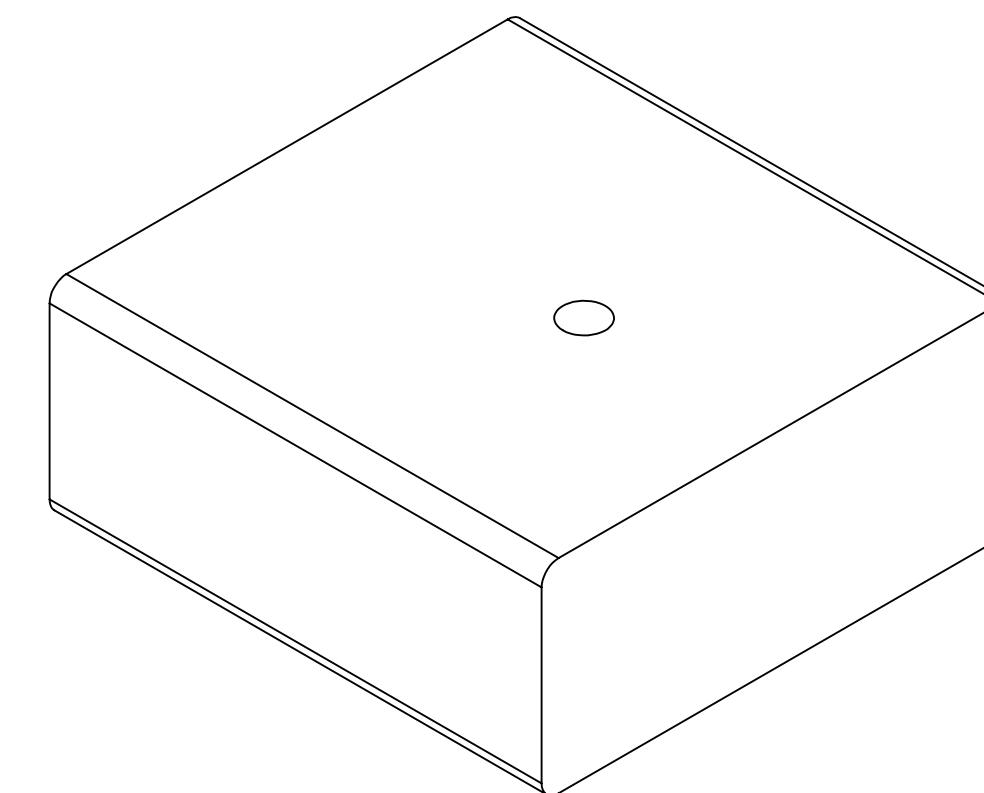
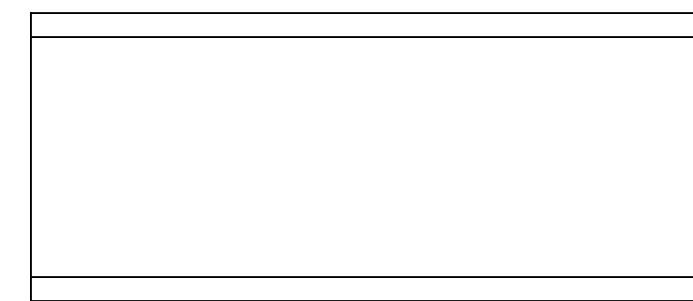
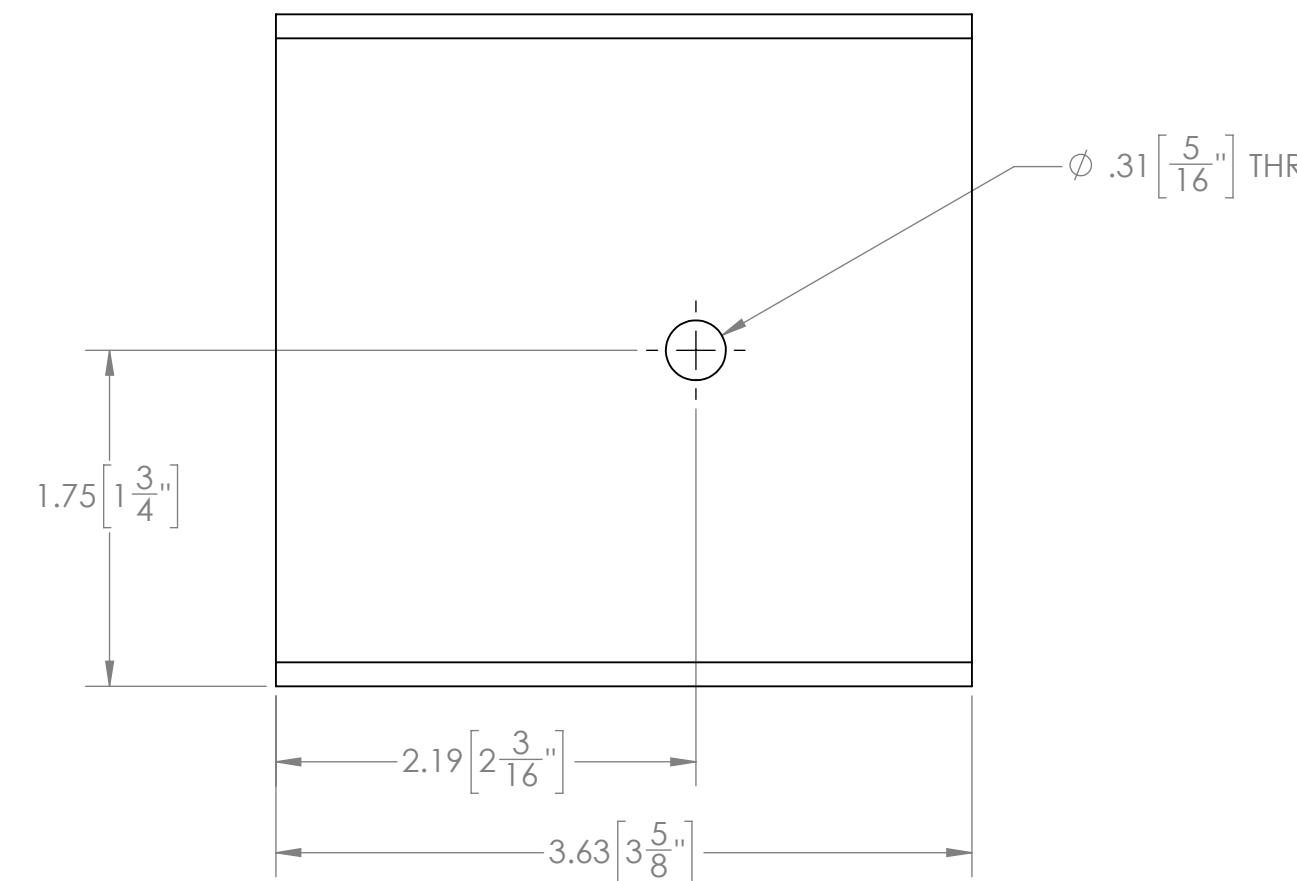
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Note:
Use TE-22141 if NOT pairing with AndyMark Upper Hub (AM-4671)

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DRAWN	KAMC	12/20/2021	
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MATERIAL/FINISH: 2" x 4" Lumber			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			
 FIRST ROBOTICS COMPETITION  SOLIDWORKS Modeling Solutions Partner			
TITLE: HUB - Complex Build - Connection Box 2x4 for AndyMark Upper Hub (AM-4671)			
SIZE DWG. NO. REV			
C TE-22141-AM			
SCALE: 1:1 SHEET 1 OF 1			

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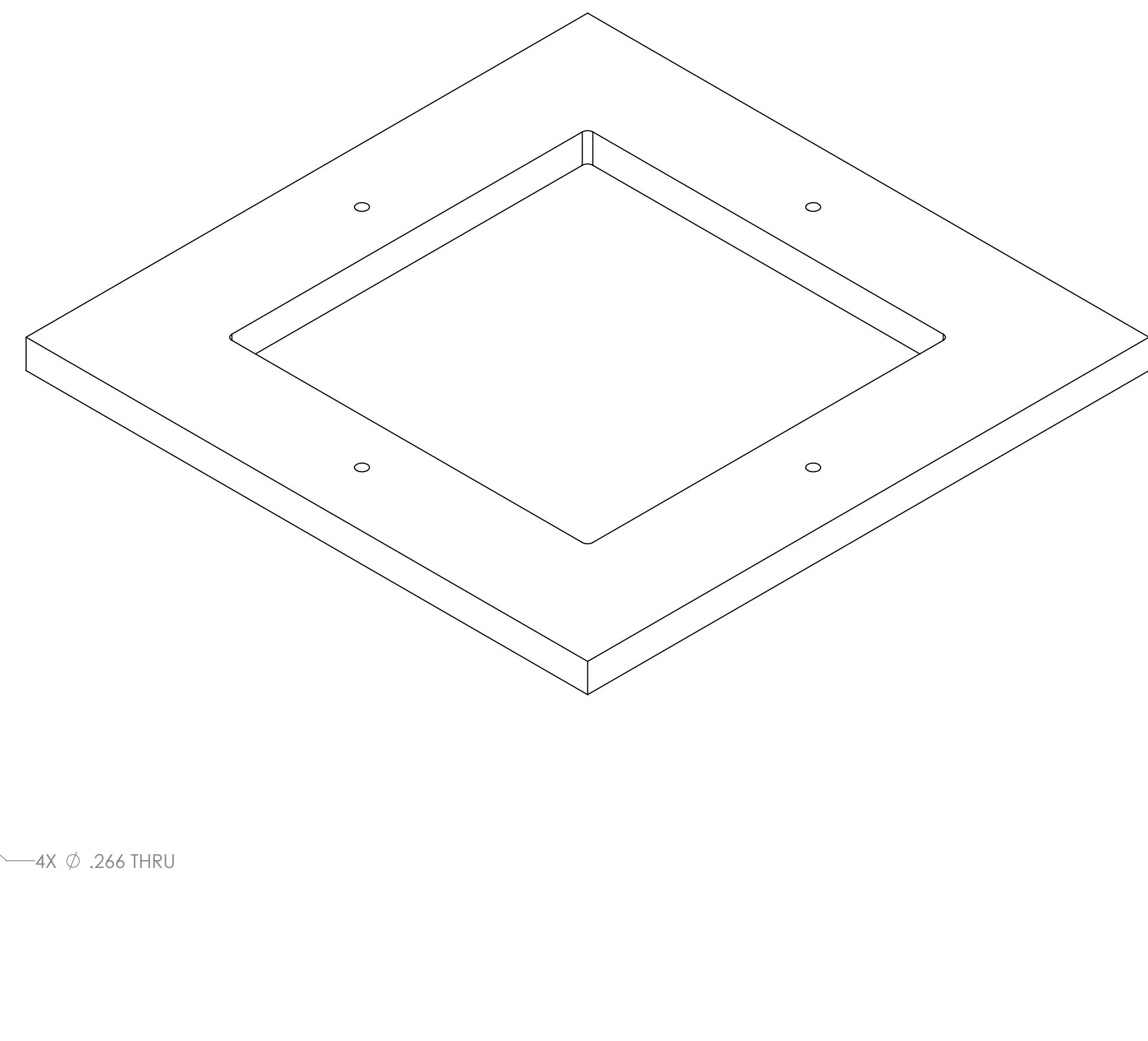
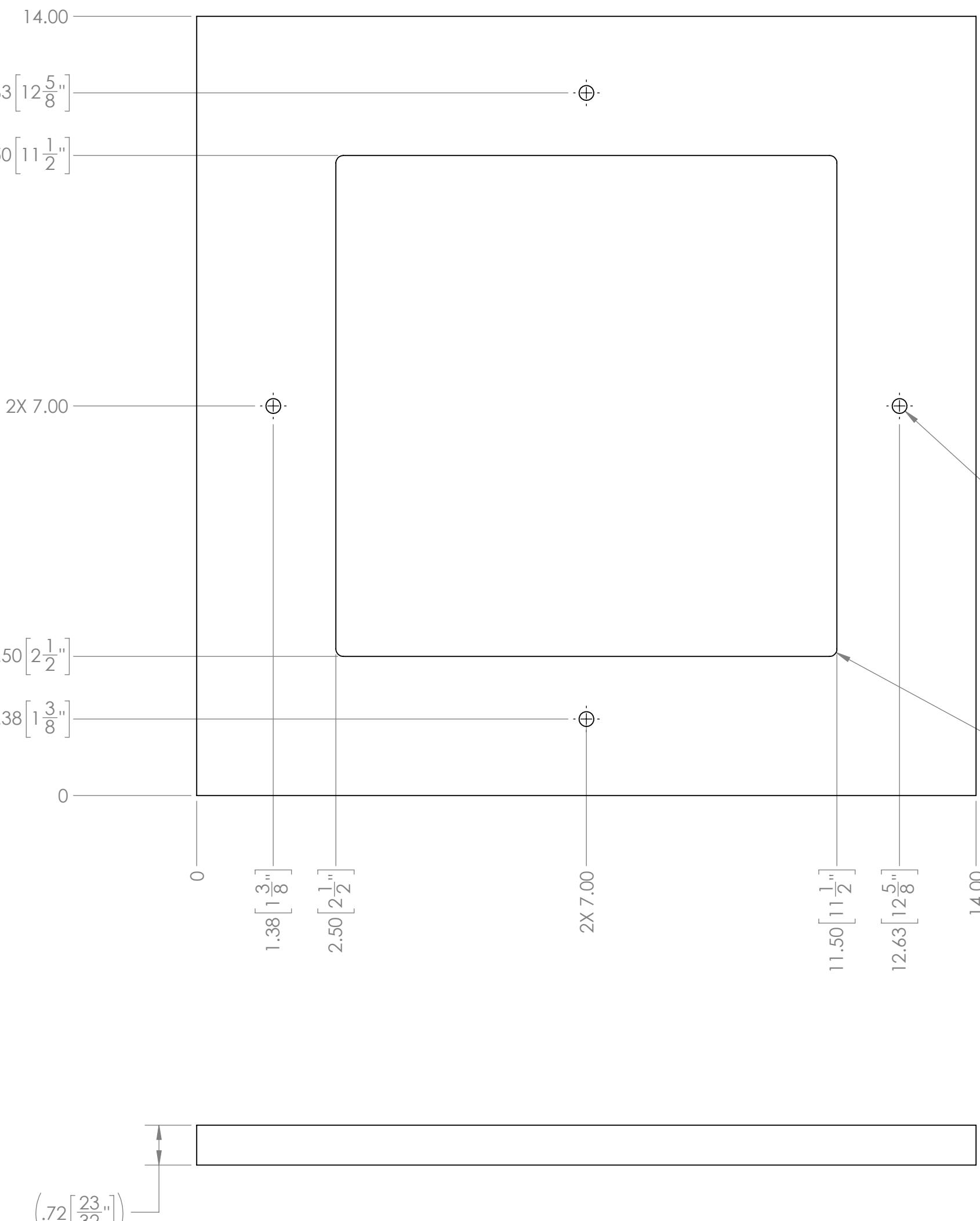
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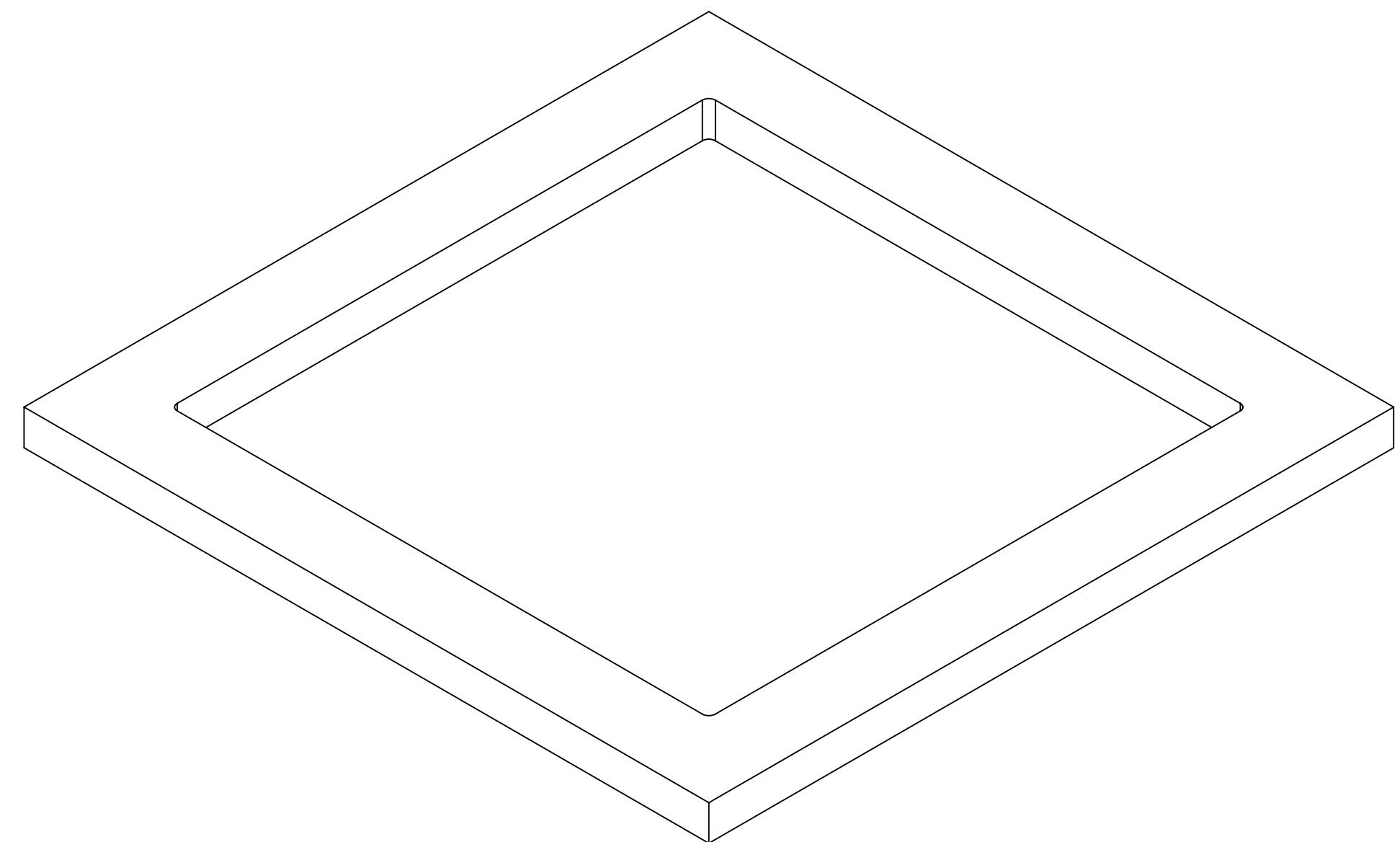
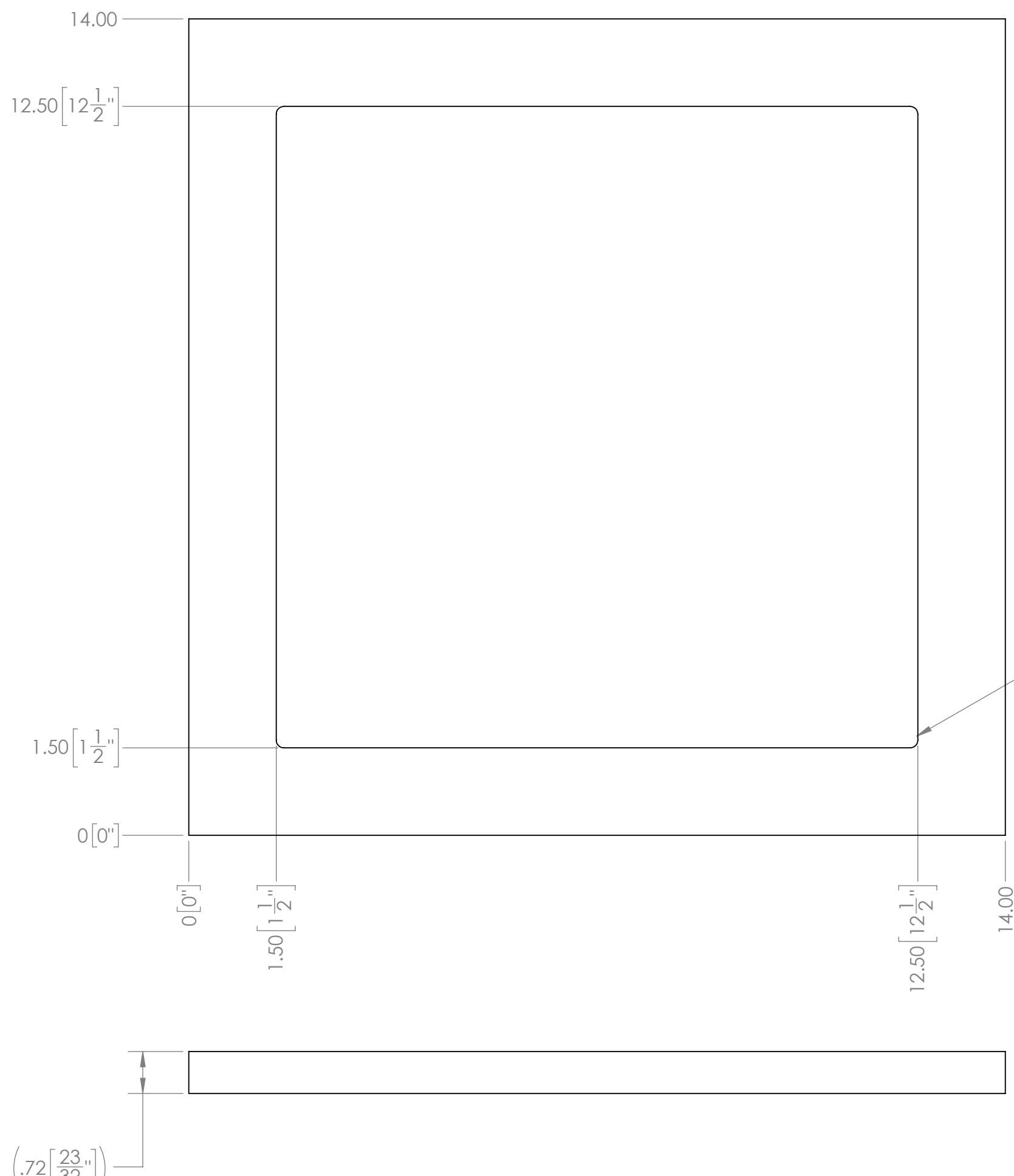
Note:
Radii located at internal corners are provided predominately for teams
making parts with a router. A 90 degree angle is sufficient clearance.

UNLESS OTHERWISE SPECIFIED:			TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES			DRAWN	KAMC	12/20/2021
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MATERIAL/FINISH:	3/4" Plywood				
COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.				
DO NOT SCALE DRAWING					

FIRST	ROBOTICS	COMPETITION
SOLIDWORKS	Modeling Solutions Partner	
TITLE: HUB - Complex Build - Connection Box Top		
SIZE	DWG. NO.	REV
C	TE-22142	
SCALE: 1:2	SHEET 1 OF 1	

D

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Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

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DIMENSIONS ARE IN INCHES	DRAWN	KAMC	12/20/2021
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	3/4" Plywood		
COMMENTS:	REMOVE ALL BURRS AND SHARP EDGES.		
DO NOT SCALE DRAWING			

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Connection Box
Bottom

SIZE DWG. NO. REV

C TE-22143

SCALE: 1:2 SHEET 1 OF 1

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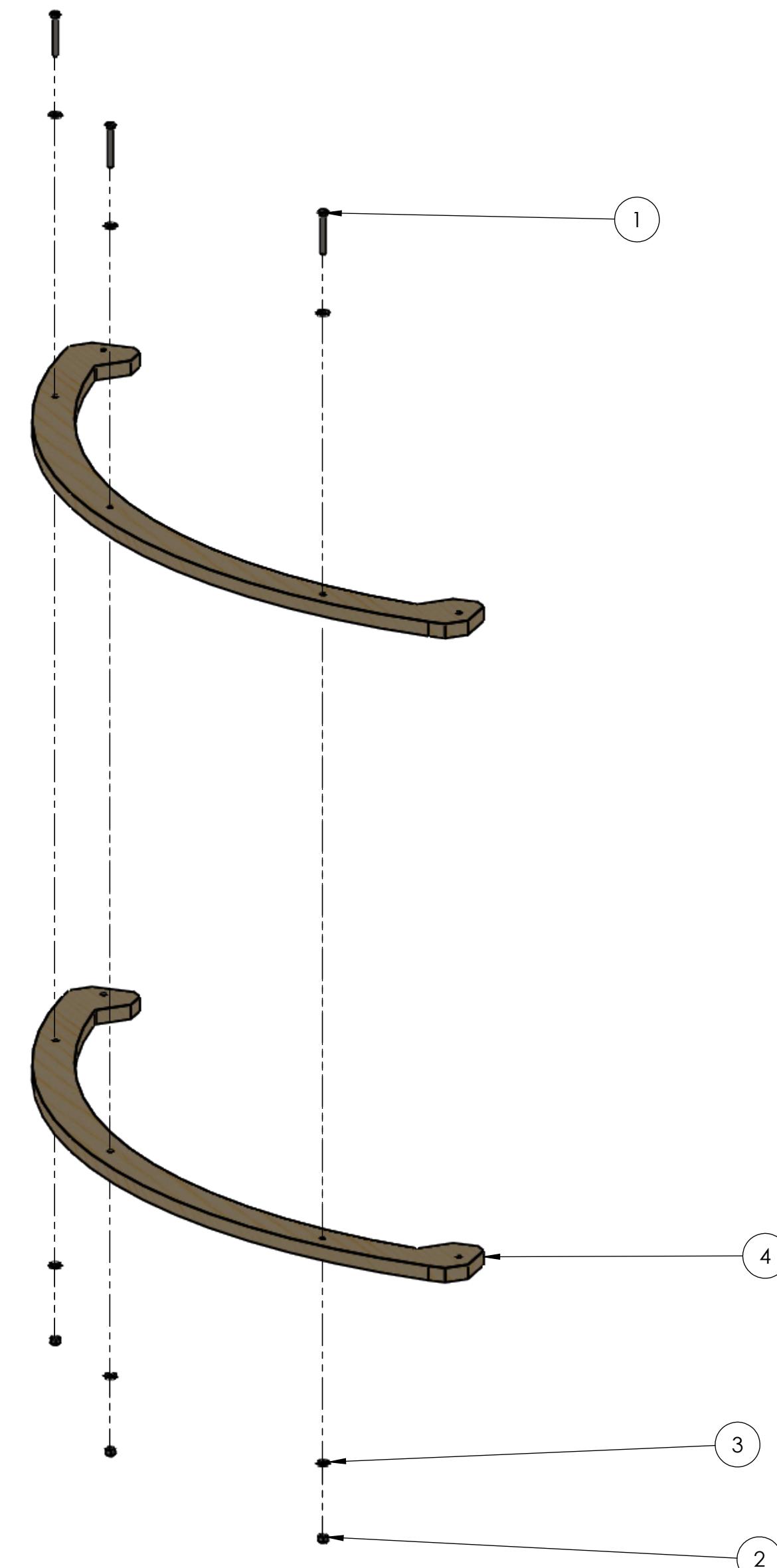
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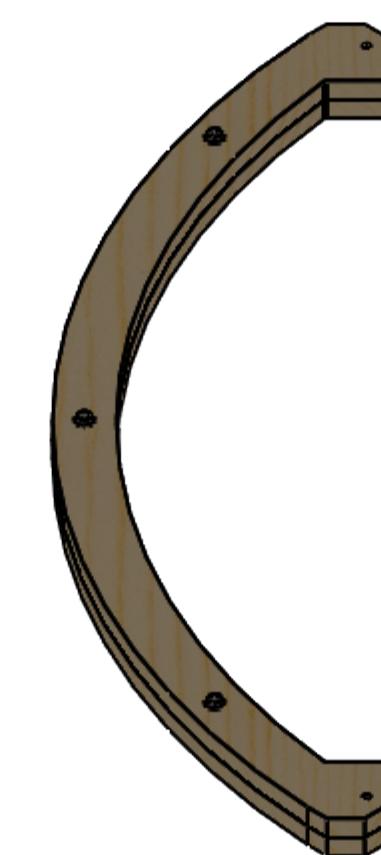
A

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- Step 1
1. Align 2x (4) to each other.

- Step 2:
2. Connect Step 1 using the center 3 holes in (4). Use 1x (1), 2x (4), and 1x (2) per hole.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	hex_.25_20_2	Steel Hex Head Screw, 1/4"-20 x 2" long, fully threaded	3
2	nylock_.25_20	Steel Nylon-Insert Locknut, 1/4"-20	3
3	washer_flat_.25	Flat Washer for 1/4" Screw	6
4	TE-22151	HUB - Complex Build - Lower Hub Ring	2

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COMMENTS:			
REMOVE ALL BURRS AND SHARP EDGES.			

FIRST ROBOTICS COMPETITION DS SOLIDWORKS Modeling Solutions Partner

TITLE: HUB - Complex Build - Lower Hub Ring Assembly

SIZE DWG. NO. REV

C TE-22150

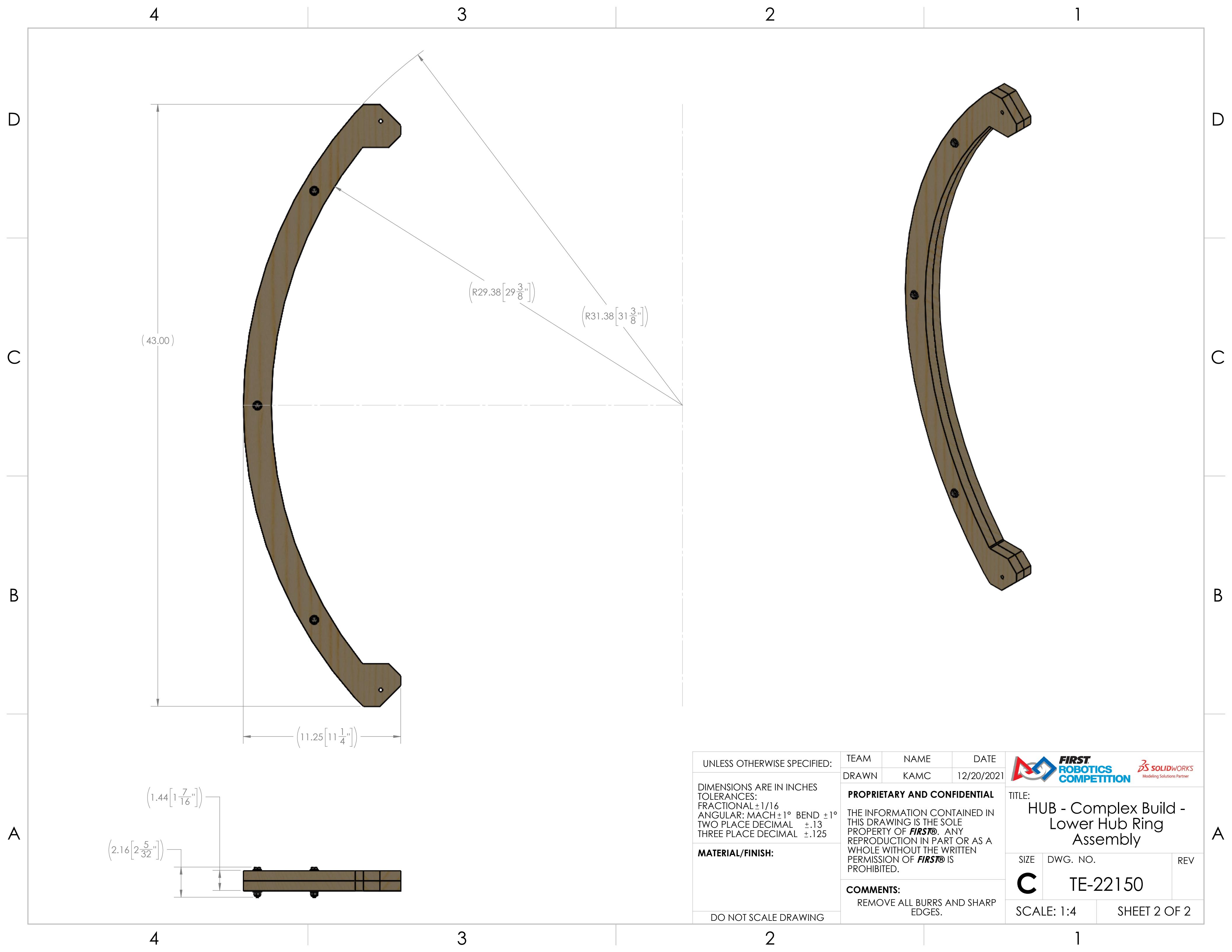
SCALE: 1:6 SHEET 1 OF 2

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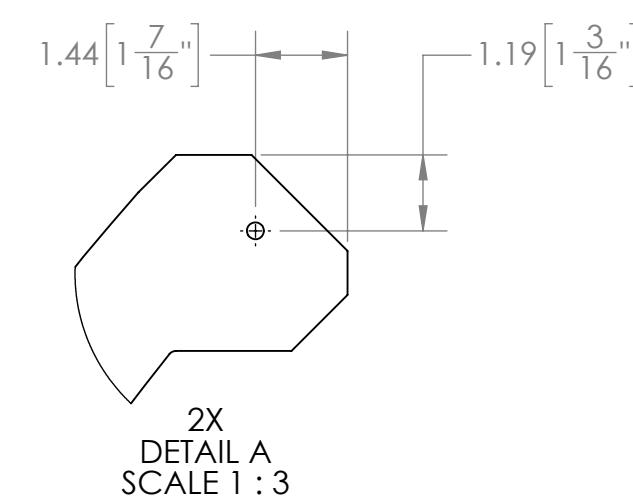
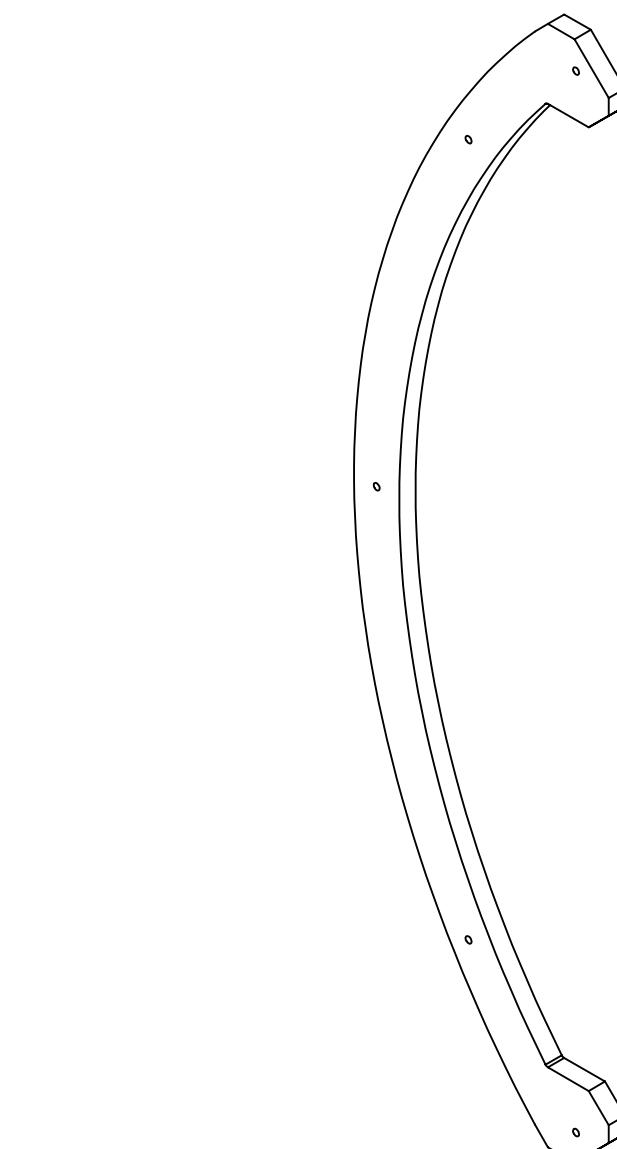
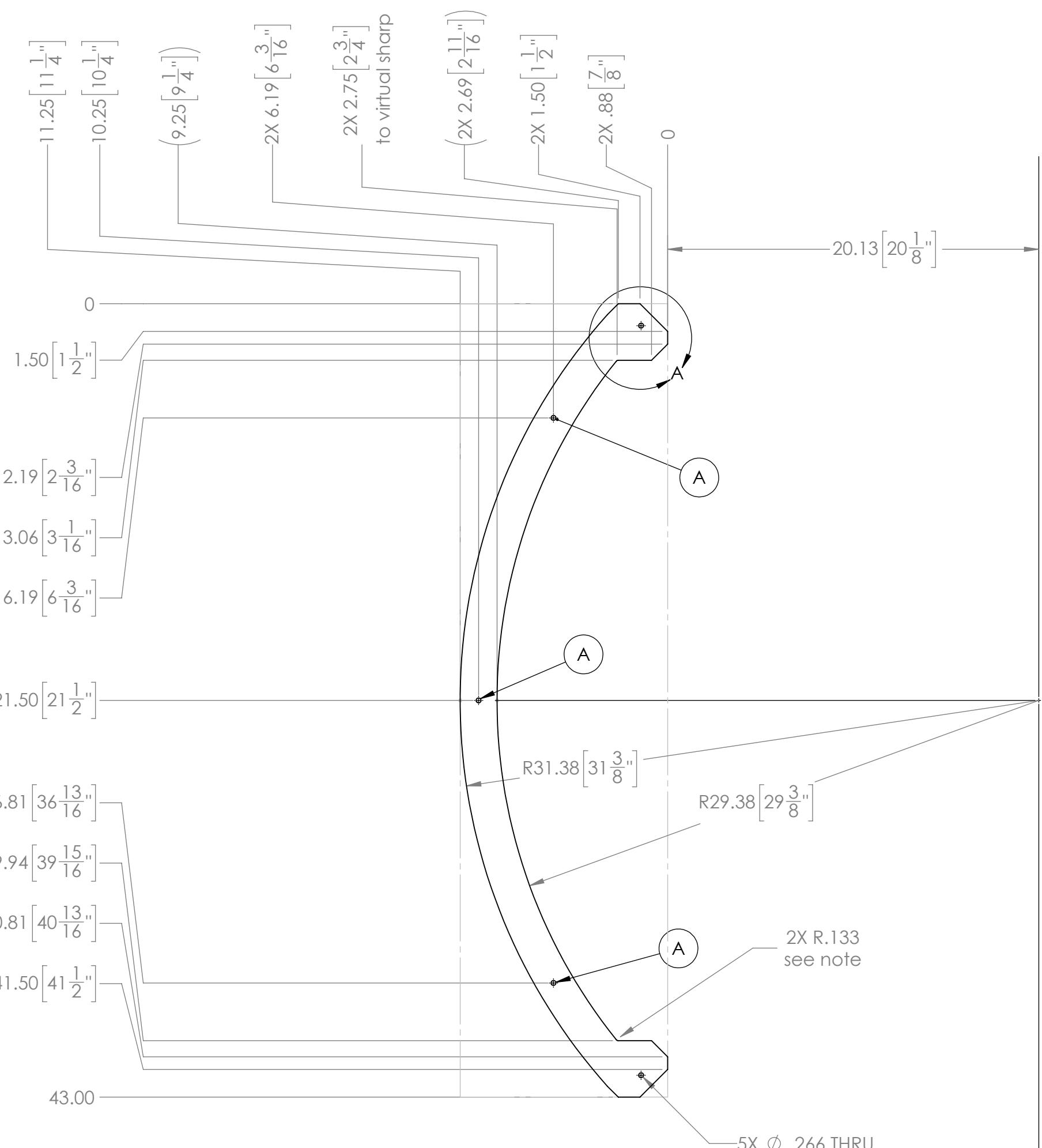
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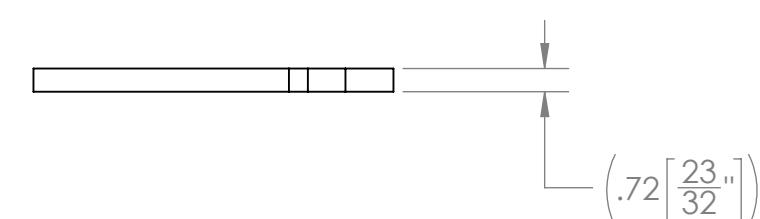
D

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Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

Holes marked with (A) are used to bolt together TE-22151 to TE-22151 in Assembly TE-22152. Match drilling at assembly level is acceptable.



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DIMENSIONS ARE IN INCHES		DRAWN	KAMC	12/20/2021
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MATERIAL/FINISH:	3/4" Plywood	SIZE	DWG. NO.	REV
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.				
DO NOT SCALE DRAWING				

FIRST ROBOTICS COMPETITION SOLIDWORKS Modeling Solutions Partner

TITLE: HUB - Complex Build - Lower Hub Ring

C TE-22151

SCALE: 1:6 SHEET 1 OF 1

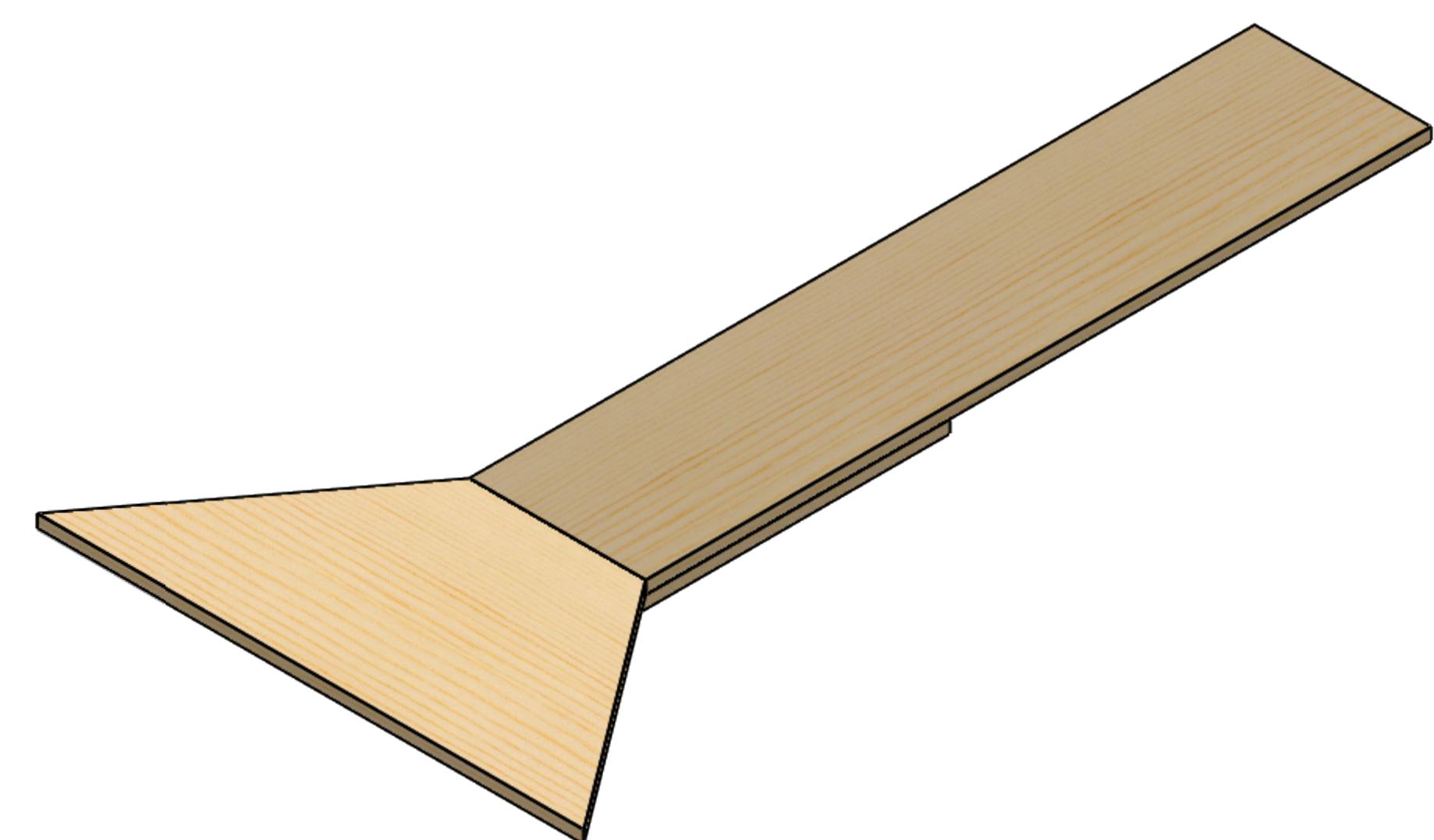
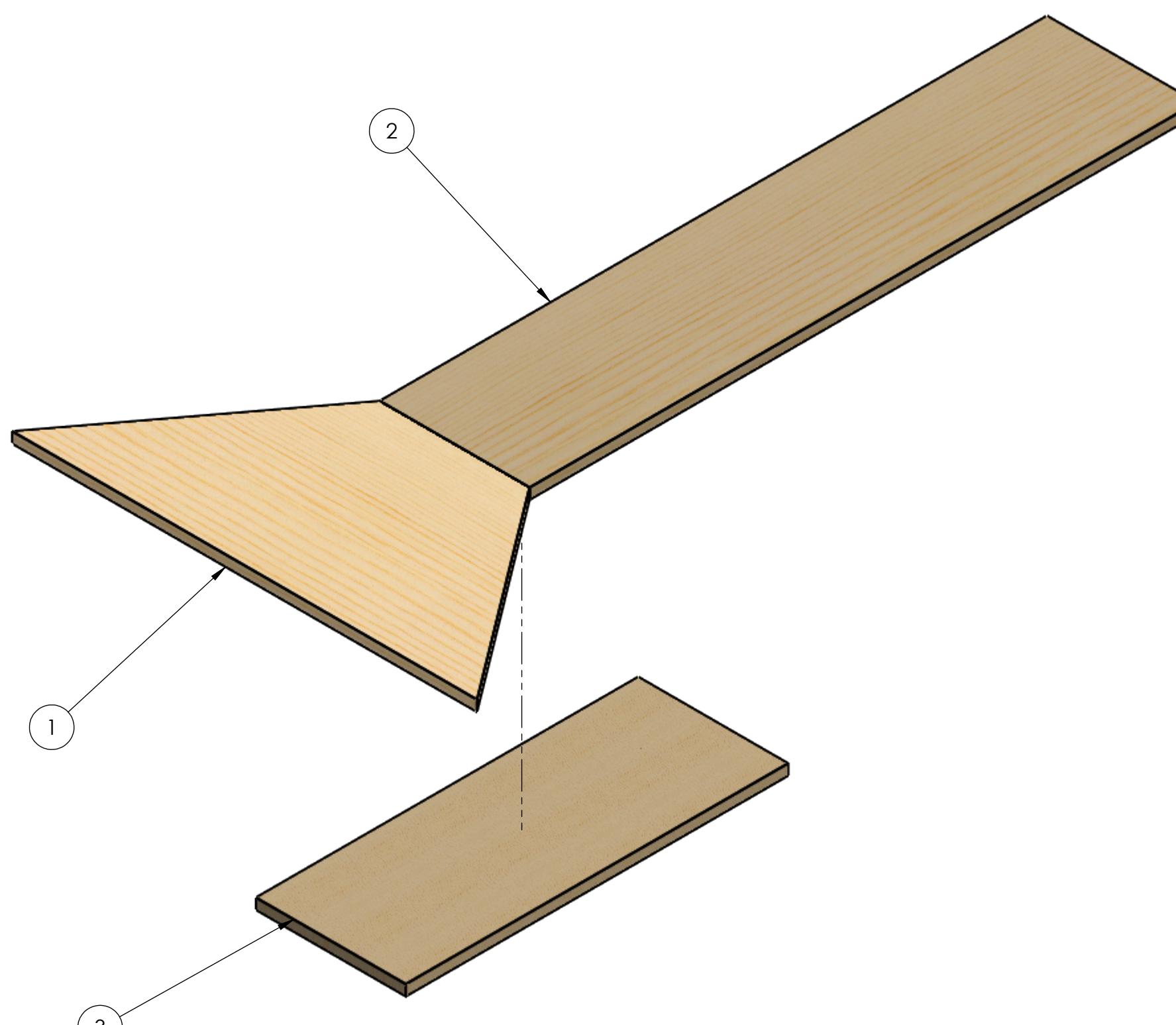
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Hardware:
#8 x 1.25" Long Screw - Qty 12

ITEM NO.	PART NUMBER	DESCRIPTION	
1	TE-22161	HUB - Complex Build - Upper Exit End	1
2	TE-22162	HUB - Complex Build - Upper Exit Base	1
3	TE-22163	HUB - Complex Build - Upper Exit Connection Plate	1

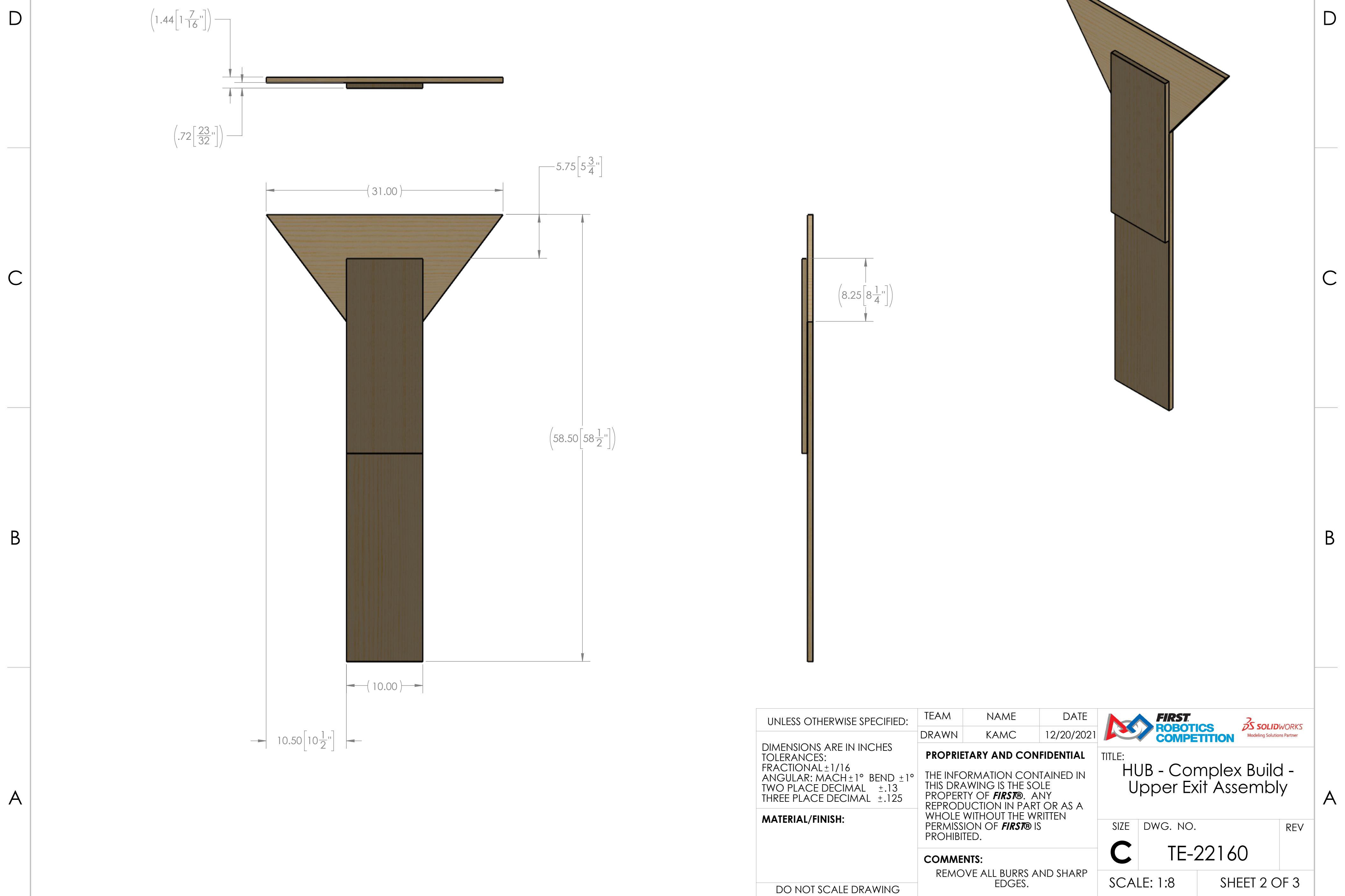
UNLESS OTHERWISE SPECIFIED:			TEAM	NAME	DATE	 FIRST ROBOTICS COMPETITION		
			DRAWN	KAMC	12/20/2021	 SOLIDWORKS Modeling Solutions Partner		
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$			PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF FIRST. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF FIRST IS PROHIBITED.					
MATERIAL/FINISH:			COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.					
DO NOT SCALE DRAWING			SIZE	DWG. NO.		REV	C	TE-22160
			SCALE: 1:6	SHEET 1 OF 3				

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DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/20/2021

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COMMENTS:
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TITLE: HUB - Complex Build - Upper Exit Assembly

SIZE DWG. NO. REV

C TE-22160

SCALE: 1:8 SHEET 2 OF 3

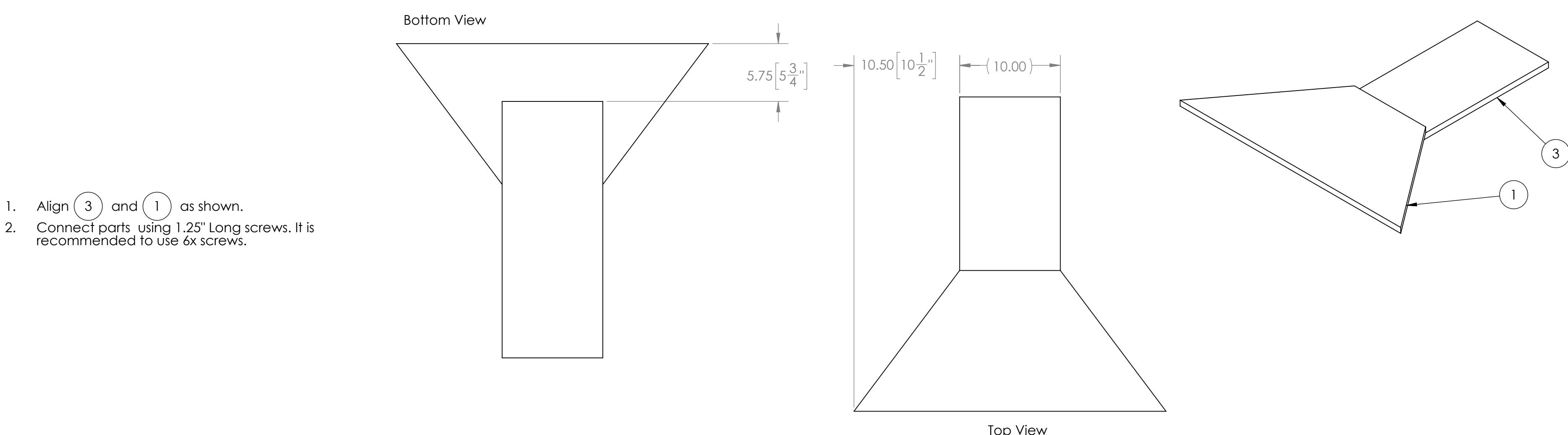
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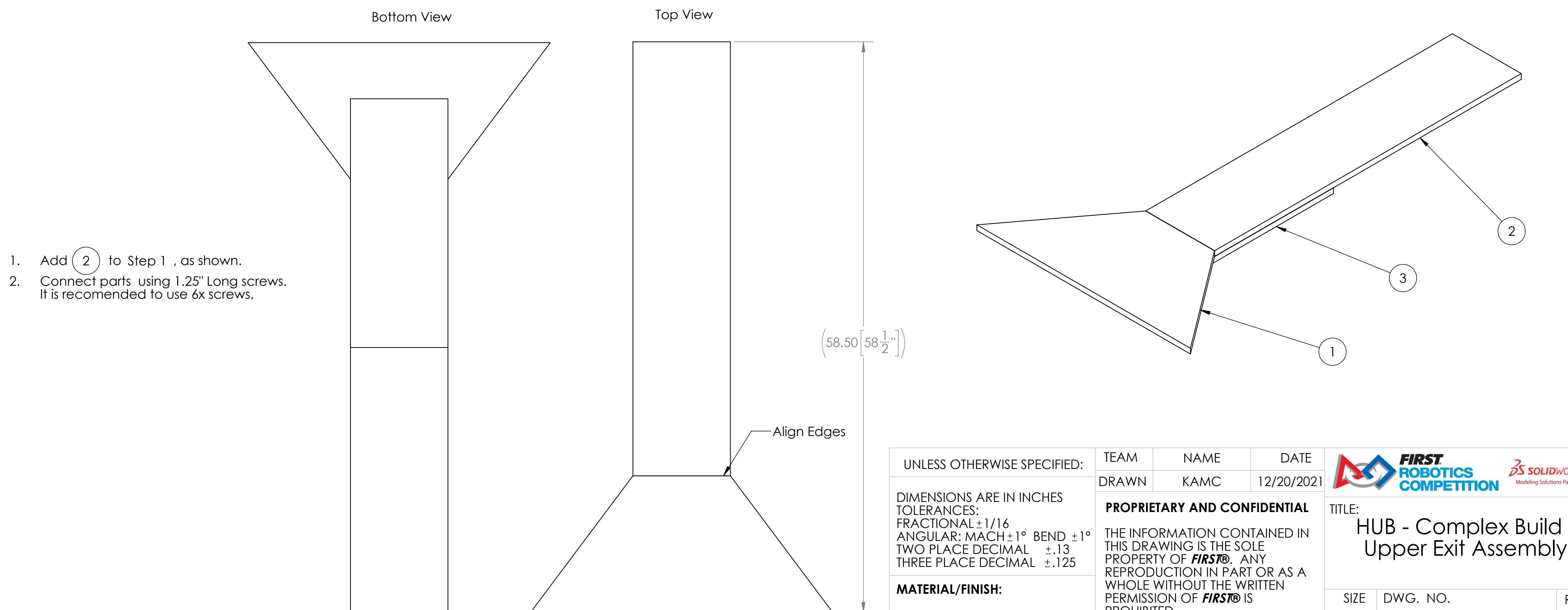
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Step 1



Step 2



UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM _____ NAME _____ DATE _____

DRAWN KAMC 12/20/2021



TITLE: HUB - Complex Build - Upper Exit Assembly

SIZE DWG. NO. REV

C TE-22160

SCALE: 1:8 SHEET 3 OF 3

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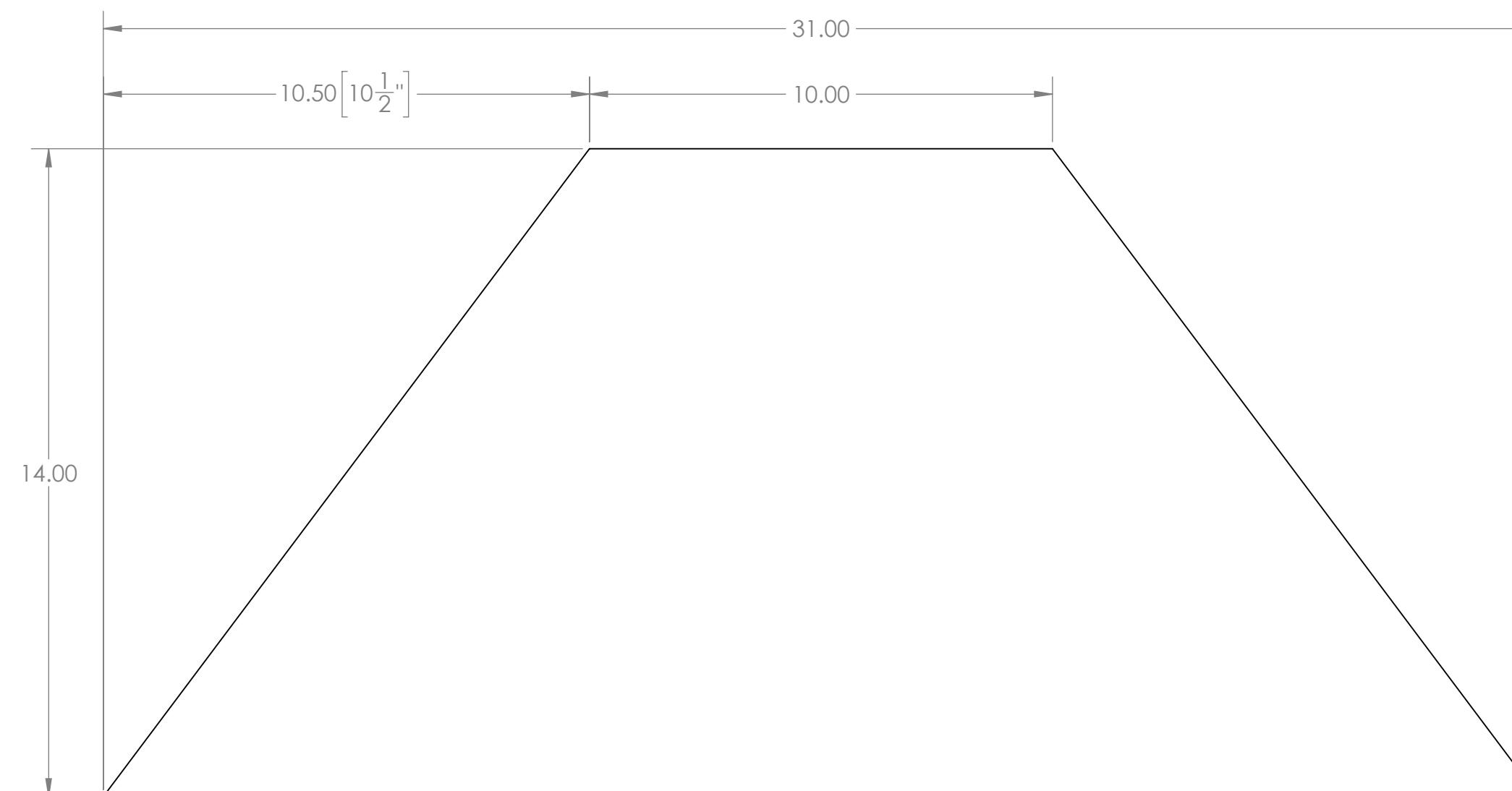
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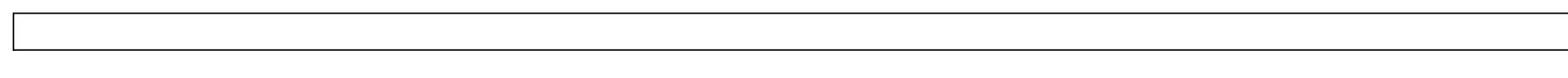
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(.72 [$\frac{23}{32}$ '])

UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/20/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
3/4" Plywood	C	TE-22161	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SCALE: 1:3	SHEET 1 OF 1	

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FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
**HUB - Complex Build -
Upper Exit End**

SIZE DWG. NO. REV
C TE-22161

SCALE: 1:3 SHEET 1 OF 1

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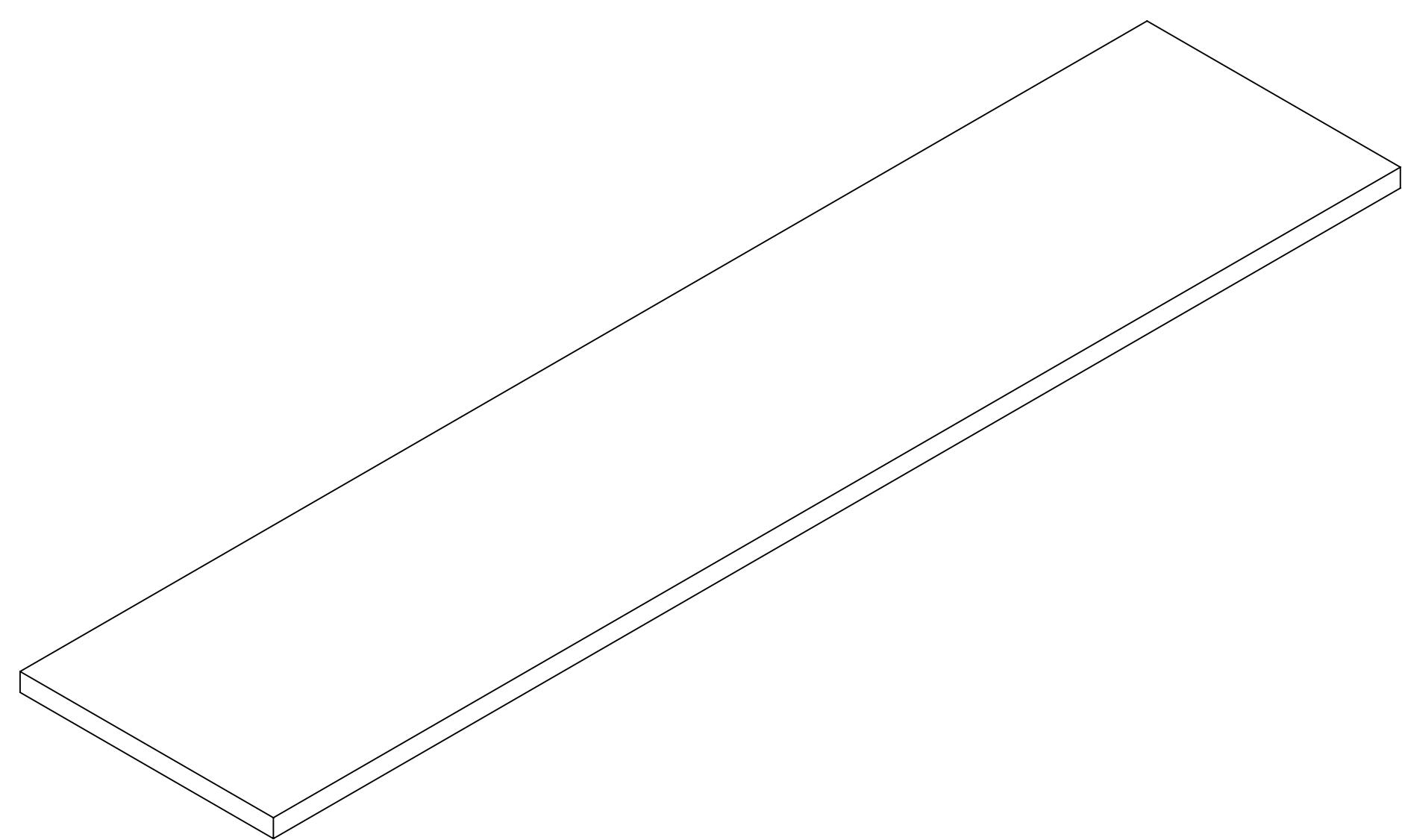
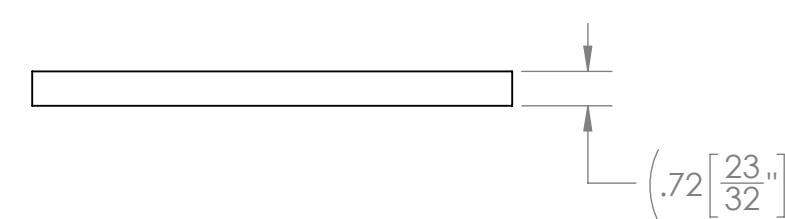
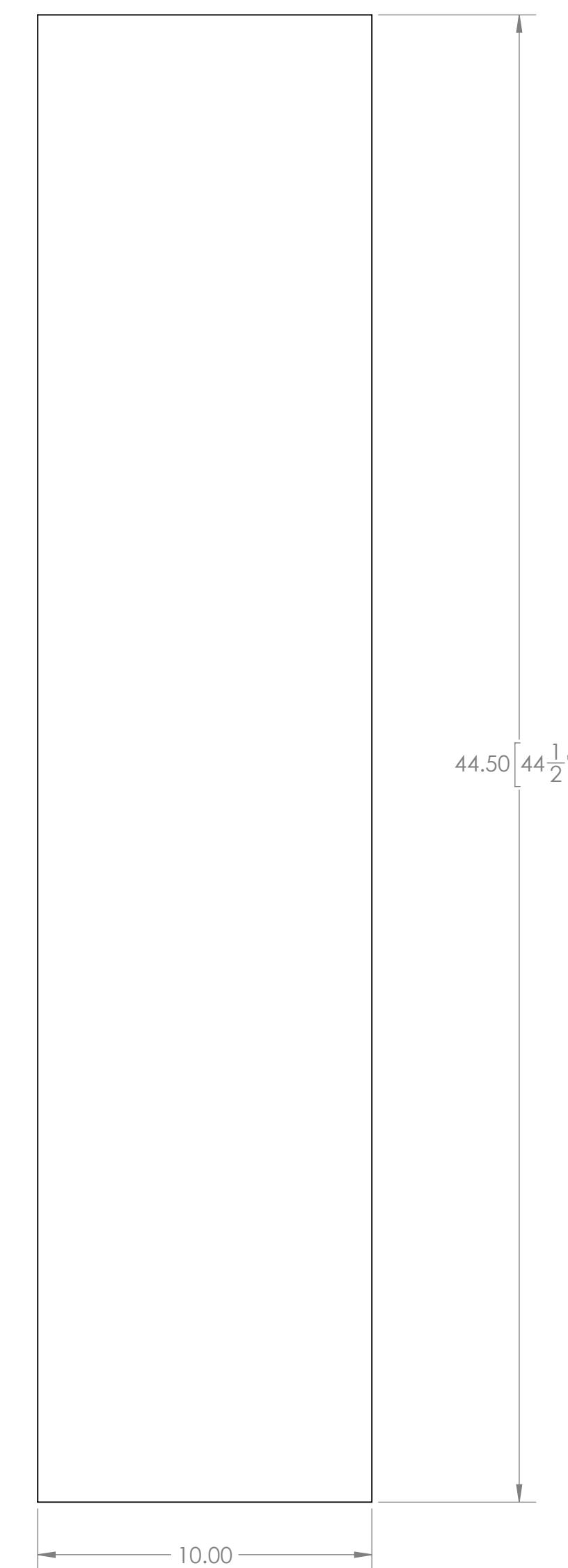
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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$

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MATERIAL/FINISH:

3/4" Plywood

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/20/2021

SOLIDWORKS
Modeling Solutions Partner

TITLE: HUB - Complex Build - Upper Exit Base

SIZE DWG. NO. REV

C TE-22162

SCALE: 1:4 SHEET 1 OF 1

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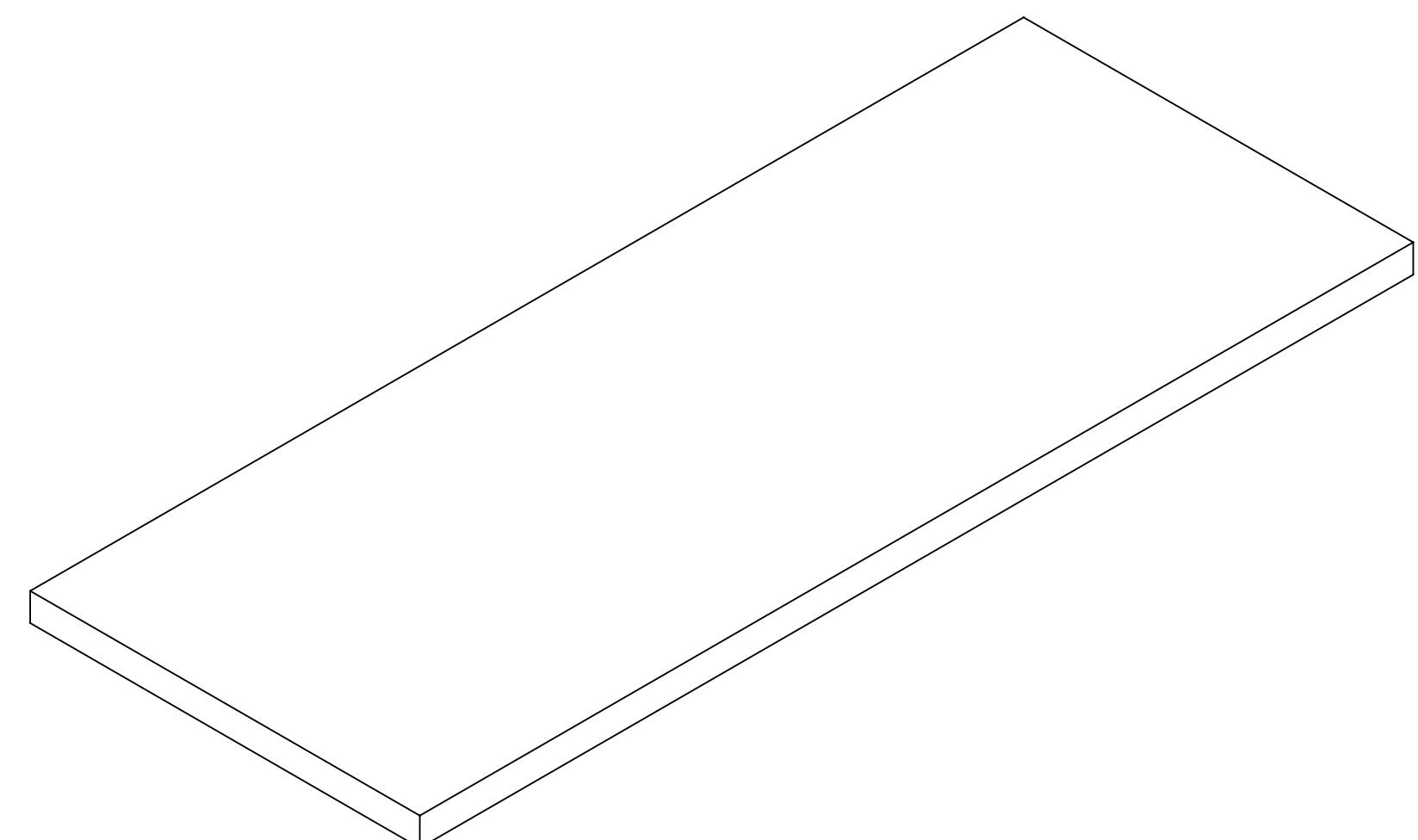
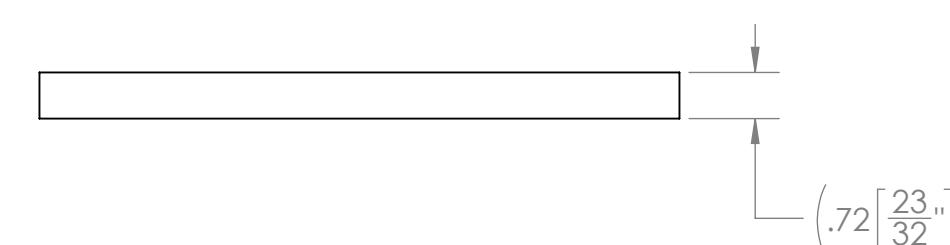
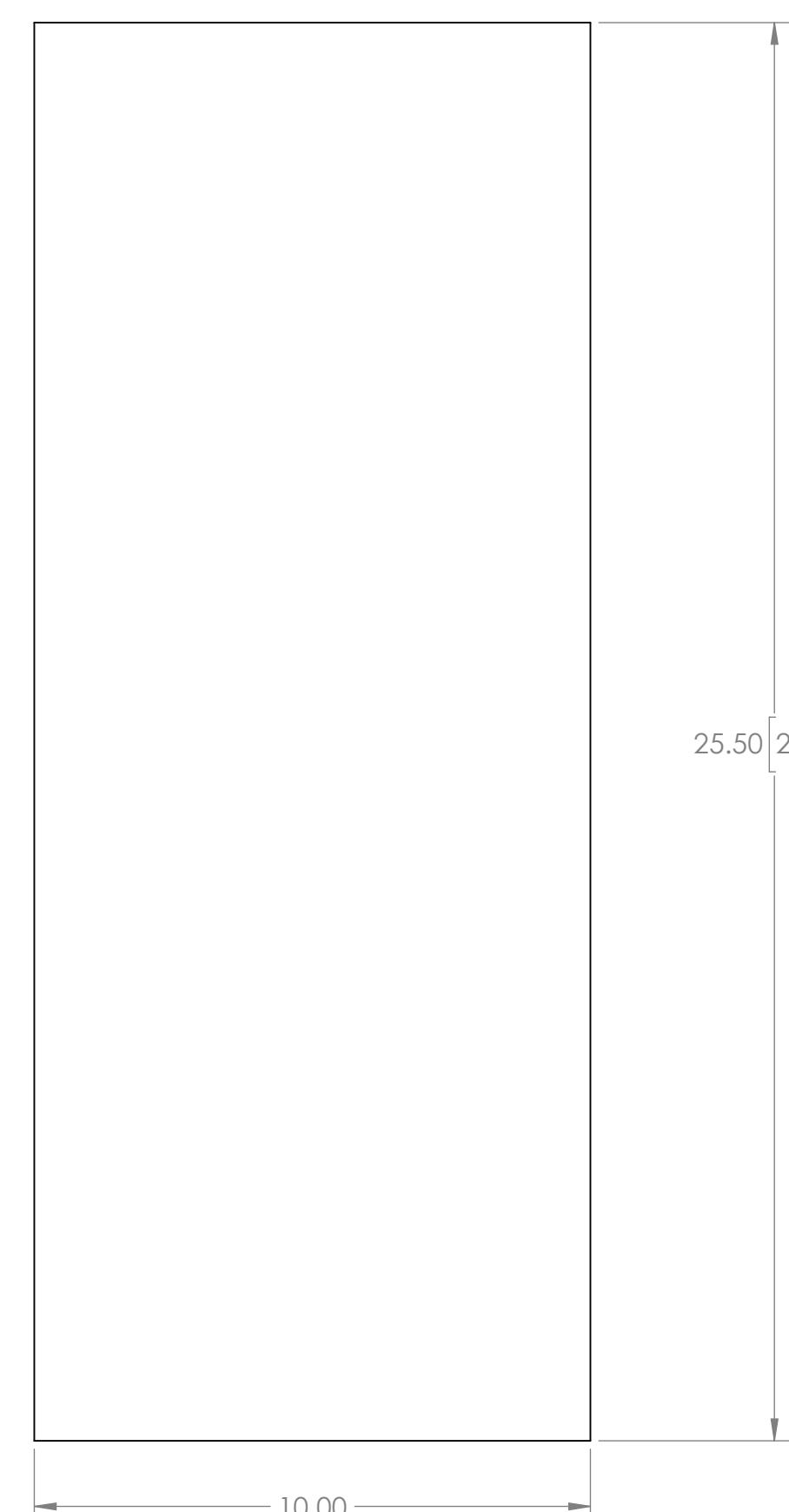
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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

3/4" Plywood

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/20/2021

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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.



TITLE: HUB - Complex Build -

Upper Exit Connection Plate

SIZE DWG. NO. REV

C TE-22163

SCALE: 1:3 SHEET 1 OF 1

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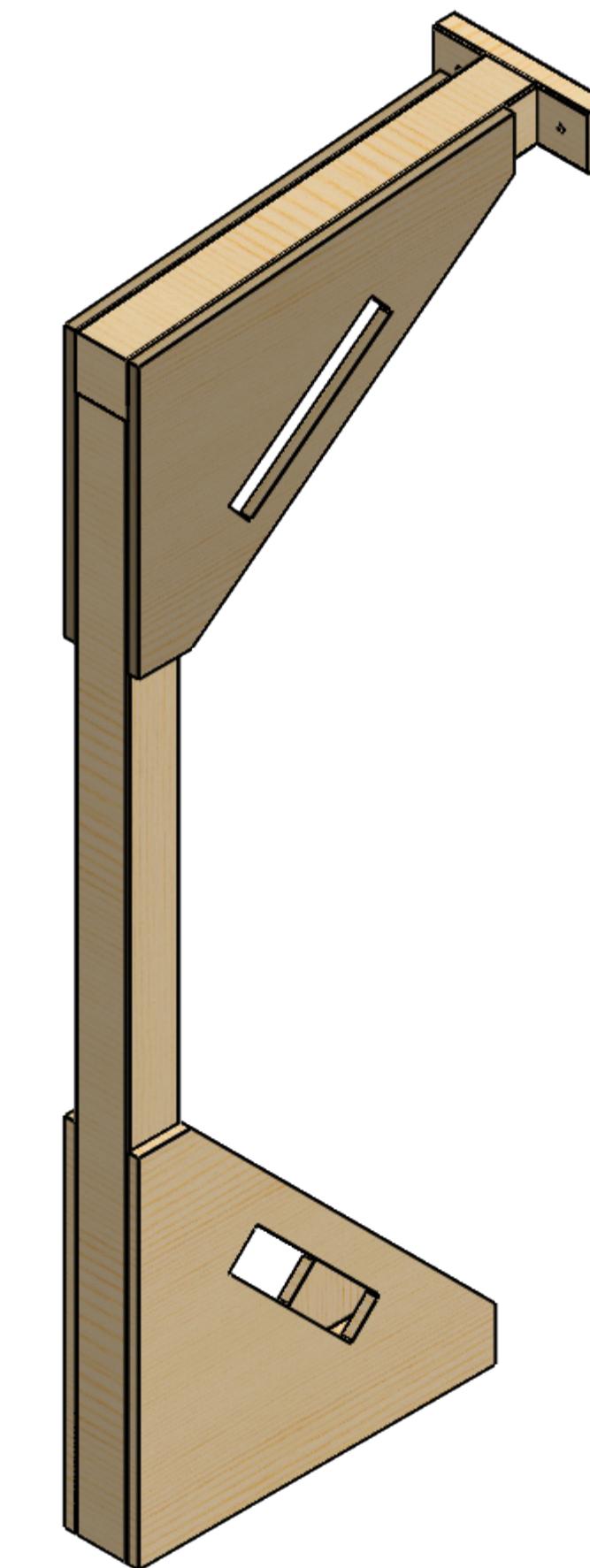
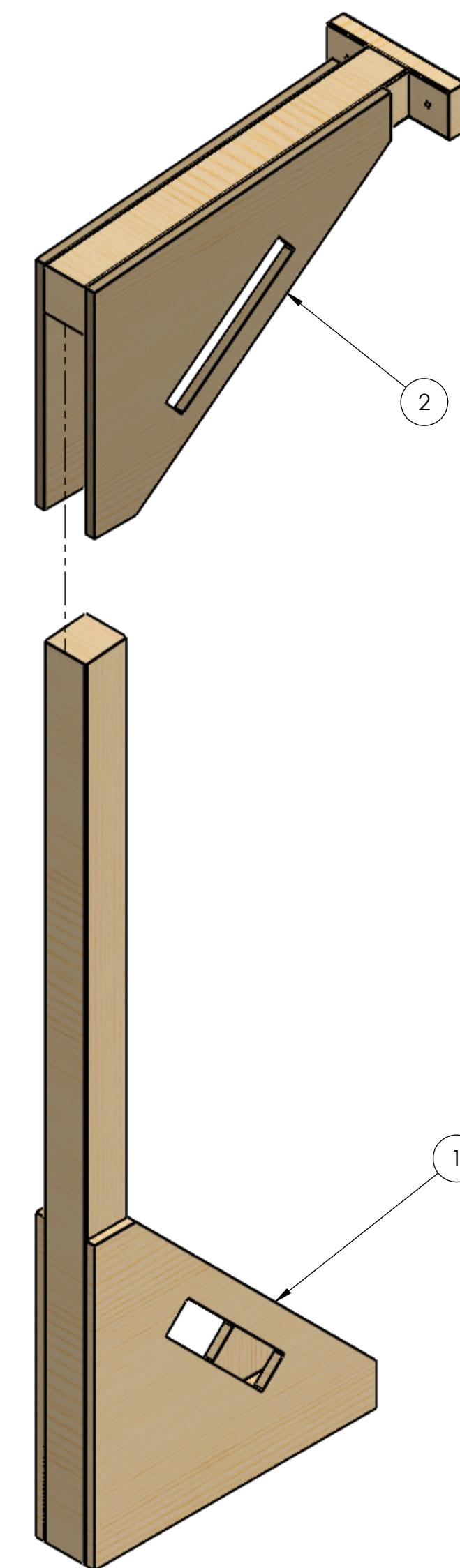
4

3

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D



Step 1:

1. Align (2) and (1), as shown.

Step 2:

1. Connect Step 1 using 2" long screws. It is recommended to use 5x screws on each side.

Hardware Needed:
#8 x 2" Long Screw - Qty 10

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22177	HUB - Complex Build - Lower Leg Assembly	1
2	TE-22178	HUB - Complex Build - Upper Leg Assembly	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$
 ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
 TWO PLACE DECIMAL $\pm .13$
 THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

PROPRIETARY AND CONFIDENTIAL
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 COMMENTS:
 REMOVE ALL BURRS AND SHARP EDGES.

DO NOT SCALE DRAWING

TEAM: KAMC DATE: 12/21/2021
 FIRST ROBOTICS COMPETITION  SOLIDWORKS Modeling Solutions Partner

TITLE: HUB - Complex Build - Leg Assembly

SIZE DWG. NO. REV

C TE-22170

SCALE: 1:8 SHEET 1 OF 2

4

3

2

1

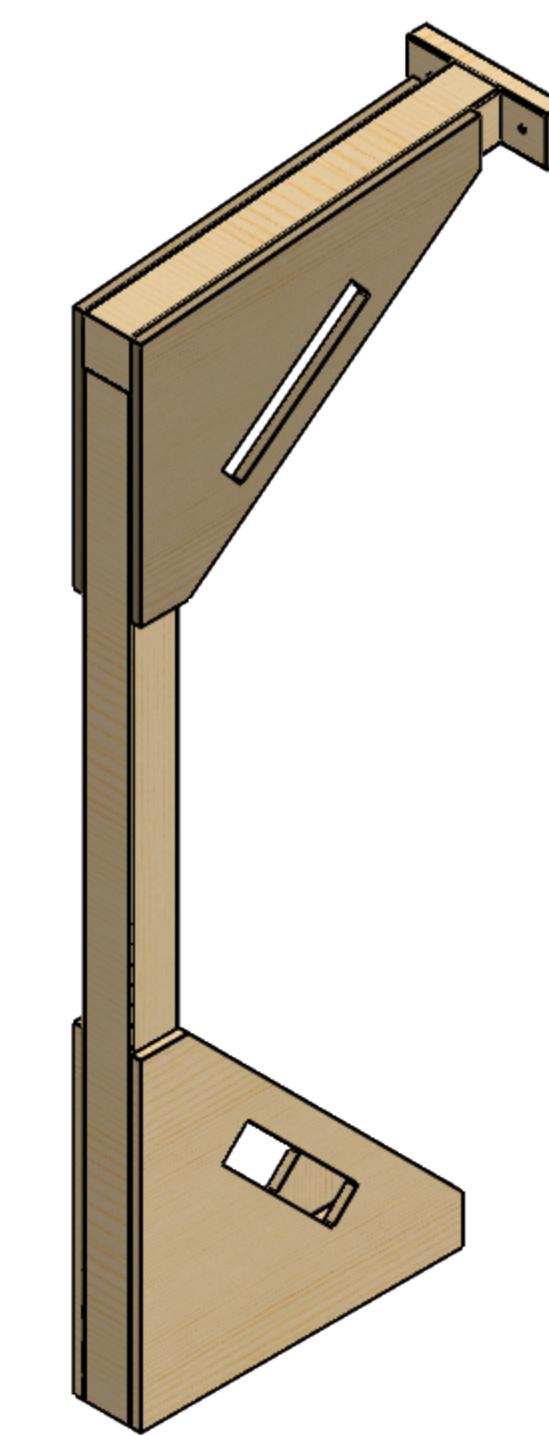
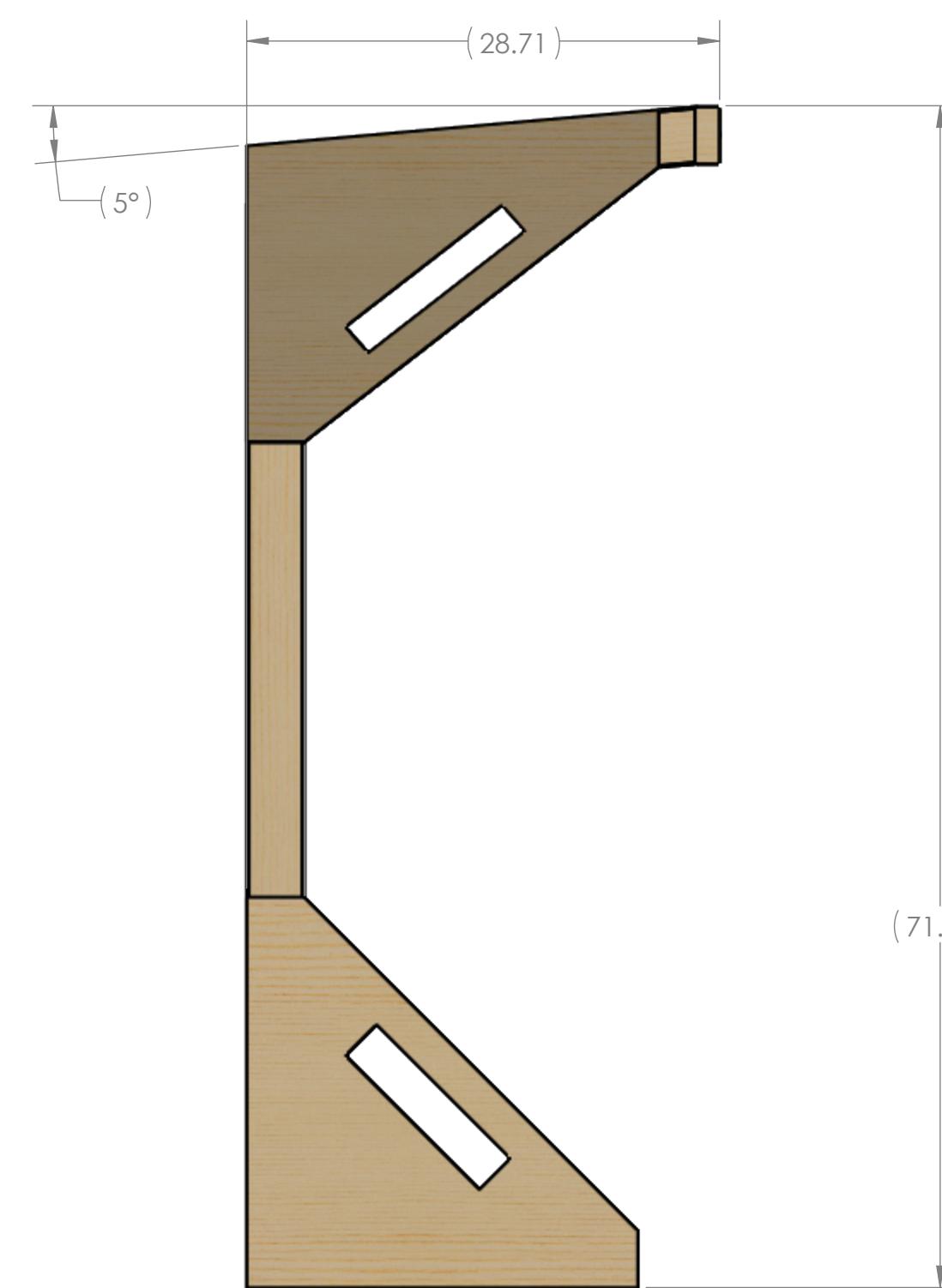
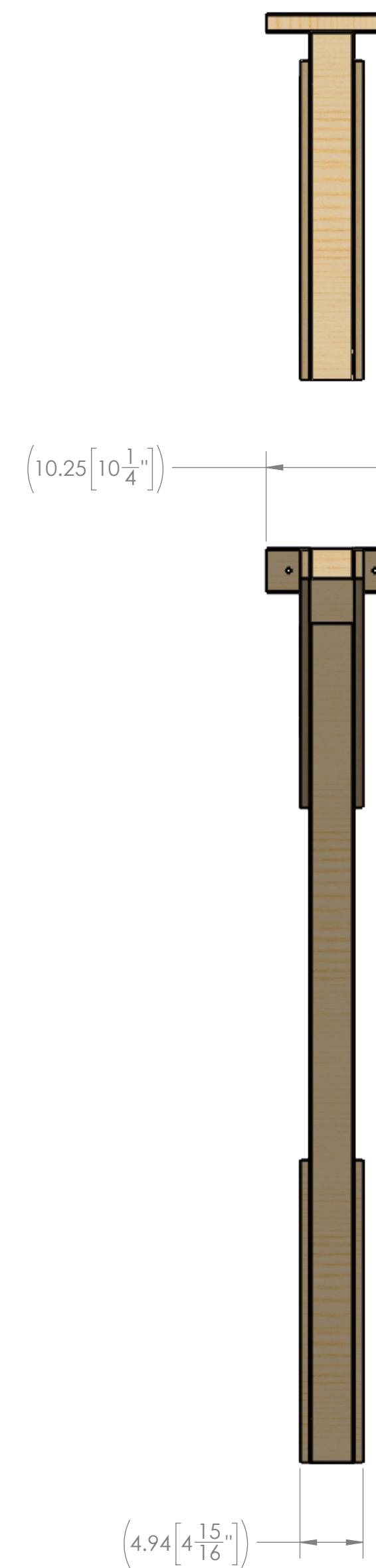
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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$

TEAM _____ NAME _____ DATE _____

DRAWN KAMC 12/21/2021

PROPRIETARY AND CONFIDENTIAL

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MATERIAL/FINISH:

COMMENTS:
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DO NOT SCALE DRAWING

**FIRST
ROBOTICS
COMPETITION**
SOLIDWORKS
Modeling Solutions Partner

TITLE: HUB - Complex Build - Leg Assembly

SIZE DWG. NO. REV

C TE-22170

SCALE: 1:10 SHEET 2 OF 2

4

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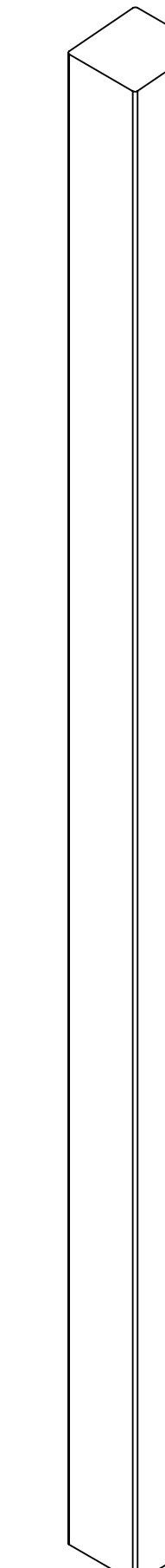
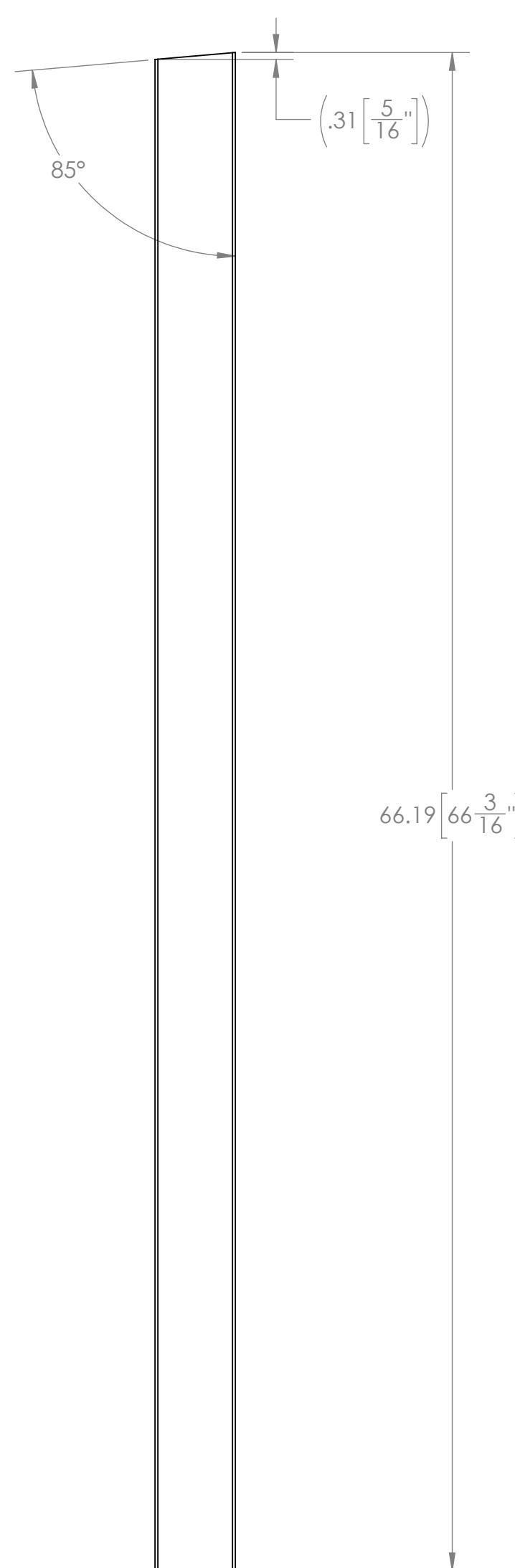
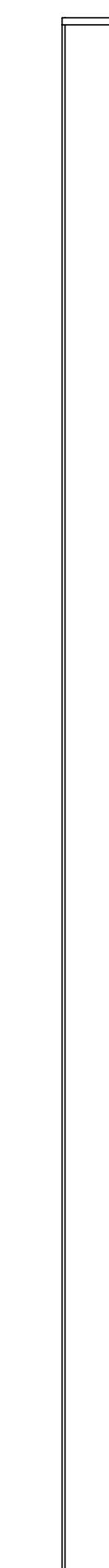
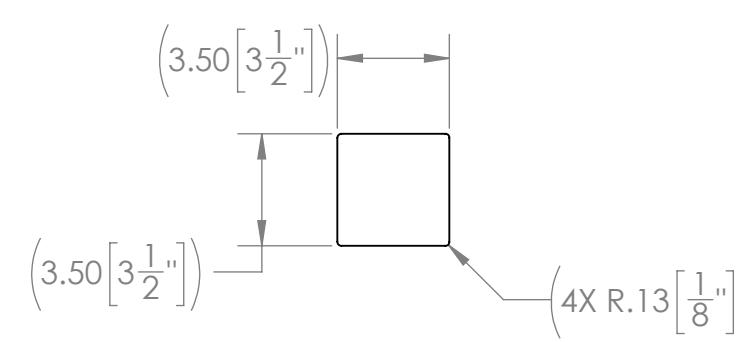
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/21/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
4" x 4" Lumber	C	TE-22171	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING		SCALE: 1:6	SHEET 1 OF 1

 **FIRST
ROBOTICS
COMPETITION**  SOLIDWORKS
Modeling Solutions Partner

TITLE:
**HUB - Complex Build -
Lower Leg Vertical 4x4**

SIZE DWG. NO. REV
C TE-22171

SCALE: 1:6 SHEET 1 OF 1

4

3

2

1

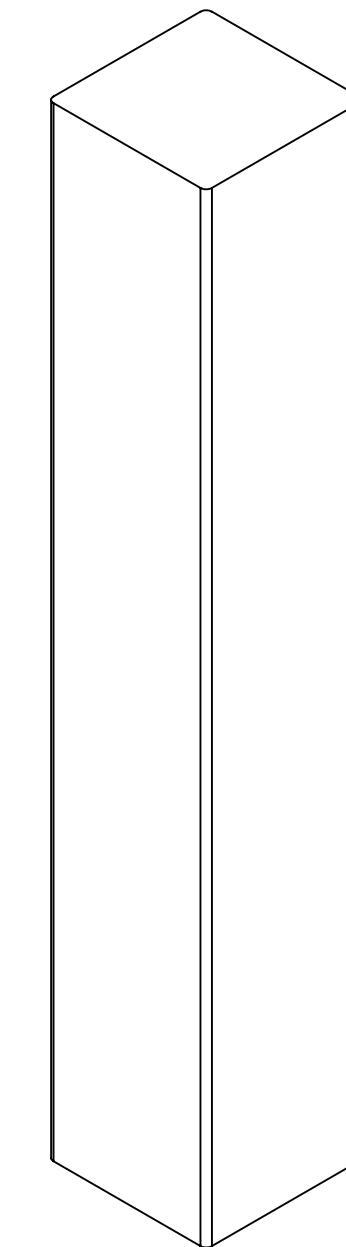
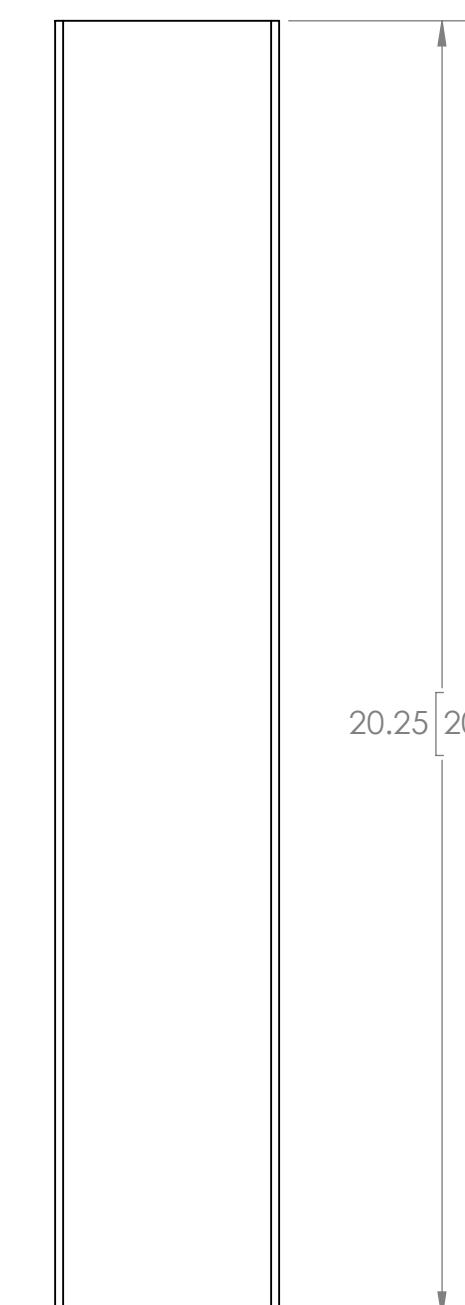
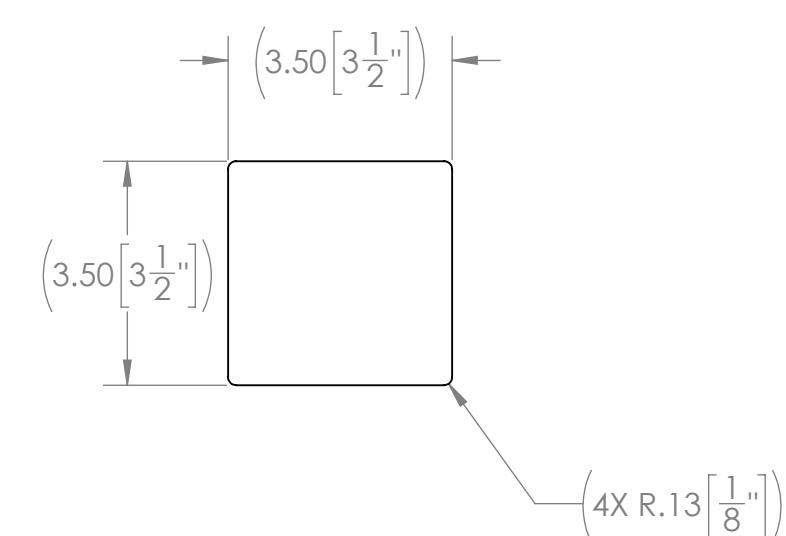
4

3

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1

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C

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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/21/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
4" x 4" Lumber	C	TE-22172	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SCALE: 1:3	SHEET 1 OF 1	

4

3

2

1

4

3

2

1

D

 $(.72[23\frac{3}{32}'])$ $23.75[23\frac{3}{4}"]$ 4x R.133
see note16.00
to virtual sharp14.13[14\frac{1}{8}"]
to virtual sharp7.88[7\frac{7}{8}"]
to virtual sharp6.00
to virtual sharp

3.50[3\frac{1}{2}"]

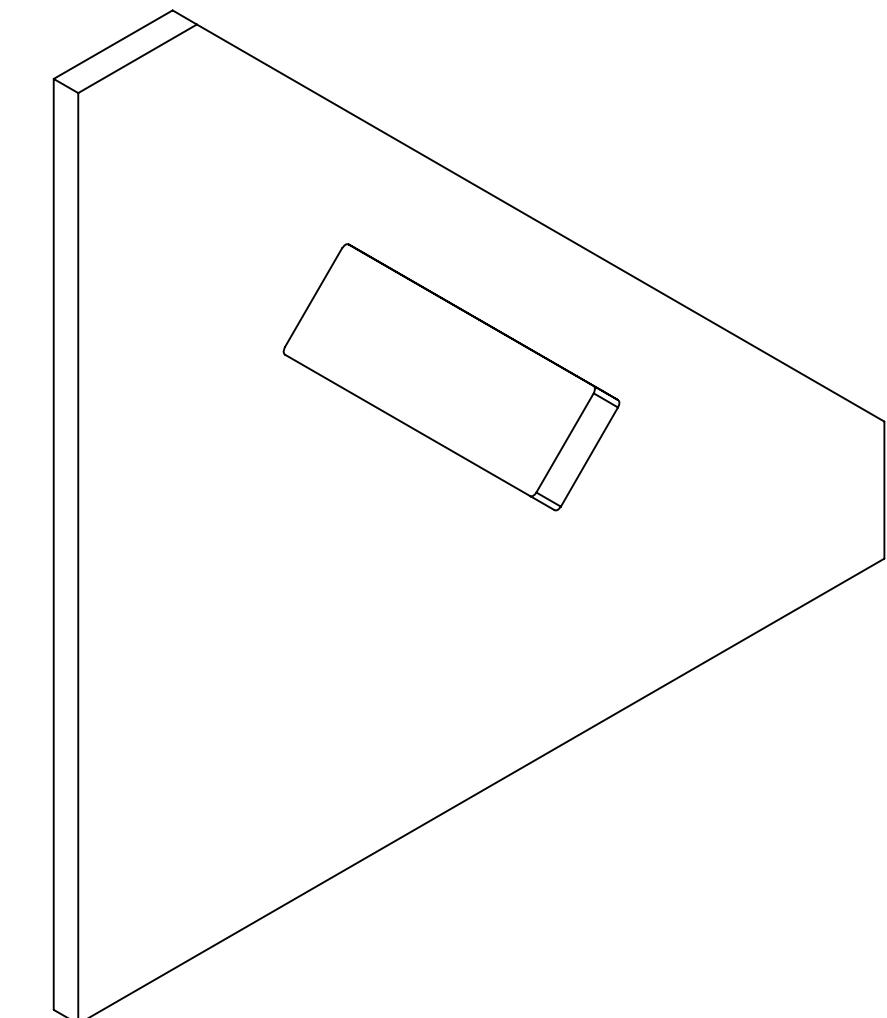
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3.50[3\frac{1}{2}"]

6.00
to virtual sharp7.88[7\frac{7}{8}"]
to virtual sharp14.13[14\frac{1}{8}"]
to virtual sharp16.00
to virtual sharp

23.75[23\frac{3}{4}"]

Cut out is strongly recommended for ease of assembly



Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

3/4" Plywood

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/21/2021

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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.

 **FIRST
ROBOTICS
COMPETITION**  **SOLIDWORKS**
Modeling Solutions Partner

TITLE:

HUB - Complex Build -
Lower Leg Base Side

SIZE DWG. NO. REV

C TE-22173

SCALE: 1:4 SHEET 1 OF 1

4

3

2

1

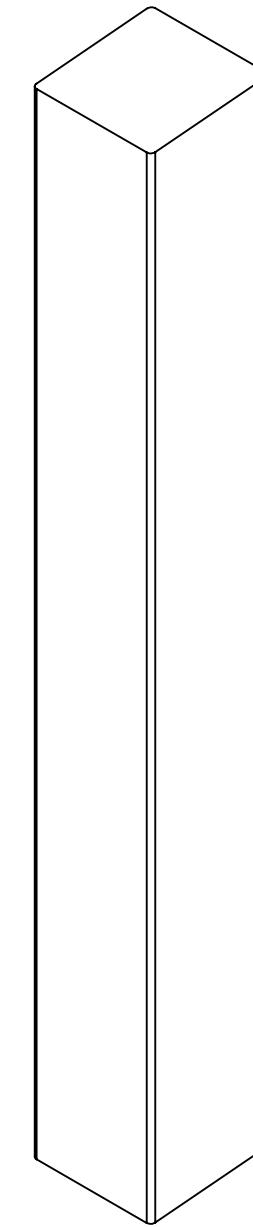
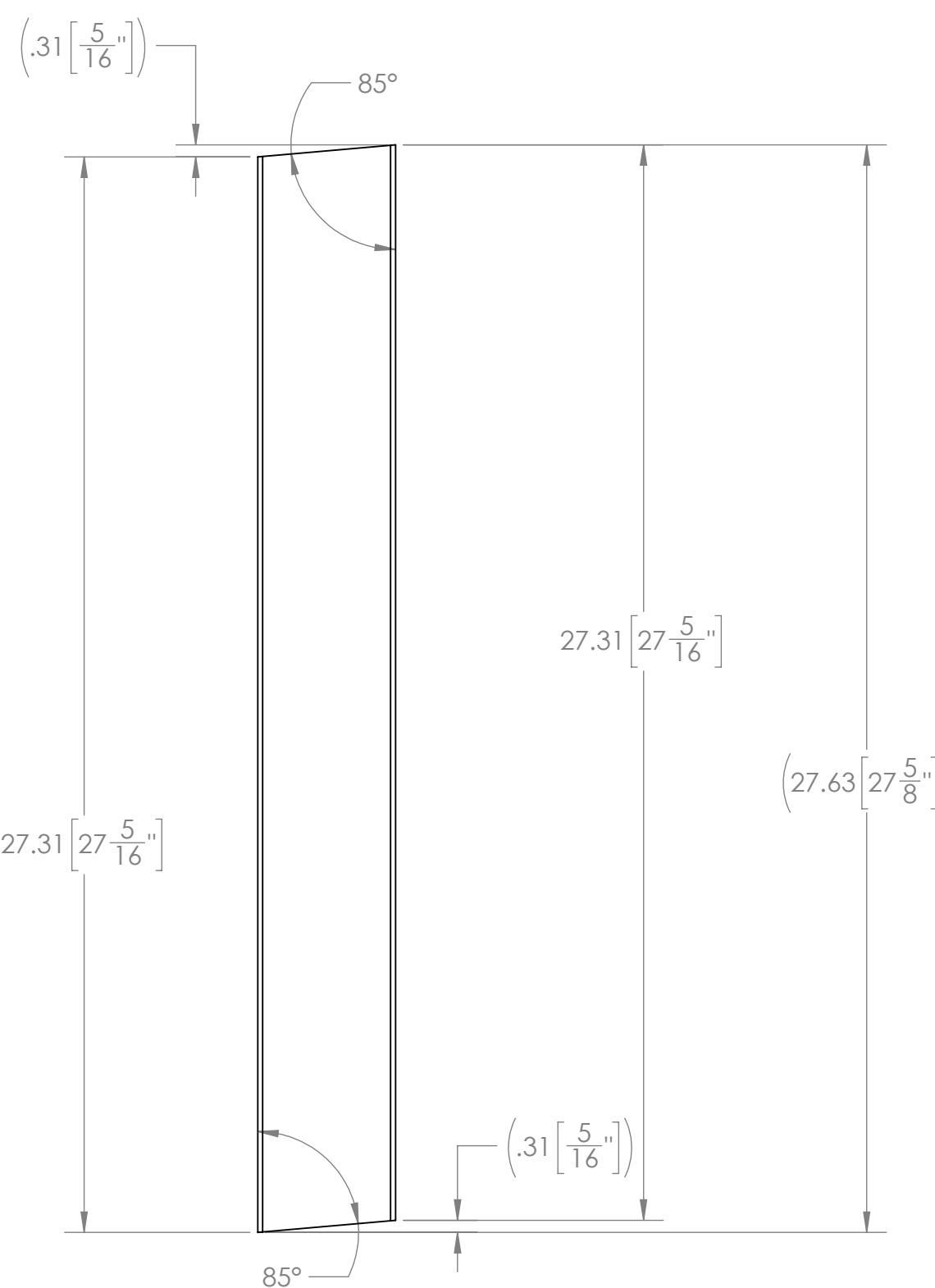
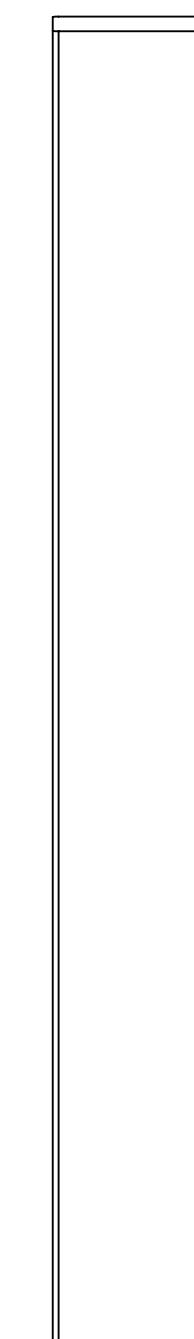
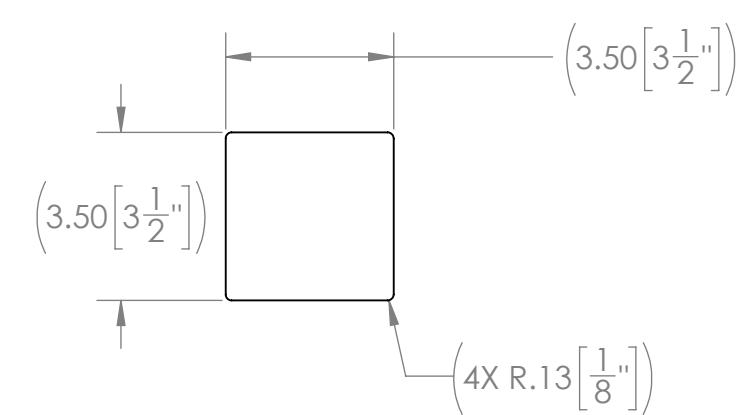
D

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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

DO NOT SCALE DRAWING

TEAM NAME DATE
DRAWN KAMC 12/21/2021

FIRST ROBOTICS COMPETITION **SOLIDWORKS**
Modeling Solutions Partner

TITLE: HUB - Complex Build -
Upper Leg 4x4

SIZE DWG. NO. REV

C TE-22174

SCALE: 1:4 SHEET 1 OF 1

4

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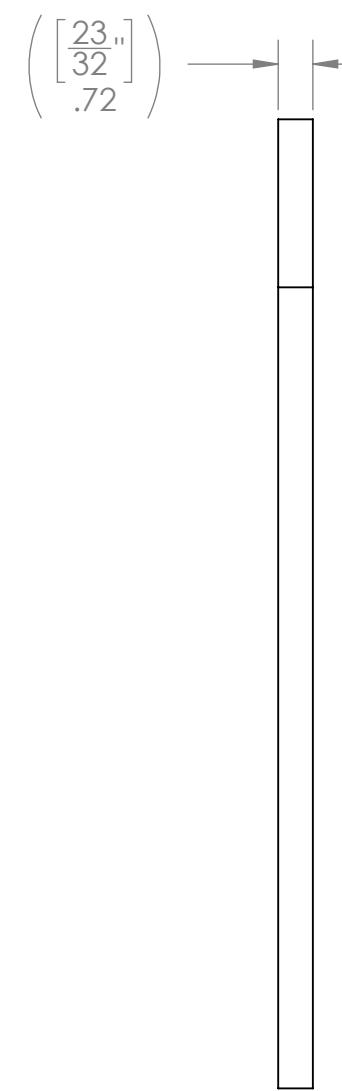
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B

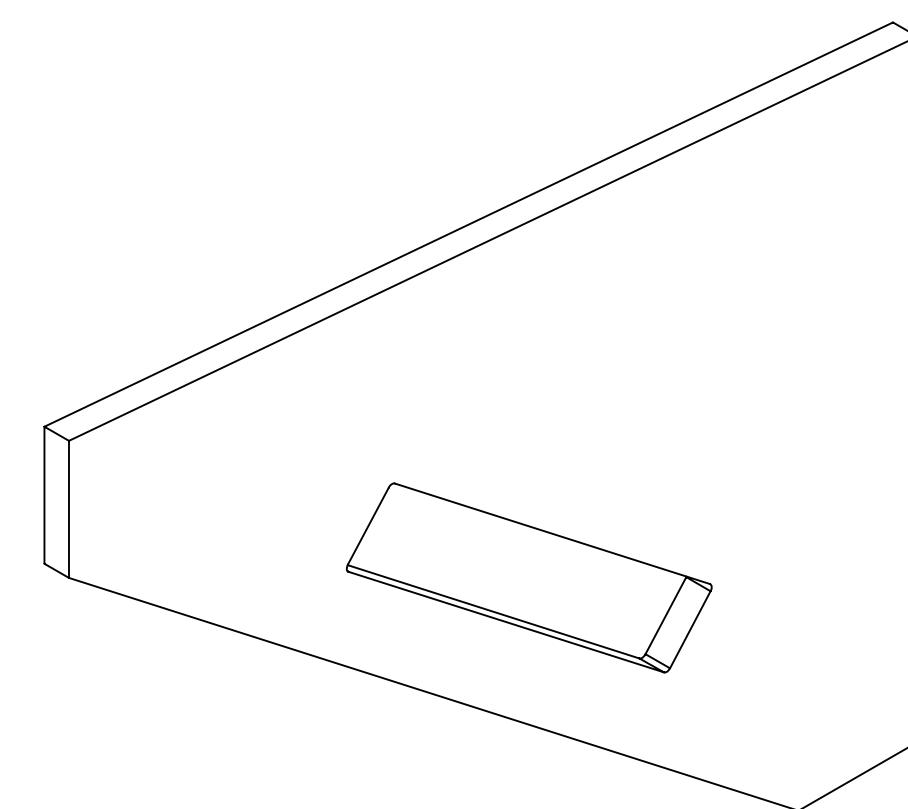
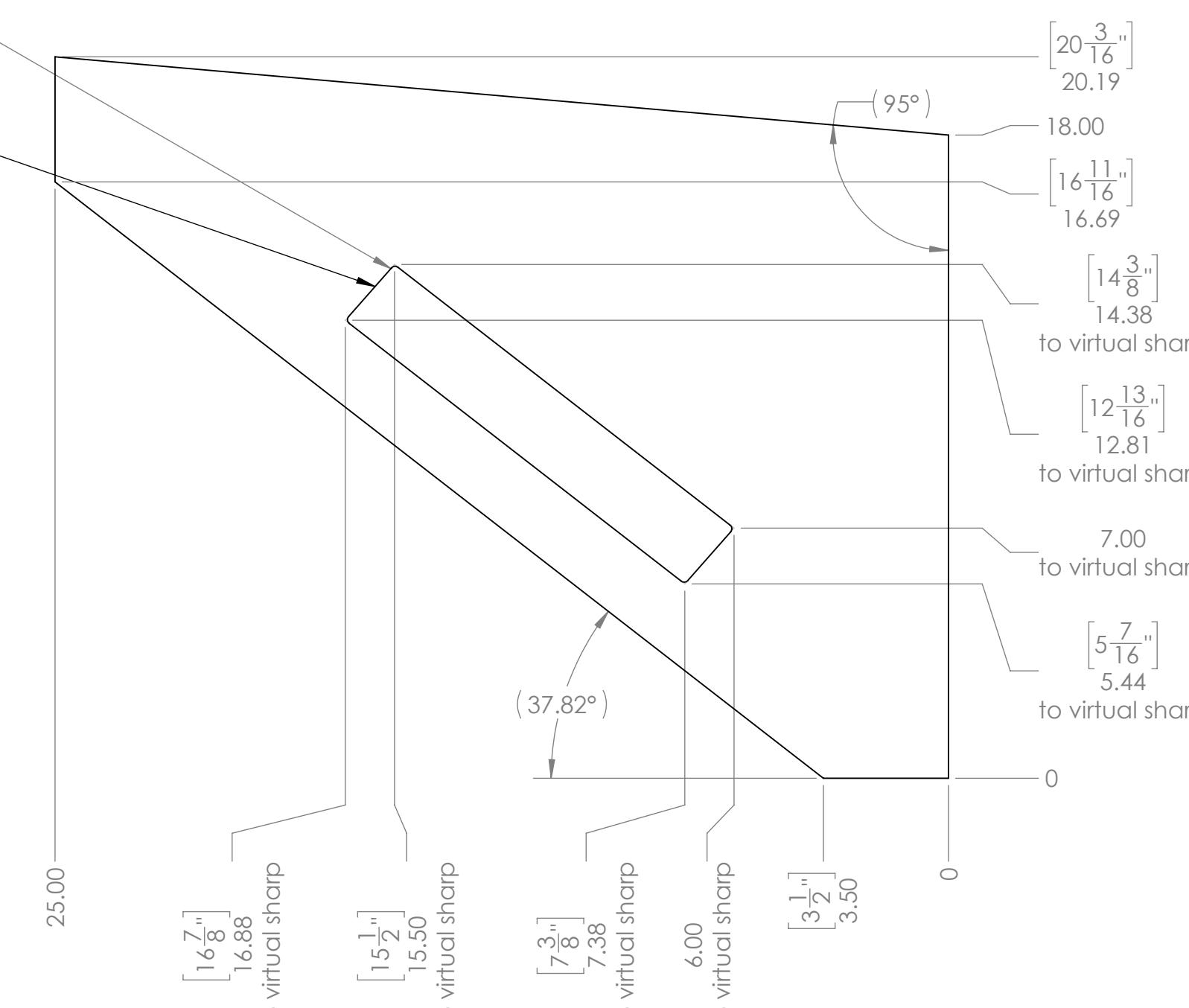
B

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Cut out is strongly recommended for ease of assembly



Note:
Radii located at internal corners are provided predominately for teams making parts with a router. A 90 degree angle is sufficient clearance.

UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	KAMC	12/21/2021
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
3/4" Plywood	C	TE-22175	
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SCALE: 1:4	SHEET 1 OF 1	



SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build - Upper Leg Side

SIZE DWG. NO. REV
C TE-22175

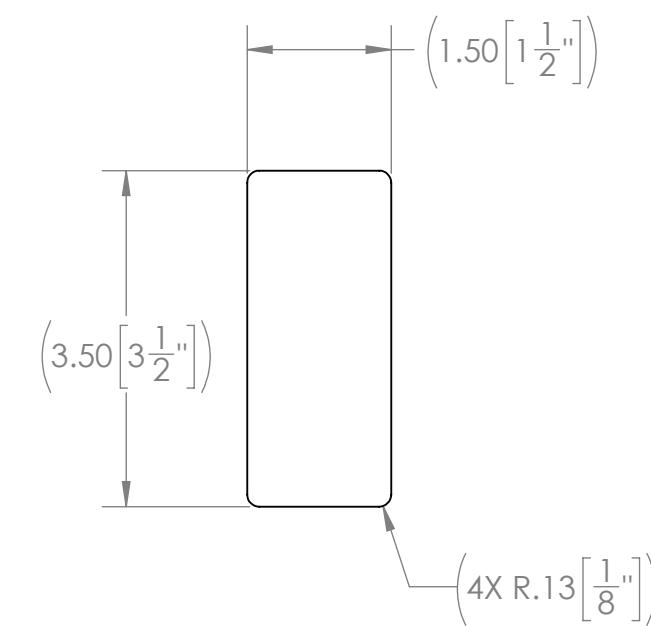
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3

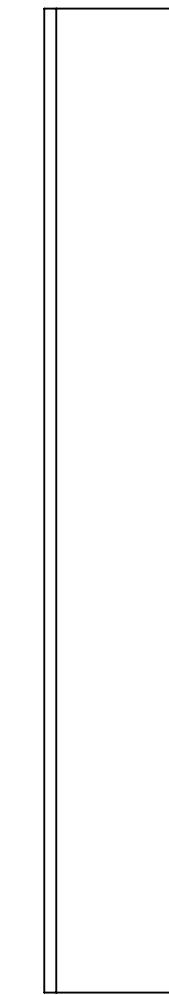
2

1

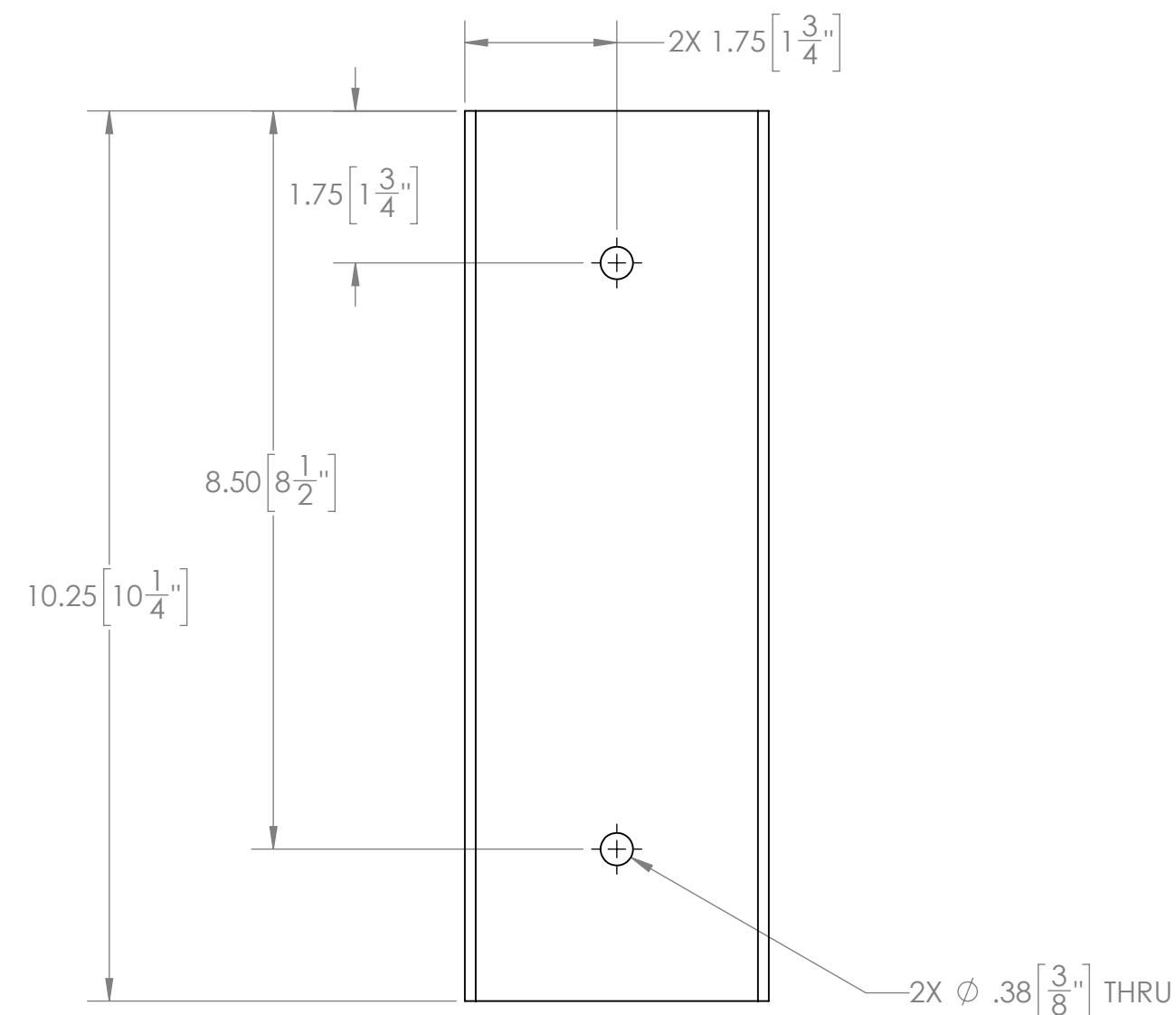
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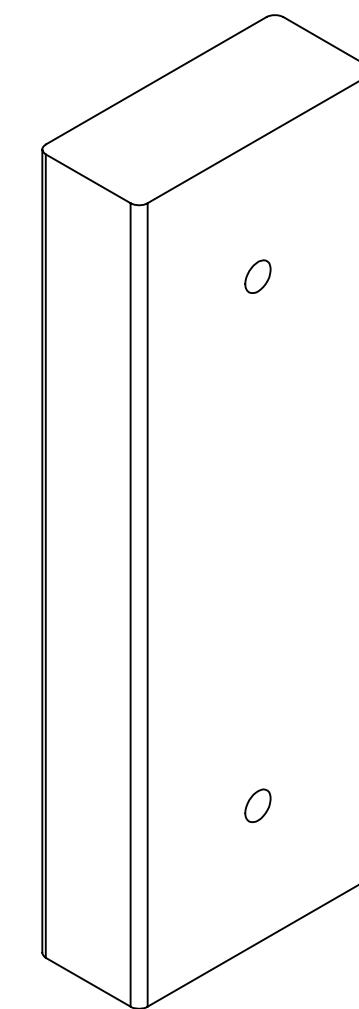
C



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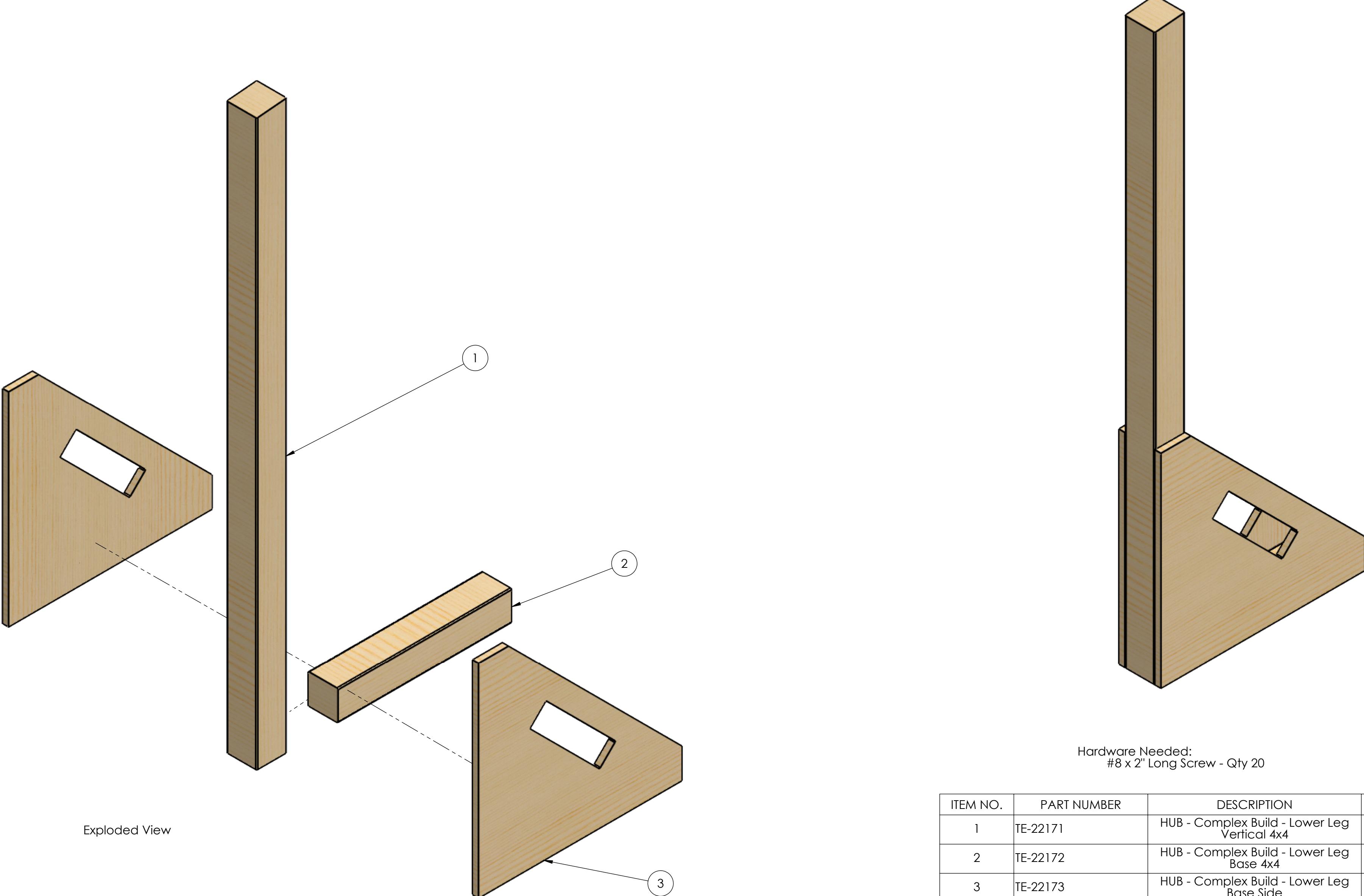


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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
2" x 4" Lumber	C	TE-22176	
COMMENTS:		SCALE: 1:2	
REMOVE ALL BURRS AND SHARP EDGES.		SHEET 1 OF 1	
DO NOT SCALE DRAWING			

 **FIRST
ROBOTICS
COMPETITION**  **SOLIDWORKS**
Modeling Solutions Partner

TITLE:
**HUB - Complex Build -
Upper Leg to
Connection Box 2x4**

SIZE DWG. NO. REV
C TE-22176
SCALE: 1:2 SHEET 1 OF 1



Hardware Needed:
#8 x 2" Long Screw - Qty 20

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22171	HUB - Complex Build - Lower Leg Vertical 4x4	1
2	TE-22172	HUB - Complex Build - Lower Leg Base 4x4	1
3	TE-22173	HUB - Complex Build - Lower Leg Base Side	2

UNLESS OTHERWISE SPECIFIED:			TEAM	NAME	DATE
			DRAWN	KAMC	12/21/2021
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COMMENTS:					
REMOVE ALL BURRS AND SHARP EDGES.					
DO NOT SCALE DRAWING					

FIRST ROBOTICS COMPETITION Modeling Solutions Partner

TITLE: HUB - Complex Build - Lower Leg Assembly

SIZE DWG. NO. REV

C TE-22177

SCALE: 1:6 SHEET 1 OF 3

4

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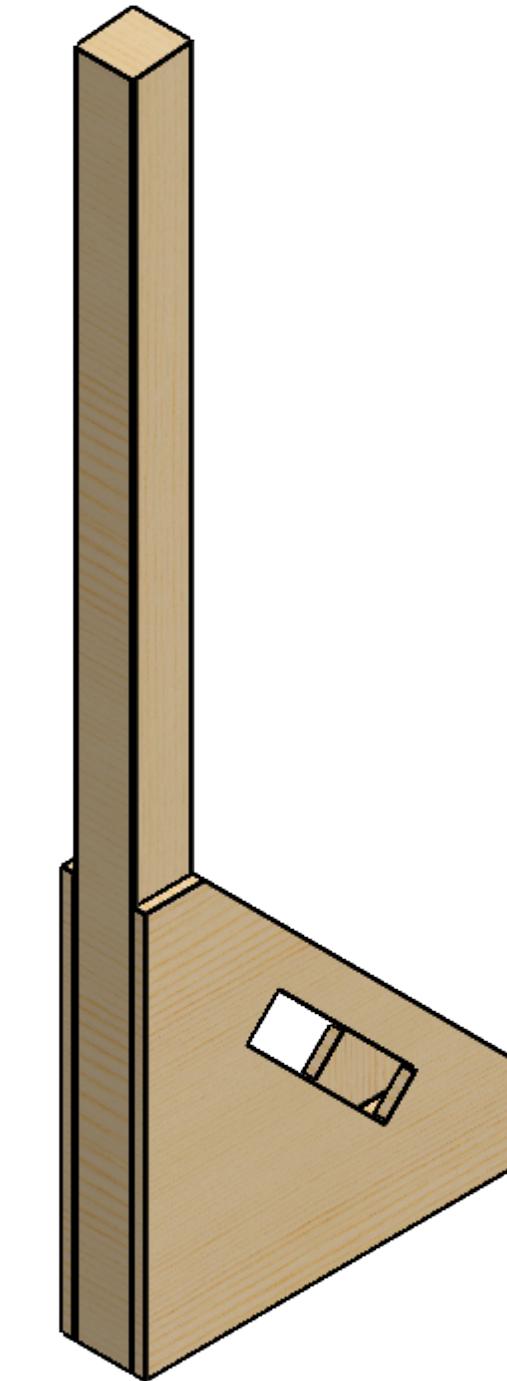
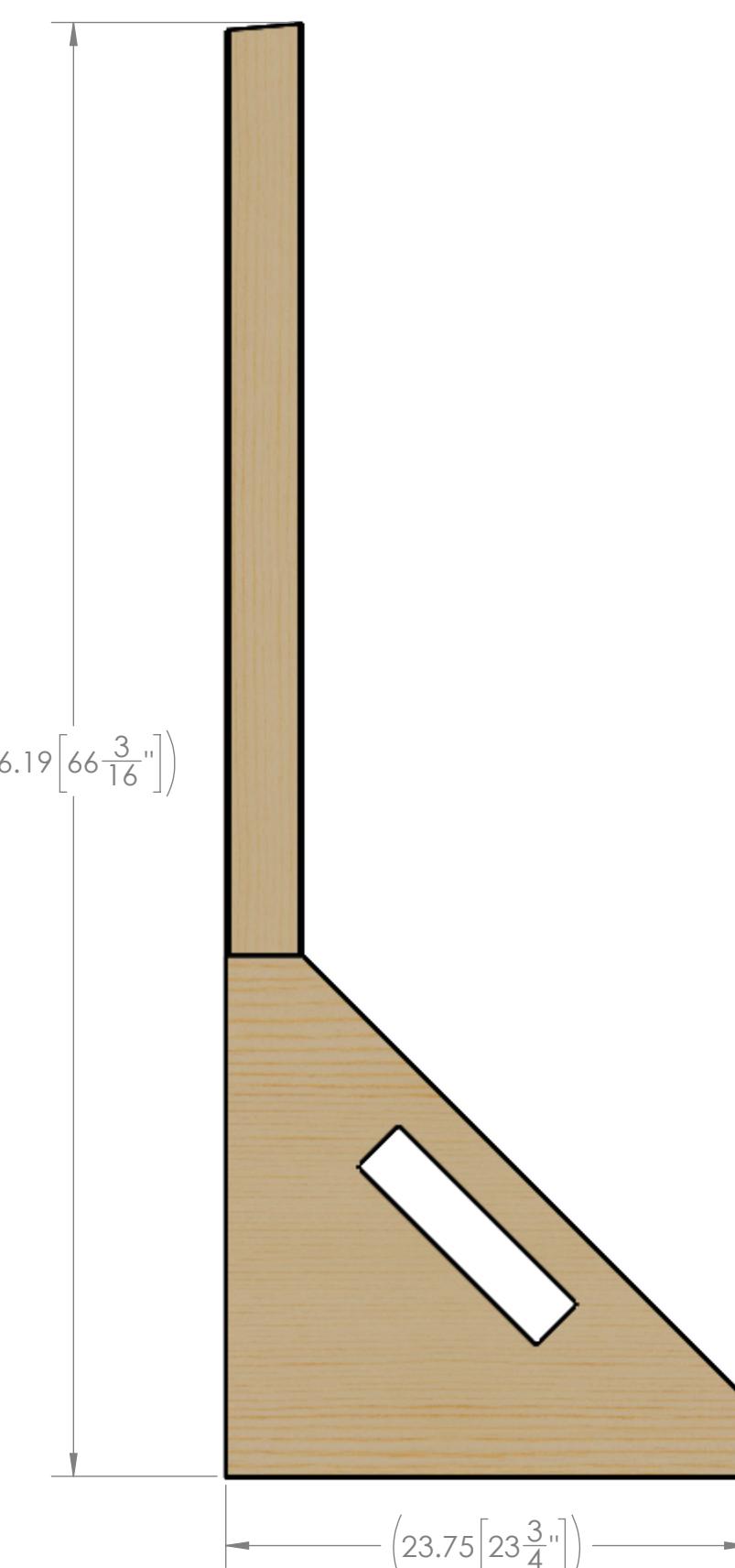
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/21/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:	SIZE	DWG. NO.	REV
C TE-22177			
COMMENTS:	SCALE: 1:8		
REMOVE ALL BURRS AND SHARP EDGES.			SHEET 2 OF 3
DO NOT SCALE DRAWING			

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Lower Leg Assembly

SIZE DWG. NO. REV

C TE-22177

SCALE: 1:8 SHEET 2 OF 3

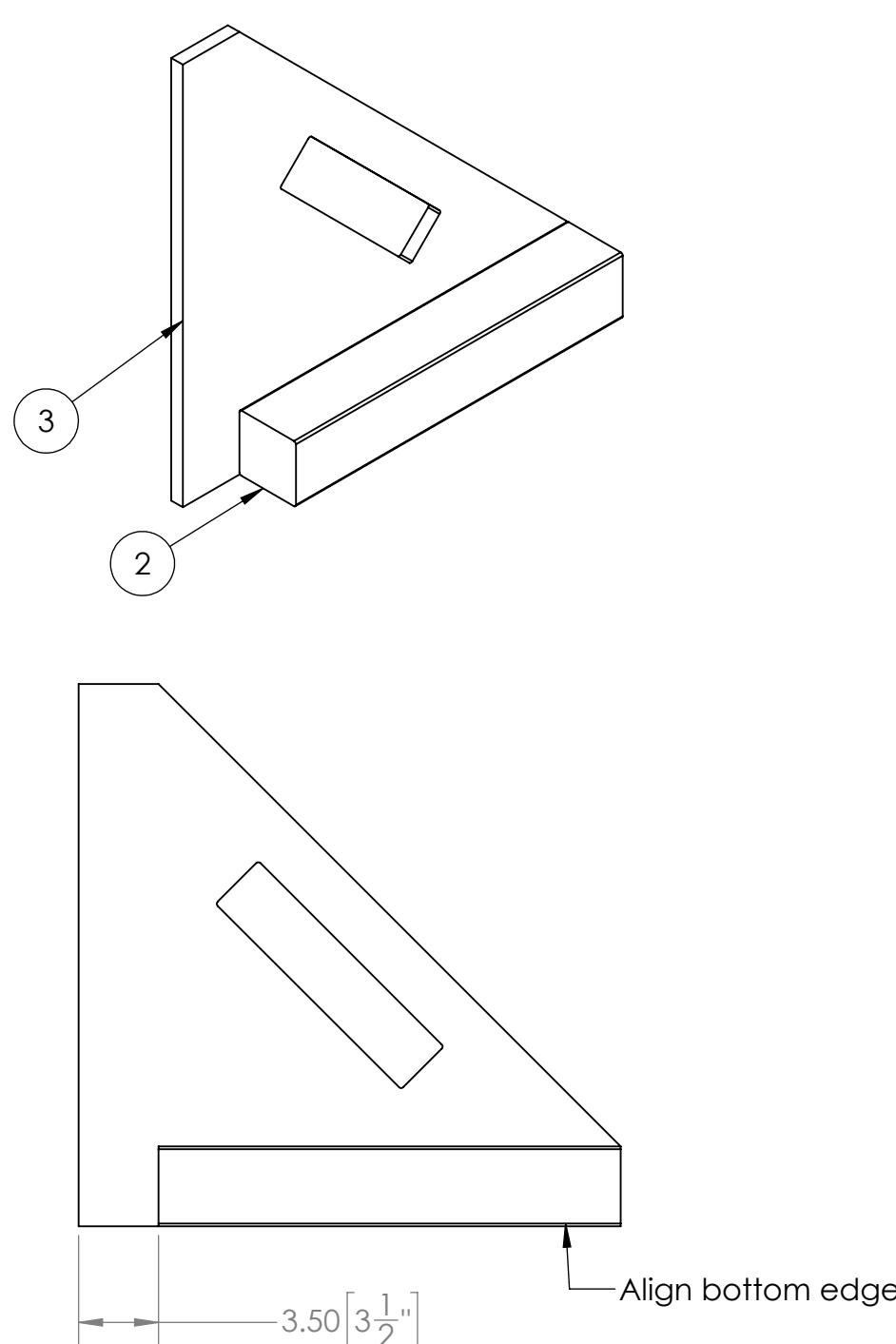
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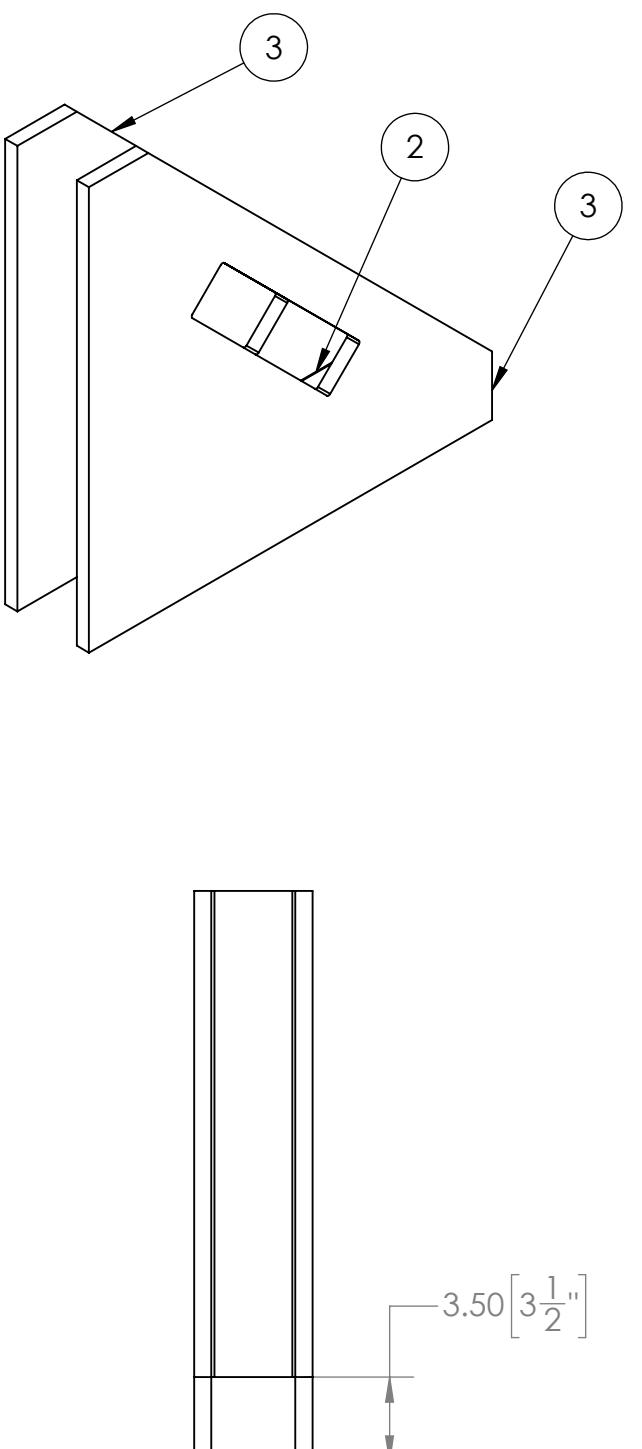
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Step 1



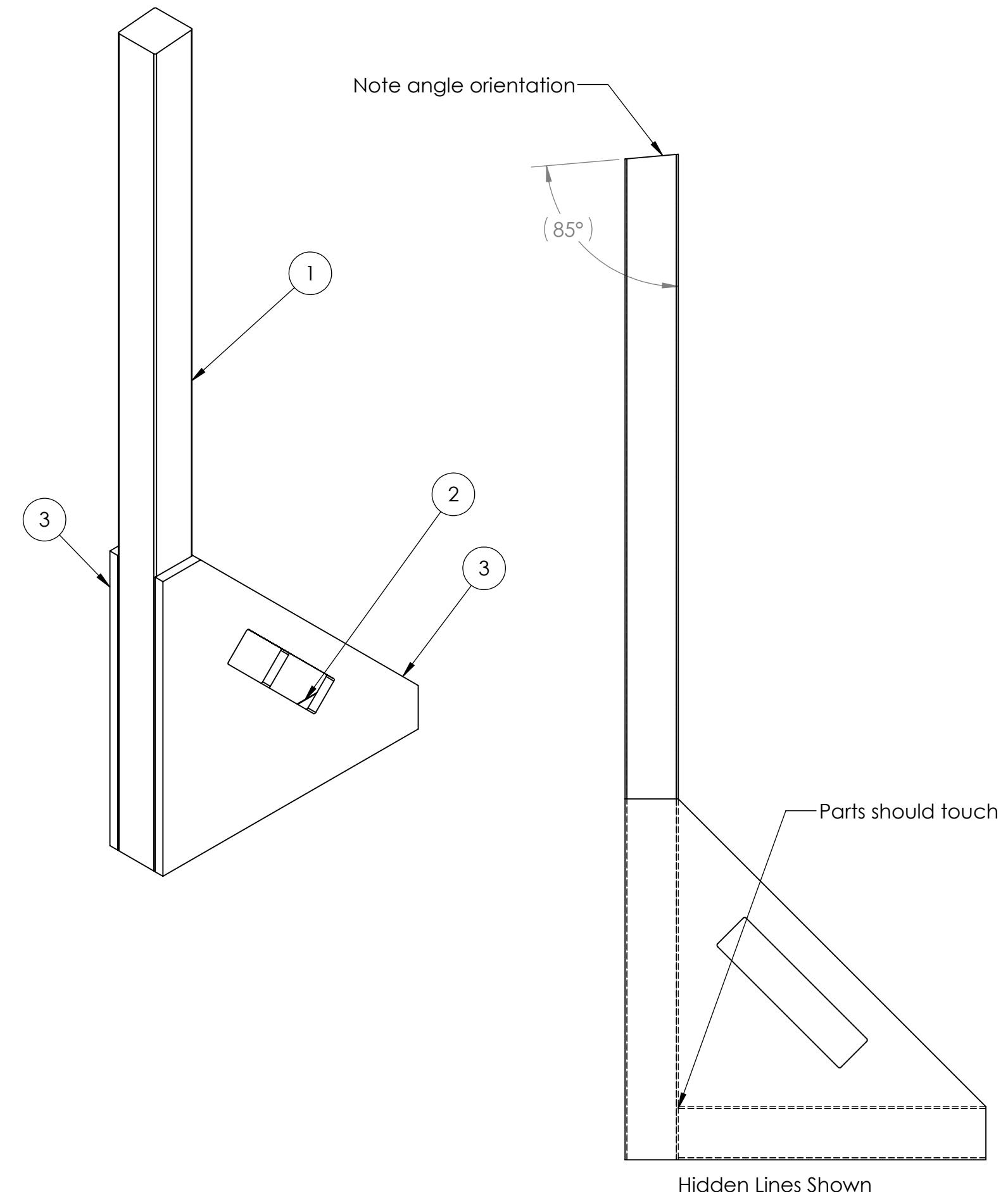
1. Align (2) and (3), as shown.
2. Connect using 2" long screws. It is recommended to use x5 screws.

Step 2



1. Add an additional (3) to Step 1, as shown.
2. Connect using 2" long screws. It is recommended to use x5 screws.

Step 3



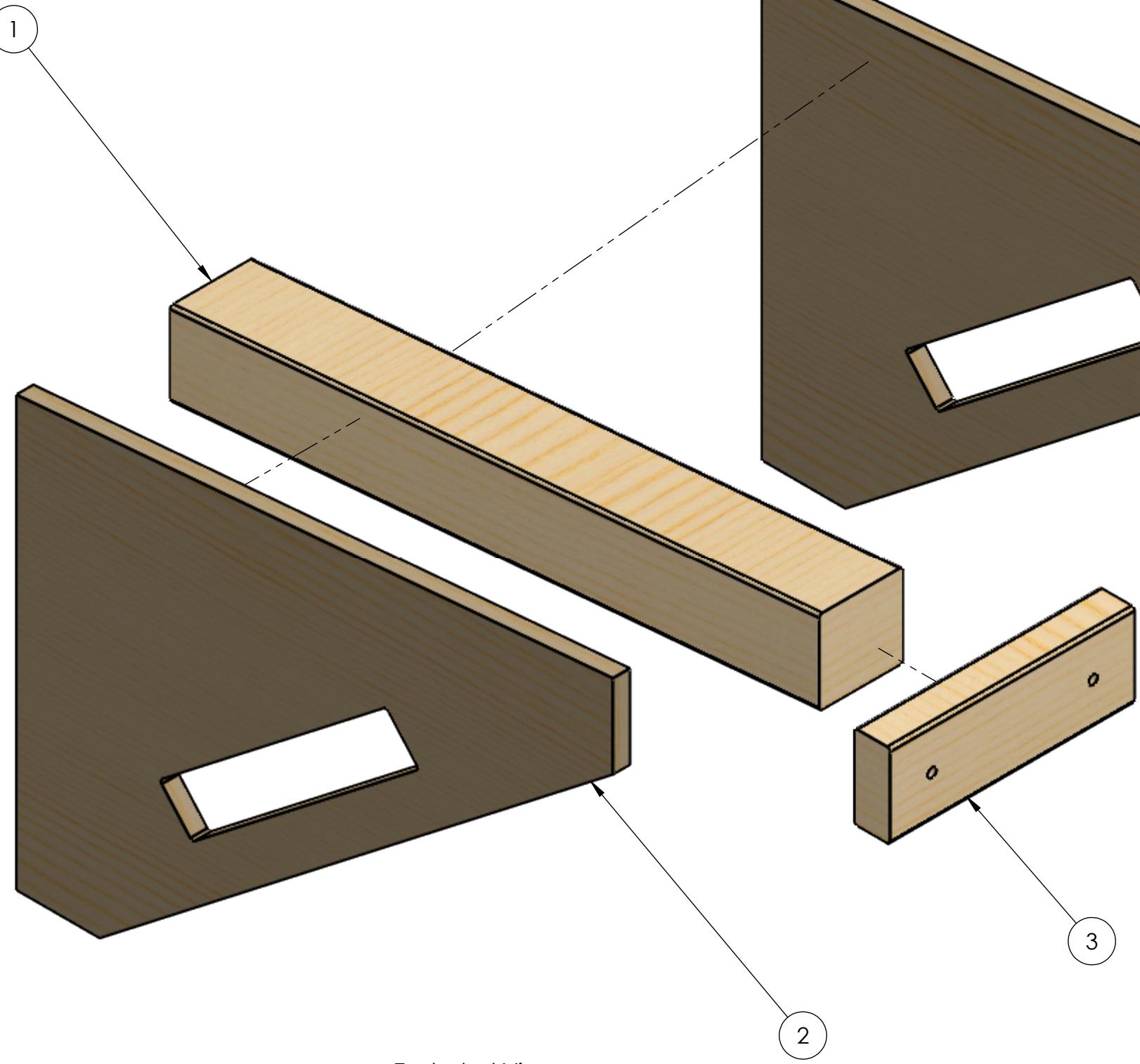
1. Add (1) to Step 2 by sliding between both (3). Align as shown, such that (1) and (2) touch, and noting the orientation of the angle on (1).
2. Connect (1) to both (3) using 2" long screws. It is recommended to use x5 screws per (3).

UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DRAWN	KAMC	12/21/2021	
PROPRIETARY AND CONFIDENTIAL			
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MATERIAL/FINISH:			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING	SIZE	DWG. NO.	REV
	C	TE-22177	
	SCALE: 1:8	SHEET 3 OF 3	

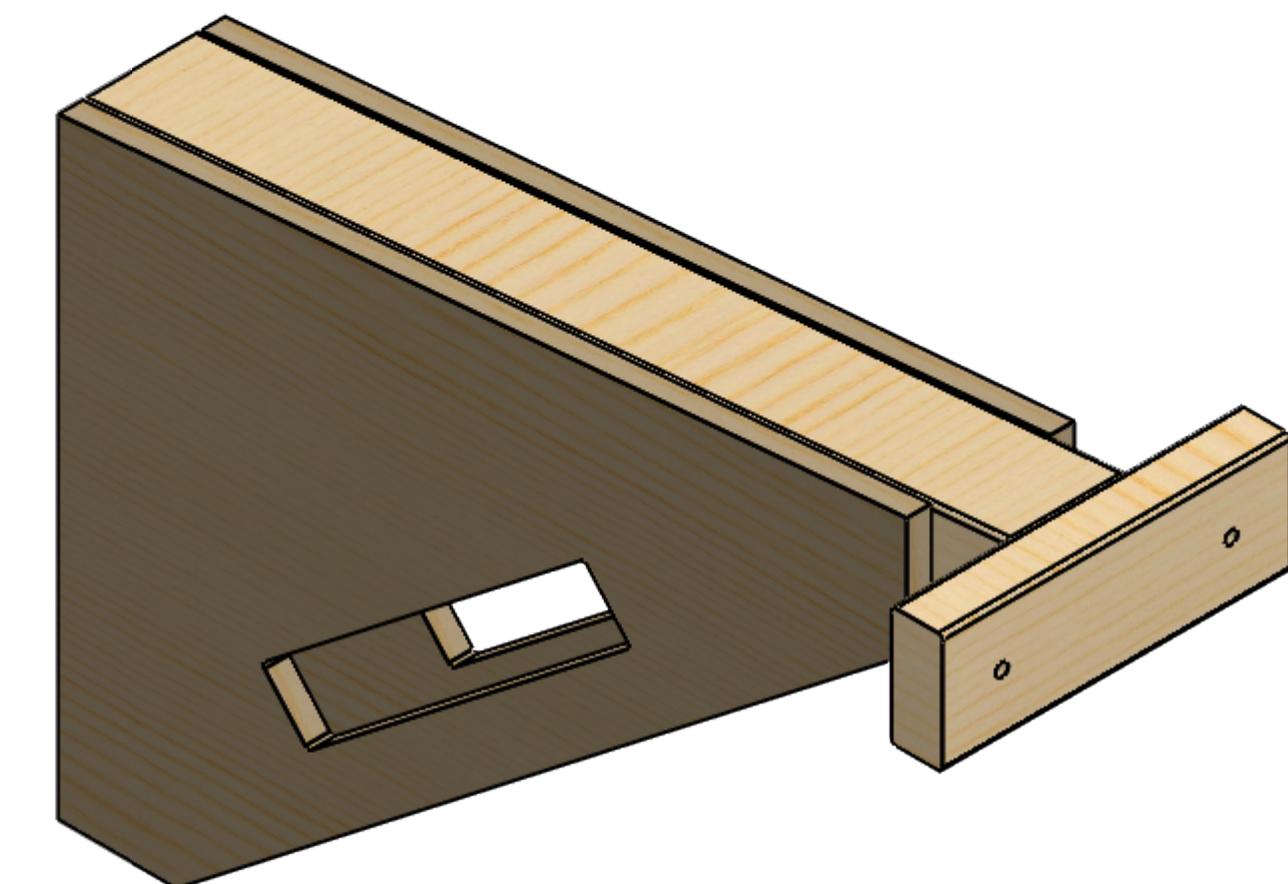
FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Lower Leg Assembly



Exploded View



Hardware Needed:
 #8 x 2" Long Screw - Qty 10
 #8 x 2.5" Long Screw - Qty 5

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	TE-22174	HUB - Complex Build - Upper Leg 4x4	1
2	TE-22175	HUB - Complex Build - Upper Leg Side	2
3	TE-22176	HUB - Complex Build - Upper Leg to Connection Box 2x4	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL $\pm 1/16$
 ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
 TWO PLACE DECIMAL $\pm .13$
 THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

DO NOT SCALE DRAWING

TEAM	NAME	DATE
DRAWN	KAMC	12/21/2021

FIRST ROBOTICS COMPETITION Modeling Solutions Partner

TITLE:
HUB - Complex Build - Upper Leg Assembly

SIZE	DWG. NO.	REV
------	----------	-----

C TE-22178

SCALE: 1:4 SHEET 1 OF 3

4

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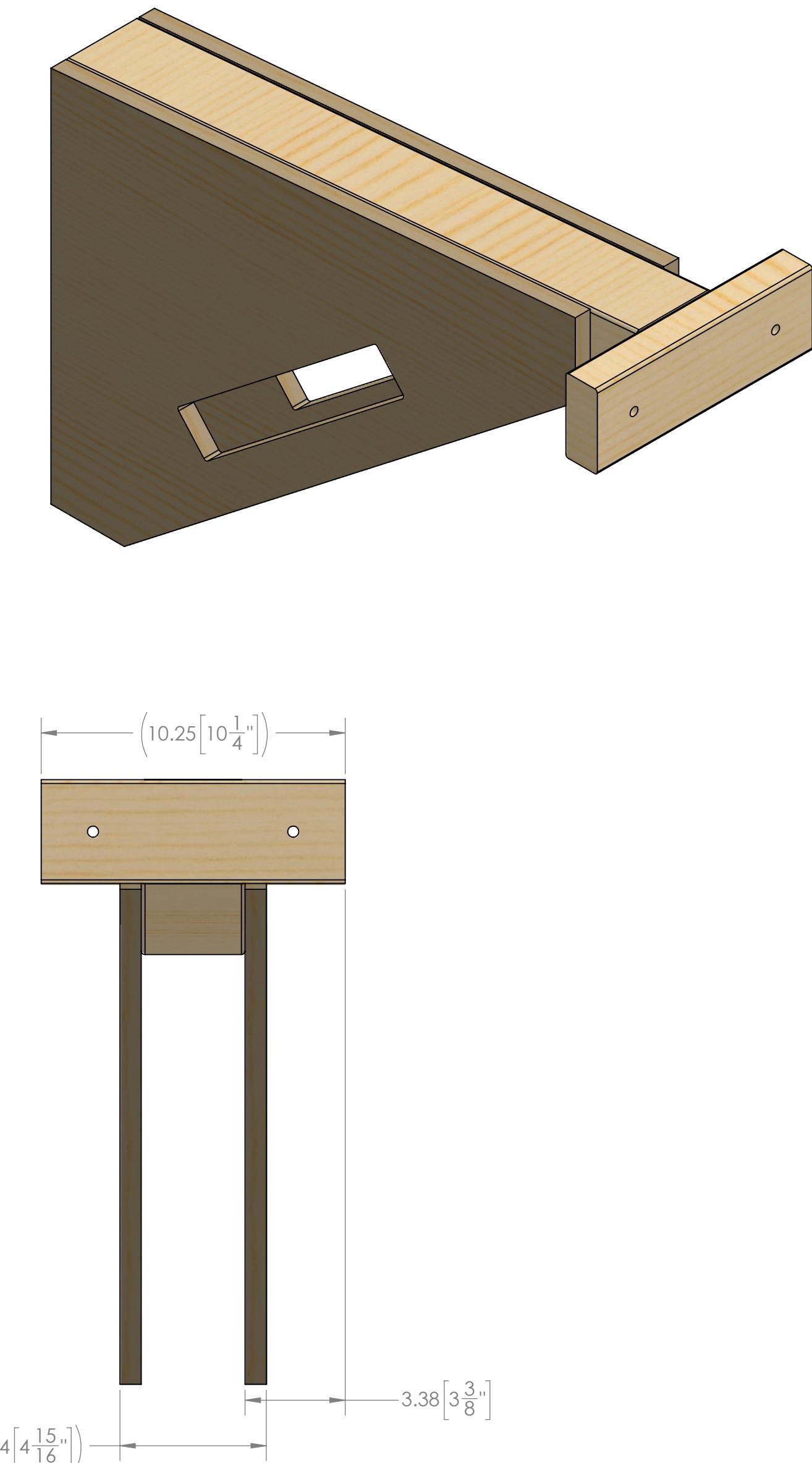
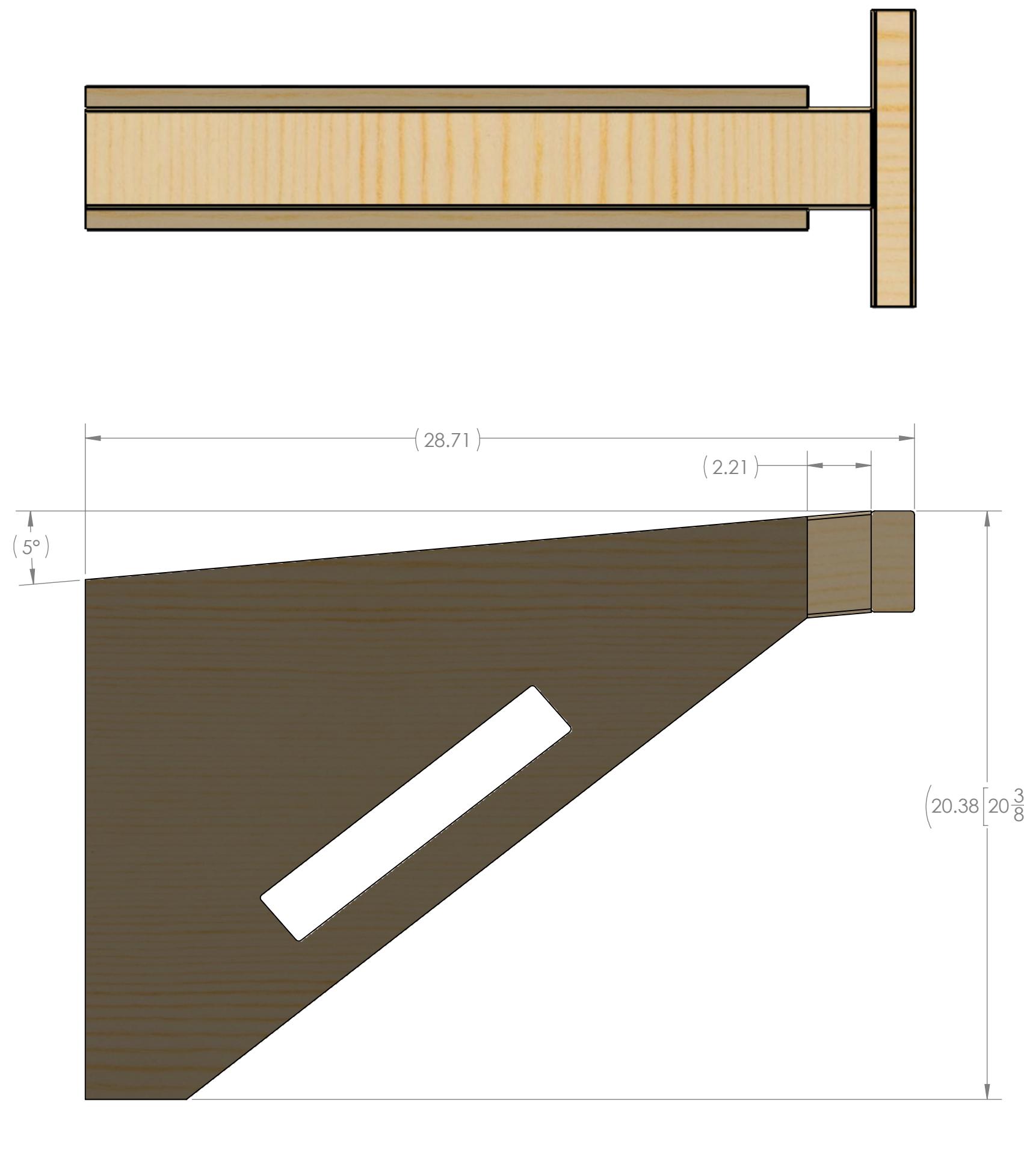
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UNLESS OTHERWISE SPECIFIED:	TEAM	NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	KAMC	12/21/2021
TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$			
TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$			
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MATERIAL/FINISH: COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Upper Leg Assembly

SIZE DWG. NO. REV

C TE-22178

SCALE: 1:4 SHEET 2 OF 3

4

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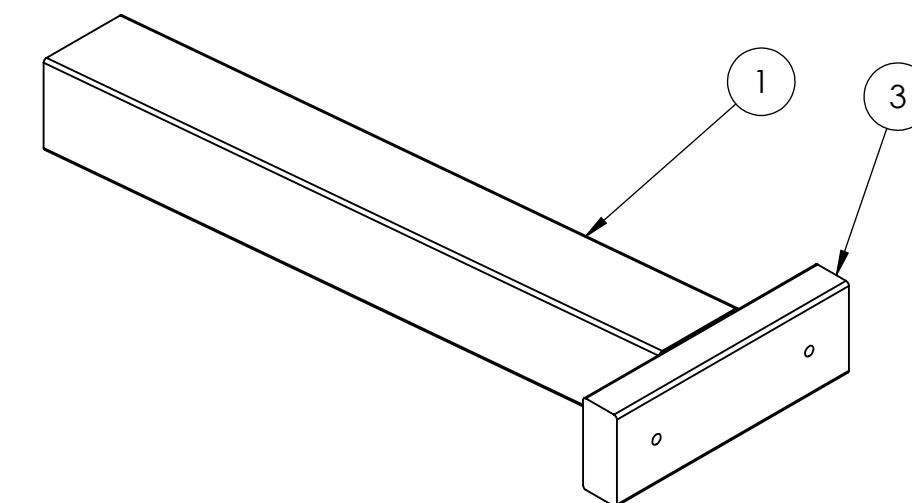
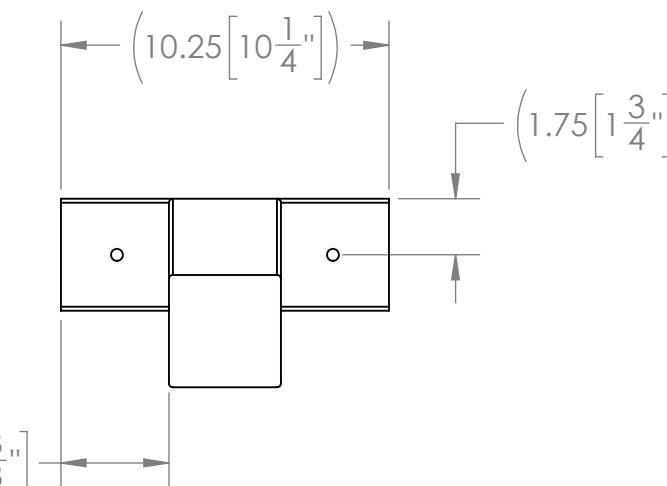
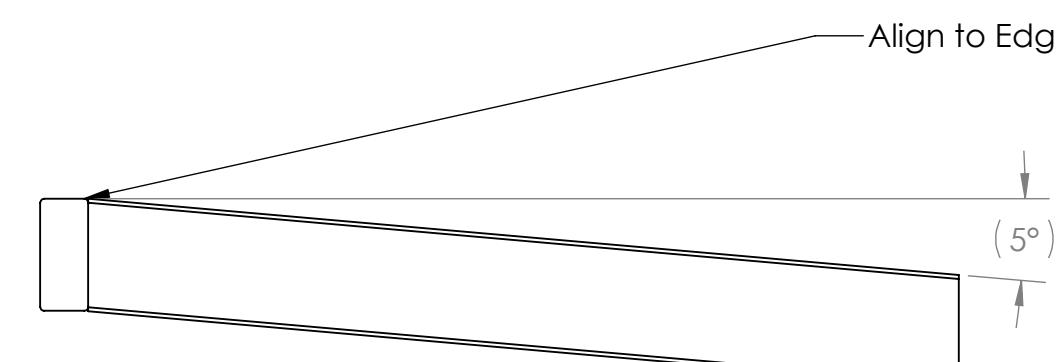
3

2

1

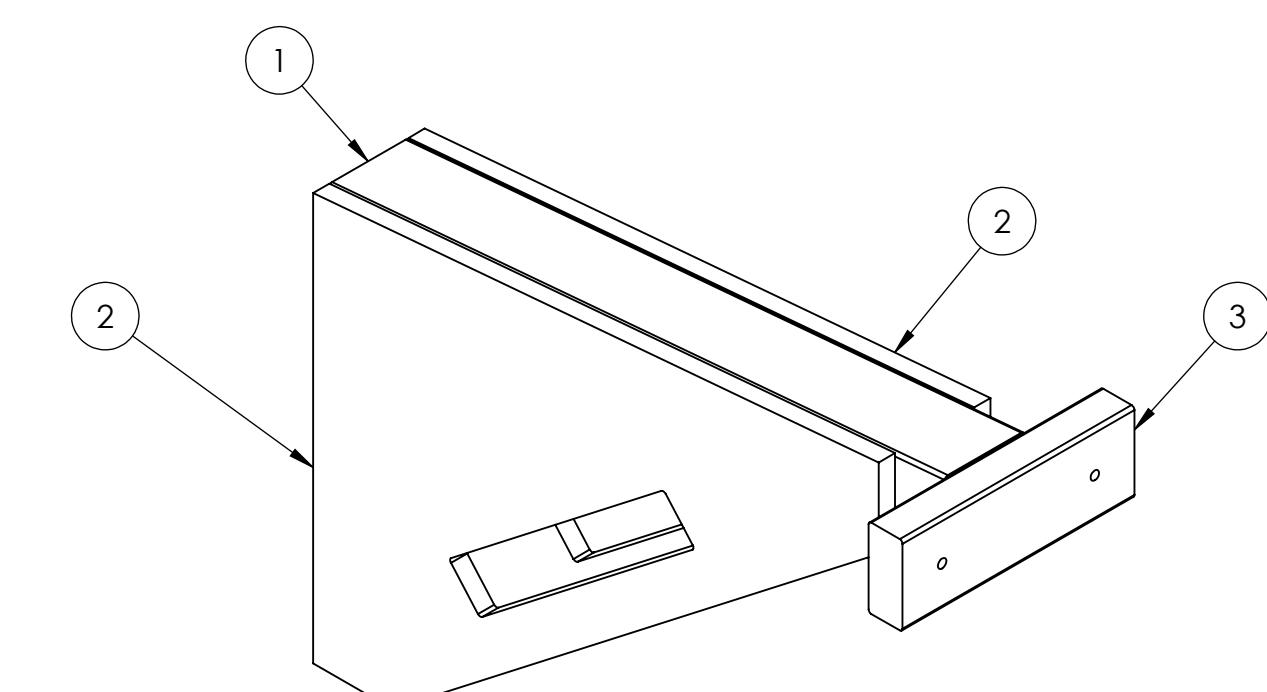
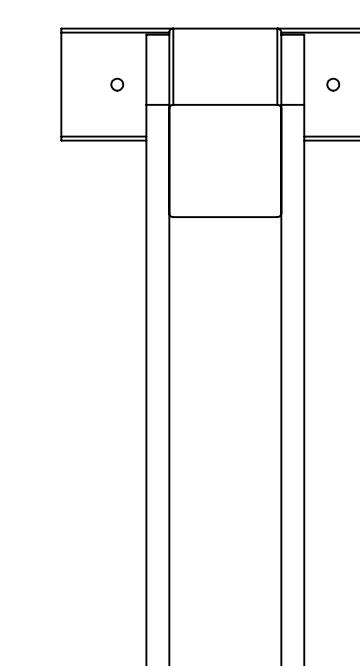
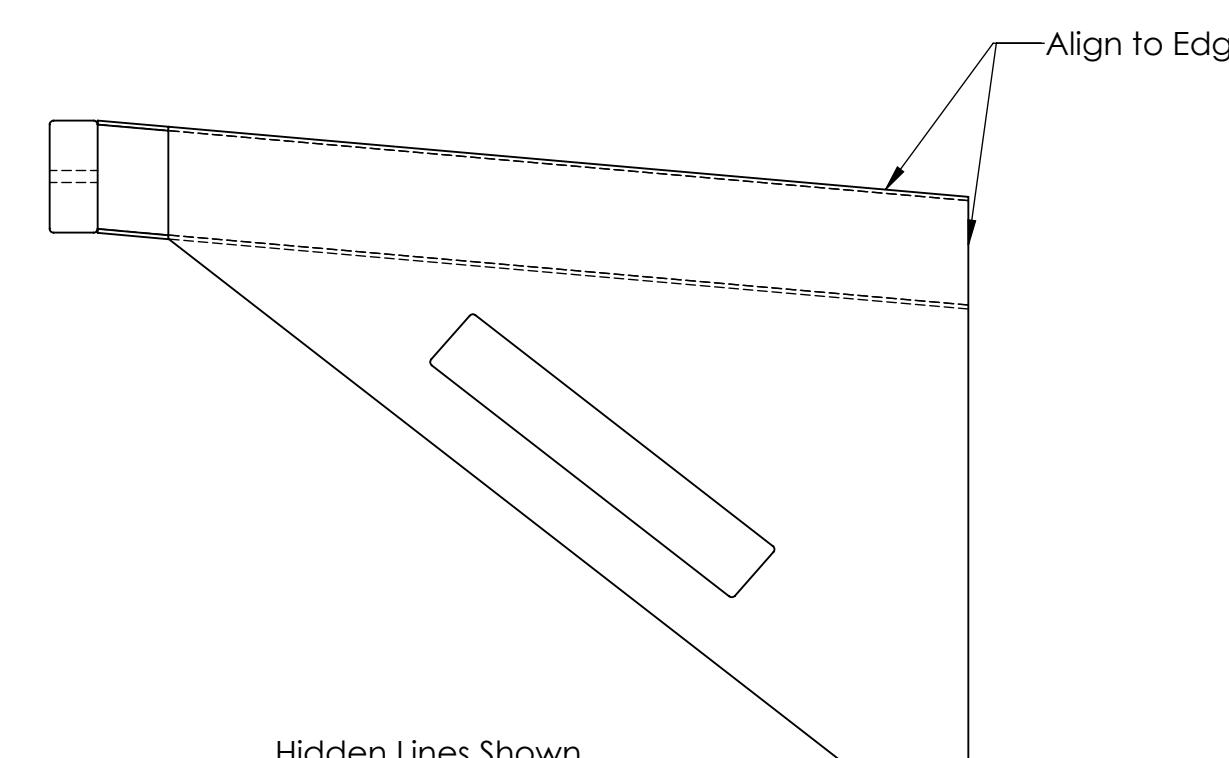
Step 1

- D
1. Align (3) on (1), as shown.
 2. Connect using 2.5" long screws. It is recommended to use 5x screws.



Step 2

- C
1. Add x1 (2) to each side of (1), as shown.
 2. Connect using 2" long screws. It is recommended to use 5x screws per (2).



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:
DO NOT SCALE DRAWING

TEAM NAME DATE
DRAWN KAMC 12/21/2021

FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:

HUB - Complex Build -
Upper Leg Assembly

SIZE DWG. NO. REV

C TE-22178

SCALE: 1:6 SHEET 3 OF 3

4

3

2

1

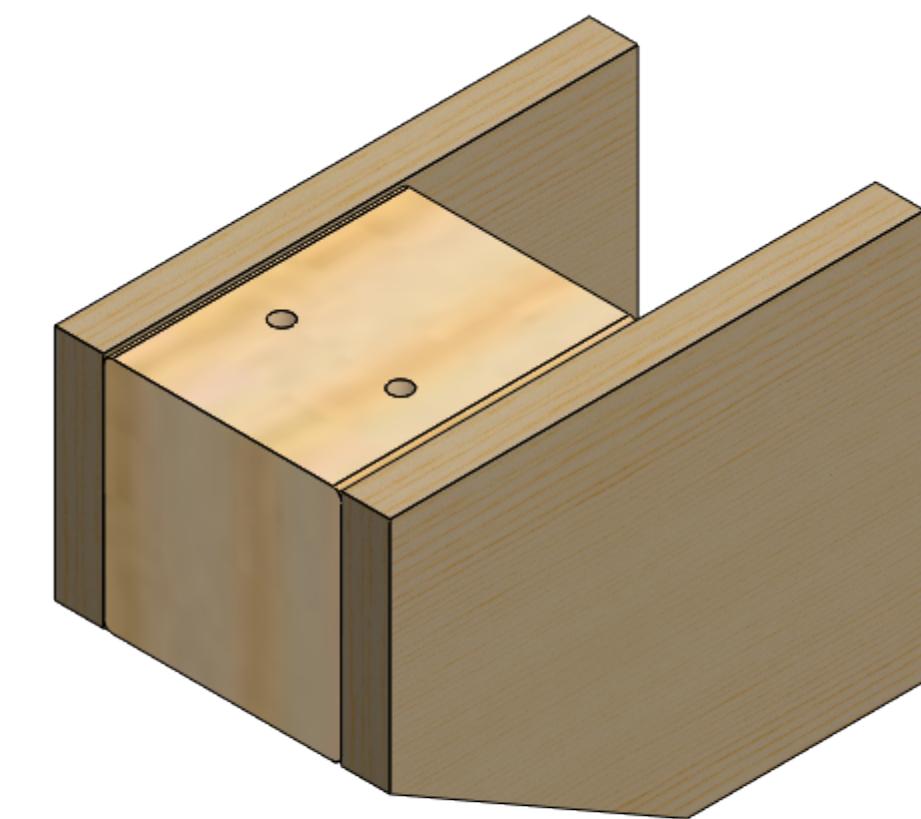
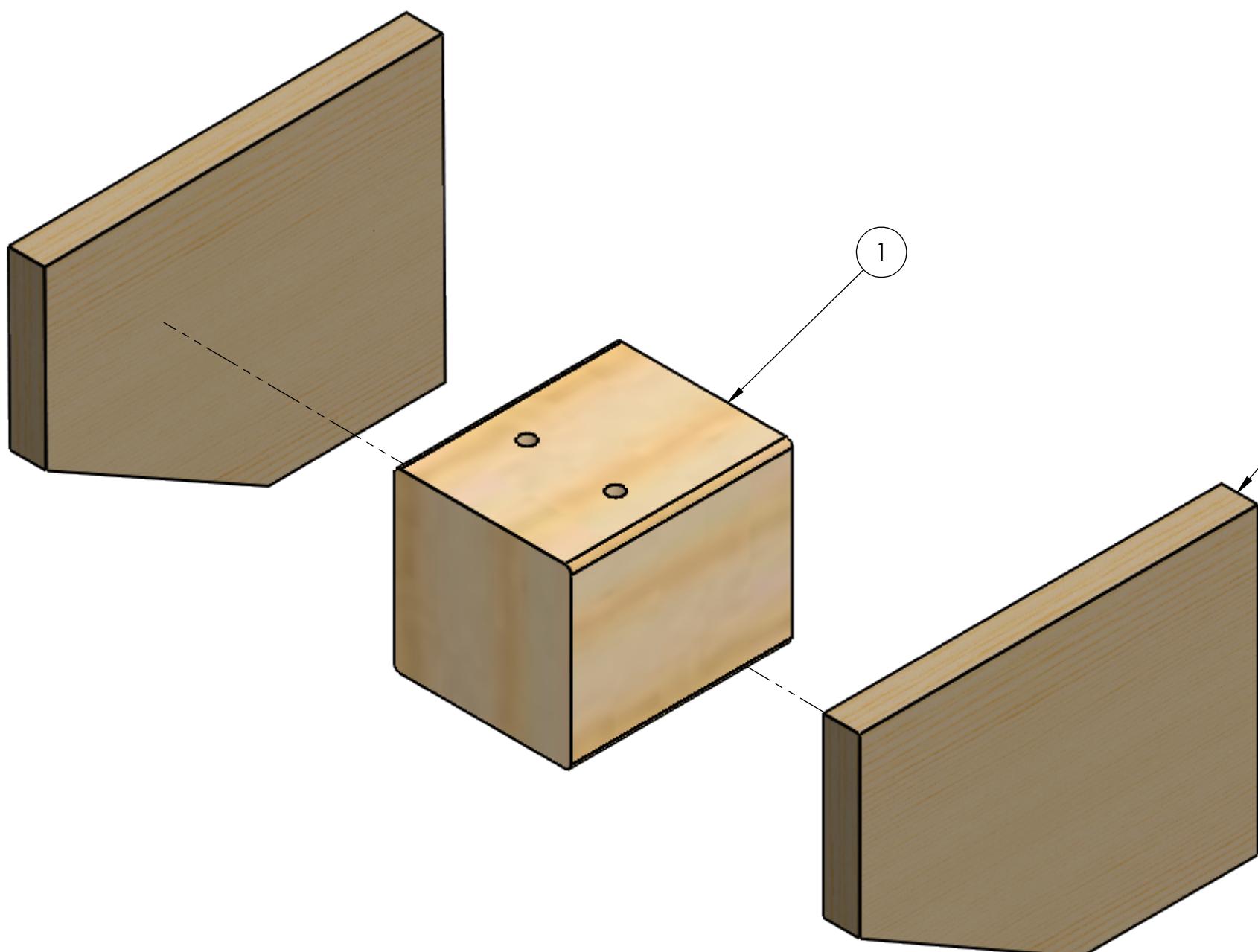
4

3

2

1

D



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1

Hardware Needed:
#8 x 2" Long Screw - Qty 8

ITEM NO.	PART NUMBER	DESCRIPTION	
1	TE-22181	HUB - Complex Build - Lower Hub Ring to Leg 4x4	1
2	TE-22182	HUB - Complex Build - Lower Hub Ring to Leg Side	2

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DRAWN	KAMC	12/21/2021	PROPRIETARY AND CONFIDENTIAL			
<p>DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/16$ ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$ TWO PLACE DECIMAL $\pm .13$ THREE PLACE DECIMAL $\pm .125$</p> <p>MATERIAL/FINISH:</p> <p>COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.</p>						
DO NOT SCALE DRAWING			SIZE	DWG. NO.	REV	
			C	TE-22180		
			SCALE: 1:2		SHEET 1 OF 3	

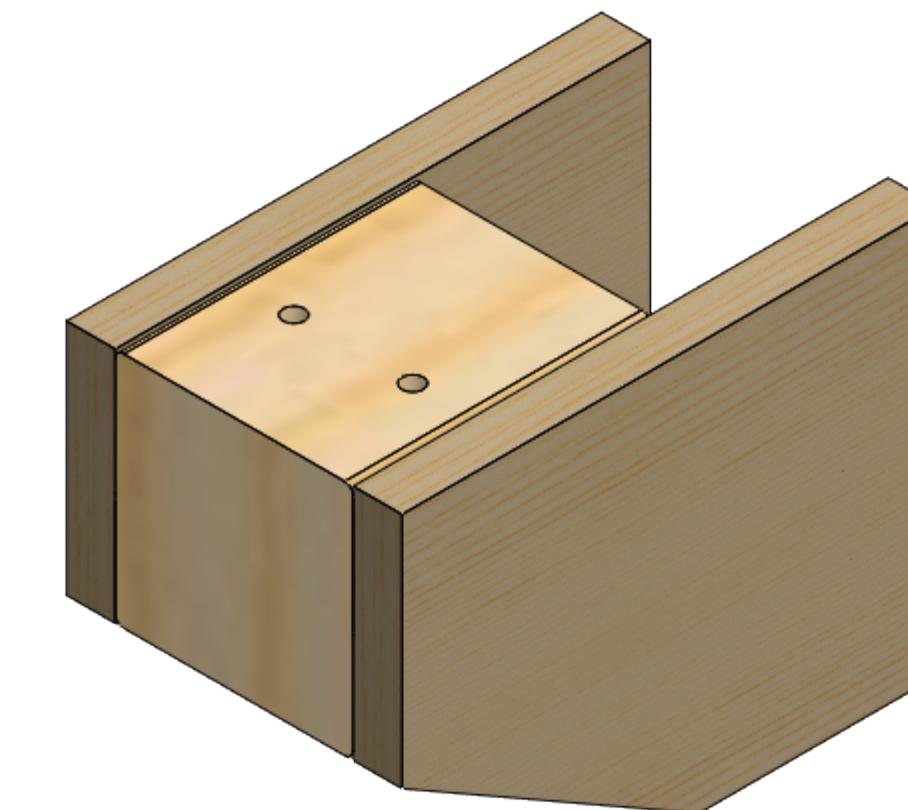
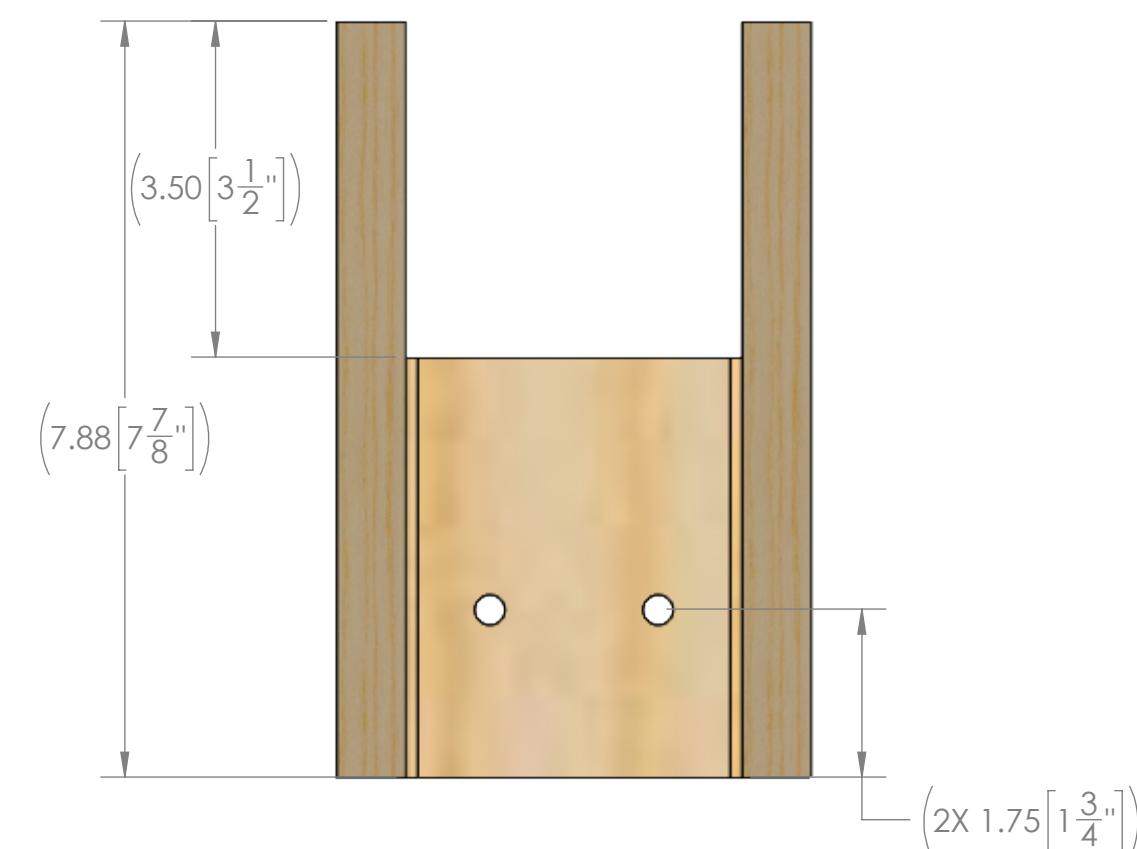
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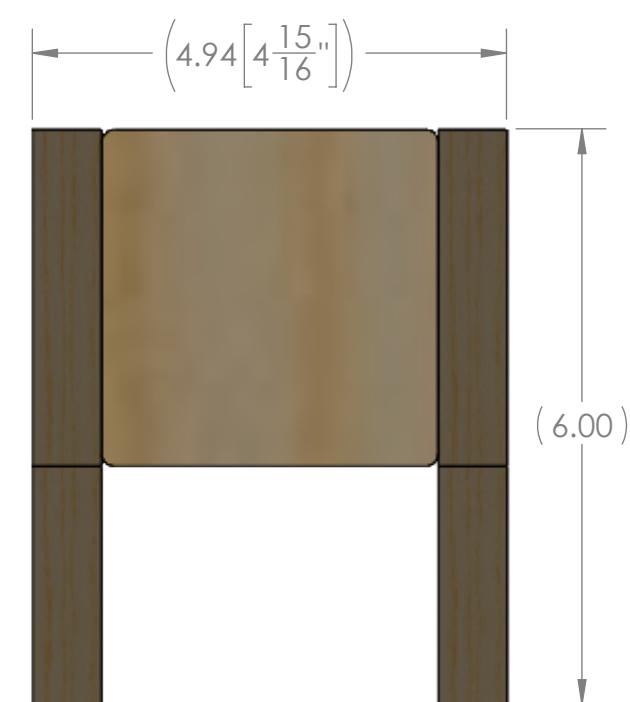
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FIRST
ROBOTICS
COMPETITION

SOLIDWORKS
Modeling Solutions Partner

TITLE:
HUB - Complex Build -
Lower Hub Ring to Leg
Assembly

SIZE DWG. NO. REV
C TE-22180

SCALE: 1:2 SHEET 2 OF 3

4

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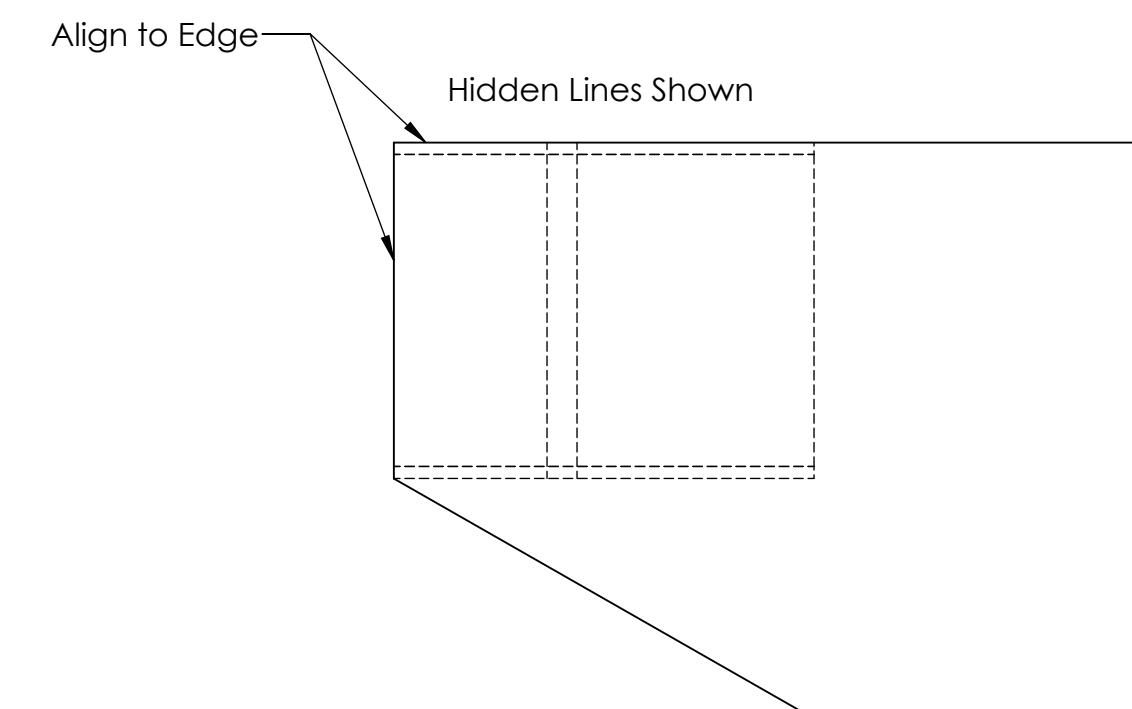
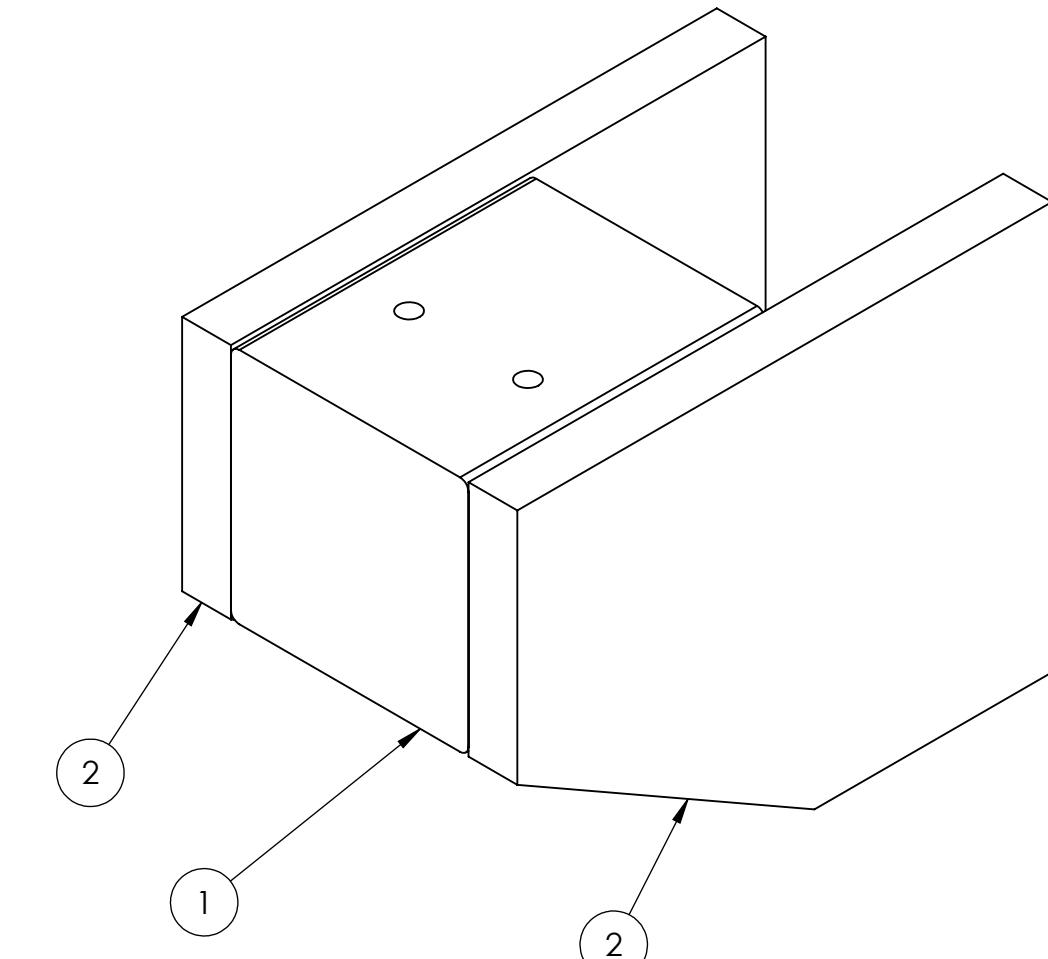
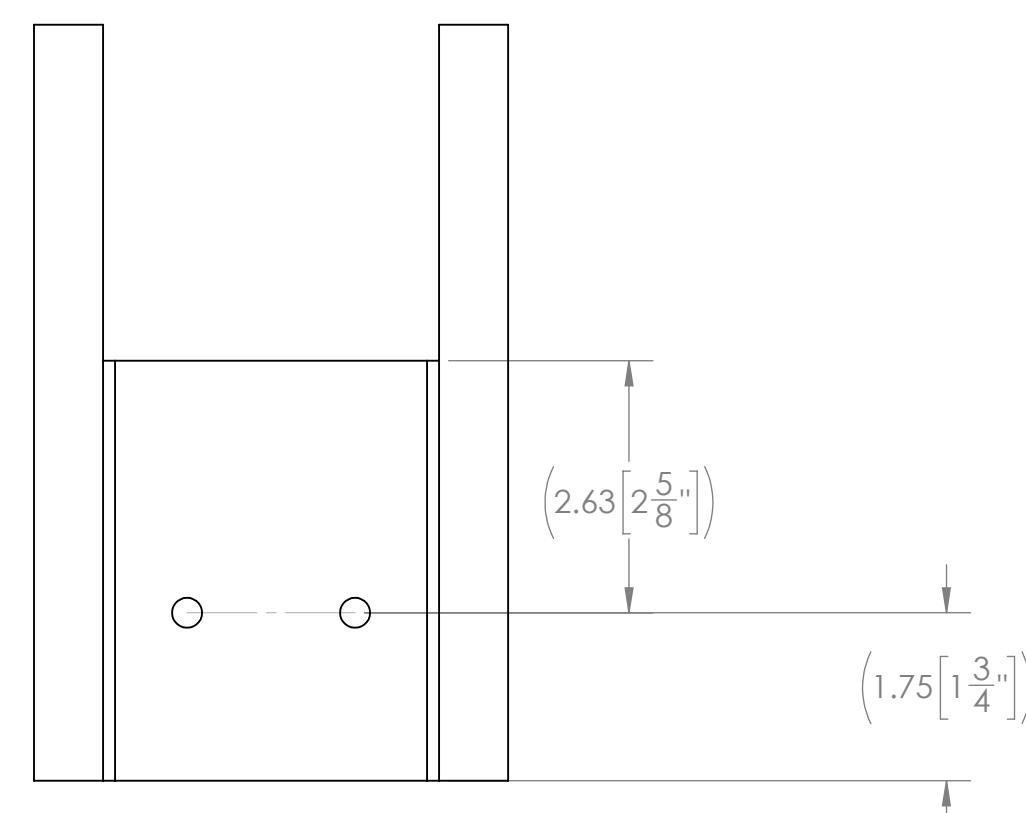
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Step 1

1. Align 2x (2) to (1), as shown.
2. Connect using 2" long screws. It is recommended to use 4x screws per (2).



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FIRST ROBOTICS COMPETITION			
SOLIDWORKS Modeling Solutions Partner			
TITLE: HUB - Complex Build - Lower Hub Ring to Leg Assembly			
SIZE	DWG. NO.	REV	
C	TE-22180		
SCALE: 1:2		SHEET 3 OF 3	

4

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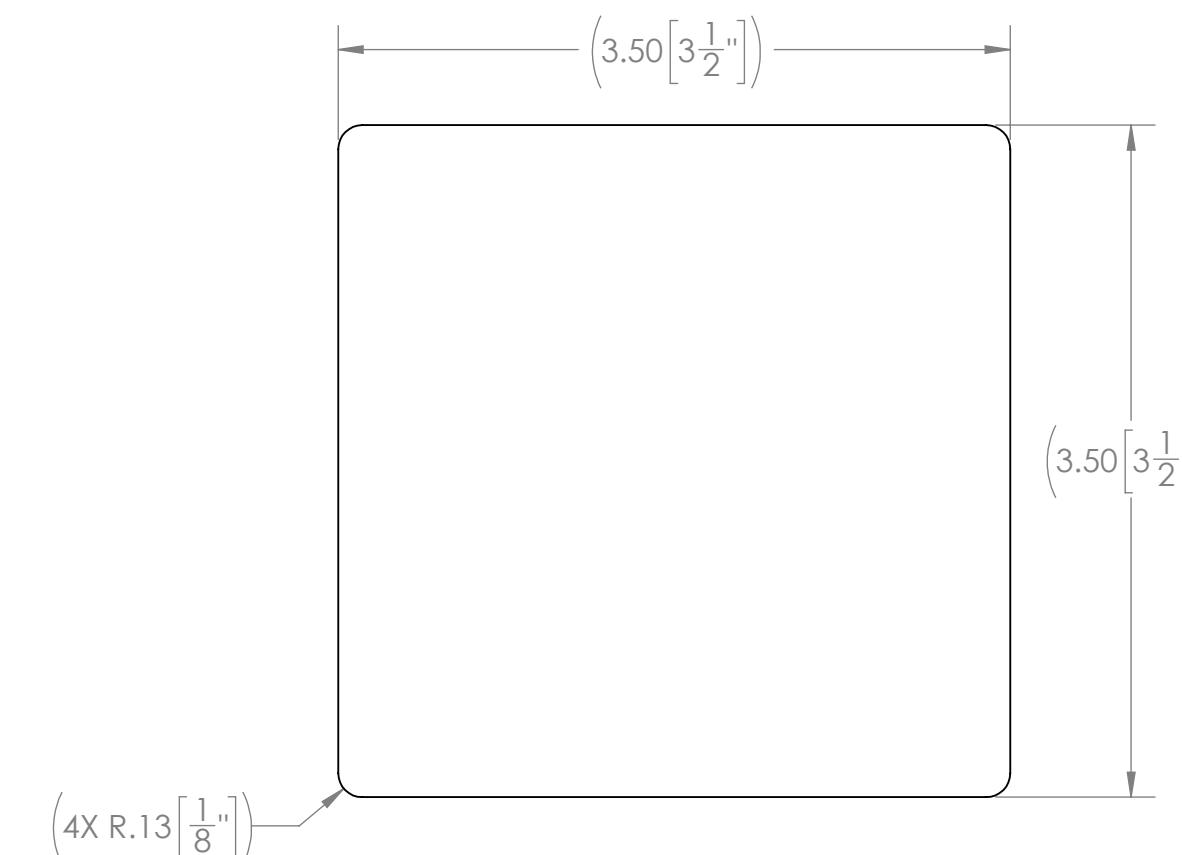
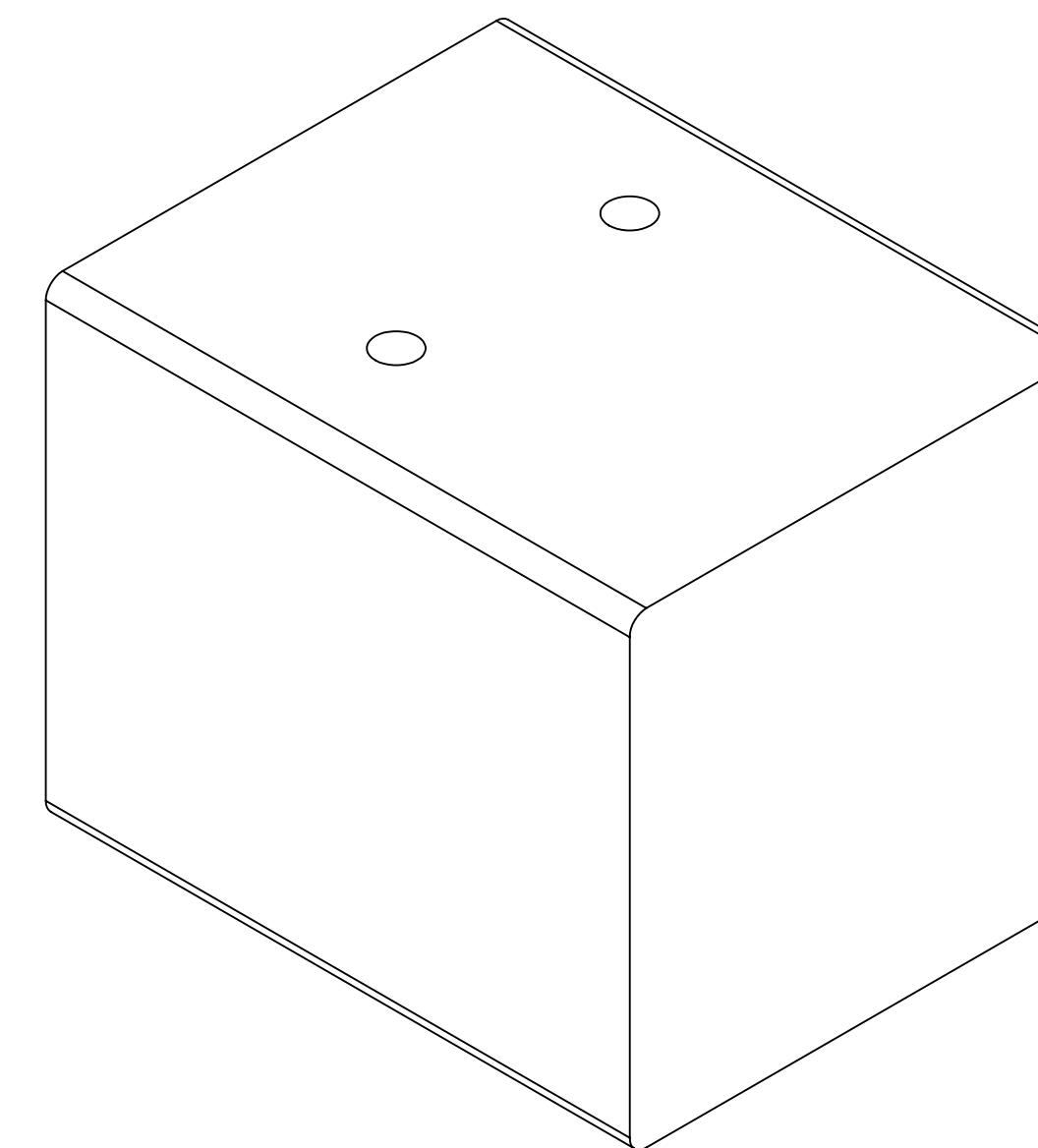
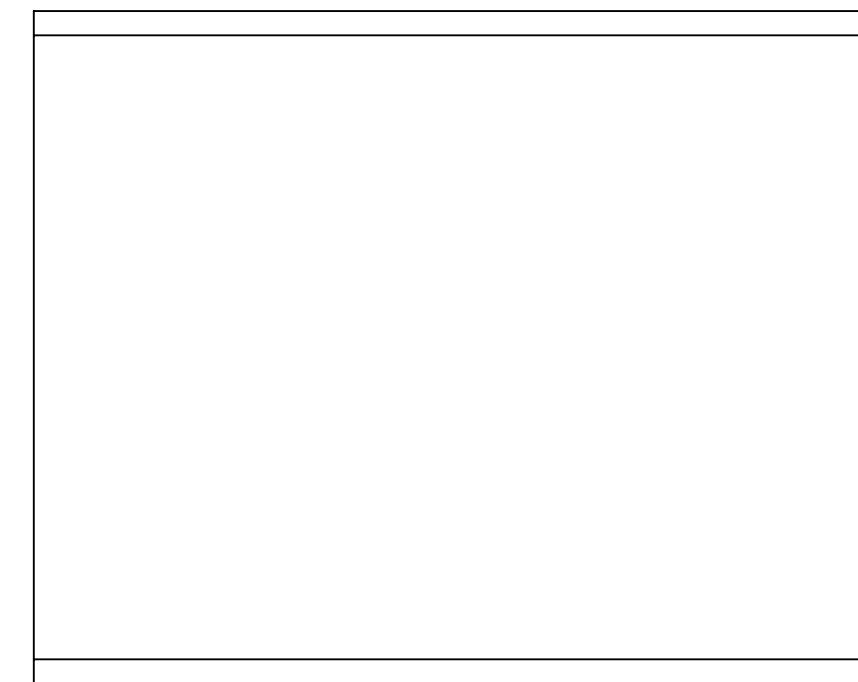
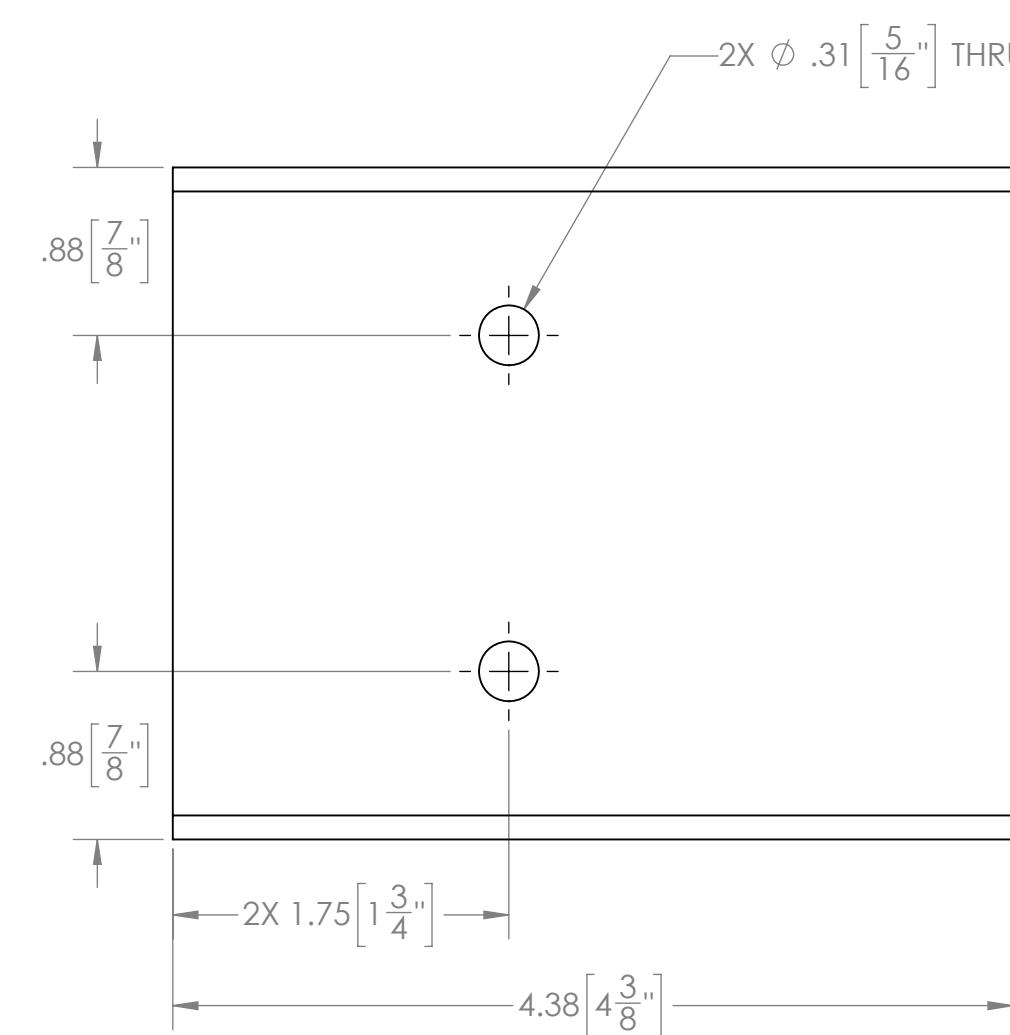
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MATERIAL/FINISH: 4" x 4" Lumber			
COMMENTS: REMOVE ALL BURRS AND SHARP EDGES.			
DO NOT SCALE DRAWING			

 **FIRST
ROBOTICS
COMPETITION**  **SOLIDWORKS**
Modeling Solutions Partner

TITLE:
**HUB - Complex Build -
Lower Hub Ring to Leg
4x4**

SIZE DWG. NO. REV
C TE-22181

SCALE: 1:1 SHEET 1 OF 1

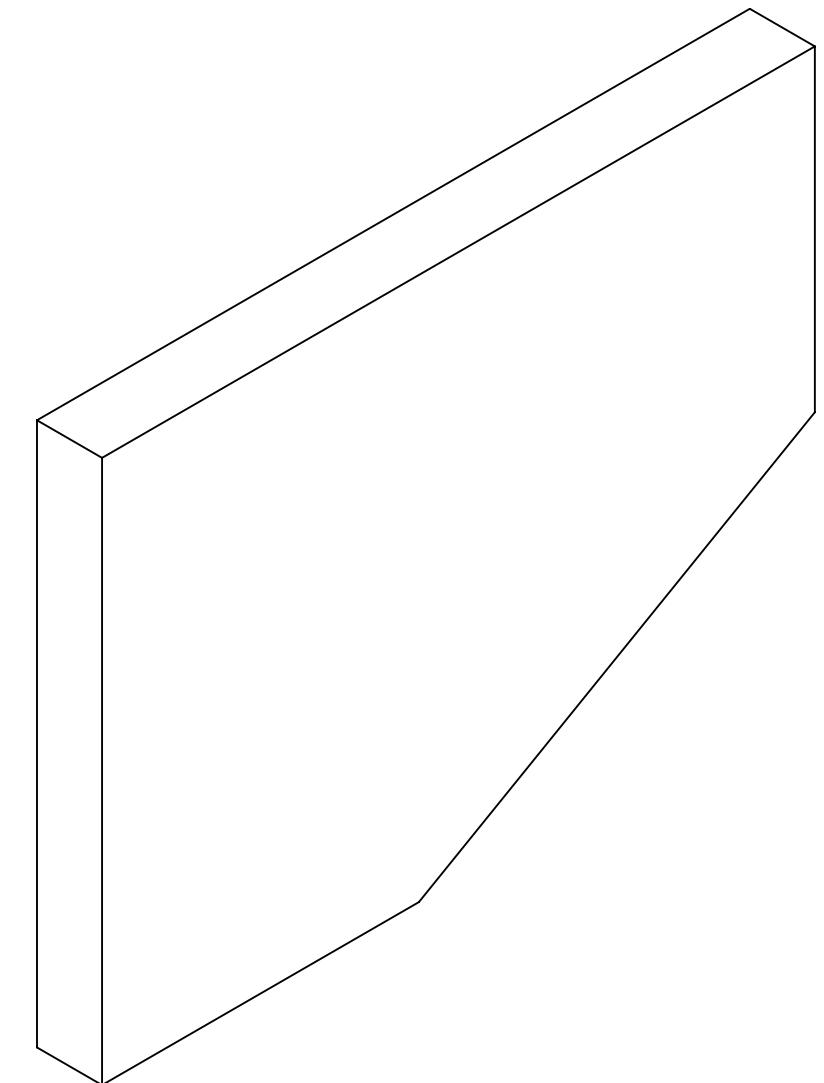
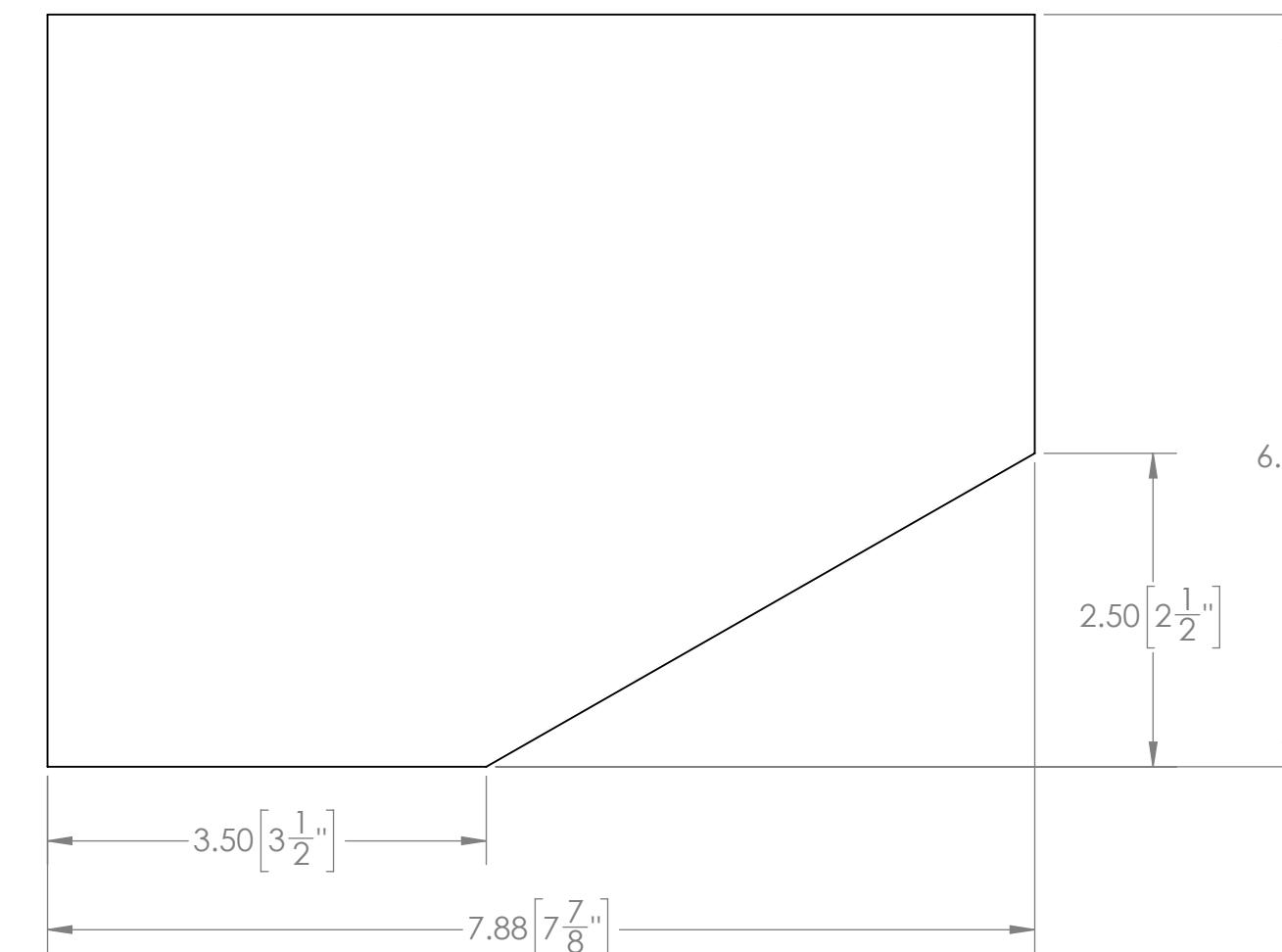
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 $(.72[23/32])$ 

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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL $\pm 1/16$
ANGULAR: MACH $\pm 1^\circ$ BEND $\pm 1^\circ$
TWO PLACE DECIMAL $\pm .13$
THREE PLACE DECIMAL $\pm .125$

MATERIAL/FINISH:

3/4" Plywood

DO NOT SCALE DRAWING

TEAM NAME DATE

DRAWN KAMC 12/21/2021



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COMMENTS:

REMOVE ALL BURRS AND SHARP EDGES.

TITLE:

HUB - Complex Build - Lower Hub Ring to Leg Side

SIZE DWG. NO. REV

C	TE-22182	
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SCALE: 2:3 SHEET 1 OF 1

4

3

2

1