

NOTE: Item 2 should be pressed into item 1 using an arbor press

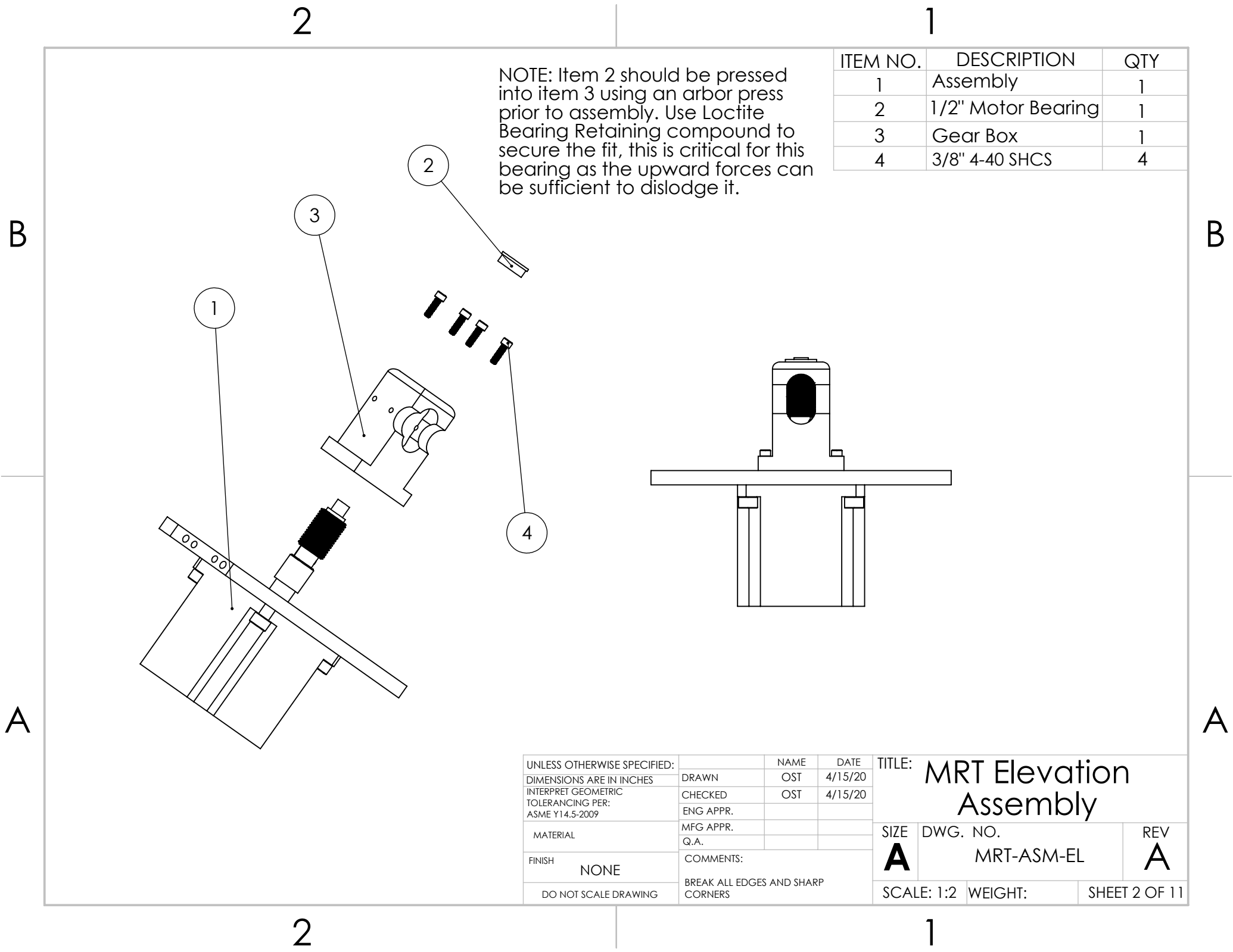
Item 8 requires a set screw to secure it to the motor shaft. This screw is included with item 8

Item 3 requires a set screw to secure it to item 8. This screw is included with item 3

ITEM NO.	DESCRIPTION	QTY
1	El Motor Holder	1
2	1/2" Motor Bearing	1
3	Worm Drive	1
4	1/16" Plastic Spacer	1
5	WD Support	1
6	Stepper Motor	1
7	10 mm M5 x 0.8mm SHCS	4
8	Shaft Extension	1

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009	DRAWN	NAME OST	DATE 4/15/20
	CHECKED	OST	4/15/20
	ENG APPR.		
	MFG APPR.		
MATERIAL	Q.A.		
FINISH NONE	COMMENTS:		
DO NOT SCALE DRAWING	BREAK ALL EDGES AND SHARP CORNERS		

TITLE: MRT Elevation Assembly			
SIZE A	DWG. NO. MRT-ASM-EL		REV A
SCALE: 1:2		WEIGHT:	SHEET 1 OF 11

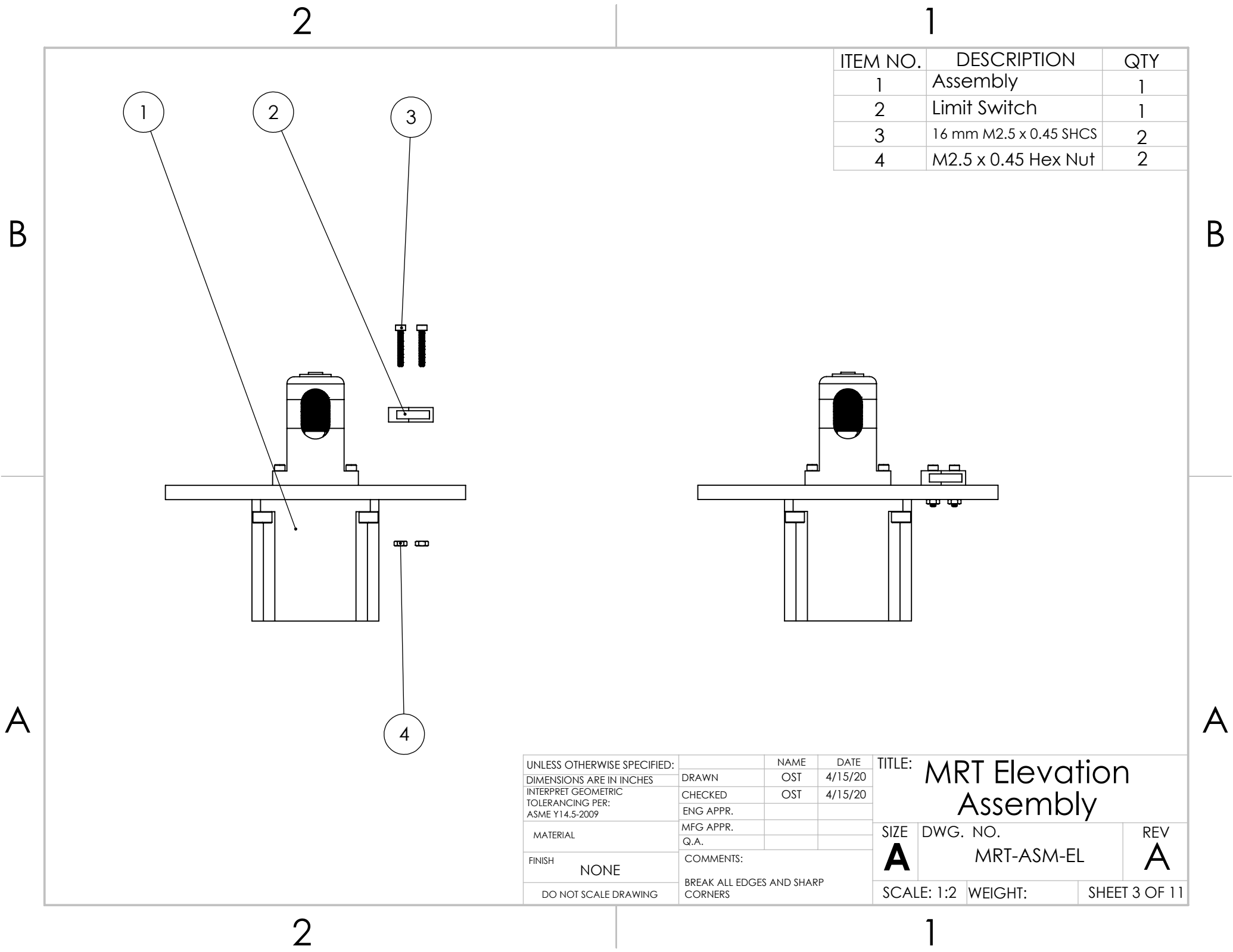


NOTE: Item 2 should be pressed into item 3 using an arbor press prior to assembly. Use Loctite Bearing Retaining compound to secure the fit, this is critical for this bearing as the upward forces can be sufficient to dislodge it.

ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	1/2" Motor Bearing	1
3	Gear Box	1
4	3/8" 4-40 SHCS	4

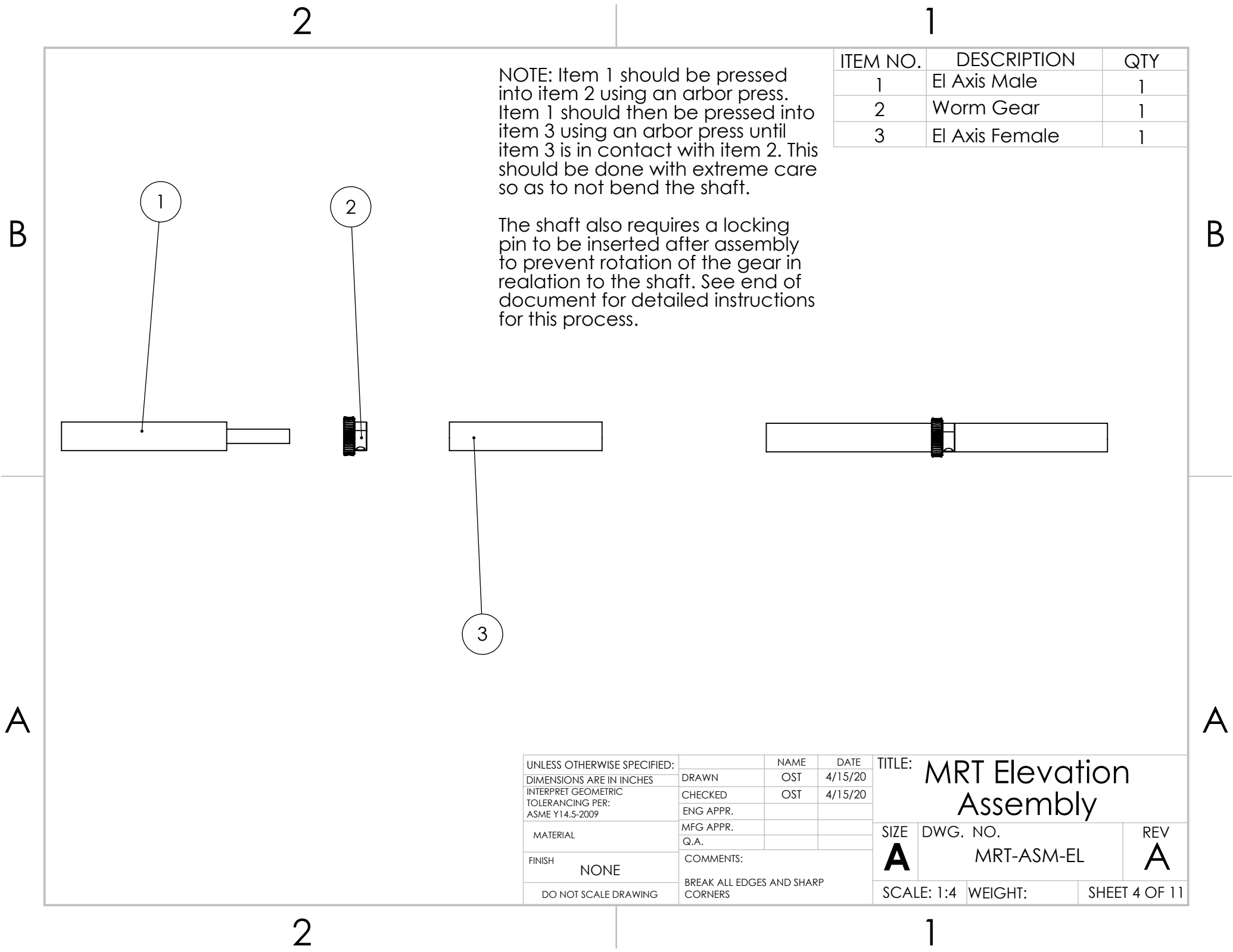
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009	DRAWN	NAME OST	DATE 4/15/20
	CHECKED	OST	4/15/20
	ENG APPR.		
	MFG APPR.		
MATERIAL	Q.A.		
FINISH NONE	COMMENTS:		
DO NOT SCALE DRAWING	BREAK ALL EDGES AND SHARP CORNERS		

TITLE: MRT Elevation Assembly			
SIZE A	DWG. NO. MRT-ASM-EL		REV A
SCALE: 1:2		WEIGHT:	SHEET 2 OF 11



ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	Limit Switch	1
3	16 mm M2.5 x 0.45 SHCS	2
4	M2.5 x 0.45 Hex Nut	2

UNLESS OTHERWISE SPECIFIED:		NAME		DATE		TITLE: MRT Elevation Assembly					
DIMENSIONS ARE IN INCHES		DRAWN		OST						4/15/20	
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009		CHECKED		OST						4/15/20	
		ENG APPR.						SIZE A DWG. NO. MRT-ASM-EL REV A			
MATERIAL		MFG APPR. Q.A.									
FINISH NONE		COMMENTS:						SCALE: 1:2 WEIGHT: SHEET 3 OF 11			
DO NOT SCALE DRAWING		BREAK ALL EDGES AND SHARP CORNERS									

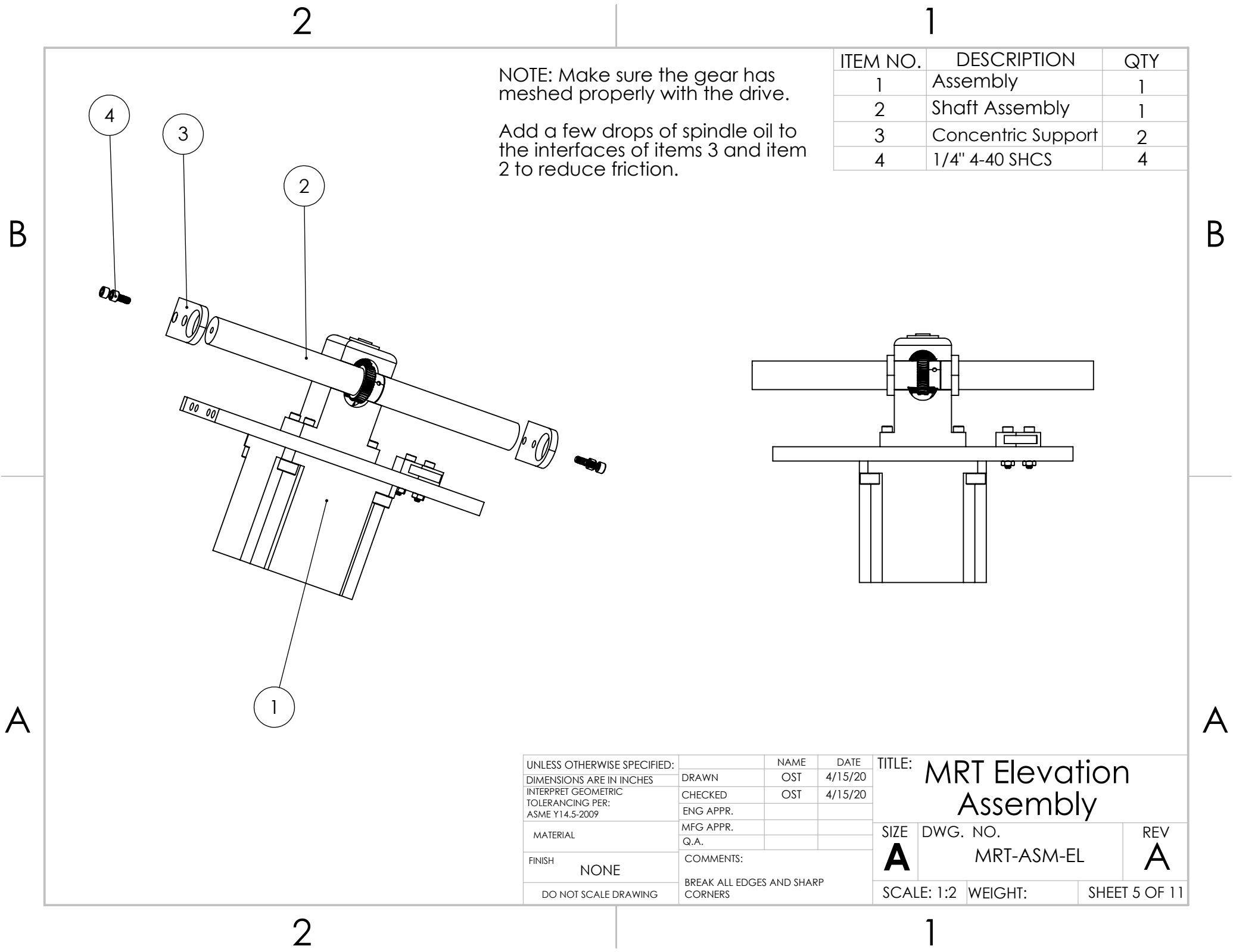


NOTE: Item 1 should be pressed into item 2 using an arbor press. Item 1 should then be pressed into item 3 using an arbor press until item 3 is in contact with item 2. This should be done with extreme care so as to not bend the shaft.

The shaft also requires a locking pin to be inserted after assembly to prevent rotation of the gear in relation to the shaft. See end of document for detailed instructions for this process.

ITEM NO.	DESCRIPTION	QTY
1	El Axis Male	1
2	Worm Gear	1
3	El Axis Female	1

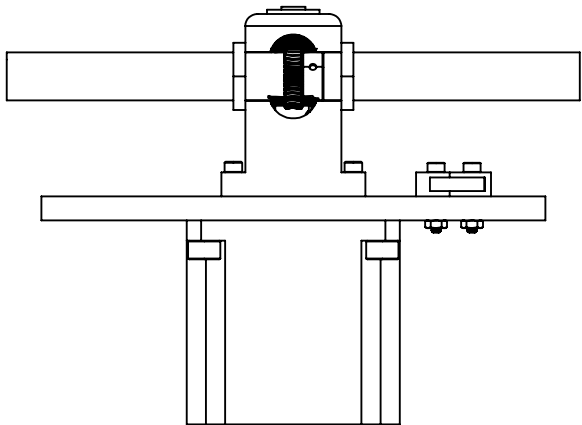
UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: MRT Elevation Assembly				
DIMENSIONS ARE IN INCHES		DRAWN	OST					4/15/20
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009		CHECKED	OST					4/15/20
MATERIAL		ENG APPR.			SIZE A DWG. NO. MRT-ASM-EL REV A			
		MFG APPR.	Q.A.					
FINISH NONE		COMMENTS:			SCALE: 1:4 WEIGHT: SHEET 4 OF 11			
DO NOT SCALE DRAWING		BREAK ALL EDGES AND SHARP CORNERS						



NOTE: Make sure the gear has meshed properly with the drive.

Add a few drops of spindle oil to the interfaces of items 3 and item 2 to reduce friction.

ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	Shaft Assembly	1
3	Concentric Support	2
4	1/4" 4-40 SHCS	4



UNLESS OTHERWISE SPECIFIED:		NAME		DATE		TITLE: MRT Elevation Assembly					
DIMENSIONS ARE IN INCHES		DRAWN		OST						4/15/20	
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009		CHECKED		OST						4/15/20	
		ENG APPR.						SIZE DWG. NO. REV A MRT-ASM-EL A			
MATERIAL		MFG APPR.		Q.A.							
FINISH		NONE		COMMENTS:				SCALE: 1:2 WEIGHT: SHEET 5 OF 11			
DO NOT SCALE DRAWING		BREAK ALL EDGES AND SHARP CORNERS									

B

A

B

A

2

1

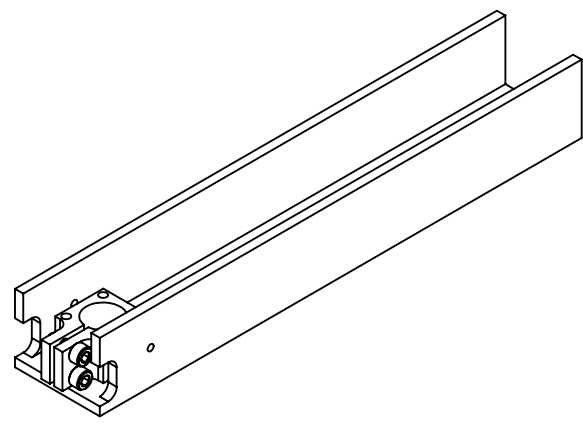
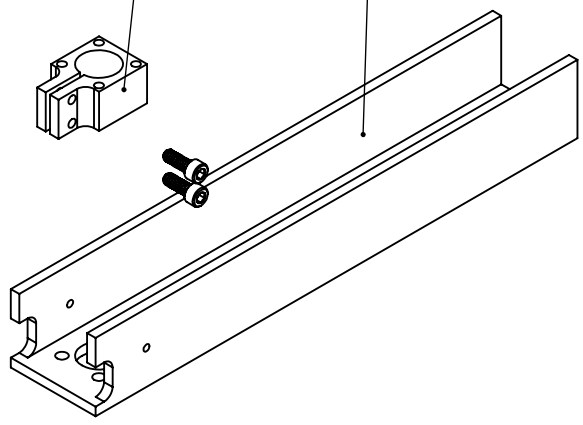
2

1

3

NOTE: Do not fully tighten any fasteners at this stage.

Assemble both uprights this way, but be sure to flip item 2 for one of them so that the tightening fasteners face outwards upon final assembly.



ITEM NO.	DESCRIPTION	QTY
1	Upright	1
2	1/2" Tube Clamp	1
3	3/8" 6-32 SHCS	6

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009	DRAWN	NAME OST	DATE 4/15/20
	CHECKED	OST	4/15/20
	ENG APPR.		
	MFG APPR.		
MATERIAL	Q.A.		
FINISH NONE	COMMENTS: BREAK ALL EDGES AND SHARP CORNERS		
DO NOT SCALE DRAWING			

TITLE: MRT Elevation Assembly			
SIZE A	DWG. NO. MRT-ASM-EL	REV A	
SCALE: 1:2	WEIGHT:	SHEET 6 OF 11	

2

1

2

1

NOTE: Items 7 may need to be pressed into items 5 and 6 prior to assembly with an arbor press.

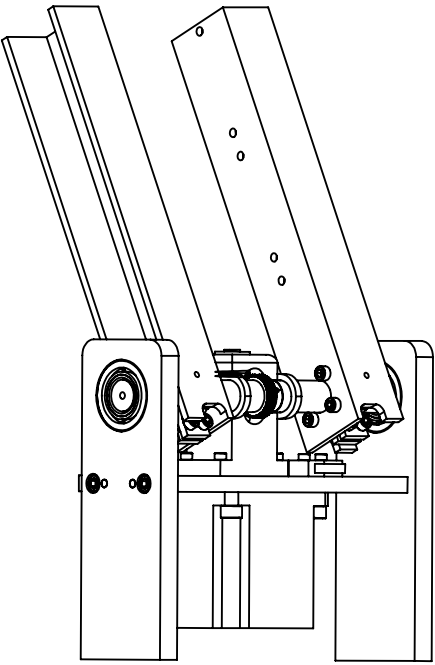
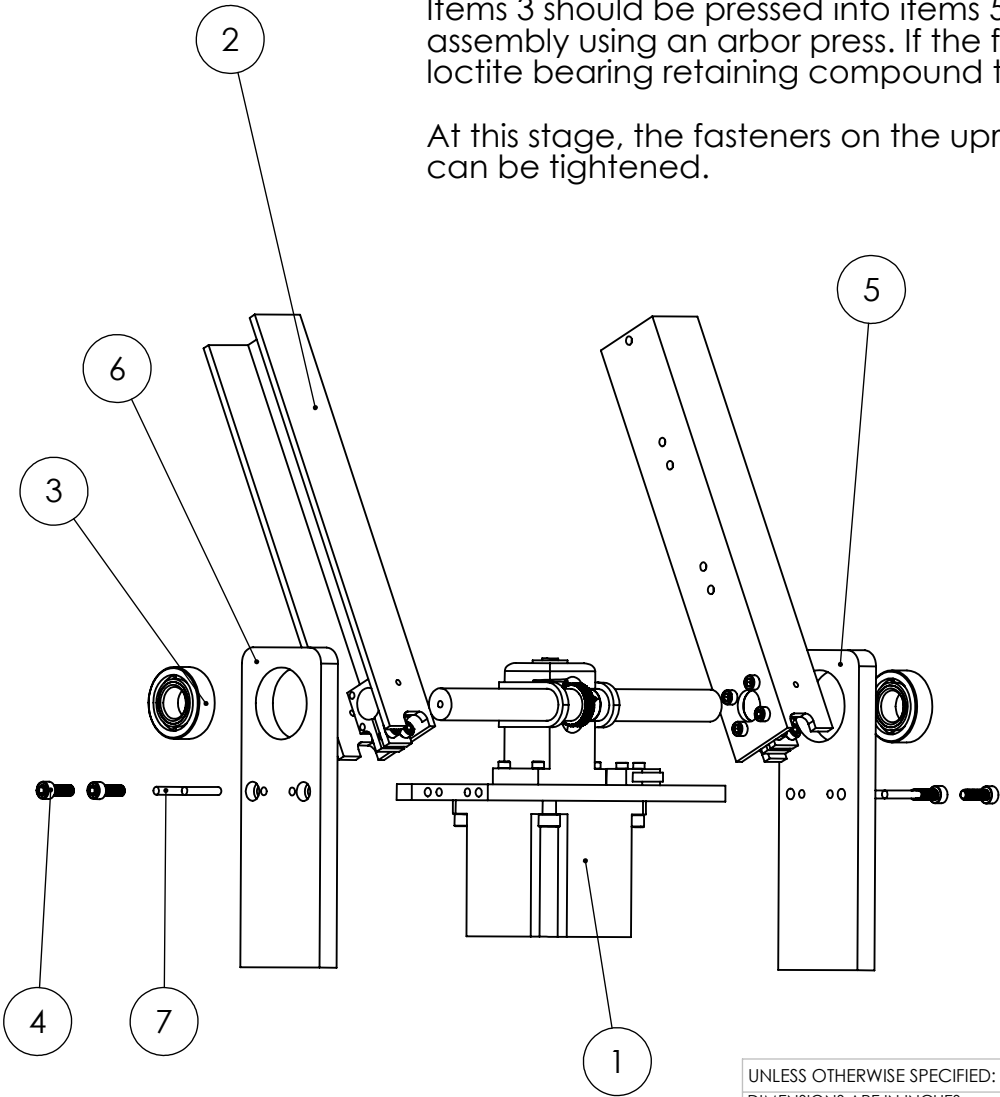
Items 3 should be pressed into items 5 and 6 prior to assembly using an arbor press. If the fit is loose, use loctite bearing retaining compound to secure it.

At this stage, the fasteners on the upright assemblies can be tightened.

ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	Upright Assembly	2
3	Elevation Bearing	2
4	1/2" 8-32 SHCS	4
5	Frame Side Right	1
6	Frame Side Left	1
7	1/8"x3/4" Dowel Pin	4

B

B



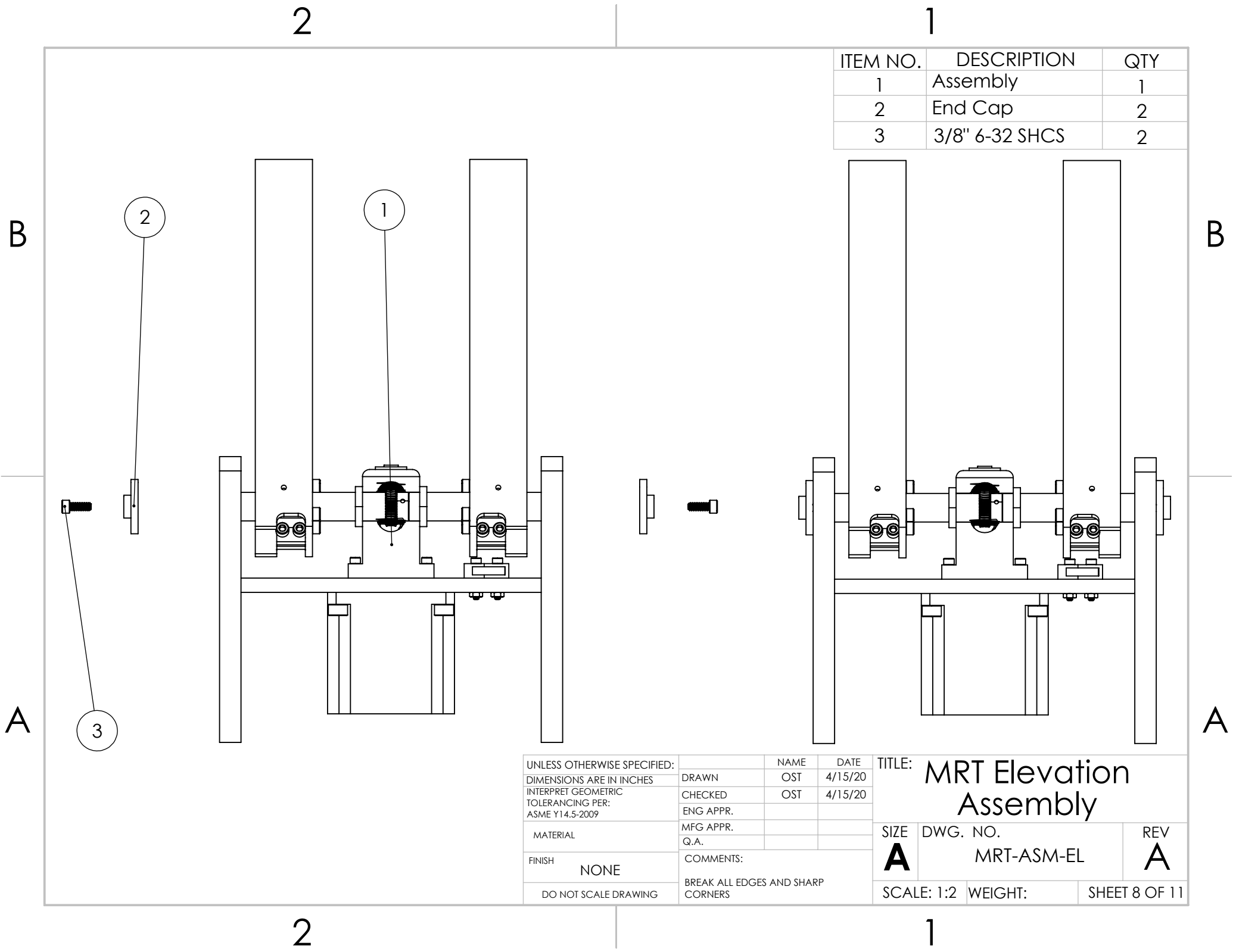
A

A

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009		DRAWN	OST	4/15/20	TITLE: MRT Elevation Assembly		
		CHECKED	OST	4/15/20			
		ENG APPR.					
MATERIAL		MFG APPR.					
FINISH		Q.A.					
NONE		COMMENTS:					
DO NOT SCALE DRAWING		BREAK ALL EDGES AND SHARP CORNERS					
		SIZE	DWG. NO.		REV		
		A	MRT-ASM-EL		A		
		SCALE: 1:3		WEIGHT:	SHEET 7 OF 11		

2

1



ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	End Cap	2
3	3/8" 6-32 SHCS	2

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
INTERPRET GEOMETRIC
TOLERANCING PER:
ASME Y14.5-2009

MATERIAL

FINISH
NONE

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	OST	4/15/20
CHECKED	OST	4/15/20
ENG APPR.		
MFG APPR.		
Q.A.		

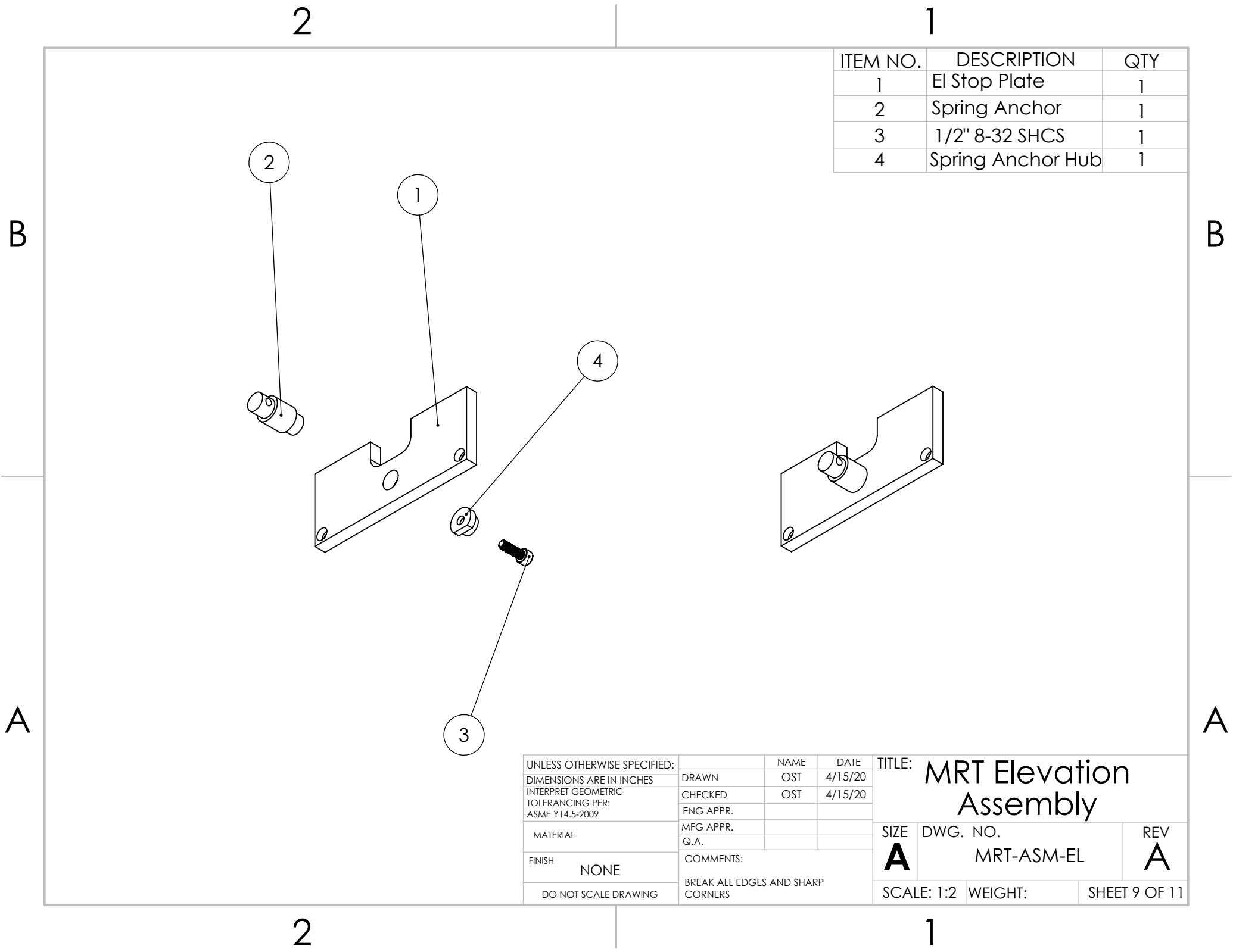
COMMENTS:

BREAK ALL EDGES AND SHARP
CORNERS

TITLE: MRT Elevation
Assembly

SIZE	DWG. NO.	REV
A	MRT-ASM-EL	A

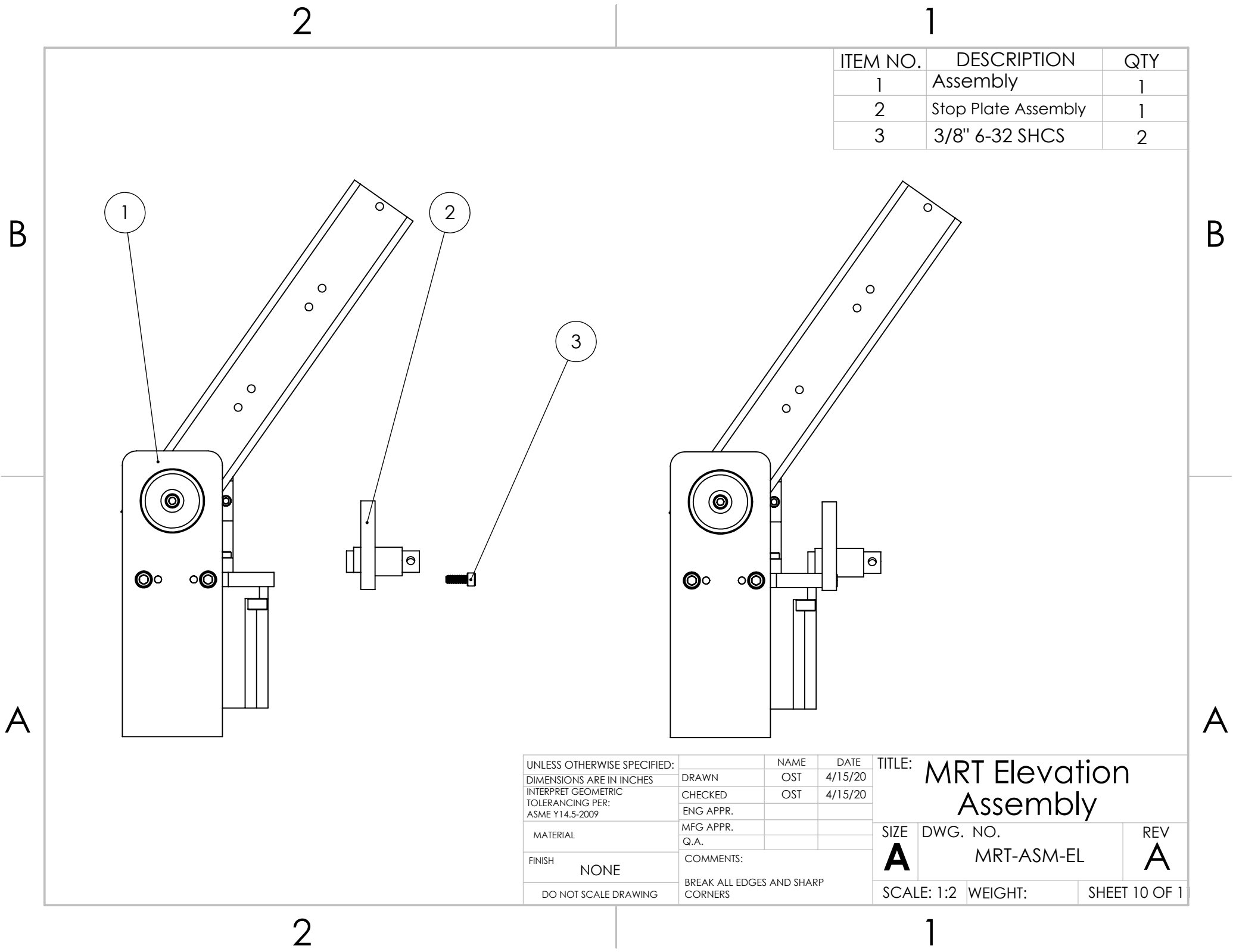
SCALE: 1:2 WEIGHT: SHEET 8 OF 11



ITEM NO.	DESCRIPTION	QTY
1	El Stop Plate	1
2	Spring Anchor	1
3	1/2" 8-32 SHCS	1
4	Spring Anchor Hub	1

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009	DRAWN	OST	4/15/20
	CHECKED	OST	4/15/20
	ENG APPR.		
	MFG APPR.		
MATERIAL	Q.A.		
FINISH	COMMENTS:		
NONE	BREAK ALL EDGES AND SHARP CORNERS		
DO NOT SCALE DRAWING			

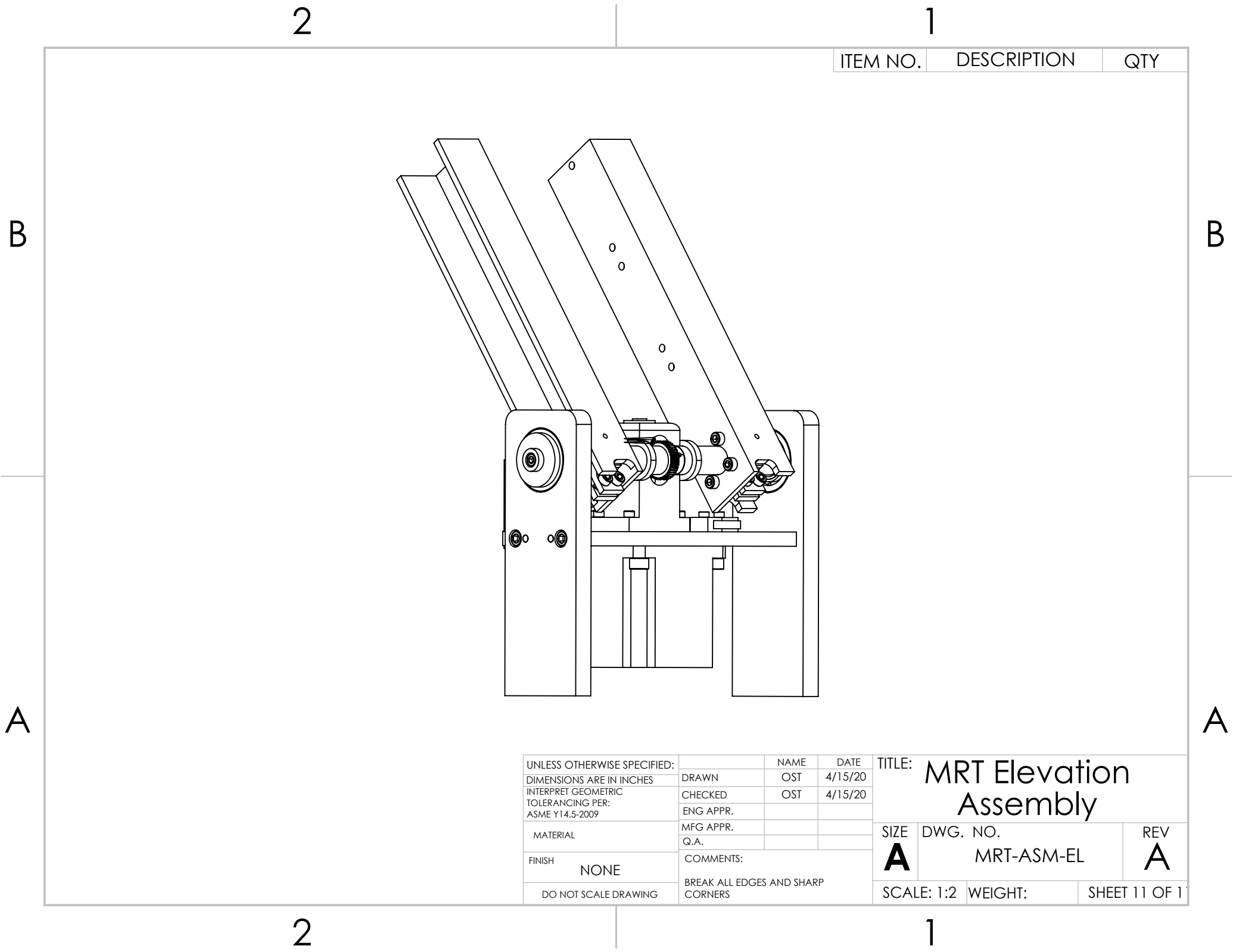
TITLE: MRT Elevation Assembly			
SIZE	DWG. NO.	REV	
A	MRT-ASM-EL	A	
SCALE: 1:2	WEIGHT:	SHEET 9 OF 11	



ITEM NO.	DESCRIPTION	QTY
1	Assembly	1
2	Stop Plate Assembly	1
3	3/8" 6-32 SHCS	2

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009	DRAWN	NAME OST	DATE 4/15/20
	CHECKED	OST	4/15/20
	ENG APPR.		
	MFG APPR.		
MATERIAL	Q.A.		
FINISH NONE	COMMENTS: BREAK ALL EDGES AND SHARP CORNERS		
DO NOT SCALE DRAWING			

TITLE: MRT Elevation Assembly			
SIZE A	DWG. NO. MRT-ASM-EL		REV A
SCALE: 1:2		WEIGHT:	SHEET 10 OF 1



ITEM NO.	DESCRIPTION	QTY
----------	-------------	-----

UNLESS OTHERWISE SPECIFIED:		NAME		DATE		TITLE: MRT Elevation Assembly					
DIMENSIONS ARE IN INCHES		DRAWN		OST						4/15/20	
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009		CHECKED		OST						4/15/20	
		ENG APPR.						SIZE A DWG. NO. MRT-ASM-EL REV A			
MATERIAL		MFG APPR.		Q.A.							
FINISH		NONE		COMMENTS:				SCALE: 1:2 WEIGHT: SHEET 11 OF 1			
DO NOT SCALE DRAWING		BREAK ALL EDGES AND SHARP CORNERS									

Elevation Axis Locking Pin

The following instructions detail the performance of the secondary operation required to complete the assembly of the elevation axis, involving the insertion of a $\frac{1}{8}$ " x $\frac{3}{8}$ " steel locking pin.

1. Begin by securing the axis in the vise of a milling machine using a collet block and $\frac{1}{2}$ " collet. The axis should be perpendicular to the z axis of the machine (and the drill chuck).
2. Using an edge finder, find the center of the axis. Then find the approximate midpoint of the hub of the worm gear (this does not have to be precise), x marks the spot on the picture below.
3. Using #2 center drill, create a divot to center the drill bit.
4. Using a #32 drill bit (0.116" diameter) drill all the way through the axis.
5. Using a 0.1247" reamer, ream the hole all the way through.
6. Using a 0.1260" reamer, ream the hole to approximately half depth (0.25").
7. Debur the hole.
8. Insert a $\frac{1}{8}$ " x $\frac{3}{8}$ " steel dowel into the larger hole, and using an arbor press, press the dowel in until it is just past tangent with the axis. The axis is complete.

