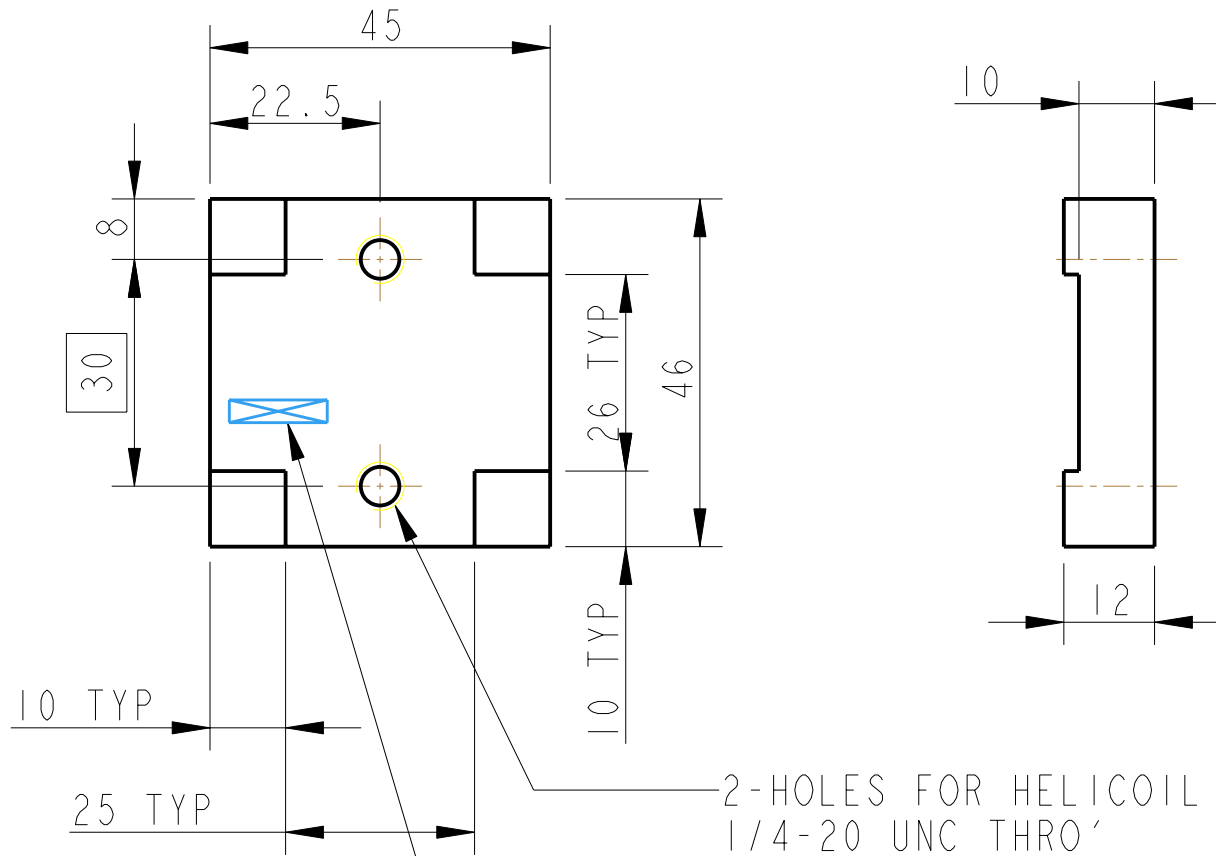


REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.



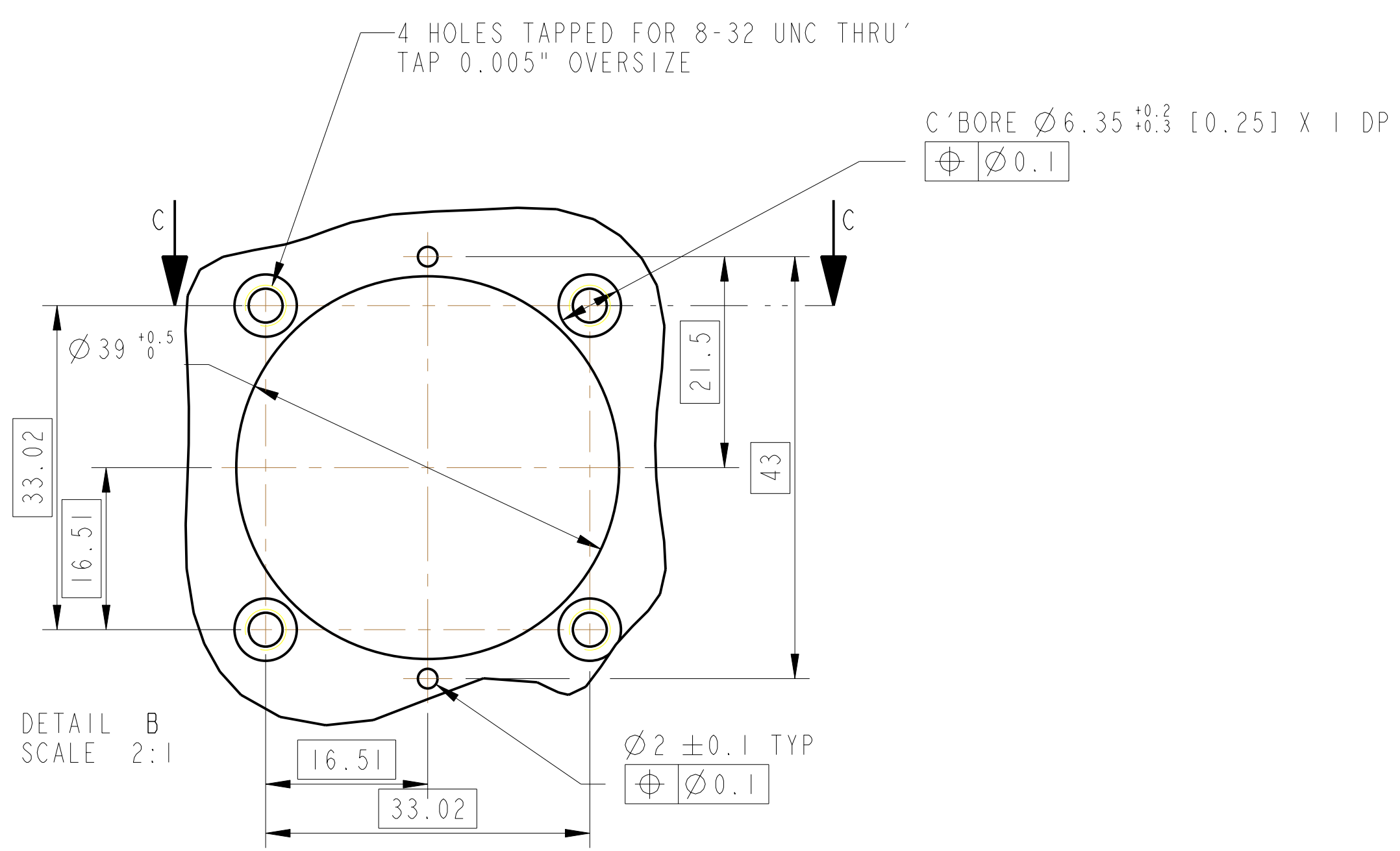
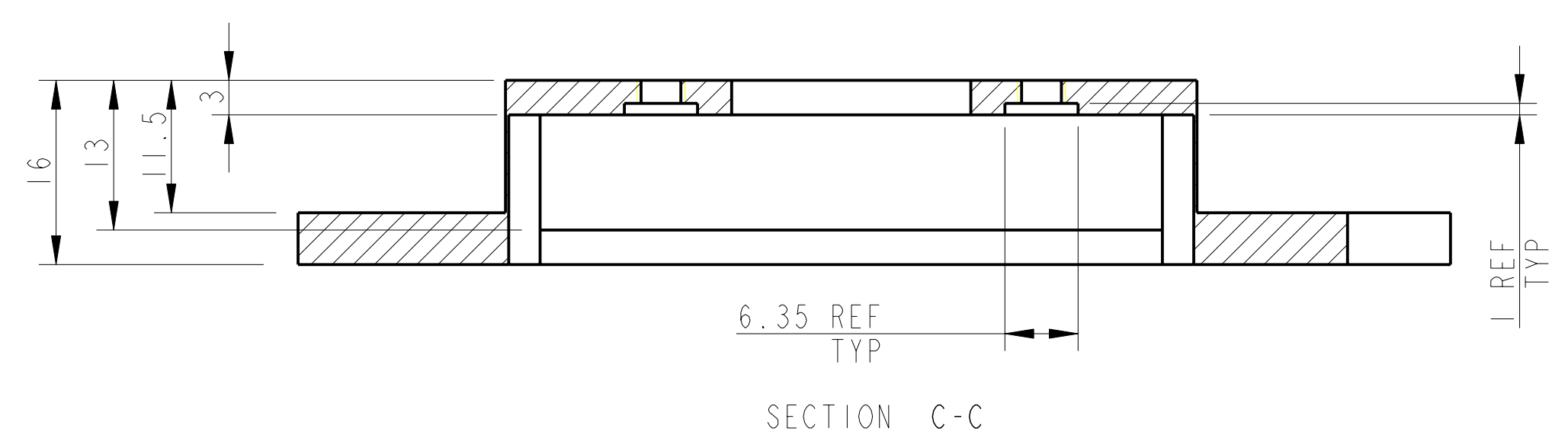
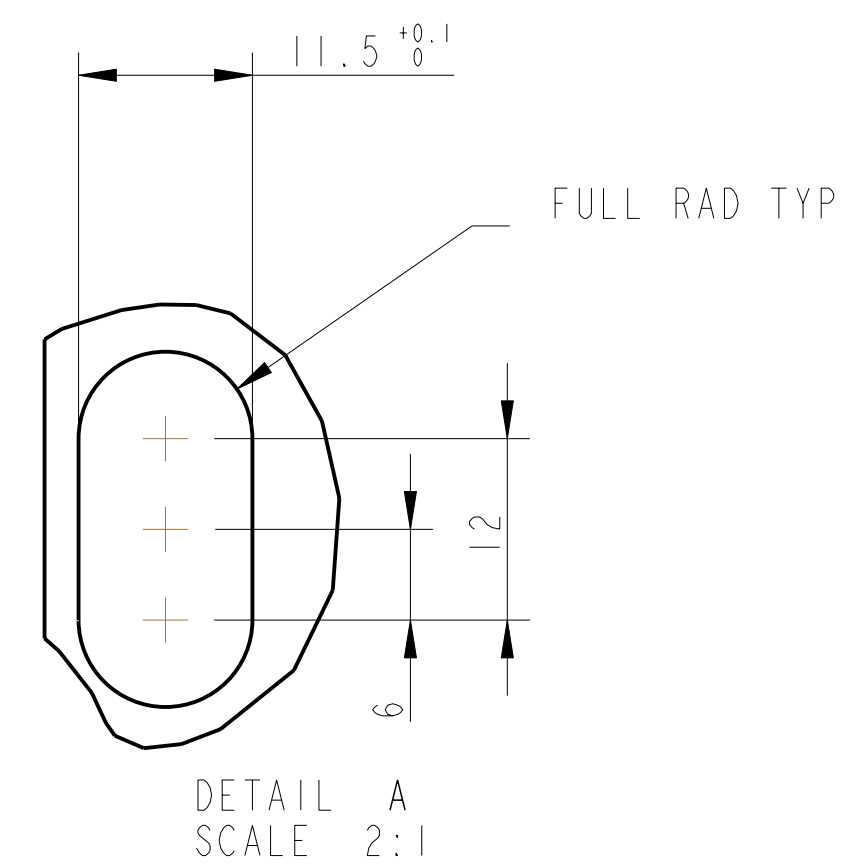
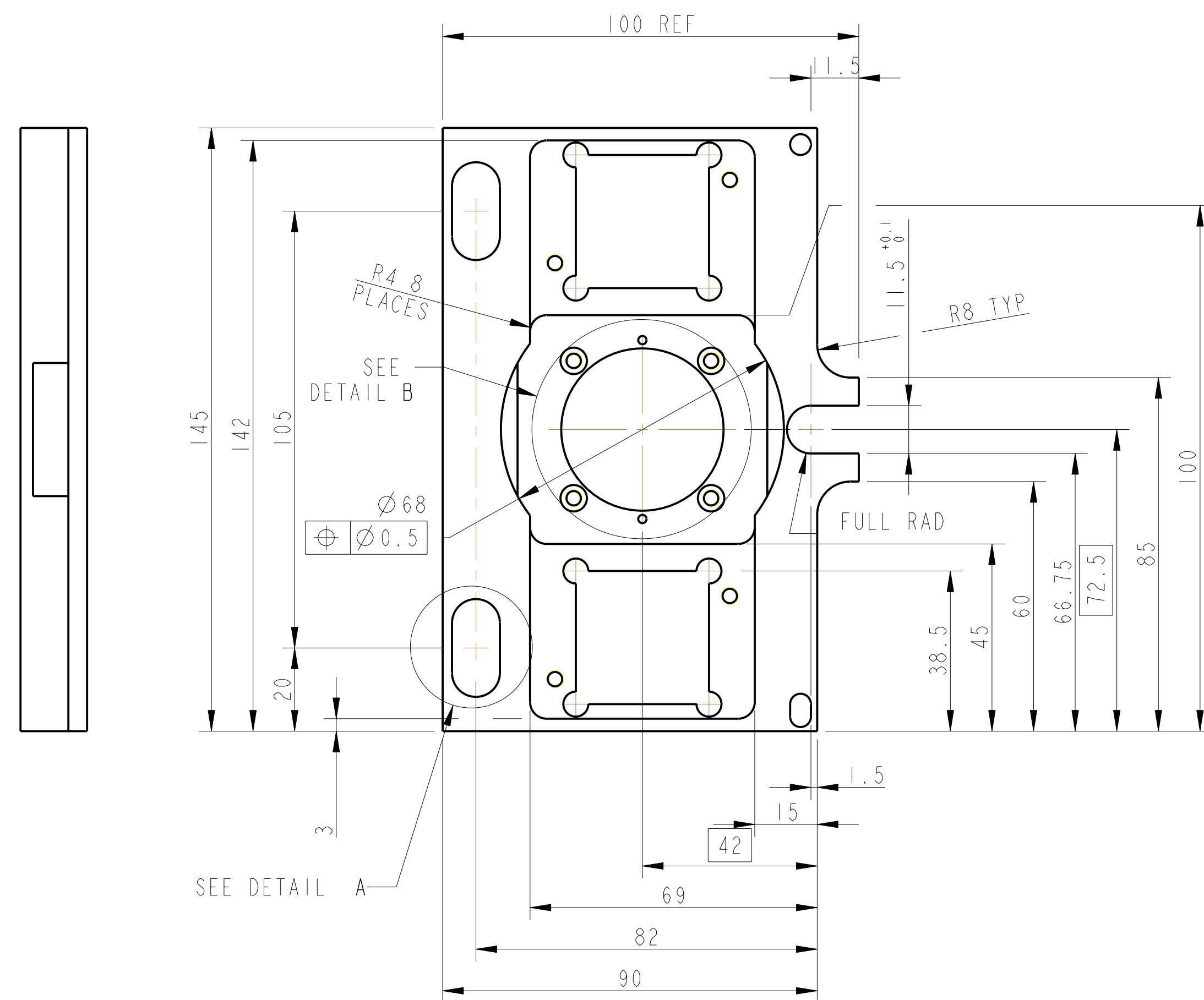
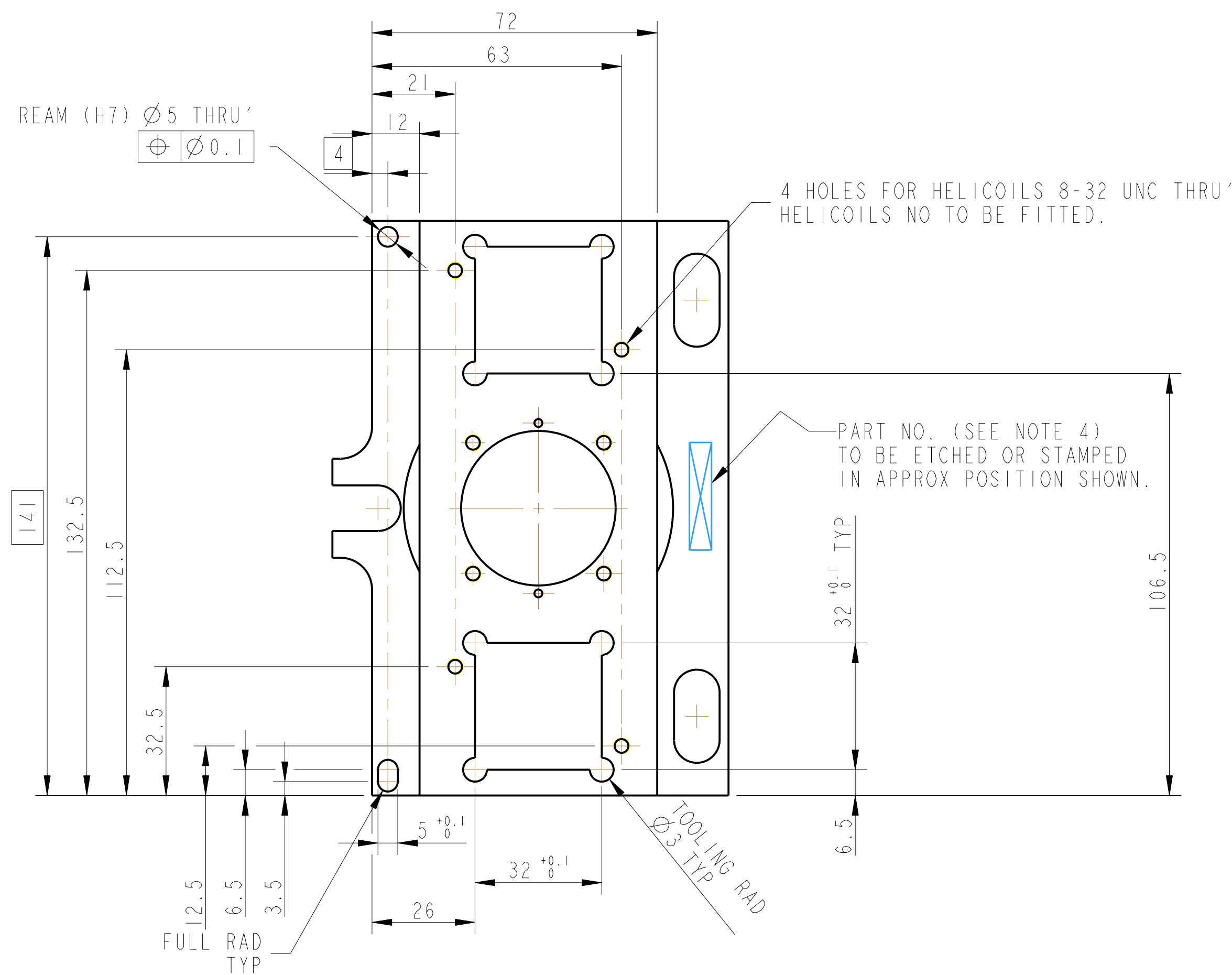
⊕ $\text{⊙} 0.2$

PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

2-HOLES FOR HELICOIL
1/4-20 UNC THRO'
HELICOILS NOT TO BE FITTED.

NOTES: (UNLESS OTHERWISE SPECIFIED)			CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES	
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.	DIMENSIONS ARE IN mm [INCHES]		LIGO	
	TOLERANCES:		SYSTEM aLIGO	
	X.XX ±0.2 mm ° ANGULAR ±0.25 °		SUB-SYSTEM SUS	
	MATERIAL: AL ALLOY 5083 T4		NEXT ASSY QUAD TABLECLOTH	
FINISH: SEE NOTE 3 $\sqrt{\mu\text{m}}$ [μin] Ra = 1.6		PART NAME TABLECLOTH PINCH PLATE UPPER STRUCTURE		
	NAME	DATE	SIZE A	DRG. NO. D060315
	DRAWN I WILMUT	26/JUN/06	SCALE 1:1	PROJECTION:
	CHECKED MB	15/MAR/10		
	APPROVED JOD	15/MAR/10		
			SHEET 1 OF	REV C.

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	
B	19/DEC/07	E060239-B	
E	16/JULY/08	E080369	



NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES. R0.2 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE. SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL).
- SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE 07* HIGH CHARACTERS. EXAMPLE: D060318-001 - A VIBRATOR TOOL MAY BE USED.

DIMENSIONS ARE IN mm (INCHES) TOLERANCES:

XX ± 0.2
ANGULAR $\pm 0.25^\circ$

MATERIAL: AL ALLOY 3003 H4

FINISH: CLEAN AND DEGREASED $\sqrt{\mu m}$ (100) Ra = 1.6

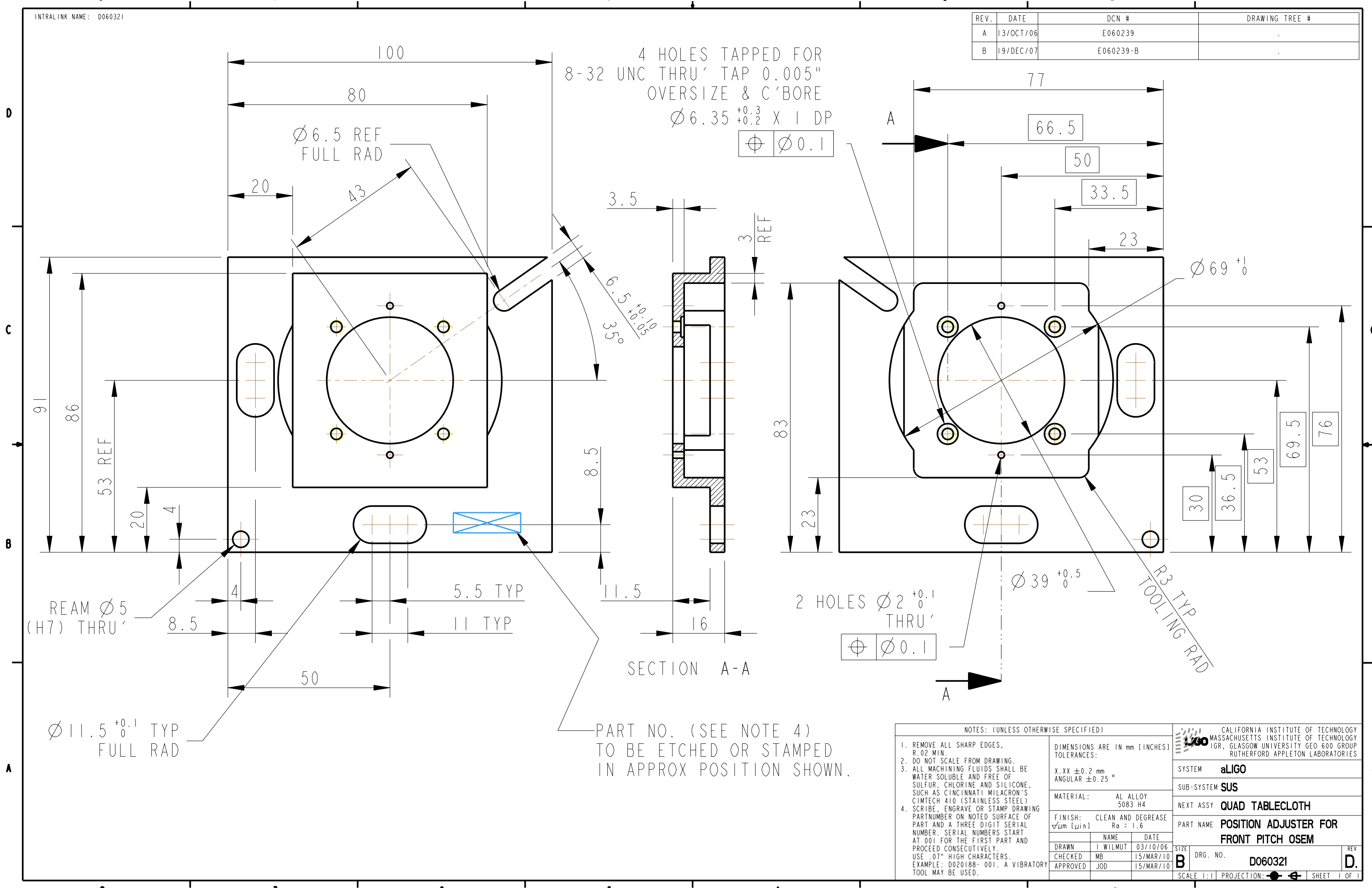
NAME	DATE	SIZE
DRAWN	15/MAR/10	1/8"
CHECKED	15/MAR/10	
APPROVED	15/MAR/10	

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
GLASGOW UNIVERSITY GEC ROU GROUP
RUTHERFORD APPLIION LABORATORIES

SYSTEM: aLIGO
SUB-SYSTEM: SUS
NEXT ASSY: QUAD TABLECLOTH
PART NAME: OSEM AND ECD MOUNTING BRACKET (LOCAL CONTROLS)

DRG. NO.: D060318
SCALE: 1:1
PROJECTION: 1st
SHEET 1 OF 1

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	
B	19/DEC/07	E060239-B	



4 HOLES TAPPED FOR
8-32 UNC THRU' TAP 0.005"
OVERSIZE & C'BORE
 $\varnothing 6.35^{+0.3}_{+0.2}$ X 1 DP
 $\varnothing 0.1$

SECTION A-A

2 HOLES $\varnothing 2^{+0.1}_0$
THRU'
 $\varnothing 0.1$

PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

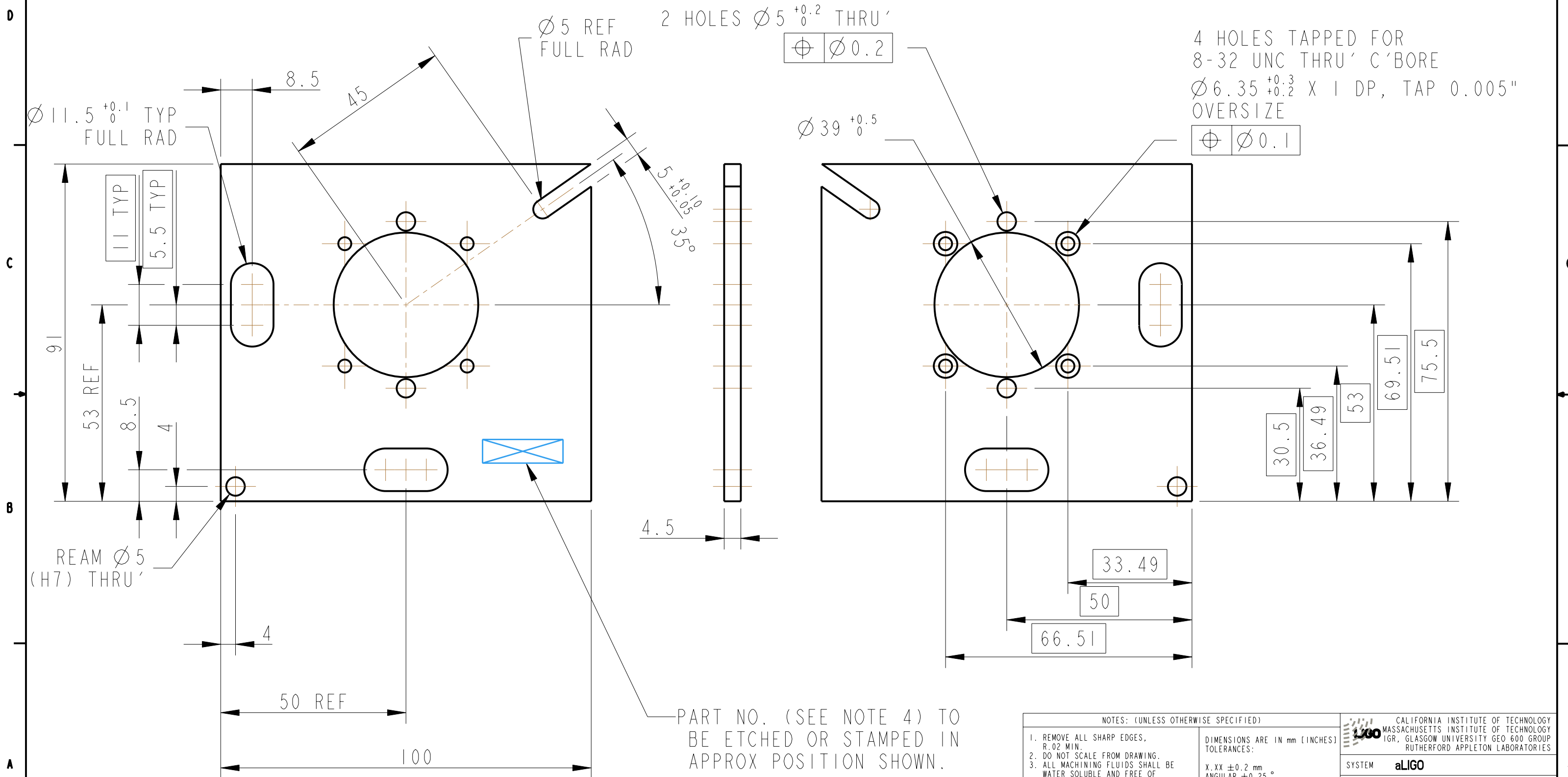
NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES, R.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
- SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]	
TOLERANCES:	
X.XX ± 0.2 mm	
ANGULAR $\pm 0.25^\circ$	
MATERIAL: AL ALLOY 5083 H4	
FINISH: CLEAN AND DEGREASE	
$\sqrt{\mu m}$ [μin] $R_a = 1.6$	
NAME	DATE
DRAWN I WILMUT	03/10/06
CHECKED MB	15/MAR/10
APPROVED JOD	15/MAR/10

CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES	
SYSTEM	aLIGO
SUB-SYSTEM	SUS
NEXT ASSY	QUAD TABLECLOTH
PART NAME	POSITION ADJUSTER FOR FRONT PITCH OSEM
SIZE	B
DRG. NO.	D060321
SHEET	1 OF 1

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.
E	16/JULY/08	E080369	.



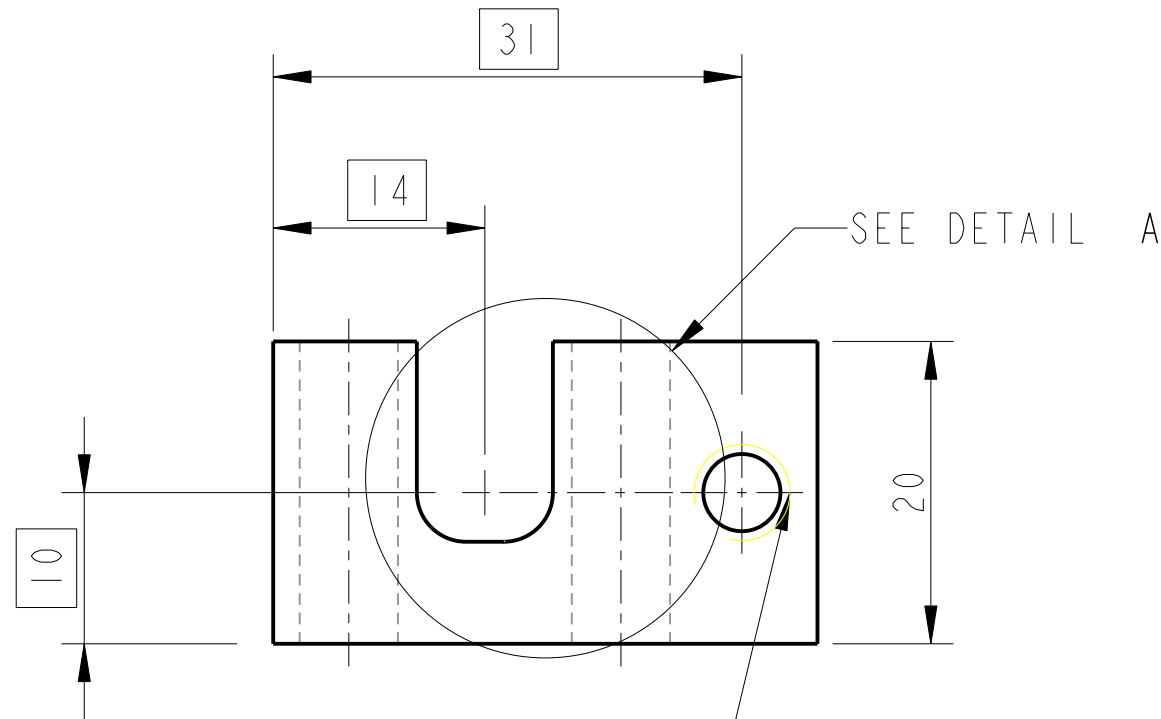
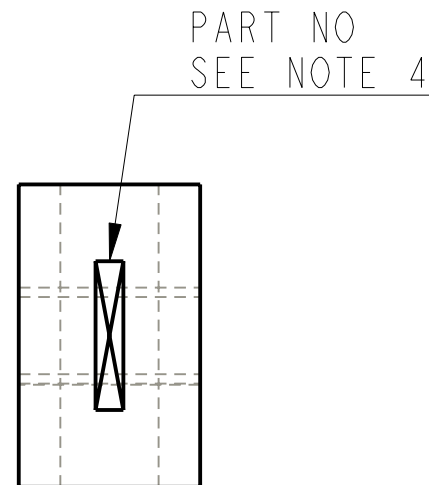
PART NO. (SEE NOTE 4) TO BE ETCHED OR STAMPED IN APPROX POSITION SHOWN.

NOTES: (UNLESS OTHERWISE SPECIFIED)			DIMENSIONS ARE IN mm [INCHES]	
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.			TOLERANCES:	
			X.XX ± 0.2 mm	
			ANGULAR $\pm 0.25^\circ$	
			MATERIAL: AL ALLOY 5083 H4	
FINISH: CLEAN AND DEGREASED			R _a = 1.6	
√μm [μin]				
DRAWN	I WILMUT	03/10/06	SIZE	B
CHECKED	MB	15/MAR/10	DRG. NO.	D060323
APPROVED	JOD	15/MAR/10	REV	F.
SCALE 1:1			PROJECTION:	
			SHEET 1 OF 1	

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 MASSACHUSETTS INSTITUTE OF TECHNOLOGY
 IGR, GLASGOW UNIVERSITY GEO 600 GROUP
 RUTHERFORD APPLETON LABORATORIES

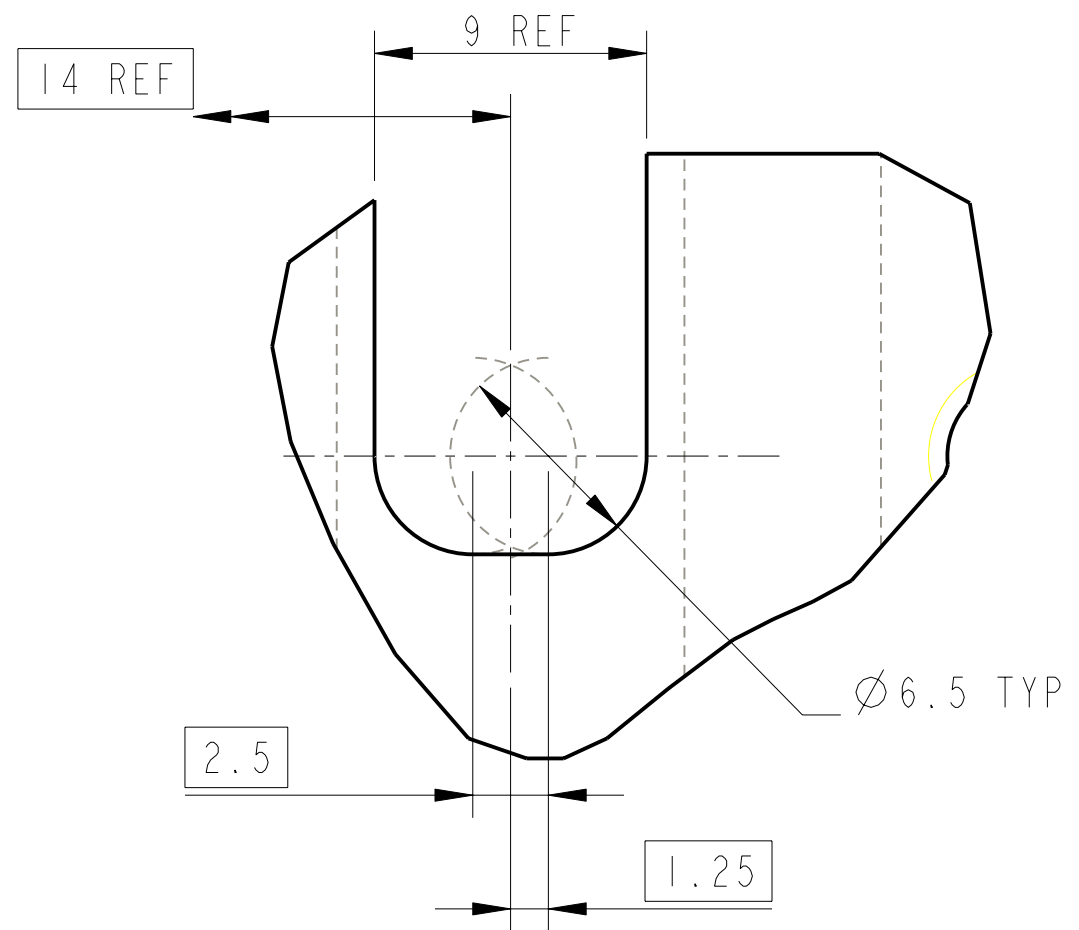
SYSTEM **aLIGO**
 SUB-SYSTEM **SUS**
 NEXT ASSY **QUAD TABLECLOTH**
 PART NAME **TRANSVERSE OSEM POSITION ADJUSTMENT PLATE**

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	



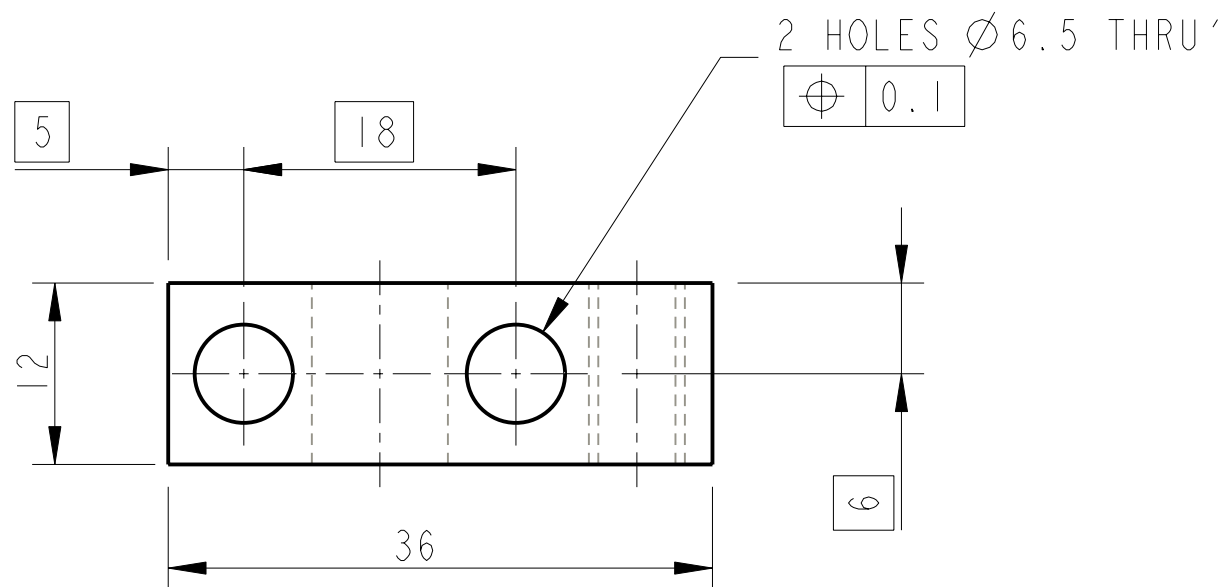
1 HOLE FOR HELICOIL 1/4-UNC THRU.
HELICOIL NOT TO BE FITTED.

\varnothing 0.25



DETAIL A
SCALE 4:1

\varnothing 0.25

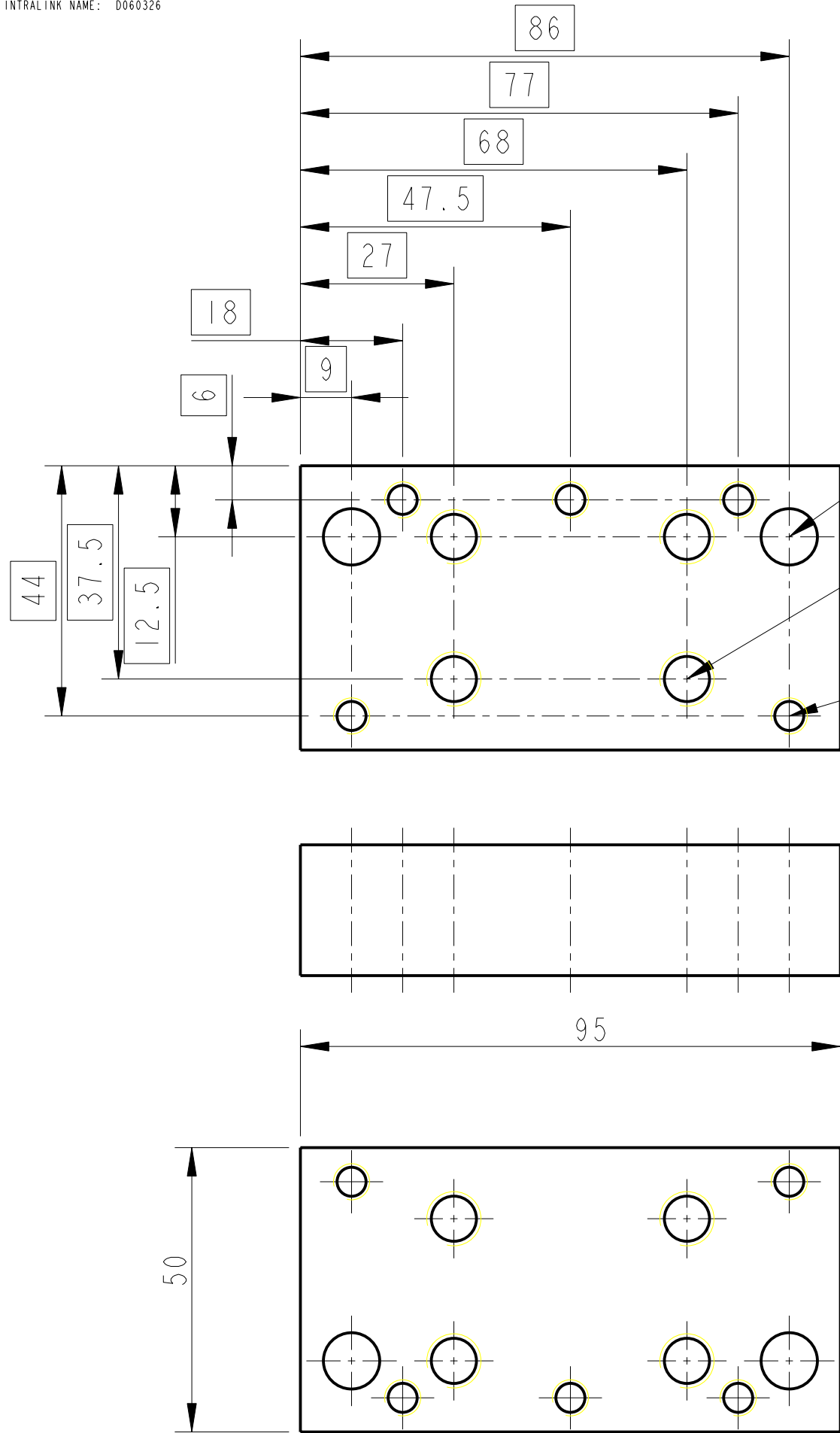


2 HOLES Ø6.5 THRU'

NOTES: (UNLESS OTHERWISE SPECIFIED)			CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES	
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.	DIMENSIONS ARE IN mm [INCHES]			
	TOLERANCES:		SYSTEM aLIGO	
	X.XX ±0.25 mm		SUB-SYSTEM SUS	
	ANGULAR ±0.25 °		NEXT ASSY QUAD TOP STAGE	
MATERIAL: ST ST 304/316		PART NAME ROTATIONAL ADJUSTER STATIC HALF		
FINISH: CLEAN AND DEGREASED		SIZE B		
√μm [μin] Ra = 1.6 [63]		DRG. NO. D060325		
DRAWN I WILMUT 3/OCT/06		REVISION F.		
CHECKED MB 15/MAR/10		SCALE 2:1		
APPROVED JOD 15/MAR/10		PROJECTION:		
			SHEET 1 OF 1	

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	

STAGE I MACHINING



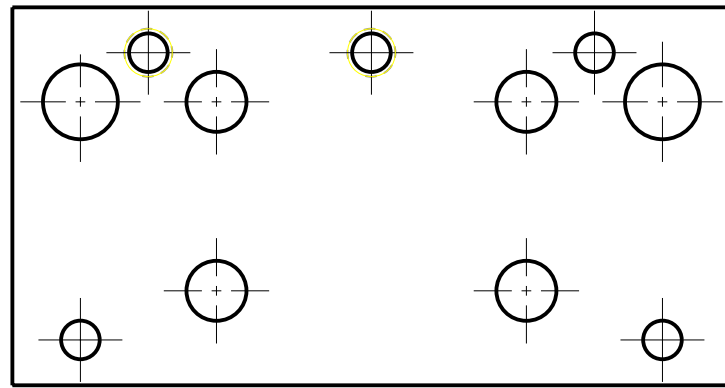
DRILL 2 HOLES $\varnothing 9.9$
THRO $\varnothing 0.2$

4 HOLES FOR 3/8-16 UNC
HELICOILS THRU, HELICOILS
NOT TO BE FITTED $\varnothing 0.2$

5 HOLES FOR 1/4-20 UNC
HELICOILS THRU, HELICOILS
NOT TO BE FITTED $\varnothing 0.15$

NOTES: (UNLESS OTHERWISE SPECIFIED)		CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES								
<ol style="list-style-type: none"> REMOVE ALL SHARP EDGES, R.02 MIN. DO NOT SCALE FROM DRAWING. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED. 	DIMENSIONS ARE IN mm [INCHES] TOLERANCES: X.XX ± 0.1 mm ANGULAR $\pm 0.25^\circ$		SYSTEM aLIGO							
	MATERIAL: ST. STEEL 304/316		SUB-SYSTEM SUS							
	FINISH: CLEAN, GREASE FREE $\sqrt{\mu m}$ [μin] $R_a = 1.6$ [63]		NEXT ASSY QUAD TOP STAGE							
	<table border="1"> <thead> <tr> <th>NAME</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>DRAWN J O'DELL</td> <td>03/NOV/09</td> </tr> <tr> <td>CHECKED MB</td> <td>15/MAR/10</td> </tr> <tr> <td>APPROVED JOD</td> <td>15/MAR/10</td> </tr> </tbody> </table>		NAME	DATE	DRAWN J O'DELL	03/NOV/09	CHECKED MB	15/MAR/10	APPROVED JOD	15/MAR/10
NAME	DATE									
DRAWN J O'DELL	03/NOV/09									
CHECKED MB	15/MAR/10									
APPROVED JOD	15/MAR/10									
<table border="1"> <tr> <td>SIZE B</td> <td>DRG. NO. D060326</td> <td>REV F.</td> </tr> </table>		SIZE B	DRG. NO. D060326	REV F.	SCALE 1:1 PROJECTION:					
SIZE B	DRG. NO. D060326	REV F.								

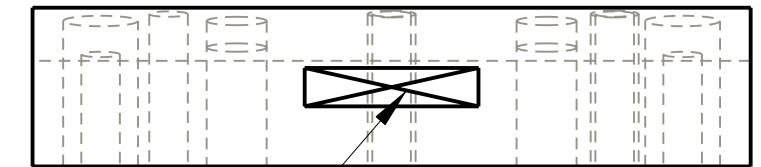
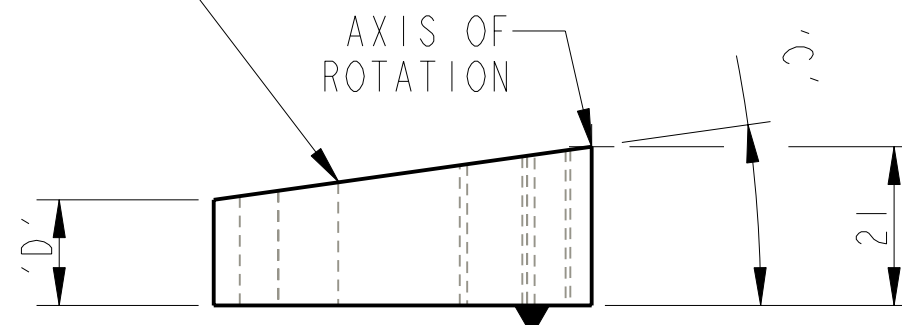
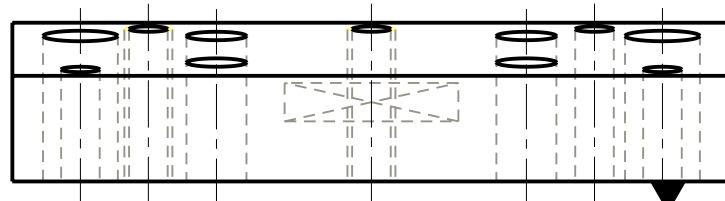
STAGE 2 MACHINING



VARIANT	ANGLE C	DIM D
-10	-1.091°	21.95 REF
-9	-0.982°	21.86 REF
-8	-0.837°	21.73 REF
-7	-0.764°	21.67 REF
-6	-0.655°	21.57 REF
-5	-0.546°	21.48 REF
-4	-0.437°	21.38 REF
-3	-0.327°	21.29 REF
-2	-0.218°	21.2 REF
-1	-0.109°	21.1 REF

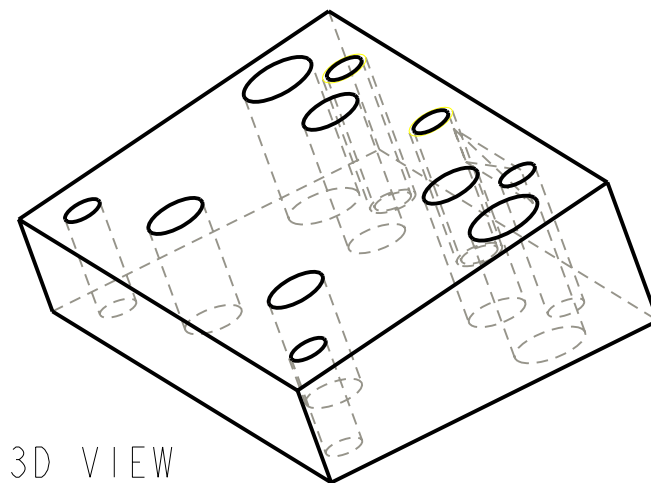
VARIANT	ANGLE C	DIM D
0	0°	21 REF
1	0.109°	20.90 REF
2	0.218°	20.80 REF
3	0.327°	20.71 REF
4	0.437°	20.62 REF
5	0.546°	20.52 REF
6	0.655°	20.43 REF
7	0.764°	20.33 REF
8	0.837°	20.27 REF
9	0.982°	20.14 REF
10	1.091°	20.05 REF

∠ 0.1 A



ENGRAVE PART NUMBER
SEE NOTE 4

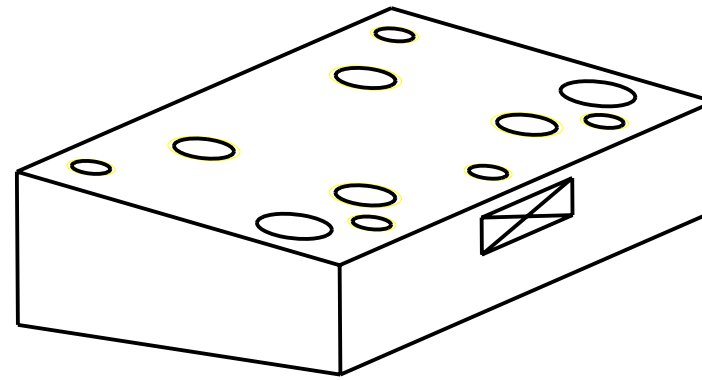
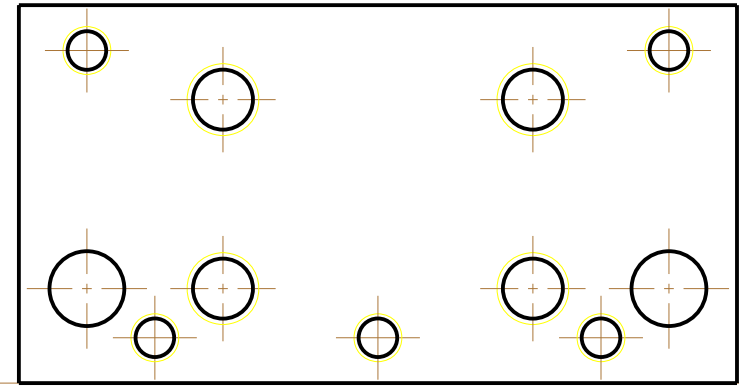
FOR DIMS C AND
D SEE TABLE



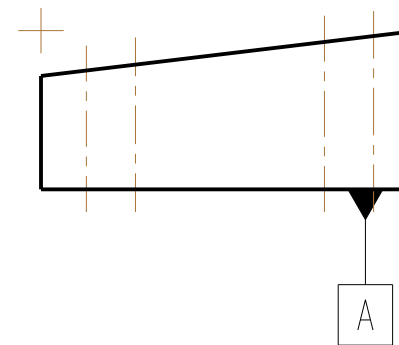
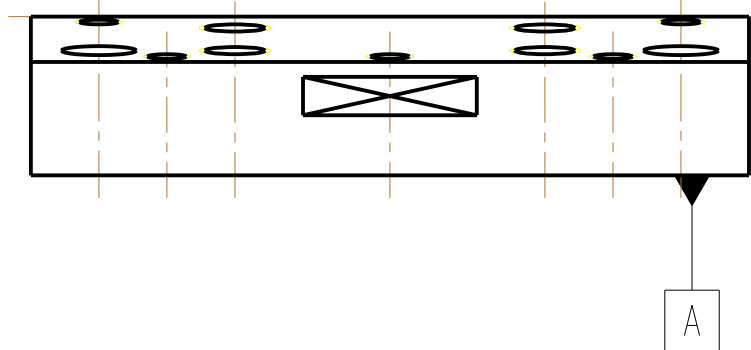
3D VIEW

NOTES: (UNLESS OTHERWISE SPECIFIED)		CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES	
1. REMOVE ALL SHARP EDGES, R.02 MIN.	DIMENSIONS ARE IN mm [INCHES] TOLERANCES: X.XX ±0.1 mm ANGULAR ±0.25 °	SYSTEM	aLIGO
2. DO NOT SCALE FROM DRAWING.		SUB-SYSTEM	SUS
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)	MATERIAL: ST. STEEL 304/316	NEXT ASSY	QUAD TOP STAGE
4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.	FINISH: CLEAN, GREASE FREE √μm [μin] Ra = 1.6 [63]	PART NAME	BLADE CLAMP (TOP HALF)
	DRAWN J O'DELL 03/NOV/09	SIZE	B
	CHECKED MB 15/MAR/10	DRG. NO.	D060326
	APPROVED JOD 15/MAR/10	REV	F.
		SCALE 1:1	PROJECTION: SHEET 2 OF 3

REV.	DATE	DCN #	DRAWING TREE #



VARIANT	ANGLE C	DIM D
0	0°	21 REF
1	0.109°	20.90 REF
2	0.218°	20.80 REF
3	0.327°	20.71 REF
4	0.437°	20.62 REF
5	0.546°	20.52 REF
6	0.655°	20.43 REF
7	0.764°	20.33 REF
8	0.837°	20.27 REF
9	0.982°	20.14 REF
10	1.091°	20.05 REF



NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES, R.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
- SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.1 mm
ANGULAR ±0.25 °

MATERIAL: ST. STEEL 304/316

FINISH: CLEAN, GREASE FREE
√μm [μin] Ra = 1.6 [63]

NAME	DATE
DRAWN J O'DELL	03/NOV/09
CHECKED MB	15/MAR/10
APPROVED JOD	15/MAR/10

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RUTHERFORD APPLETON LABORATORIES

SYSTEM **aLIGO**

SUB-SYSTEM **SUS**

NEXT ASSY **QUAD TOP STAGE**

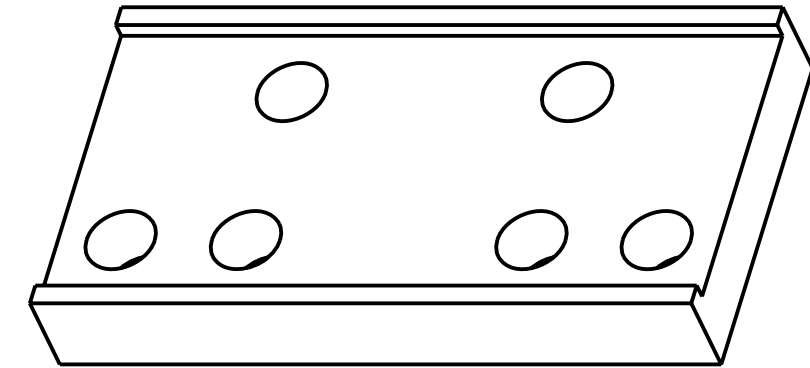
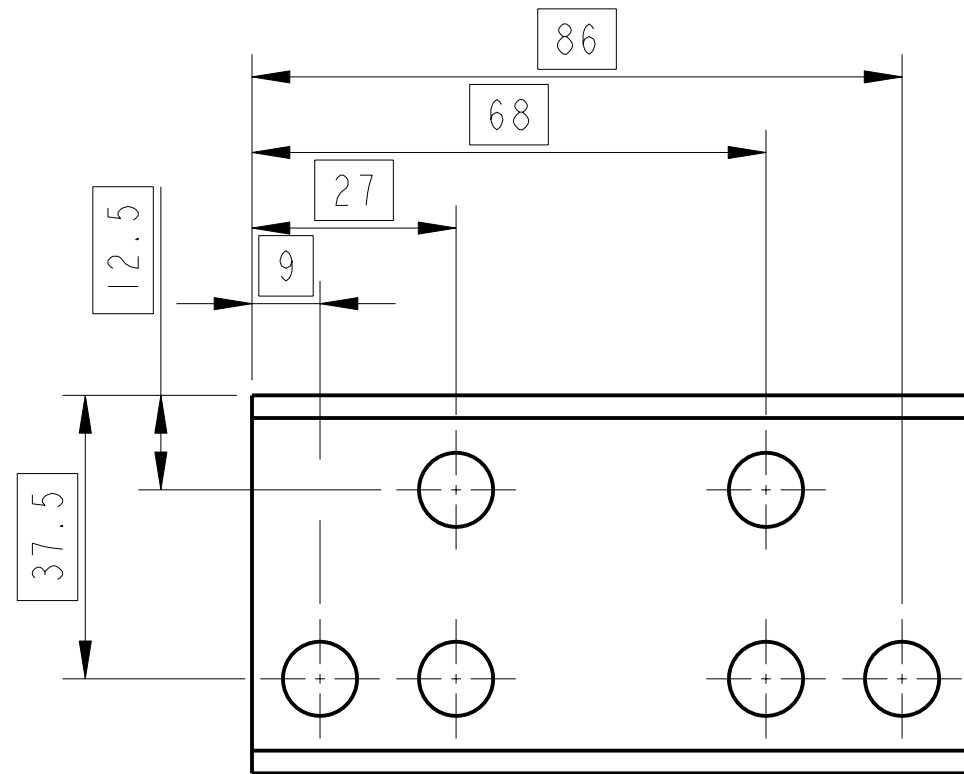
PART NAME **BLADE CLAMP (TOP HALF)**

SIZE **B** DRG. NO. **D060326** REV **F.**

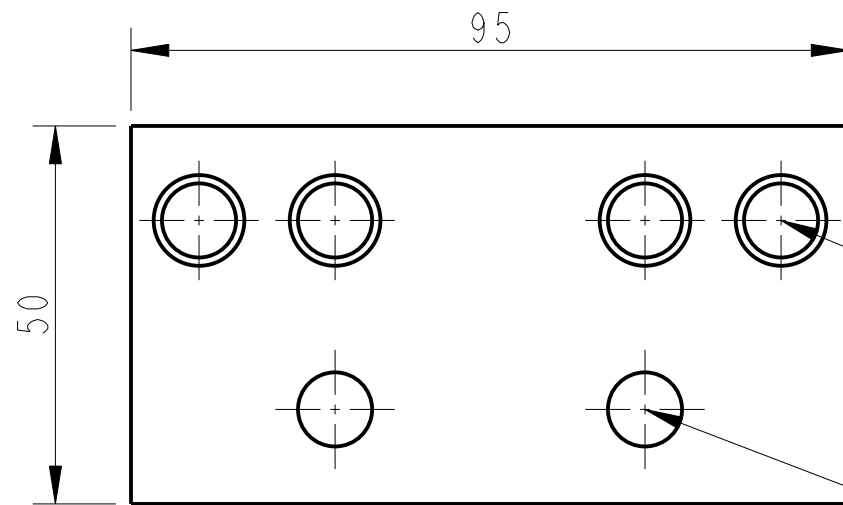
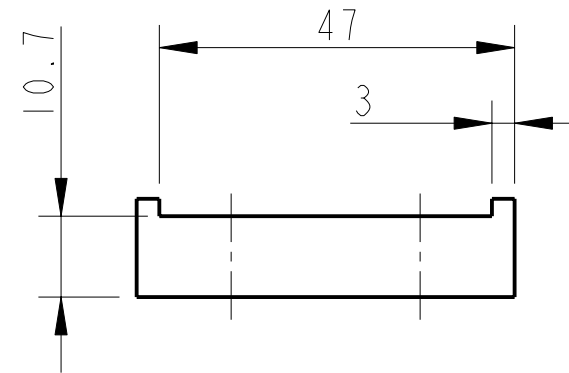
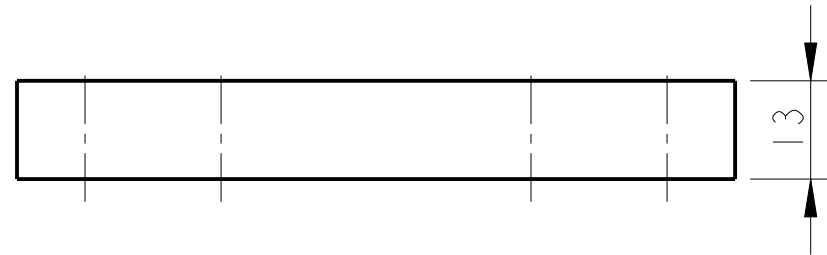
SCALE 1:1 PROJECTION: SHEET 3 OF 3

STAGE I MACHINING

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	



3D VIEW



DRILL 4 HOLES $\varnothing 9.8$ THRU
C'SINK $\varnothing 12$

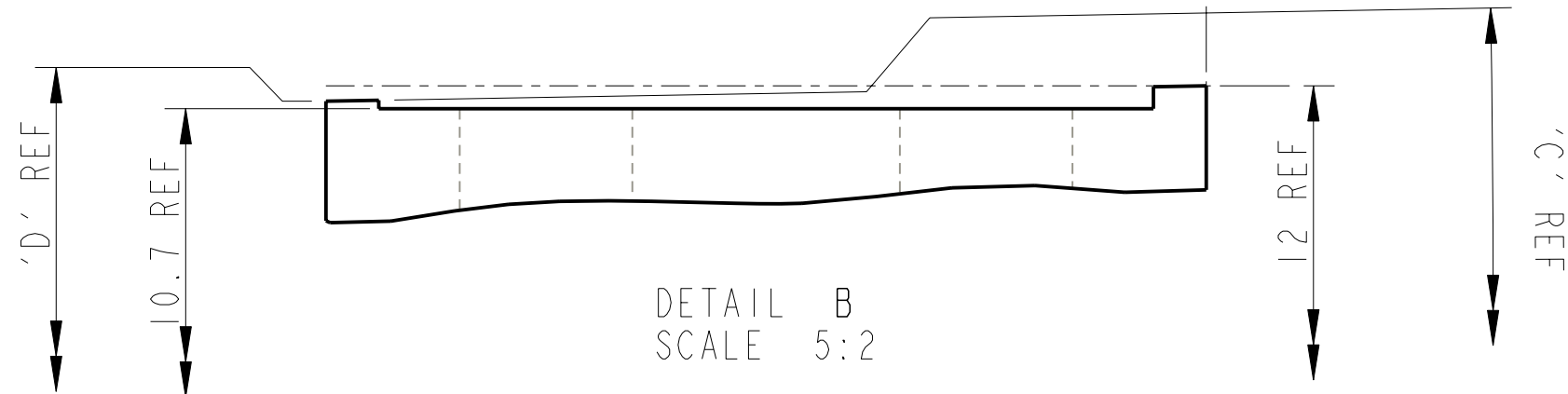
$\varnothing 0.2$

DRILL 2 HOLES $\varnothing 9.8$ THRU

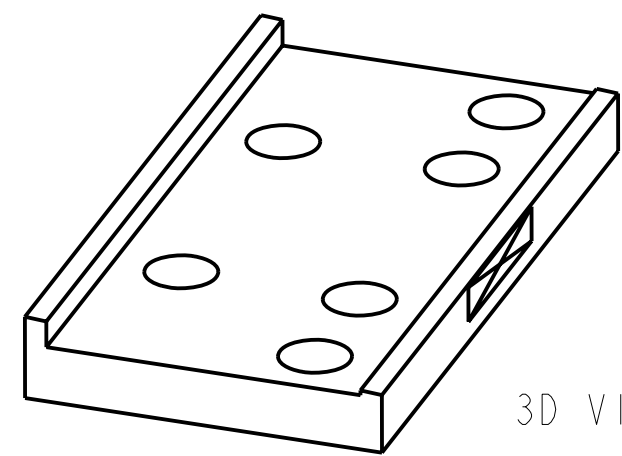
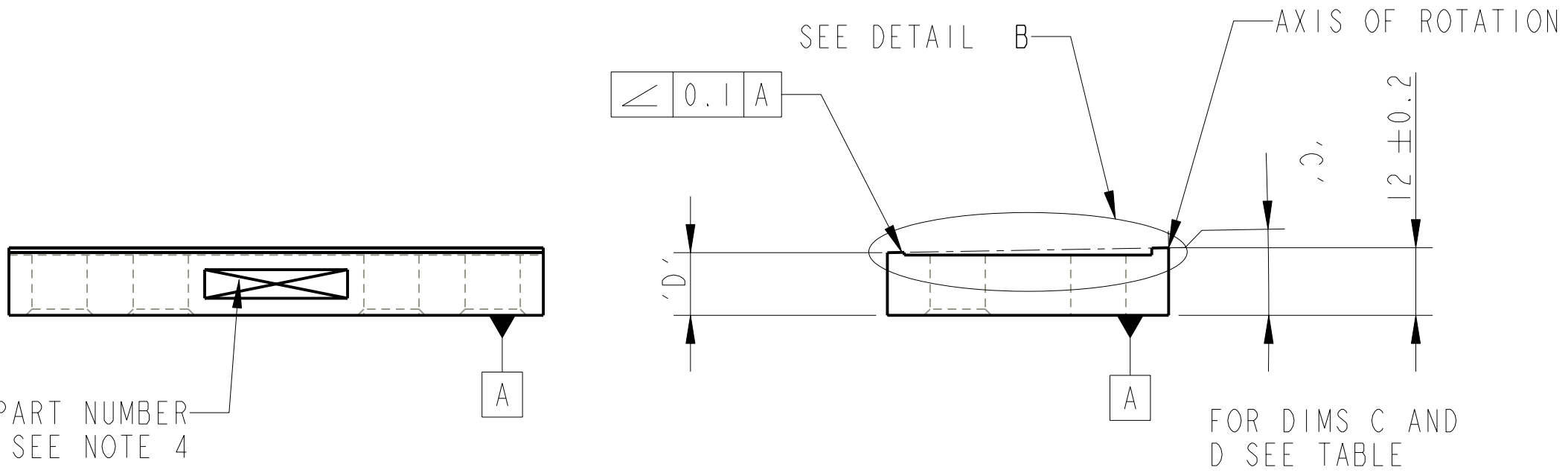
$\varnothing 0.2$

NOTES: (UNLESS OTHERWISE SPECIFIED)		DIMENSIONS ARE IN mm [INCHES]		TOLERANCES:			
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.		X.XX ± 0.25 mm		ANGULAR $\pm 0.25^\circ$			
		MATERIAL: ST STEEL 304/316		FINISH: CLEAN AND DEGREASED $\sqrt{\mu m}$ [μin] Ra = 1.6 [63]			
		DRAWN	J O'DELL	03/NOV/09	CHECKED	MB	15/MAR/10
		APPROVED	JOD				
CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES		SYSTEM		aLIGO			
		SUB-SYSTEM		SUS			
		NEXT ASSY		QUAD TOP STAGE			
		PART NAME		BLADE CLAMP (BTM HALF)			
SIZE	B	DRG. NO.	D060327		REV		
SCALE 1:1		PROJECTION:		SHEET 1 OF 2			

STAGE 2 MACHINING



DETAIL B
SCALE 5:2



EXAGGERATED REPRESENTATION
DO NOT SCALE

VARIANT	ANGLE C	DIM D
0	0°	12 REF
1	0.109°	11.90 REF
2	0.218°	11.80 REF
3	0.327°	11.71 REF
4	0.437°	11.62 REF
5	0.546°	11.52 REF
6	0.655°	11.43 REF
7	0.764°	11.33 REF
8	0.837°	11.27 REF
9	0.982°	11.14 REF
10	1.091°	11.05 REF

VARIANT	ANGLE C	DIM D
-10	-1.091°	12.95 REF
-9	-0.982°	12.86 REF
-8	-0.837°	12.73 REF
-7	-0.764°	12.67 REF
-6	-0.655°	12.57 REF
-5	-0.546°	12.48 REF
-4	-0.437°	12.38 REF
-3	-0.327°	12.29 REF
-2	-0.218°	12.2 REF
-1	-0.109°	12.1 REF

NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES, R.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
- SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN AND DECREASED
√μm [μin] Ra = 1.6 [63]

NAME	DATE
DRAWN J O'DELL	03/NOV/09
CHECKED MB	15/MAR/10
APPROVED JOD	15/MAR/10

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM **aLIGO**

SUB-SYSTEM **SUS**

NEXT ASSY **QUAD TOP STAGE**

PART NAME **BLADE CLAMP (BTM HALF)**

SIZE **B** DRG. NO. **D060327** REV **F.**

SCALE 1:1 PROJECTION: SHEET 2 OF 2

NOTES CONTINUED:

5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) REVISION NUMBER ON EACH PART. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. EXAMPLE (PART): 001-v1 EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD

6. ALL HOLES TO BE 100% GAGED WITH EMHART TOOL: 1442-6 OR 1440-6

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364

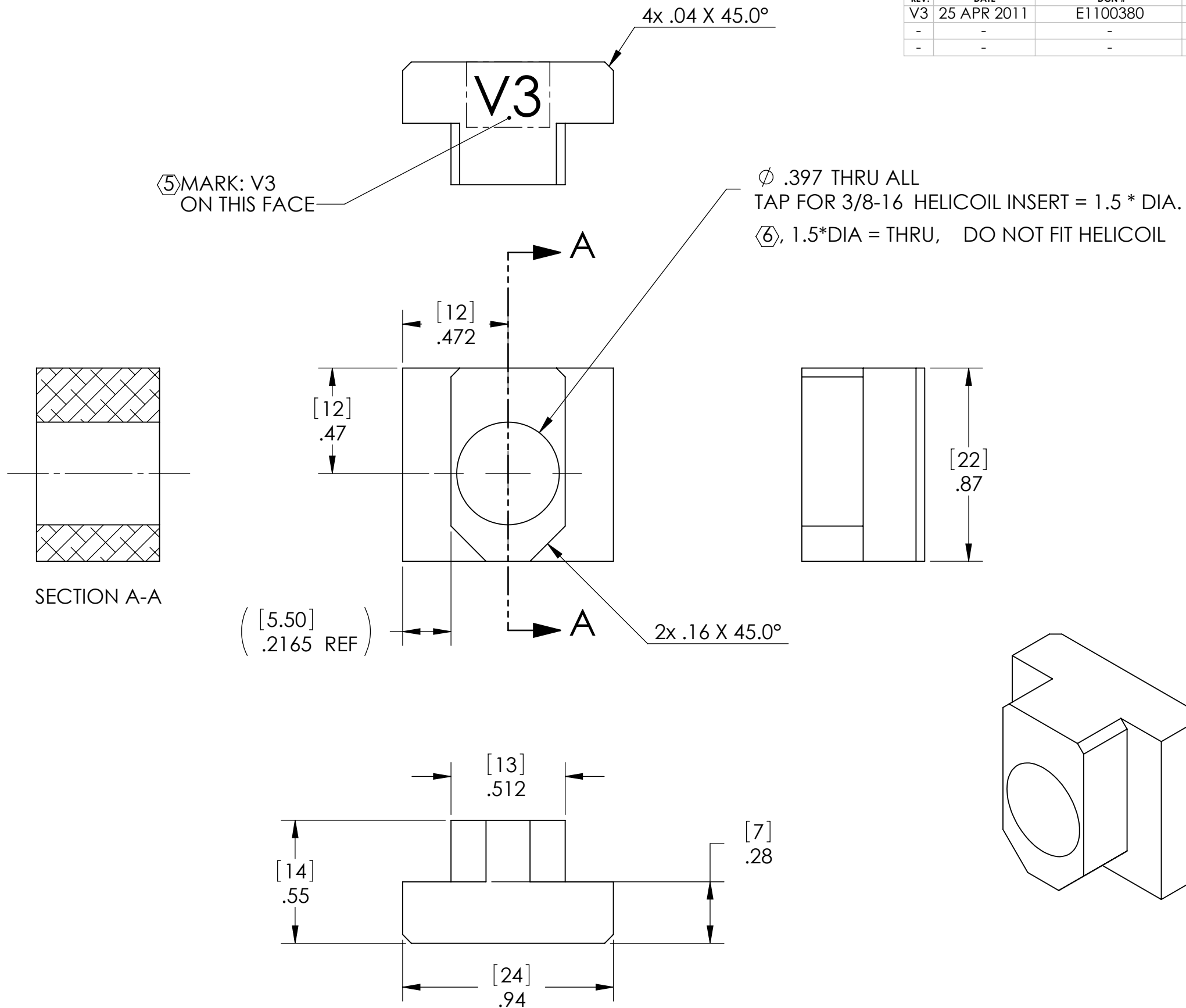
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG, HC2000, REV 4

10. ALL HELI-COIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL. AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

REV.	DATE	DCN #	DRAWING TREE #
V3	25 APR 2011	E1100380	-
-	-	-	-
-	-	-	-

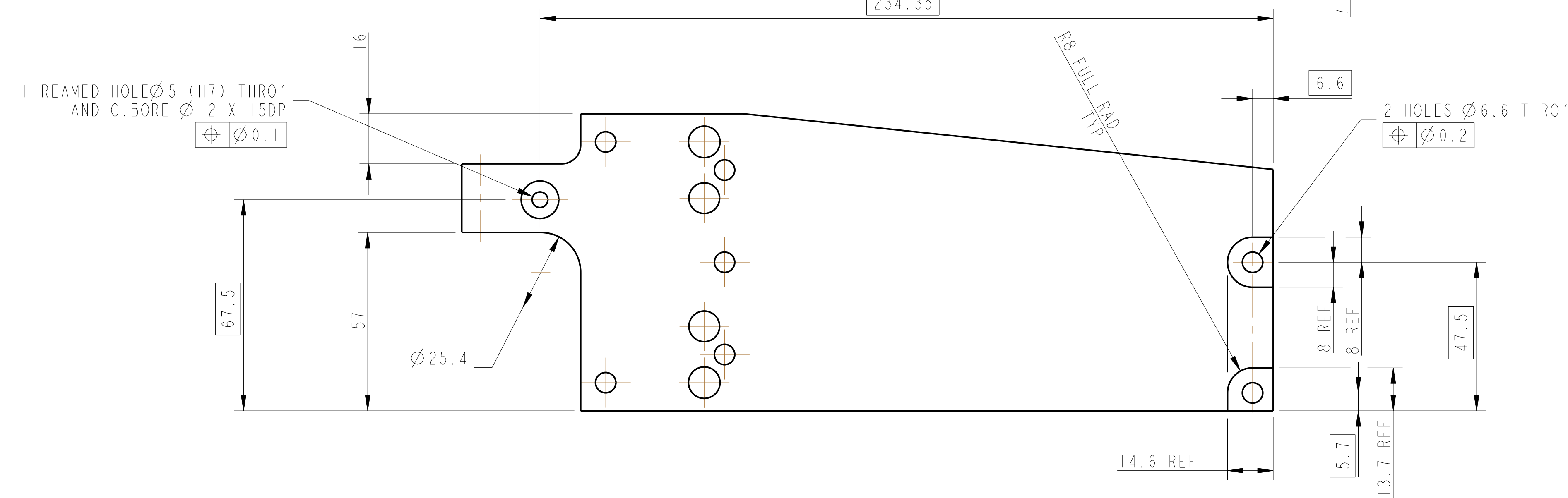
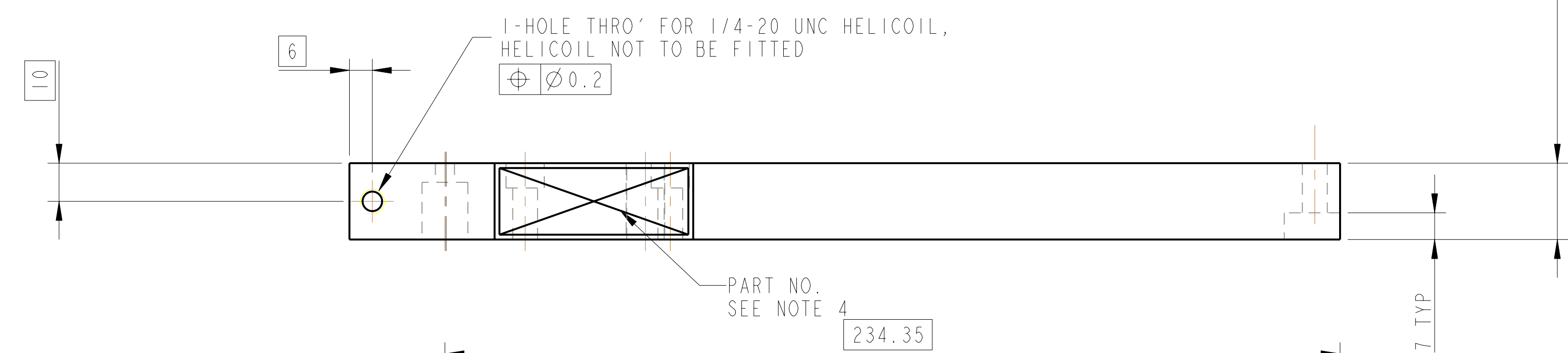
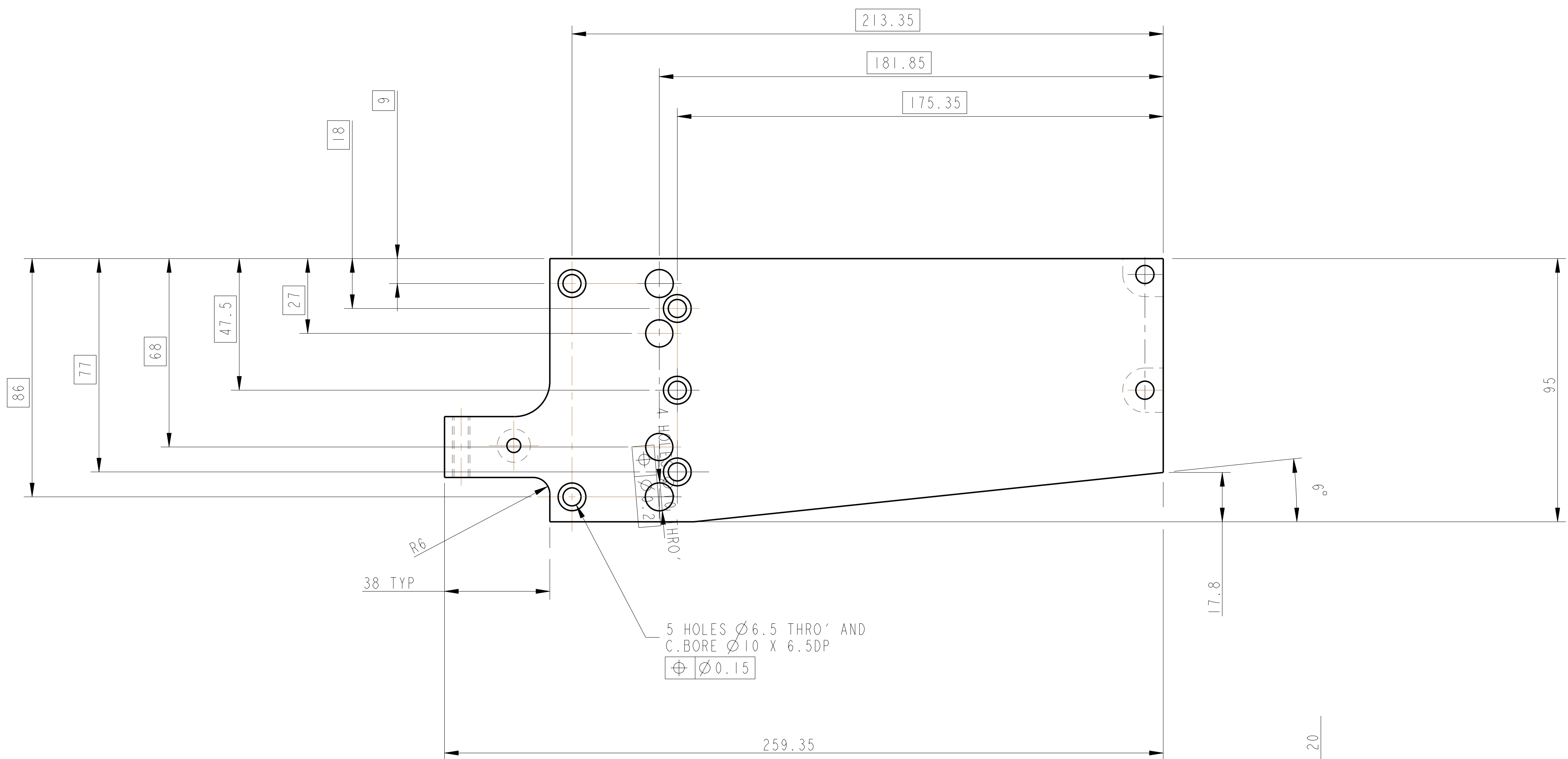


D060328 aLIGO, SUS, Quad N-P Top Stage, 3/8-16 UNC T-NUT, PART PDM REV: , DRAWING PDM REV:

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)	
DIMENSIONS ARE IN INCHES [MM]	
TOLERANCES: .XX ± .008 .XXX ± .004 ANGULAR ± 0.3°	
1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015, FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.	
MATERIAL	FINISH
304 SSSL	32 μinch

CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
SYSTEM ADVANCED LIGO		SUB-SYSTEM SUS	
NEXT ASSY		DESIGNER Joe Odell 22 April 2011 DRAFTER SBARNUM 25 Apr 2011 CHECKER APPROVAL CTORRIE	
D060324		SIZE DWG. NO. B D060328	
		REV. v3	
		SCALE: 2:1 PROJECTION: SHEET 1 OF 1	

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	



NOTES: (UNLESS OTHERWISE SPECIFIED)

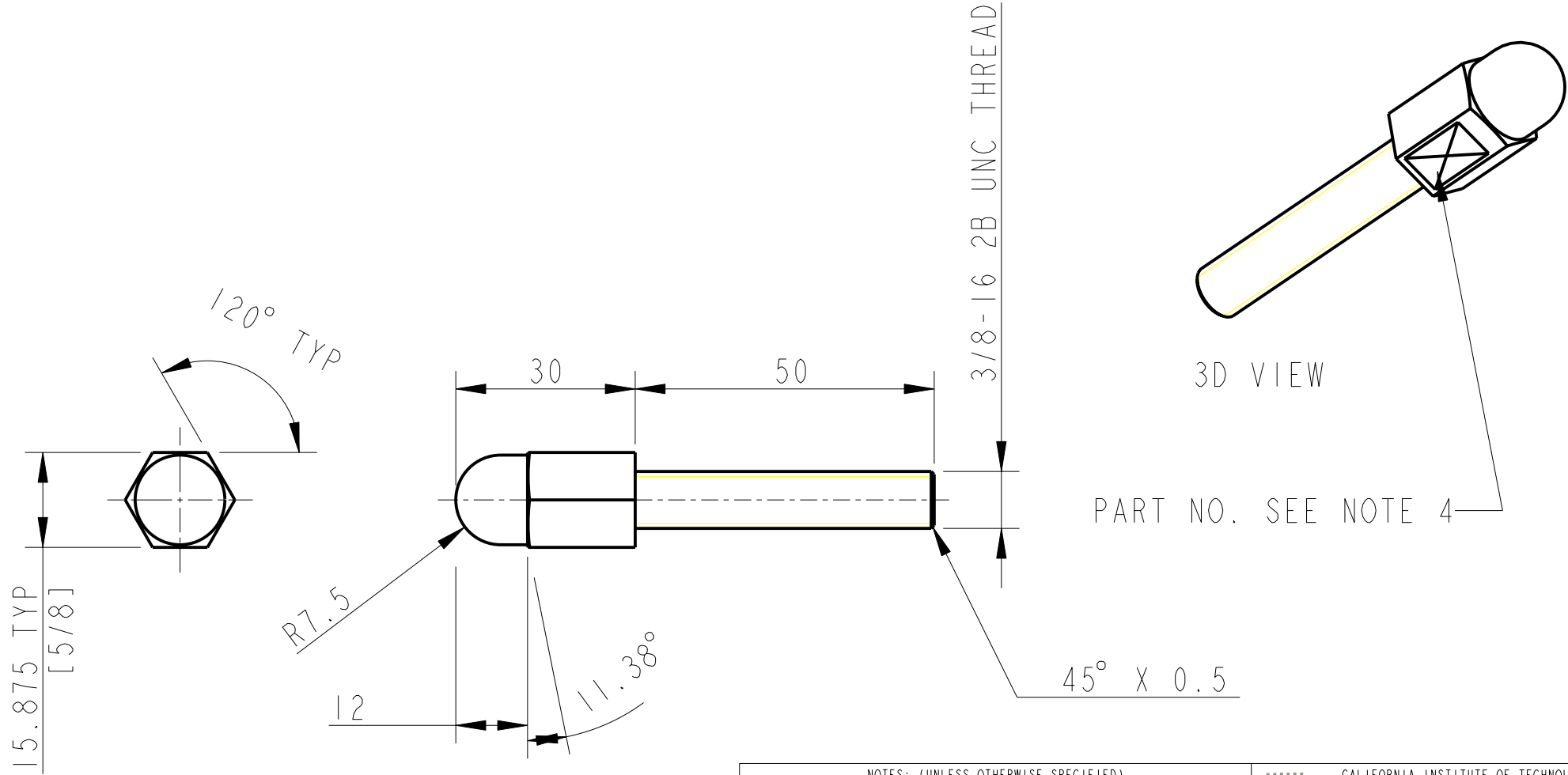
- REMOVE ALL SHARP EDGES. 0.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE. SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL).
- SCORE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE 07" HIGH CHARACTERS. EXAMPLE: 000100-001 - A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm (INCHES)
TOLERANCES:
X.XX ± 0.2
ANGULAR ±0.25°
√μm (μIN)
R_a = 1.6 (63)

NAME	DATE
DRAWN	15/MAR/10
CHECKED	MB
APPROVED	JSD

MATERIAL: ST STEEL 304/316
FINISH: CLEAN AND DEGREASE
SYSTEM: aLIGO
SUB-SYSTEM: SUS
NEXT ASSY: QUAD TOP STAGE
PART NAME: ROTATIONAL ADJUSTER BASE PLATE
DRG. NO.: D060330
SCALE: 1:1
PROJECTION: 1st Angle
SHEET 1 OF 1

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	



NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES, R.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
- SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.25 mm
ANGULAR ±0.5°

MATERIAL: ST STEEL 304/316

FINISH: CLEAN
√μm [μin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	I WILMUT	5/OCT/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

SCALE: A

DRG. NO. D060331

REV. F.

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

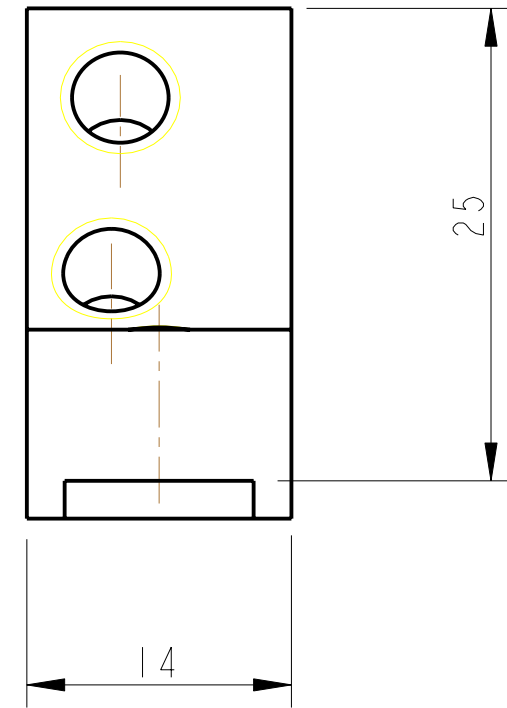
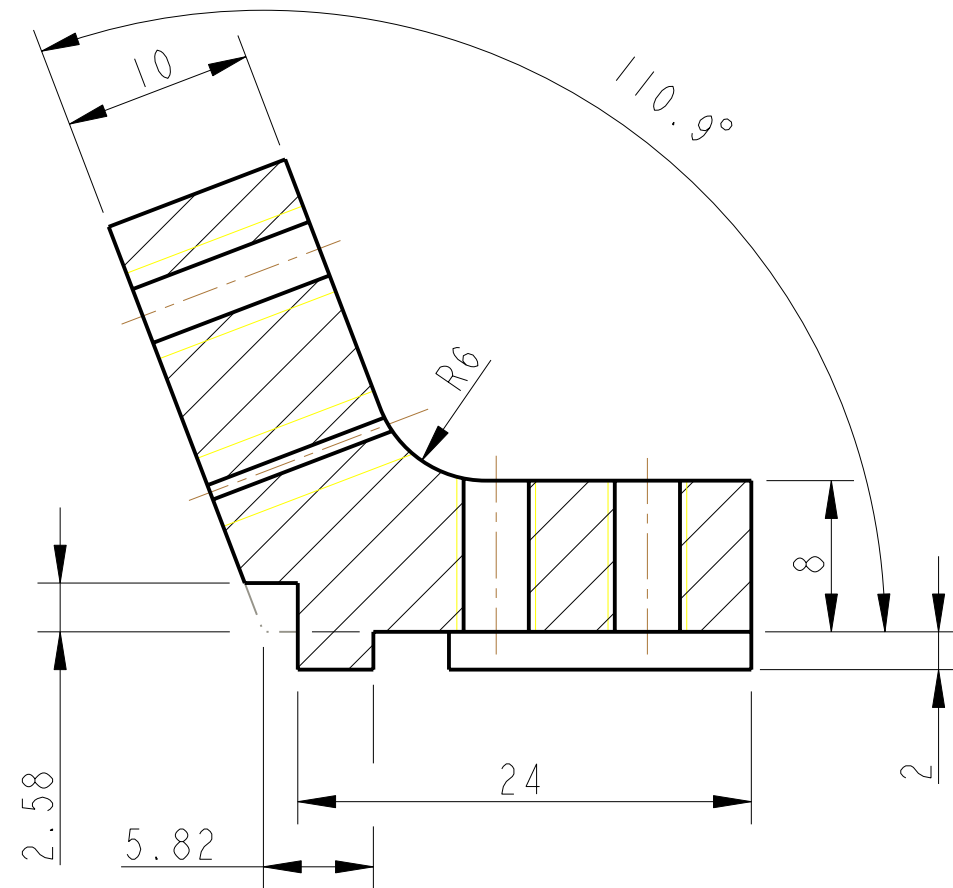
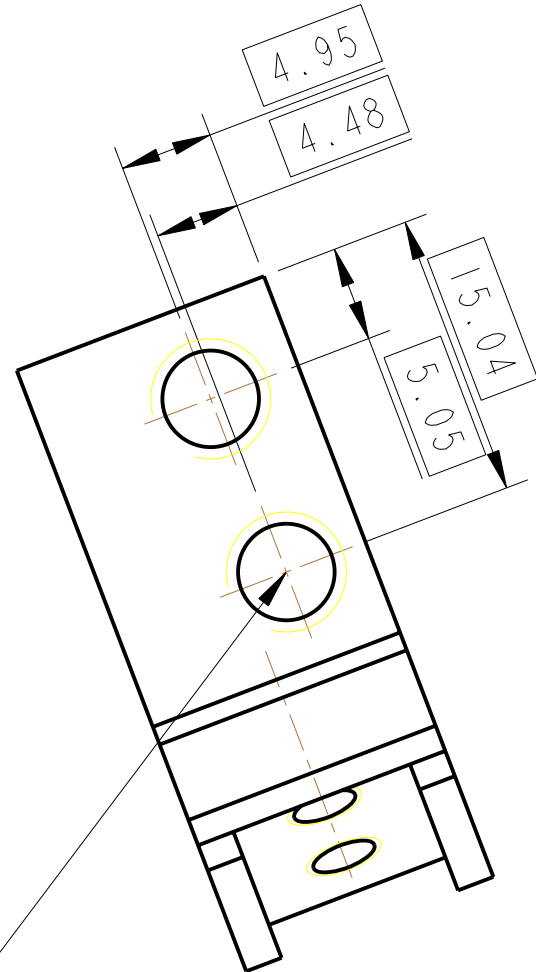
SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

PART NAME JACKING SCREW / EARTHQUAKE STOP

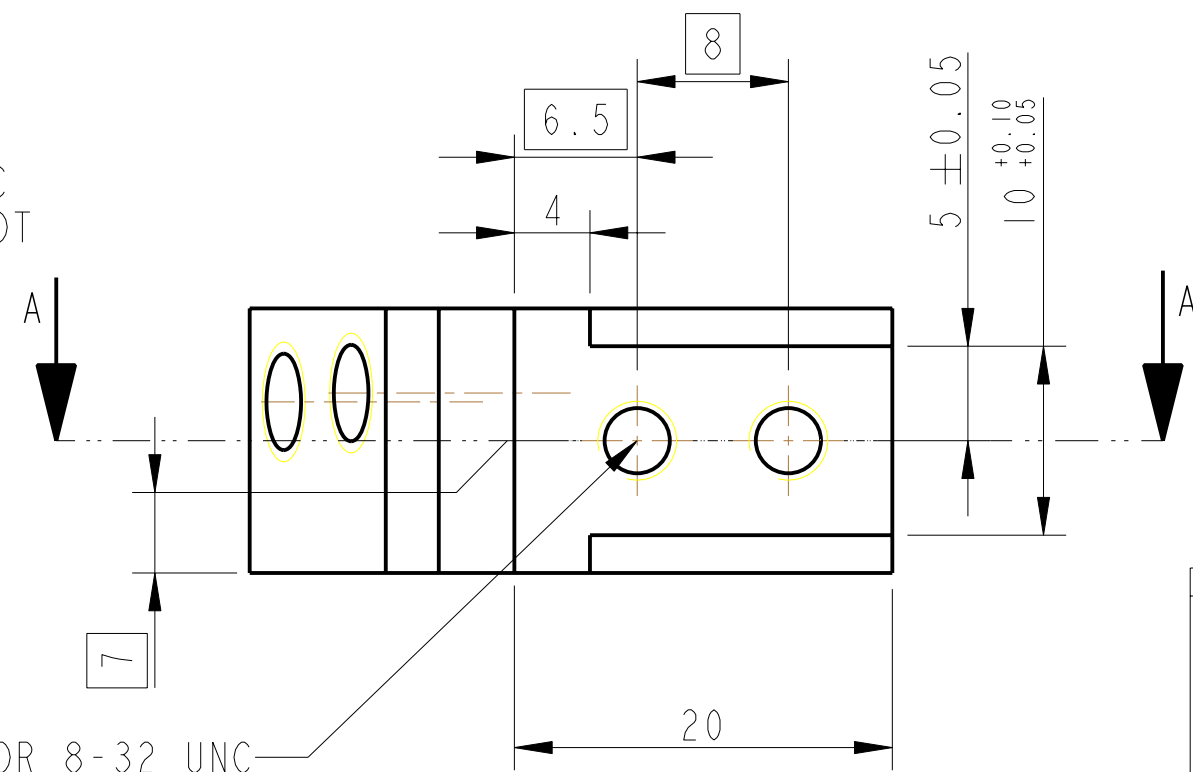
SCALE 1:1 PROJECTION: [Symbol] SHEET 1 OF 1

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	
E	15/JULY/08	E080367	



SECTION A-A

2 HOLES TAPPED FOR 1/4-20 UNC HELICOILS THRO, HELICOILS NOT TO BE FITTED $\text{⌀} \text{⌀} 0.1$



2 HOLES TAPPED FOR 8-32 UNC HELICOILS THRO, HELICOILS NOT TO BE FITTED $\text{⌀} \text{⌀} 0.1$

NOTES: (UNLESS OTHERWISE SPECIFIED)

- REMOVE ALL SHARP EDGES, R.02 MIN.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
- SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]	
TOLERANCES:	
X.XX ±0.2 mm	ANGULAR ±0.25 °
MATERIAL: ST STEEL 304/316	
FINISH: CLEAN AND DEGREASED $\sqrt{\mu\text{m}} [\mu\text{in}]$ Ra = 1.6 [63]	
DRAWN	I WILMUT 05/OCT/06
CHECKED	MB 15/MAR/10
APPROVED	JOD 15/MAR/10

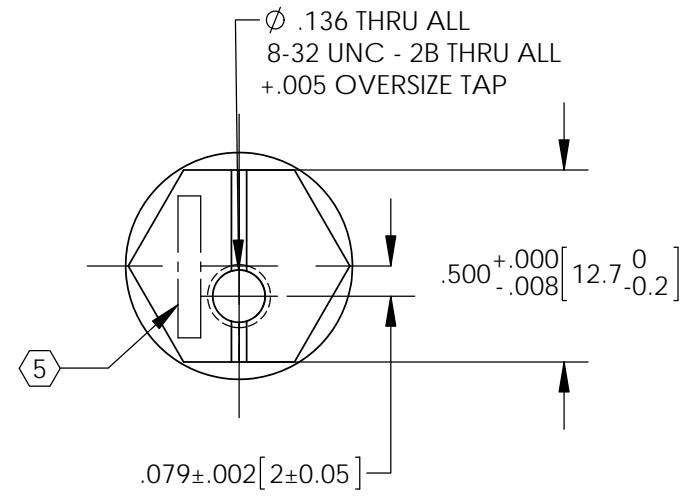
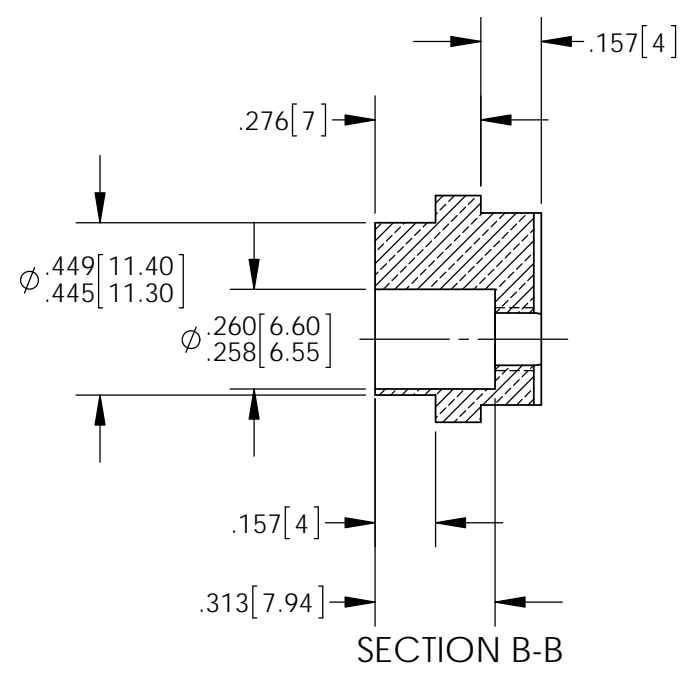
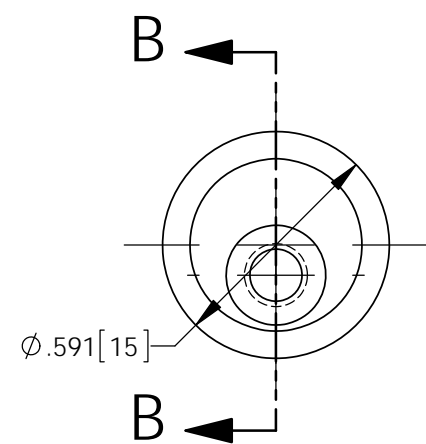
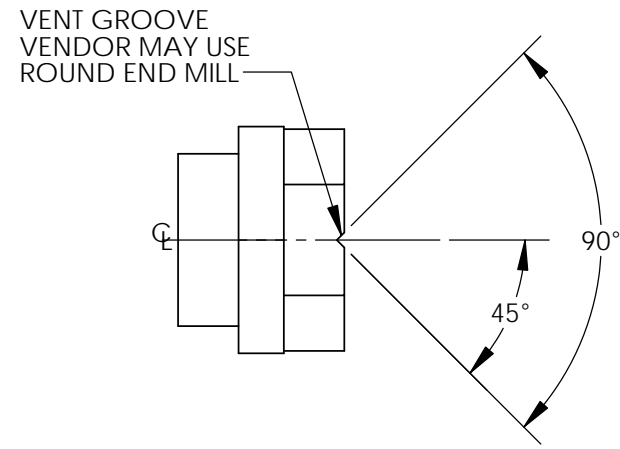
CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY 1GR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES	
SYSTEM	aLIGO
SUB-SYSTEM	SUS
NEXT ASSY	QUAD TOP STAGE
PART NAME	WIRE CLAMP BODY, TOP STAGE
SIZE	B
DRG. NO.	D060333
SCALE	5:2
PROJECTION	
SHEET	1 OF 1
REV	F.

D060336_aLIGO, SUS, Penre MASS Quad N-Ptype, 2MM CAM, OSEM ADJUSTER, PART PDM REV: X-017, DRAWING PDM REV: X-005

NOTES CONTINUED:

- 5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD
- 6. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364
- 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 8. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

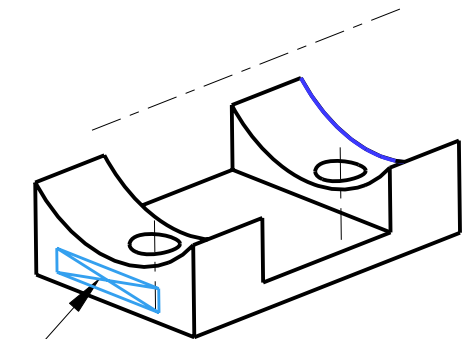
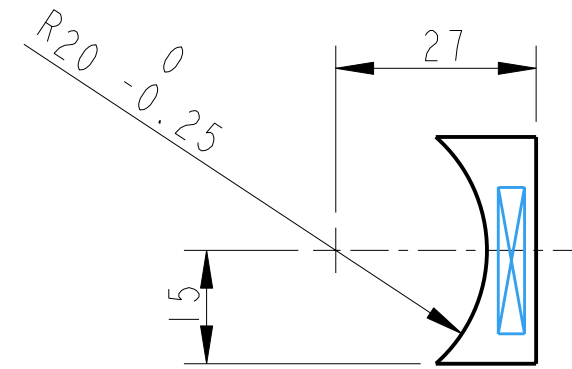
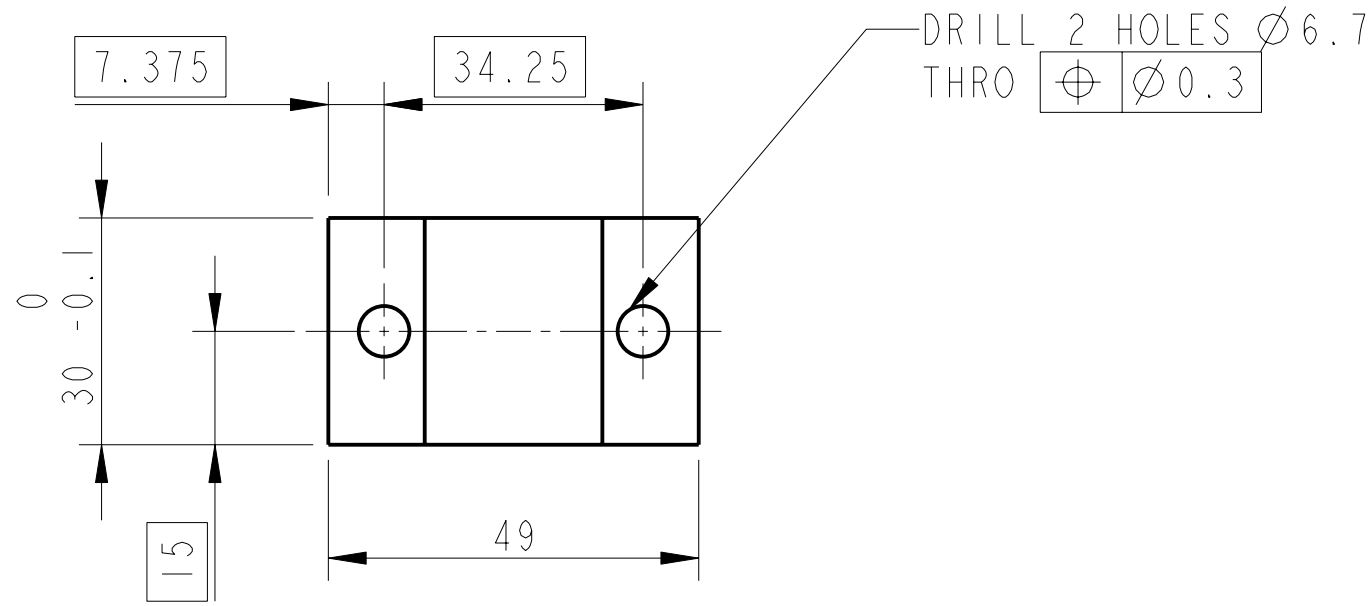
REV.	DATE	DCN #	DRAWING TREE #
v3	21 Jan 2012	E1200066	E1200069
v4	26 Jan 2012	E1200057	E1200069



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)	
DIMENSIONS ARE IN INCHES [MM]	
TOLERANCES: .XX ± .01 .XXX ± .005	
ANGULAR ± .5°	
1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015, FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS. 3. DO NOT SCALE FROM DRAWINGS. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.	
MATERIAL	FINISH
PHOSPHOR BRONZE P<or=0.35%, PB<or= 1%, Zn<or= 1%	63 µinch

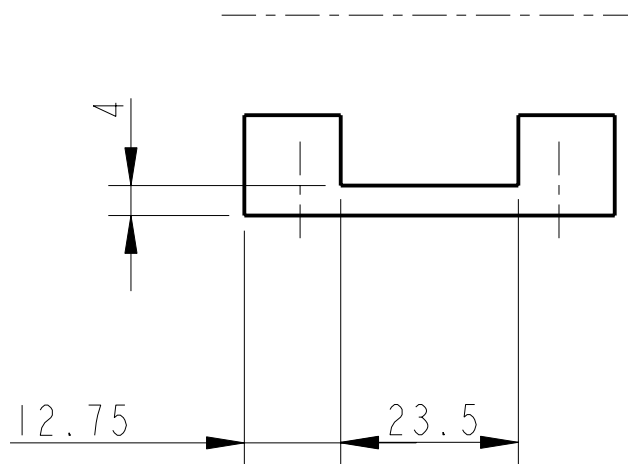
CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
SYSTEM ADVANCED LIGO		SUB-SYSTEM SUS	
NEXT ASSY		DESIGNER J.ODELL 28 Oct 2006 DRAFTER IWILMUT 28 OCT 2005 CHECKER MB 15 MAR 2010 APPROVAL JOD 15 MAR 2010	
MULTIPLE		SIZE DWG. NO. B D060336	REV. v4
		SCALE: 2:1	PROJECTION: SHEET 1 OF 1

REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	
B	19/DEC/07	E060247-B	



PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

3D VIEW



NOTES: (UNLESS OTHERWISE SPECIFIED)		DIMENSIONS ARE IN mm [INCHES]		TOLERANCES:			
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.		X.XX ± 0.1 mm		ANGULAR $\pm 0.25^\circ$			
		MATERIAL: AL ALLOY 5083 OR 6061		FINISH: CLEAN, GREASE FREE $\sqrt{\mu m}$ [μin] Ra = 1.6			
		DRAWN	I WILMUT	10/DEC/05	CHECKED	MB	15/MAR/10
		APPROVED	JOD	15/MAR/10			
CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY IGR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES		SYSTEM		aLIGO			
		SUB-SYSTEM		SUS			
		NEXT ASSY		QUAD UI MASS			
		PART NAME		BLADE TIP Z POSITION ADJ (BTM HALF PART 2)			
SIZE	B	DRG. NO.	D060377		REV. H.		
SCALE 1:1		PROJECTION:		SHEET 1 OF 1			

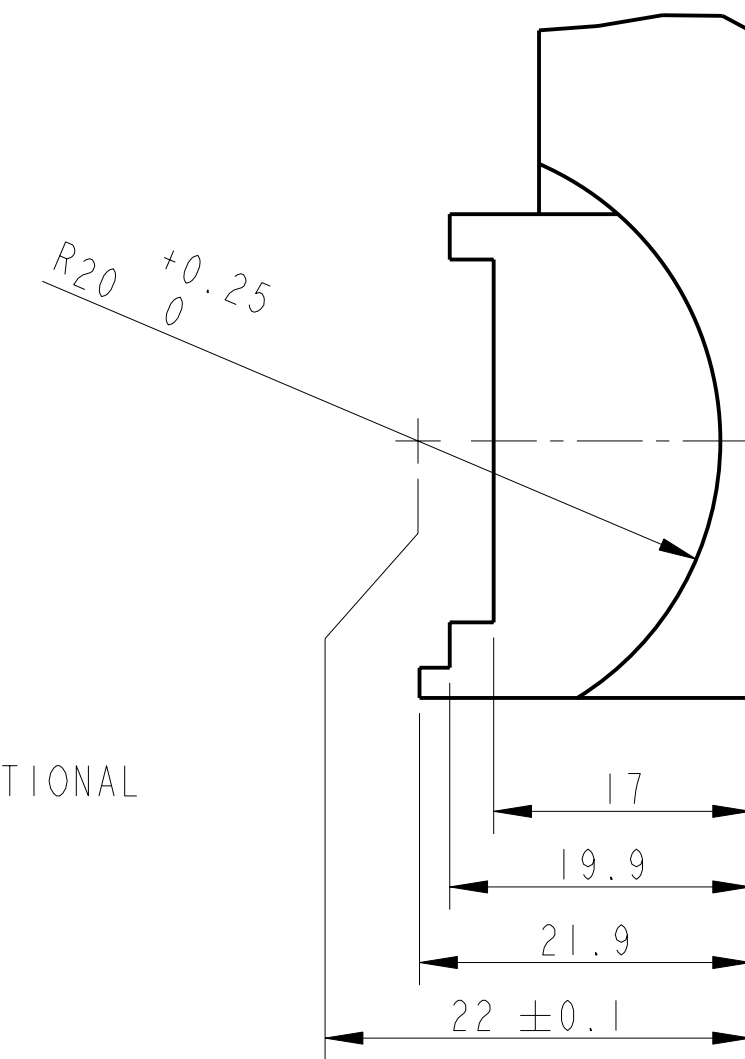
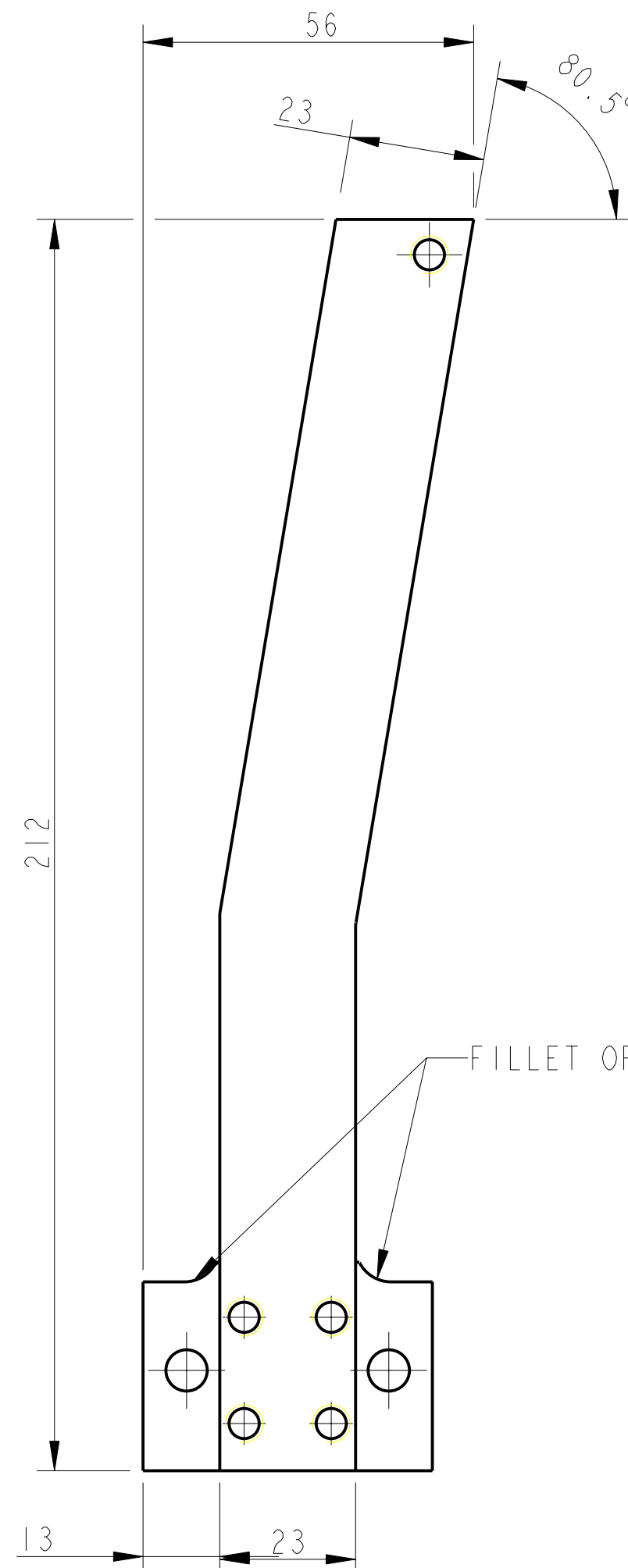
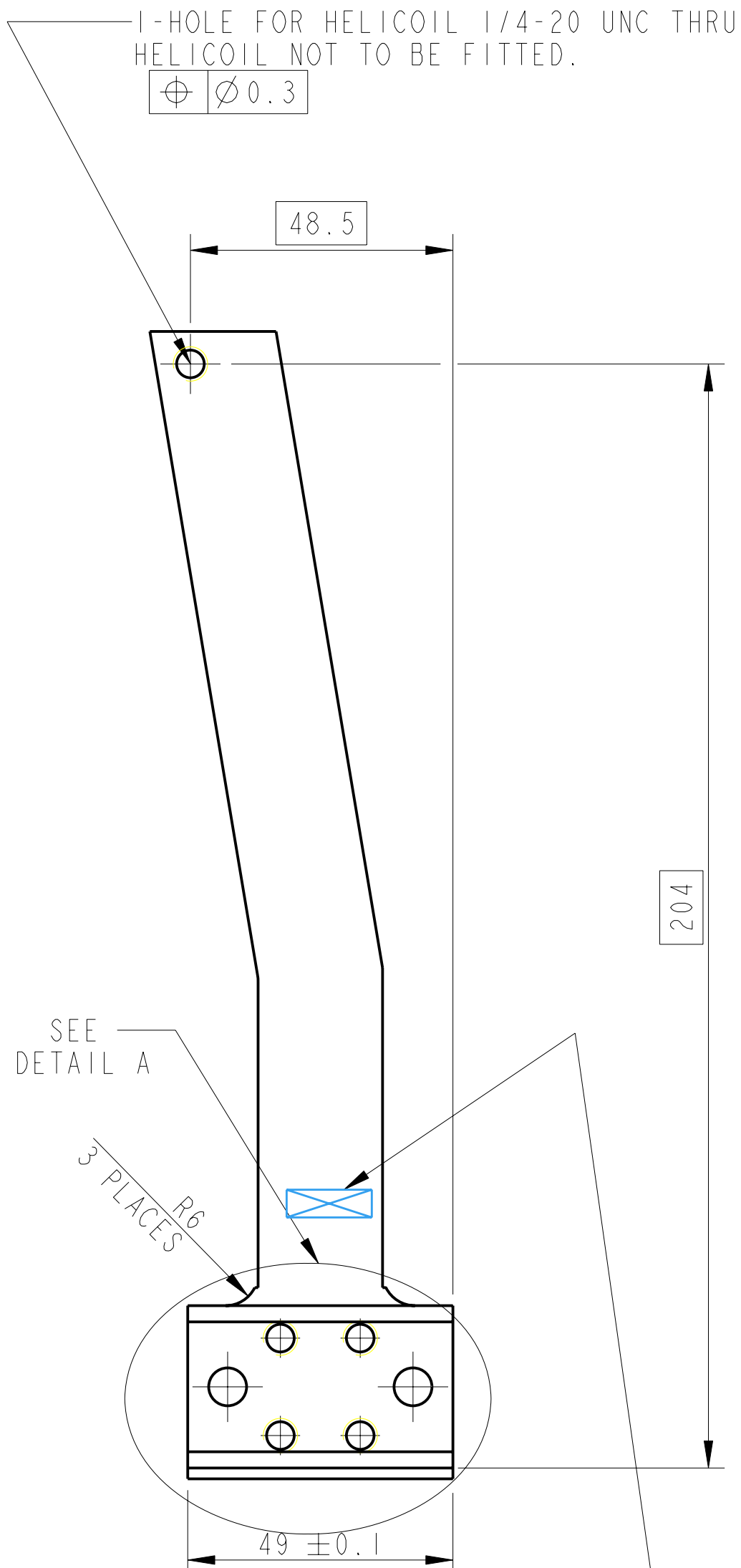
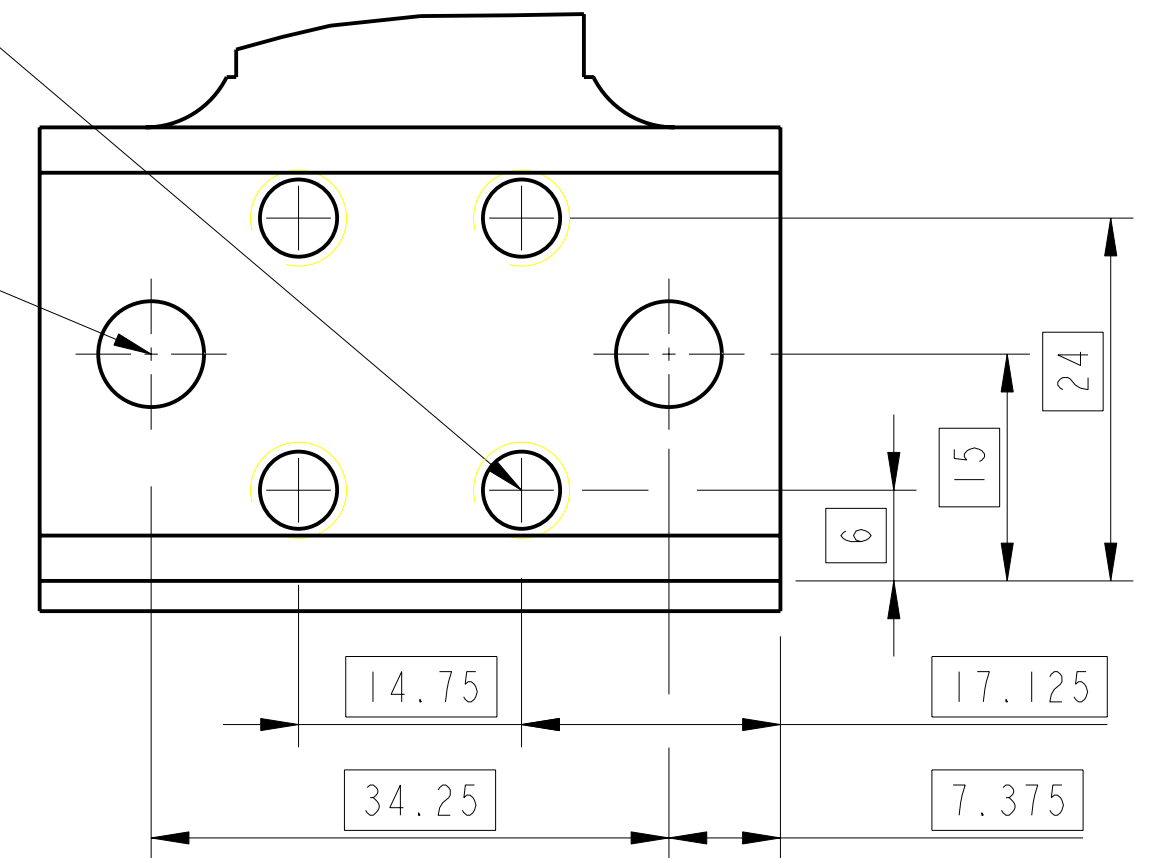
REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	
B	19/DEC/07	E060247-B	
H	21/JULY/08	E080371	

TAP 4-HOLES FOR HELICOILS 1/4-20 UNC THRU' HELICOILS NOT TO BE FITTED. $\text{H} \begin{matrix} \text{Ø} \\ \text{0.1} \end{matrix}$

DETAIL A
SCALE 2:1

DRILL 2 HOLES $\text{Ø} 7$ THRU $\text{H} \begin{matrix} \text{Ø} \\ \text{0.2} \end{matrix}$

1-HOLE FOR HELICOIL 1/4-20 UNC THRU HELICOIL NOT TO BE FITTED. $\text{H} \begin{matrix} \text{Ø} \\ \text{0.3} \end{matrix}$

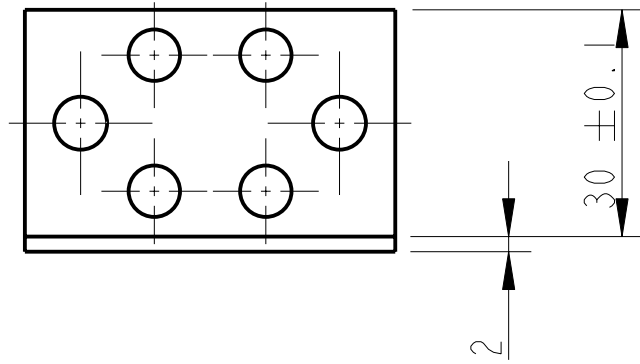


DETAIL B
SCALE 2:1

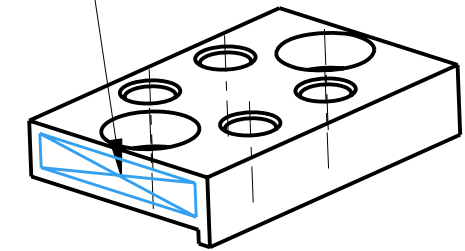
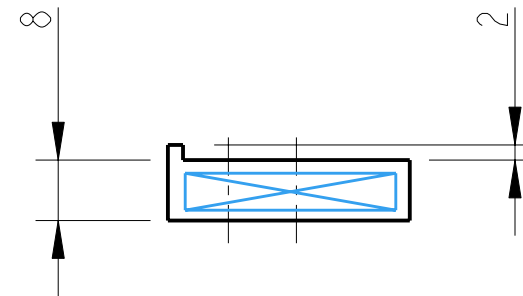
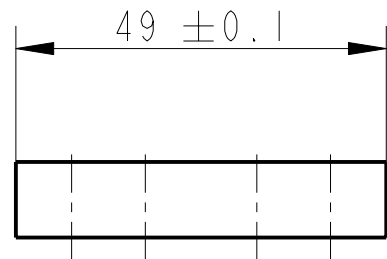
PART NO. (SEE NOTE 4) TO BE ETCHED OR STAMPED IN APPROX POSITION SHOWN.

NOTES: (UNLESS OTHERWISE SPECIFIED)			DIMENSIONS ARE IN mm (INCHES)		TOLERANCES:	
1.	REMOVE ALL SHARP EDGES, R. 02 MIN.		X.XX ± 0.25 mm			
2.	DO NOT SCALE FROM DRAWING.		ANGULAR ± 0.25°			
3.	ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)					
4.	SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188-001. A VIBRATORY TOOL MAY BE USED.					
FINISH: CLEAN, GREASE FREE			MATERIAL: ST STEEL 304/316		SYSTEM: aLIGO	
DRAWN: I WILMUT 7/DEC/05			CHECKED: MB 15/MAR/10		SUB-SYSTEM: SUS	
APPROVED: JOD 15/MAR/10			PART NAME: BLADE TIP Z POSITION ADJ (BTM HALF)		NEXT ASSY: QUAD UI MASS	
SCALE: 1:1			PROJECTION:		PART NO.: D060378	
					REV: J	
					SHEET 1 OF 1	

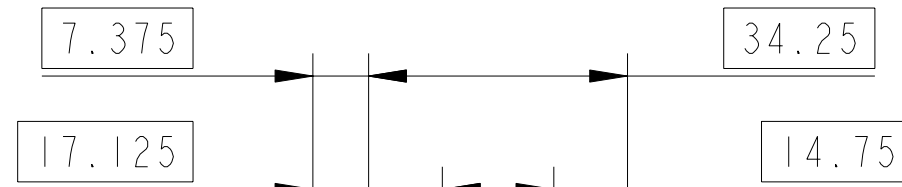
REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	
B	19/DEC/07	E060247-B	
H	21/JULY/08	E080371	



PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.



3D VIEW



2 HOLES $\varnothing 6.8 \pm 0.1$, C'SINK
 $\varnothing 8 \times 45^\circ$ $\oplus \varnothing 0.1$

DRILL $\varnothing 7 \pm 0.1$ THRO
C'BORE $\varnothing 13 \times 5$ DP $\oplus \varnothing 0.1$

NOTES: (UNLESS OTHERWISE SPECIFIED)				CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY 1GR, GLASGOW UNIVERSITY GEO 600 GROUP RUTHERFORD APPLETON LABORATORIES								
1. REMOVE ALL SHARP EDGES, R.02 MIN. 2. DO NOT SCALE FROM DRAWING. 3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL) 4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.	DIMENSIONS ARE IN mm [INCHES] TOLERANCES: X.XX ±0.25 mm ANGULAR ±0.25 °		SYSTEM aLIGO									
	MATERIAL: ST. STEEL 304		SUB-SYSTEM SUS									
	FINISH: CLEAN, GREASE FREE $\sqrt{\mu m}$ [μin] Ra = 1.6		NEXT ASSY QUAD UI MASS									
	<table border="1"> <thead> <tr> <th>NAME</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>DRAWN I WILMUT</td> <td>09/DEC/05</td> </tr> <tr> <td>CHECKED MB</td> <td>15/MAR/10</td> </tr> <tr> <td>APPROVED JOD</td> <td>15/MAR/10</td> </tr> </tbody> </table>		NAME	DATE	DRAWN I WILMUT	09/DEC/05	CHECKED MB	15/MAR/10	APPROVED JOD	15/MAR/10	PART NAME BLADE CLAMP (TOP HALF)	
NAME	DATE											
DRAWN I WILMUT	09/DEC/05											
CHECKED MB	15/MAR/10											
APPROVED JOD	15/MAR/10											
<table border="1"> <thead> <tr> <th>SIZE</th> <th>DRG. NO.</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>D060380</td> <td>J.</td> </tr> </tbody> </table>		SIZE	DRG. NO.	REV	B	D060380	J.	SCALE 1:1 PROJECTION: SHEET 1 OF 1				
SIZE	DRG. NO.	REV										
B	D060380	J.										

NOTES CONTINUED:

5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
 EXAMPLE (PART): 001-v1
 EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD

6. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364

7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

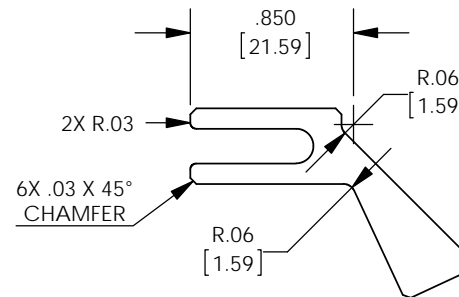
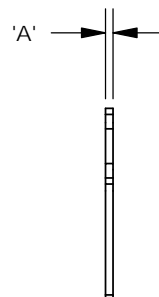
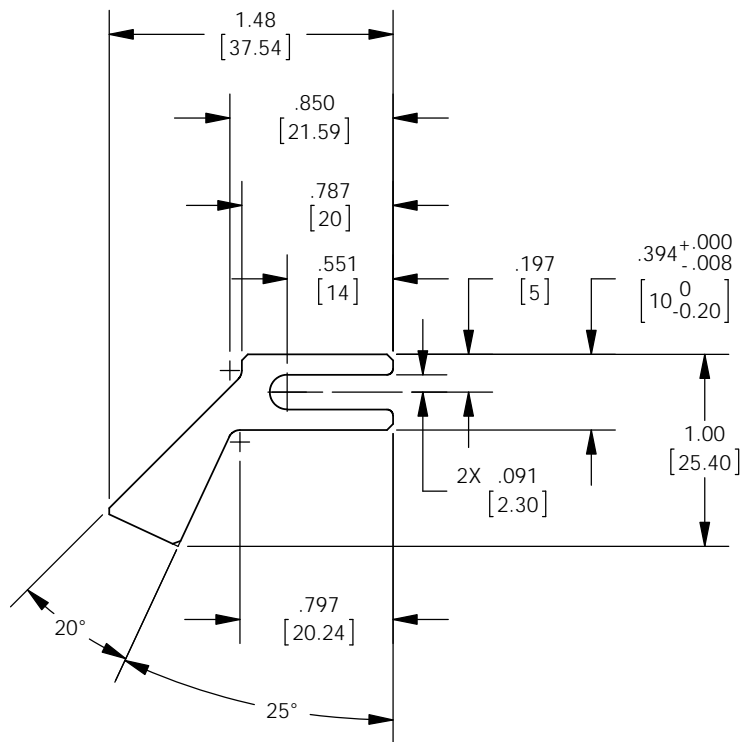
8. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

PART NO.	'A' (mm)	APPROX. WEIGHT (LB.)
D070140-05	.5	-
D070140-1	1	.001
D070140-2	2	.003
D070140-3	3	.004
D070140-4	4	.006
D070140-5	5	.007
D070140-6	6	.009

REV.	DATE	DCN #	DRAWING TREE #
v1	11 AUG 2009	-	-
v3	20 JAN 2012	E1200066-x0	-
-	-	-	-



ISO VIEW



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES [MM]
 TOLERANCES:
 XX ± .01
 XXX ± .005
 ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
 2. REMOVE ALL SHARP EDGES: .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS.
 3. DO NOT SCALE FROM DRAWING.
 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

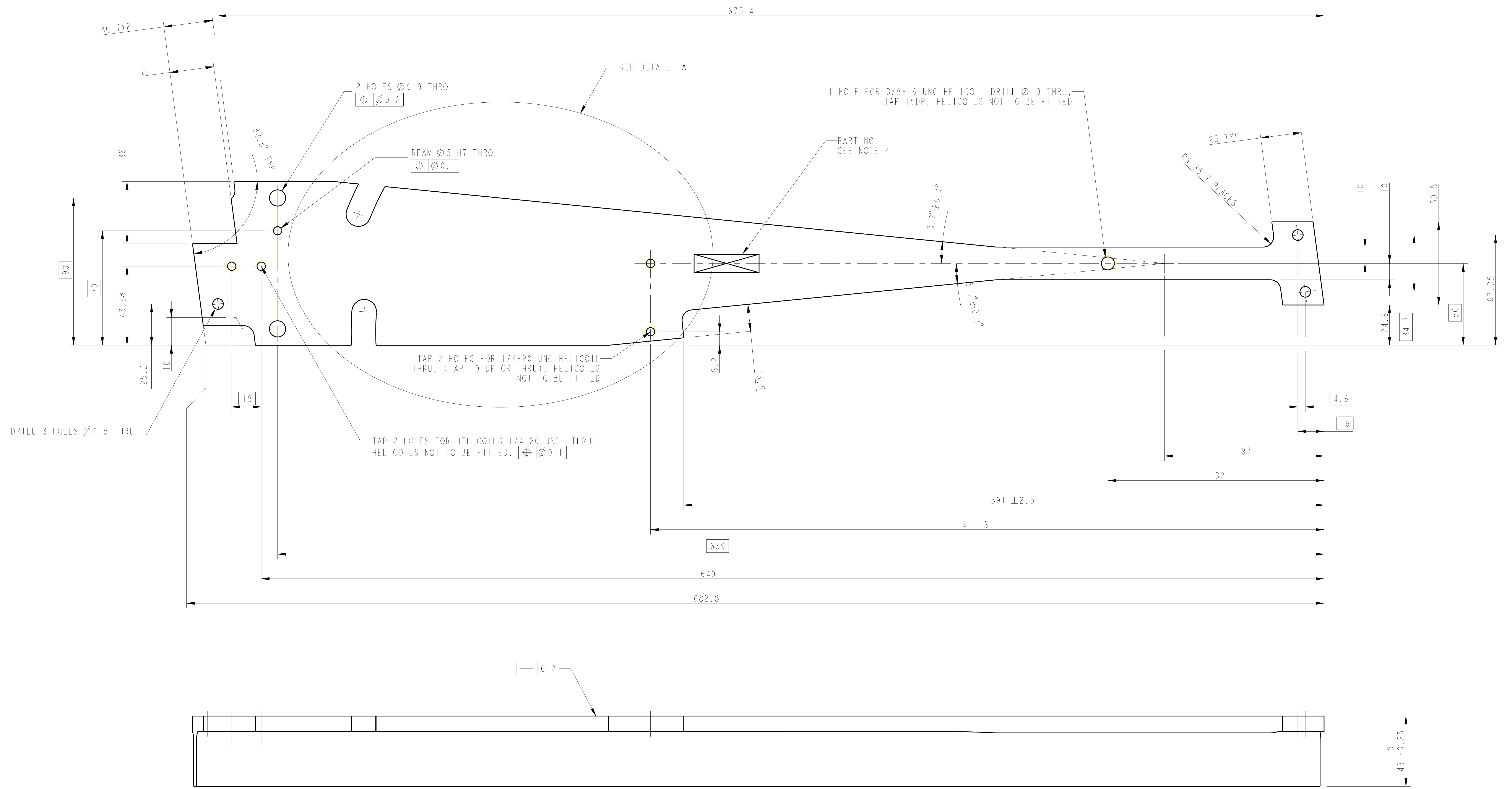
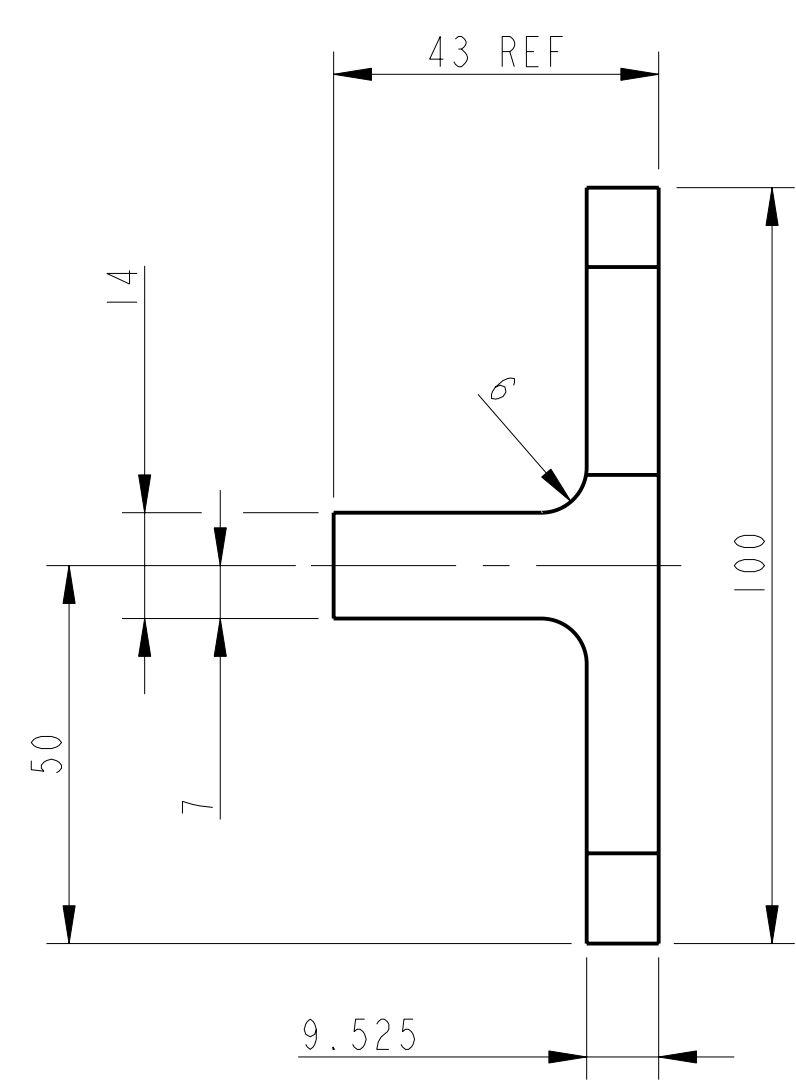
MATERIAL 6061-T6 Al
 FINISH 63 μinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

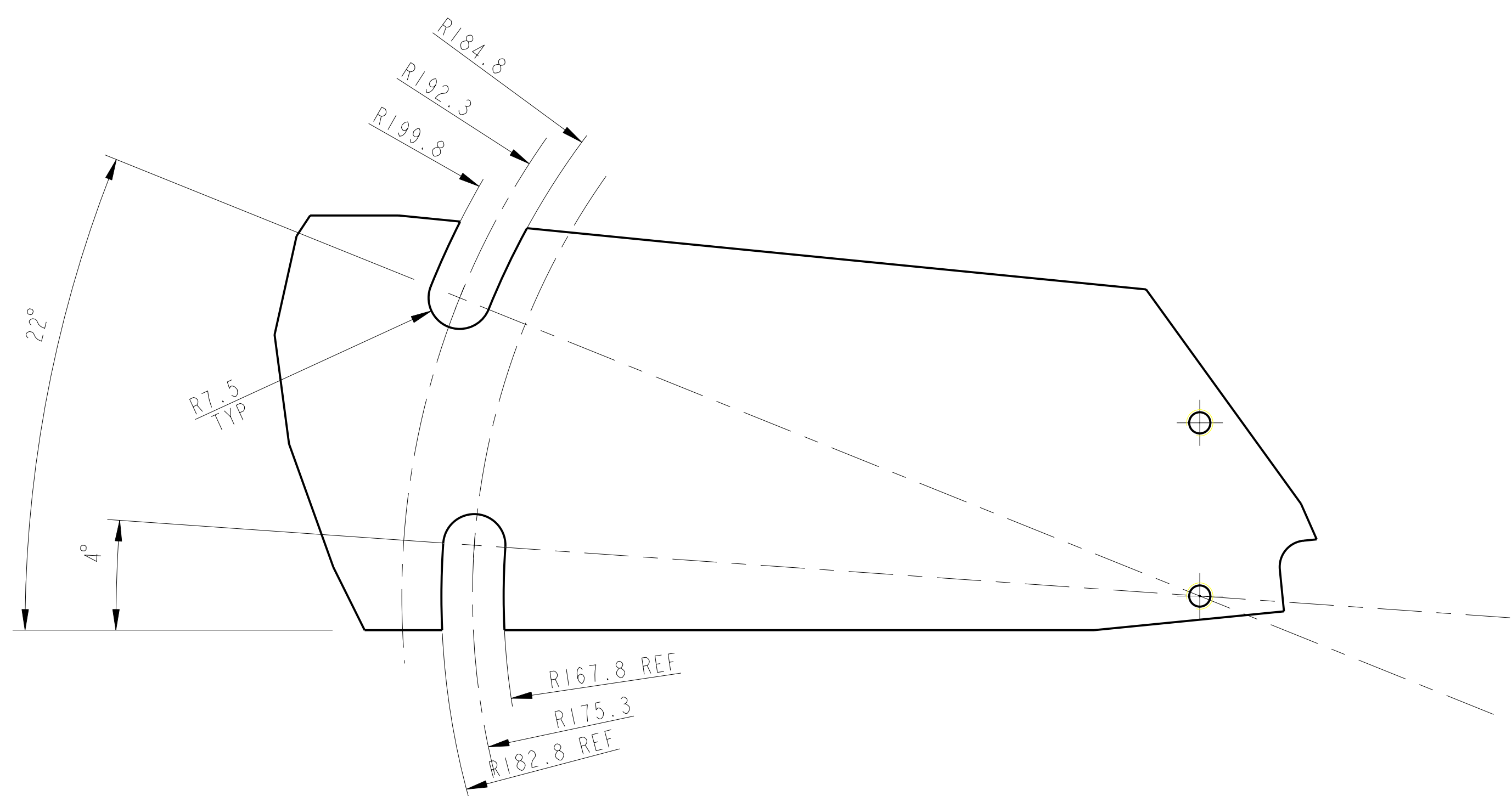
SYSTEM ADVANCED LIGO SUB-SYSTEM SUS
 NEXT ASSY D060324

PART NAME ALIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim

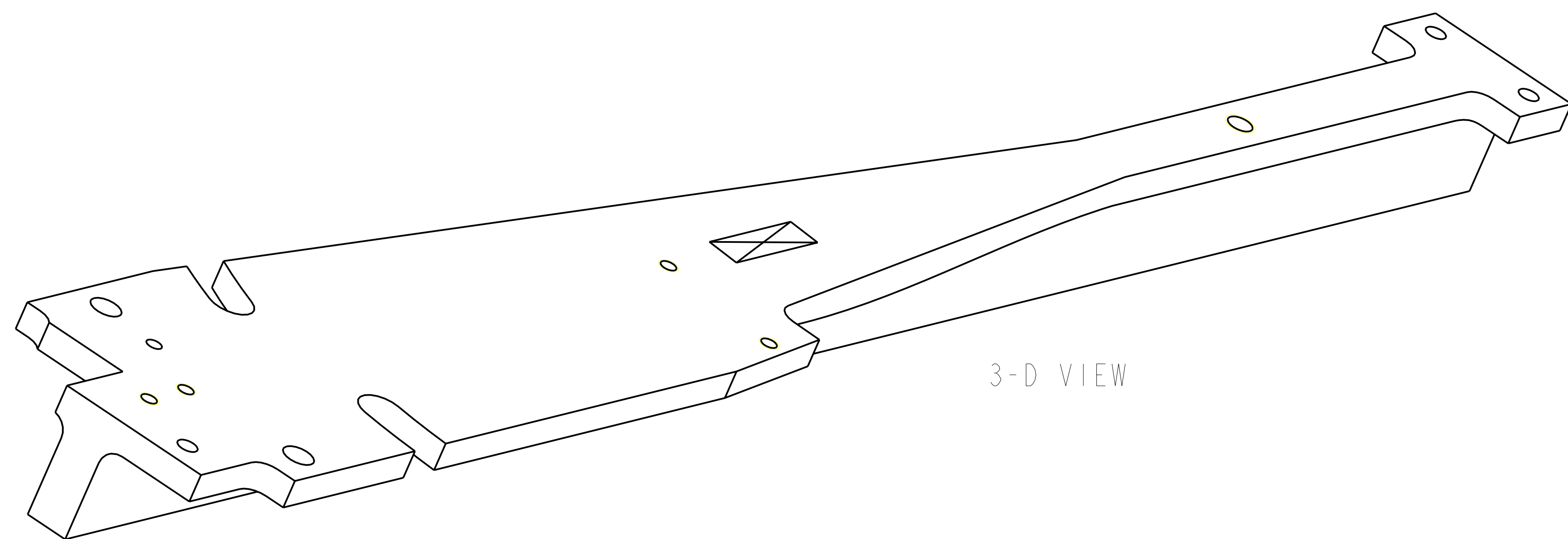
DESIGNER	I.WILMUT	27 APR 2007	SIZE	DWG. NO.	REV.
DRAFTER	E.SANCHEZ	20 JAN 2012	A	D070140	v3
CHECKER	SEE DCC	SEE DCC	SCALE: 1:1	PROJECTION:	SHEET 1 OF 1
APPROVAL	SEE DCC	SEE DCC			



± 0.2



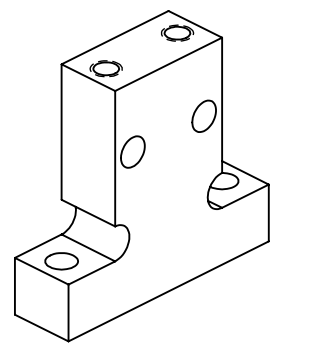
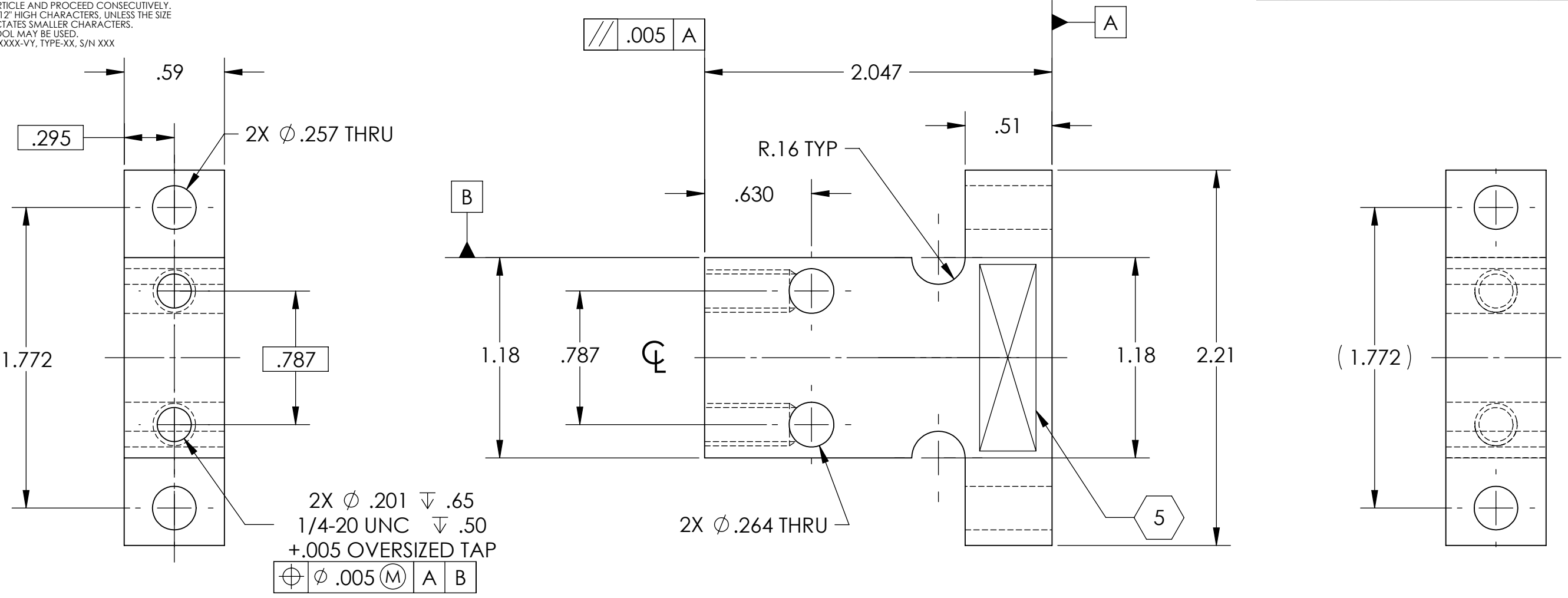
DETAIL A
SCALE 1:1



NOTES: UNLESS OTHERWISE SPECIFIED:		26/94 CALIFORNIA INSTITUTE OF TECHNOLOGY
1. REMOVE ALL SHARP EDGES.	DIMENSIONS ARE IN mm (INCHES)	040038 CALIFORNIA INSTITUTE OF TECHNOLOGY
2. DO NOT SCALE FROM DRAWING.	ALL DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	SYSTEM ALISO
3. ALL WORKING DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	ANGLE DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	SUB-SYSTEM SUS
4. SPECIFY GRADE OF STAMP DRAWING MATERIAL AND FINISH OF SURFACE OF PART AND NUMBER OF STAMP DRAWING NUMBER FOR THE WORKING DIMENSIONS.	DATE: 13/OCT/94	PART NAME TOP STAGE STIFF BACK
5. ALL DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	DATE: 13/OCT/94	DESIGNER: [Signature]
6. ALL DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	DATE: 13/OCT/94	CHECKED: [Signature]
7. ALL DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	DATE: 13/OCT/94	APPROVED: [Signature]
8. ALL DIMENSIONS SHALL BE TO UNLESS OTHERWISE SPECIFIED	DATE: 13/OCT/94	DATE: 13/OCT/94

NOTES CONTINUED:
 ⑤ SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED.
 EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

REV.	DATE	DCN #	DRAWING TREE #
v1	JUN-29-2010	E1000234	



ISO VIEW

- 3. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE TECHNIQUES IS NOT ALLOWED.
- 2. DO NOT USE SANDPAPER, SCOTCH BRITE OR SIMILAR PRODUCTS.
- 1. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364

NOTE: WEIGHT 0.45 lbs.

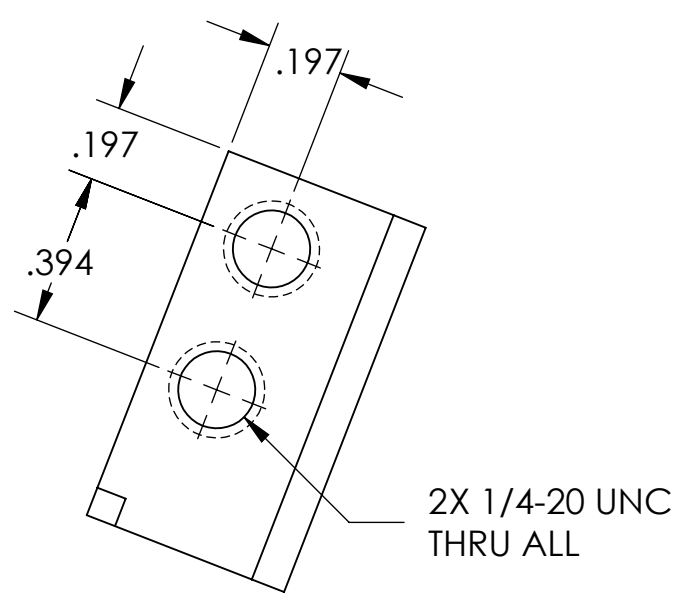
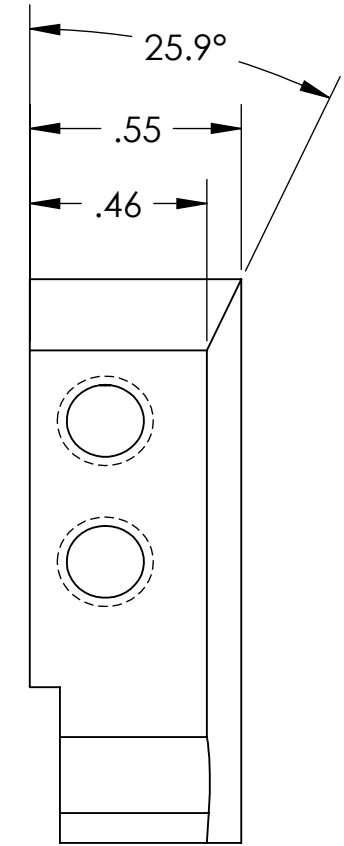
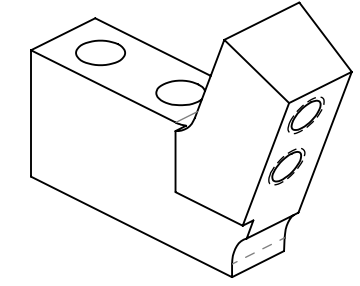
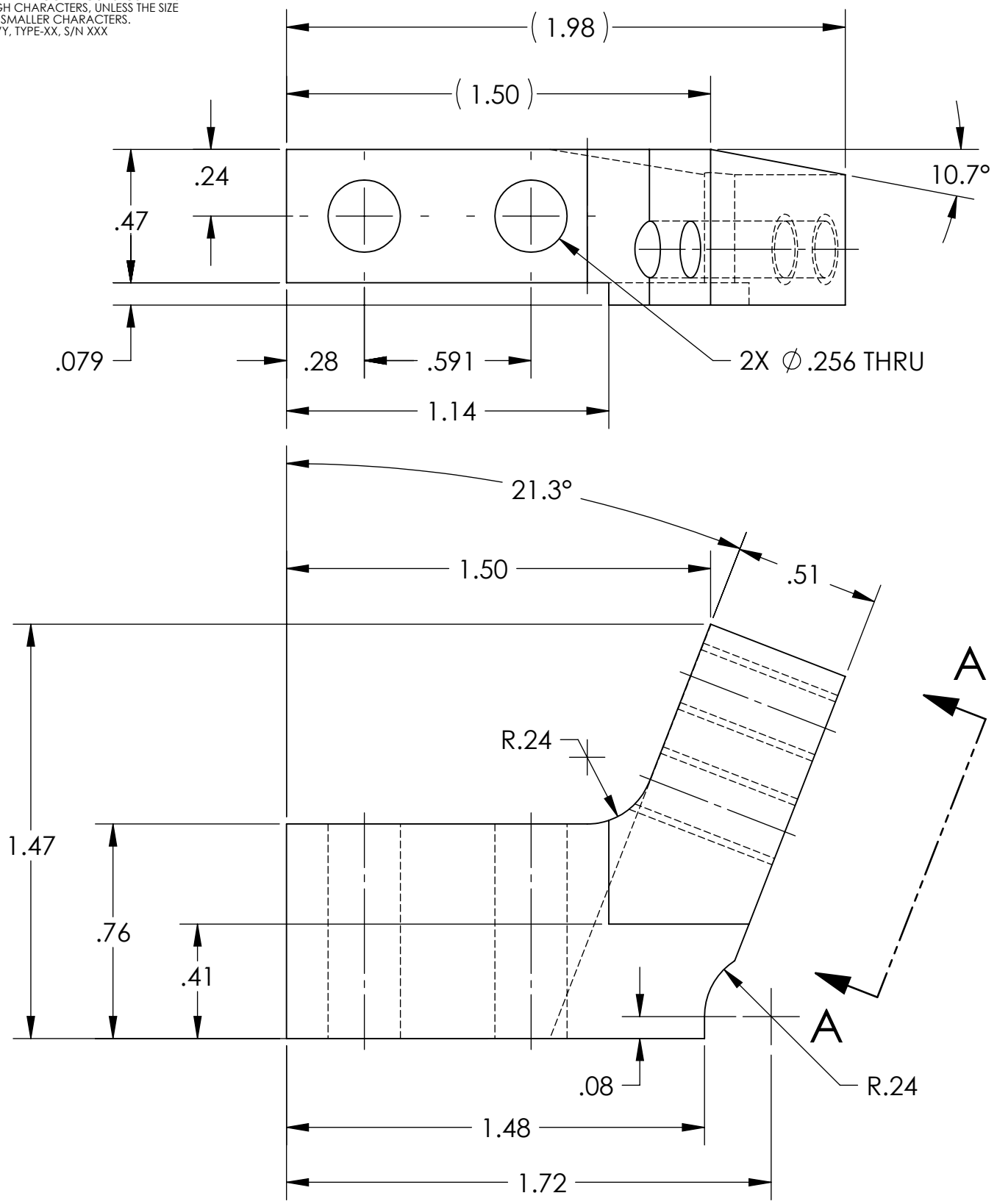
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN TOLERANCES: .XX ± .010 .XXX ± .005 ANGULAR ± 5°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, R.02 MIN. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		aLIGO INTERMEDIATE TOP MASS SPACER	
MATERIAL		FINISH		SYSTEM		SUB-SYSTEM	
S. STL 304		32 pinch		aLIGO AOS		TRANSMON	
NEXT ASSY				DESIGNER		SIZE DWG. NO.	
D1000442				I ROMERO 4/14/10		B D1000395	
				CHECKER		REV.	
				K MAILAND 4/14/10		v1	
				APPROVAL		SCALE: 2:1 PROJECTION: SHEET 1 OF 1	
				KMAILAND 4/14/10			

D1000395 aLIGO INTERMEDIATE TOP MASS SPACER, PART PDM REV: X-007, DRAWING PDM REV: X-004

D1000396 aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE, PART PDM REV: X-015, DRAWING PDM REV: X-003

NOTES CONTINUED:
 ⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

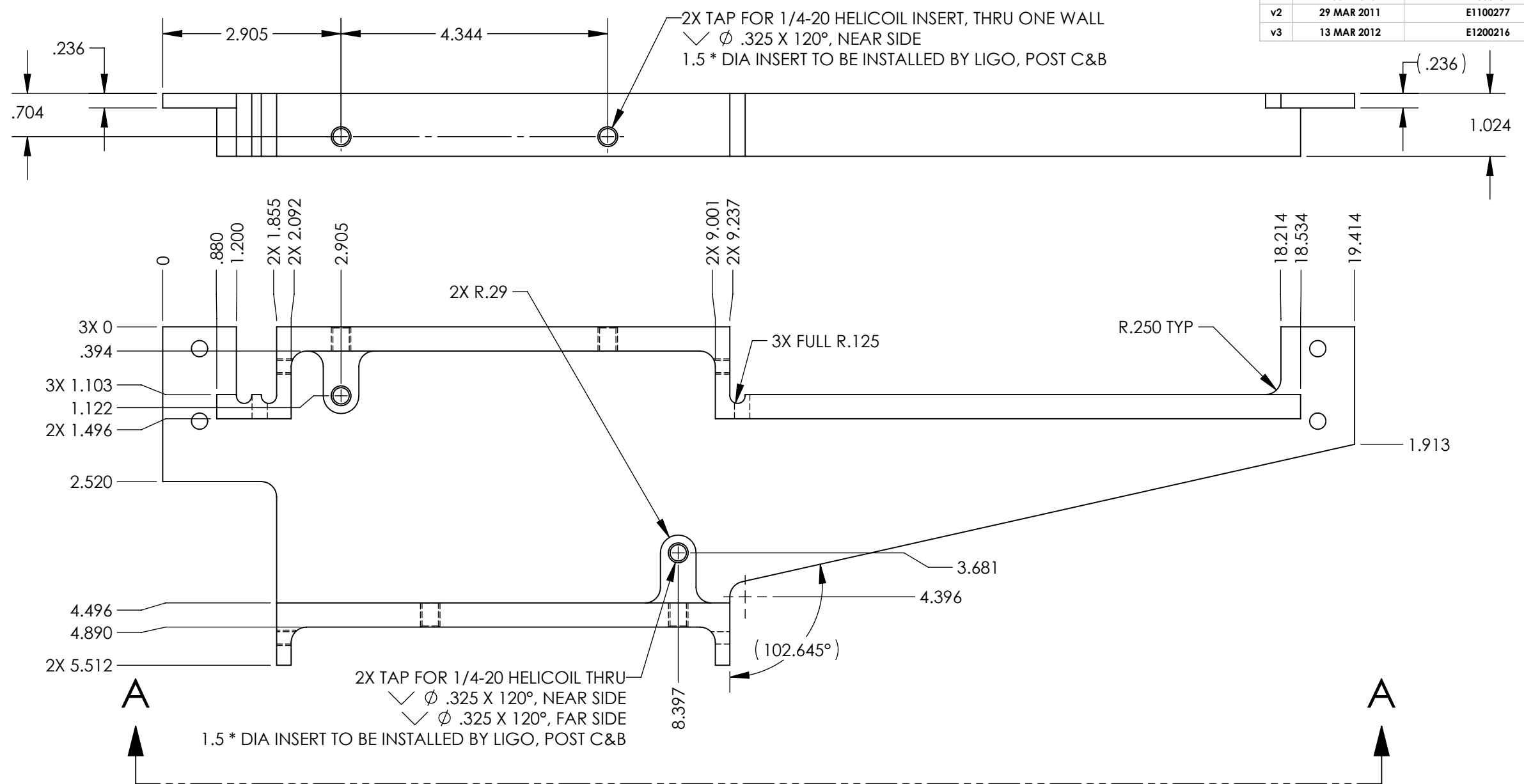
REV.	DATE	DCN #	DRAWING TREE #
v1	20 JUN 2011	E1100351	-
-	-	-	-
-	-	-	-



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO		PART NAME	
DIMENSIONS ARE IN TOLERANCES: .XX ± .XXX ± ANGULAR ± °				CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE	
1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, R.02 MIN. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.				ADVANCED LIGO		SUS	
MATERIAL 304 S3TL				FINISH 63 μinch		NEXT ASSY D1000441	
				DESIGNER K. MAILAND 224918/2010		SIZE DWG. NO. B	
				DRAFTER K. MAILAND 4/14/10		REV. v1	
				CHECKER K. MAILAND 4/14/10		SCALE: 2:1 PROJECTION:	
						SHEET 1 OF 1	

D1000407 qLIGO_OSUMS_INTERMEDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-089, DRAWING PDM REV: X-039

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	29 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



NOTES (CONTINUED):

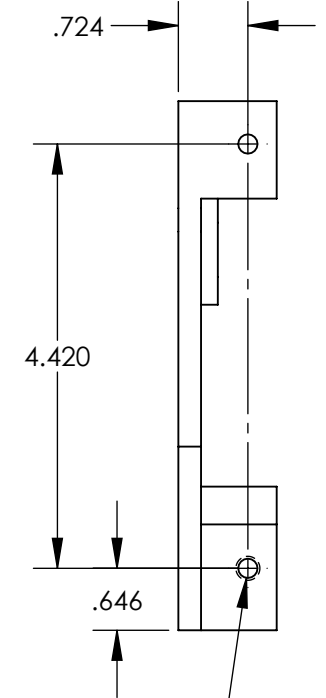
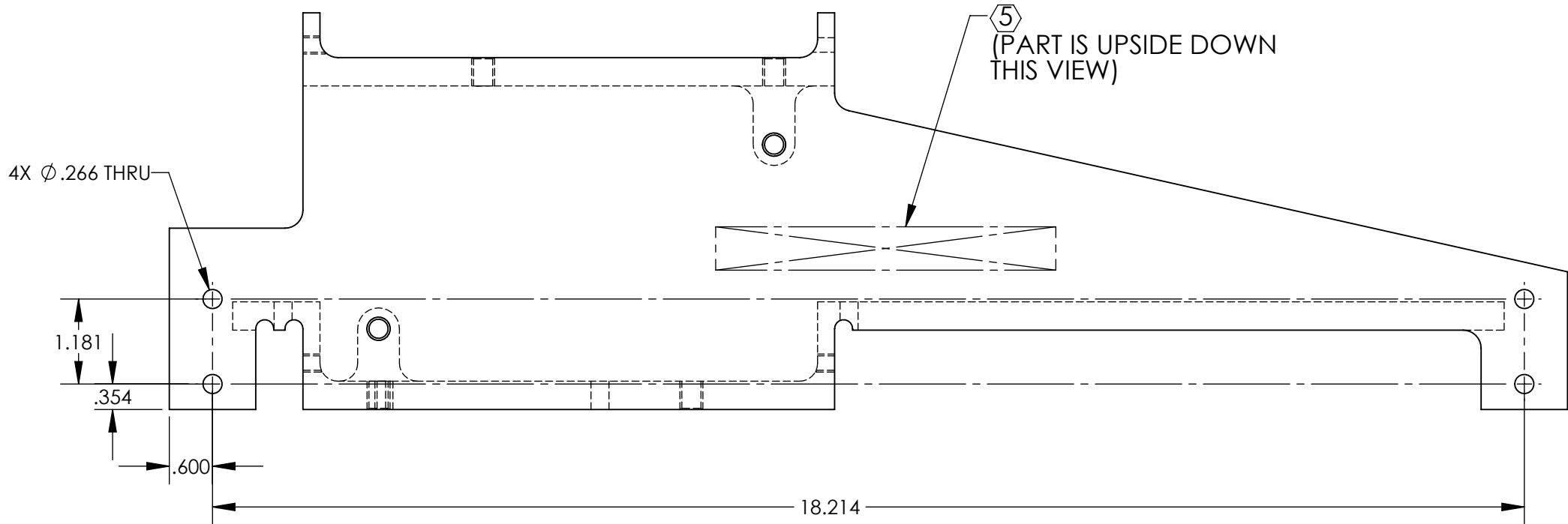
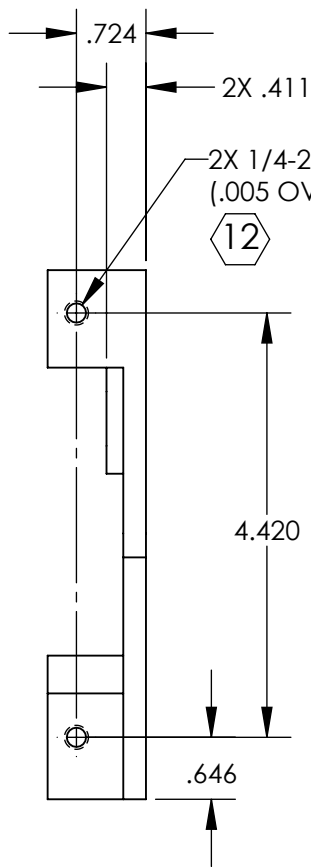
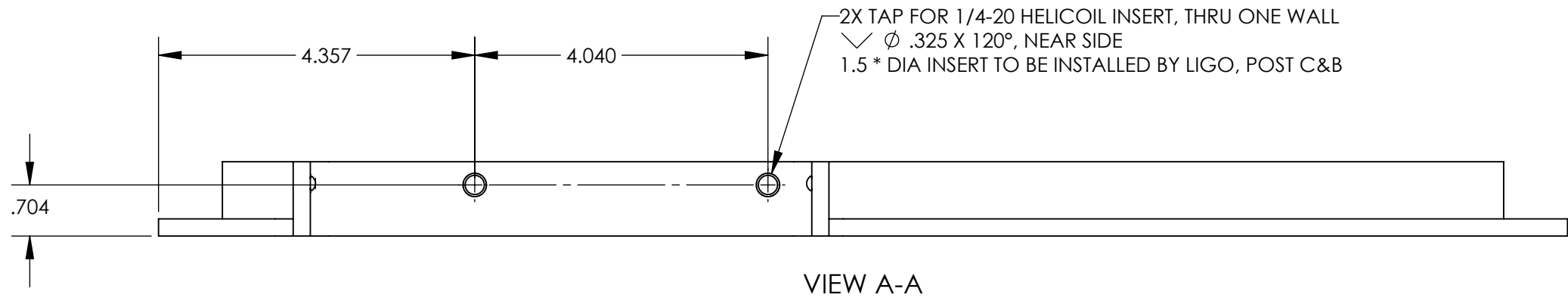
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
- SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXX-VY, TYPE-XX, S/N XXX.
- MASS: 1.013 KG [2.234 LB].
- MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
- ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
- ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.
- ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.

12 ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)	
DIMENSIONS ARE IN INCHES	1. INTERPRET DRAWING PER ASME Y14.5-1994.
TOLERANCES: .XX ± .01 .XXX ± .005	2. REMOVE ALL SHARP EDGES, .005-.015.
ANGULAR ± 0.1°	3. DO NOT SCALE FROM DRAWING.
MATERIAL	6061-T6 Al
FINISH	63 μinch Ra

CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME qLIGO OSUMS INTERMEDIATE SUPPORT RIGHT SIDE BRACKET	
SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER K. MAILAND 23 FEB 2010	SIZE DWG. NO. B D1000407
DRAFTER I ROMERO 07 JUN 2010	CHECKER SEE DCN	APPROVAL SEE DCN	REV. v3
NEXT ASSY D1000549		SCALE: NONE	PROJECTION:

D1000407 dLIGO_OSUMS_INTERMEDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-089, DRAWING PDM REV: X-039



2X 1/4-20 UNC - 2B, H11, THRU NEXT
 (.005 OVERSIZE BOTH DRILL & TAP)

12

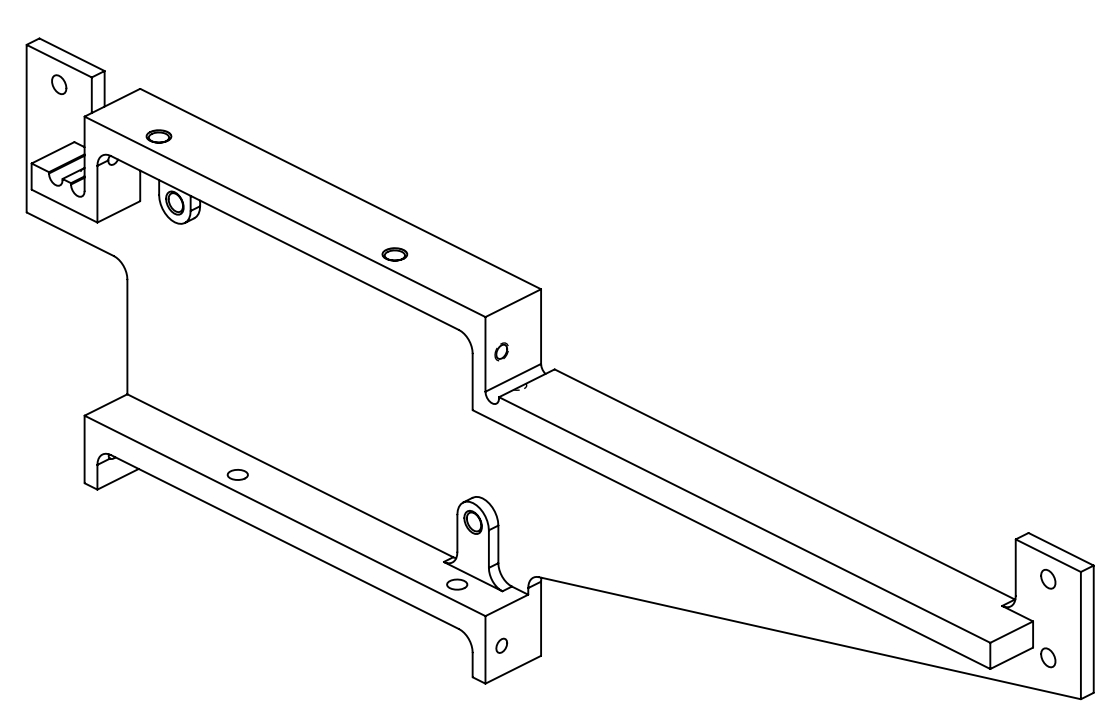
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1000407	v3
SCALE: NONE	PROJECTION:	SHEET 2 OF 3

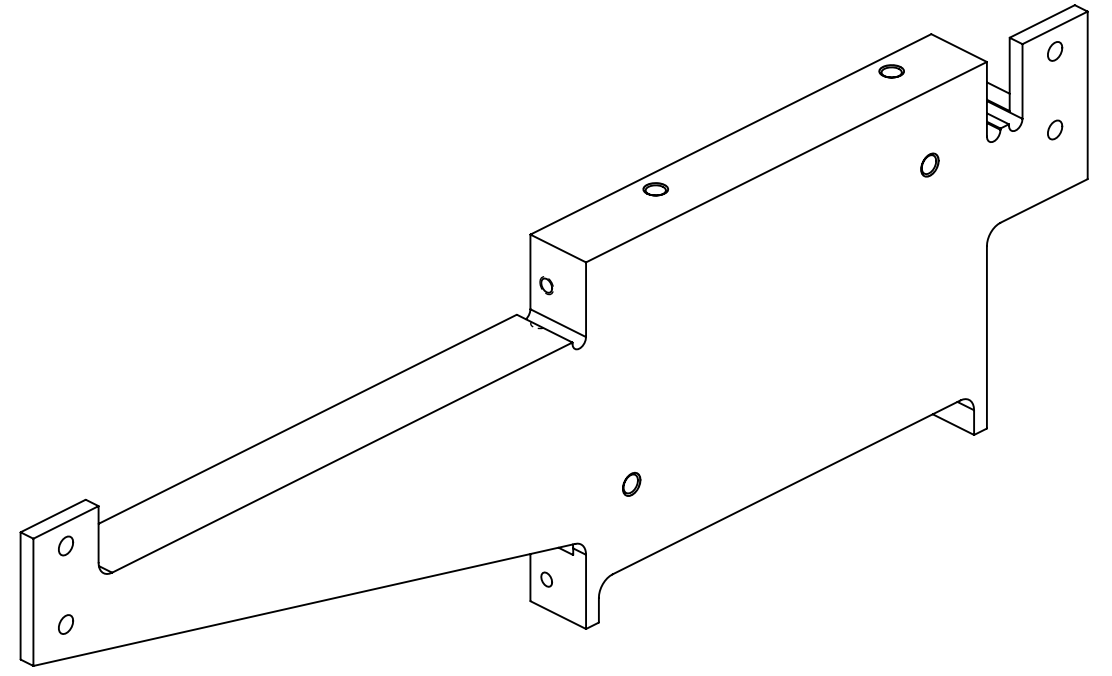
D1000407 dLIGO_OSUMS_INTERMEDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-089, DRAWING-PDM REV: X-039

8 7 6 5 4 3 2 1

D
C
B
A




INSIDE ISO VIEW



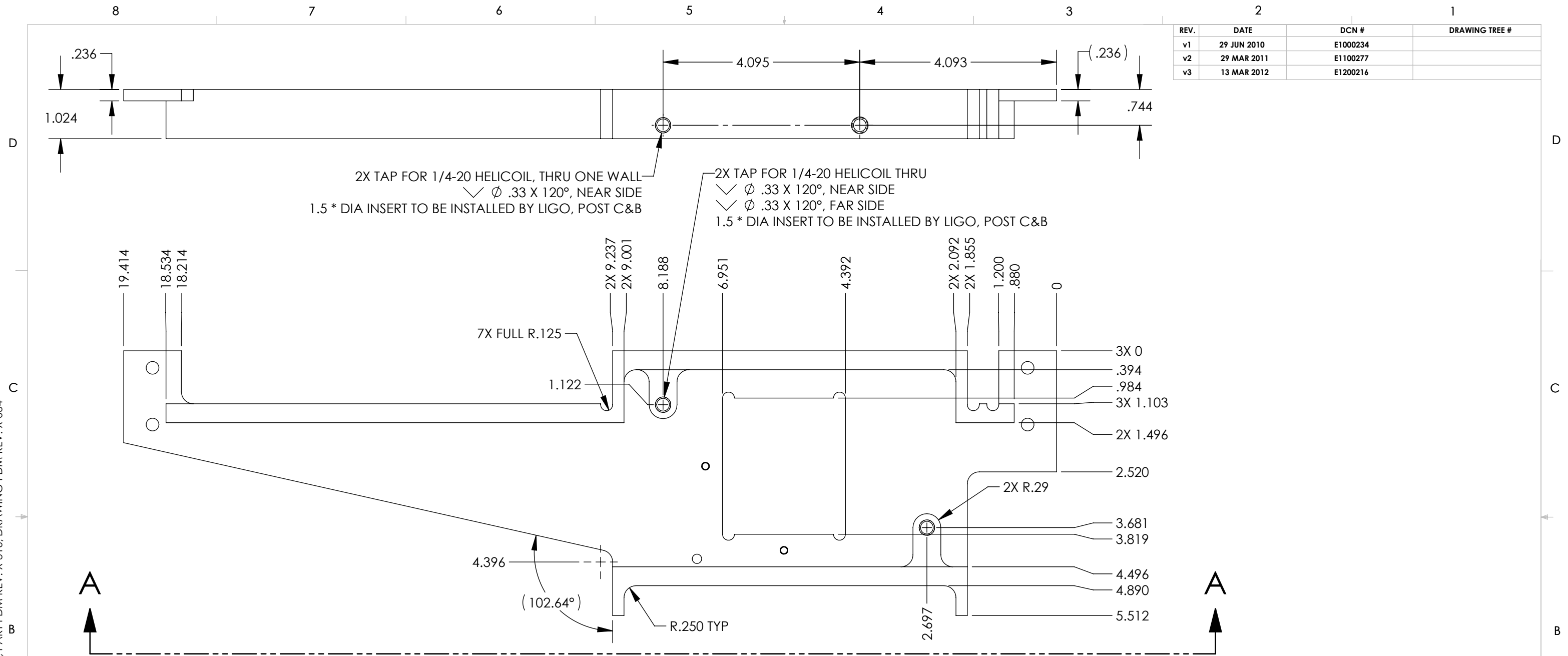
OUTSIDE ISO VIEW

8 7 6 5 4 3 2 1

 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1000407	REV. v3
SCALE: NONE PROJECTION: 		SHEET 3 OF 3

D1000408 qLIGO_OSUMS_INTERMEDIATE_SUPPORT_LEFT_SIDE_BRACKET, PART PDM REV: X-316, DRAWING PDM REV: X-034

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	29 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



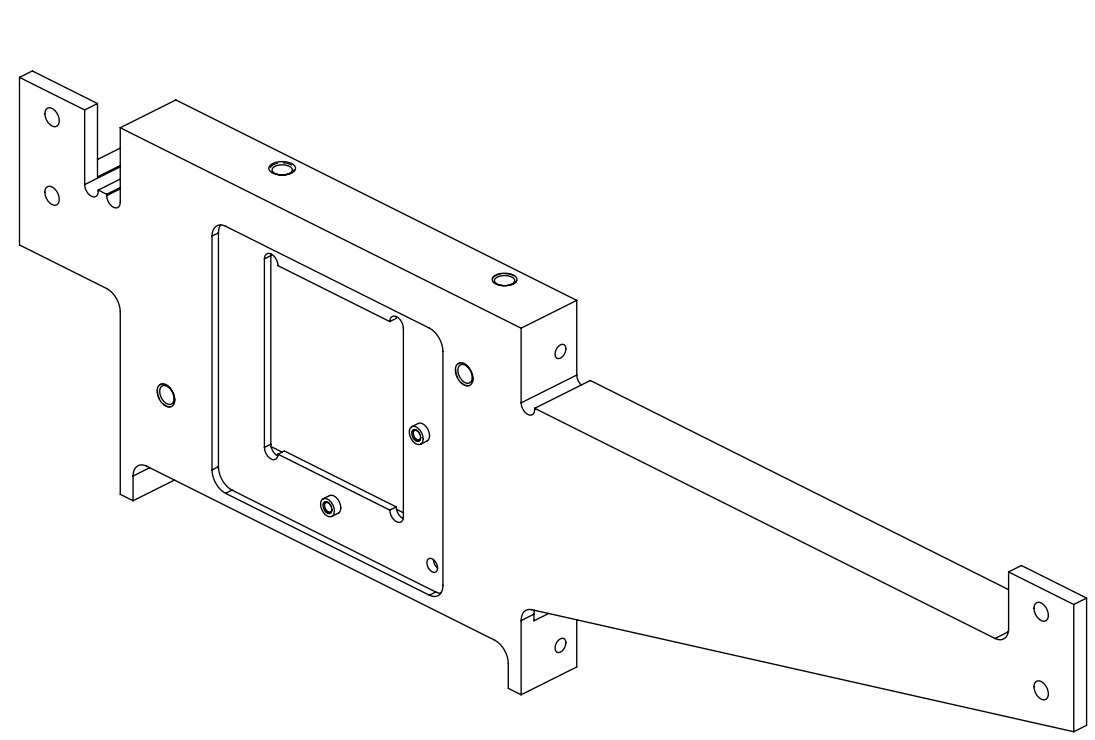
- NOTES (CONTINUED):**
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
 - SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.
 - MASS: 0.886 KG [1.953 LB].
 - MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
 - ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
 - ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.
 - ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.
 - ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING.		ADVANCED LIGO		qLIGO OSUMS INTERMEDIATE SUPPORT LEFT SIDE BRACKET	
TOLERANCES: .XX ± .01 .XXX ± .005		MATERIAL 6061-T6 Al		SUB-SYSTEM AOS		DESIGNER K. MAILLAND 23 FEB 2010	
ANGULAR ± 1.0°		FINISH 63 μinch Ra		NEXT ASSY D1000549		SIZE DWG. NO. B D1000408	
				CHECKER SEE DCN		REV. v3	
				APPROVAL SEE DCN		SCALE: NONE PROJECTION: 1st ANGLE SHEET 1 OF 3	

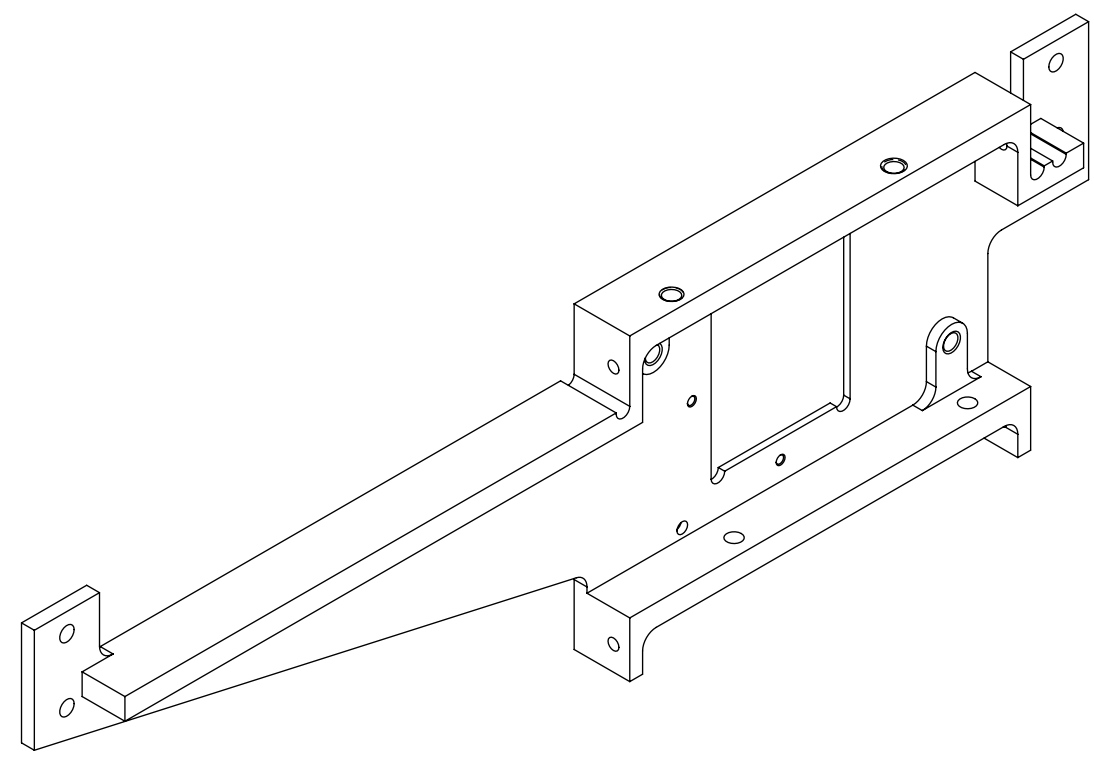
D1000408 dLIGO_OSUMS_INTERMEDIATE_SUPPORT_LEFT_SIDE_BRACKET, PART PDM REV: X-316, DRAWING PDM REV: X-034

8 7 6 5 4 3 2 1

D
C
B
A





INSIDE ISO VIEW



OUTSIDE ISO VIEW

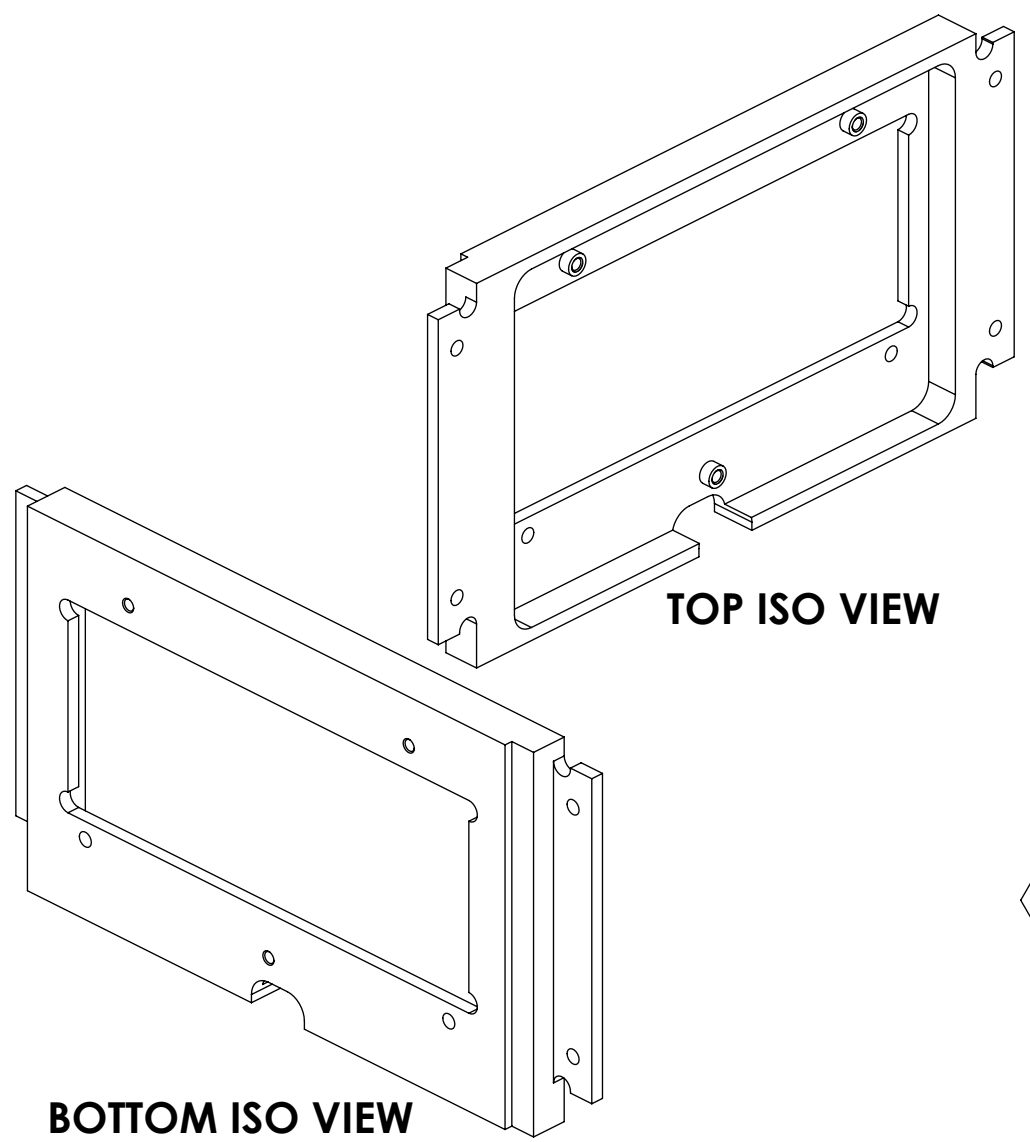
8 7 6 5 4 3 2 1

 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1000408	REV. v3
SCALE: 1:8	PROJECTION: 	SHEET 3 OF 3

D1000409 aLIGO OSUMS INTERMEDIATE_SUPPORT_RIGHT_SIDE_TRAY, PART PDM REV: X-044, DRAWING PDM REV: X-023

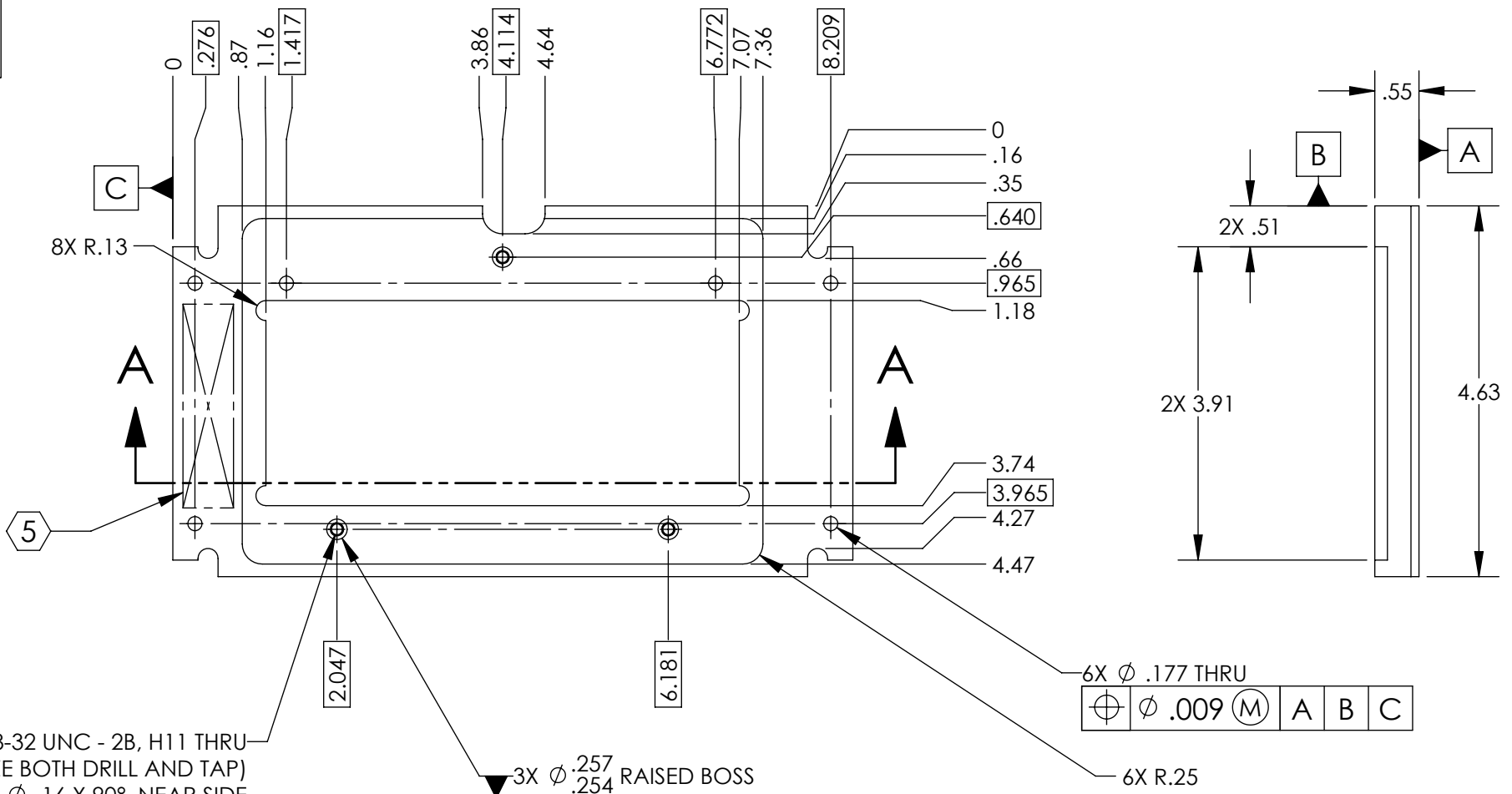
REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	

D
C
B
A



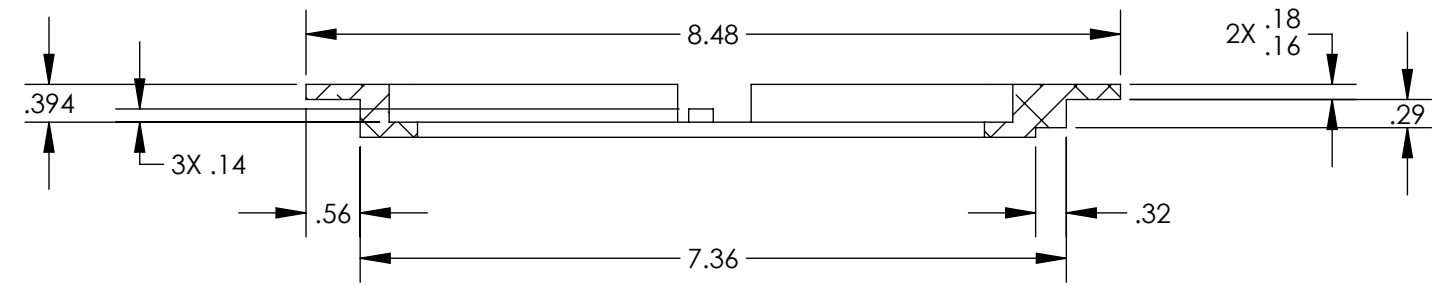
TOP ISO VIEW

BOTTOM ISO VIEW



3X 8-32 UNC - 2B, H11 THRU
(0.005 OVERSIZE BOTH DRILL AND TAP)
✓ ϕ .16 X 90°, NEAR SIDE
✓ ϕ .16 X 90°, FAR SIDE
 ϕ .010 D L

6X ϕ .177 THRU
 ϕ .009 (M) A B C



SECTION A-A

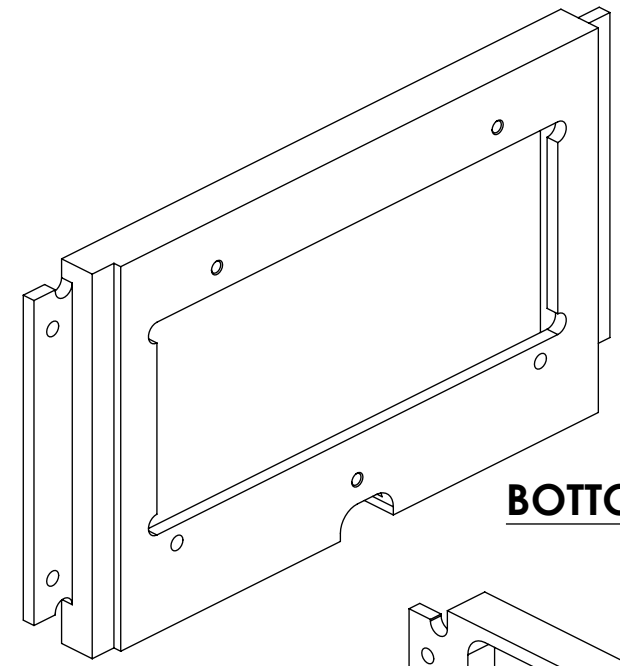
- NOTES (CONTINUED):**
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
 - SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXX-VY, TYPE-XX, S/N XXX.
 - MASS: 256 G [0.564 LB].
 - MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
 - ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
 - ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS. USE NITRONIC 60 THREADED INSERTS.
 - ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.
 - ALL TAPPED HOLES: 0.005" OVERSIZE, BOTH DRILL AND TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				1. INTERPRET DRAWING PER ASME Y14.5-1994.		aLIGO OSUMS INTERMEDIATE SUPPORT RIGHT SIDE TRAY	
TOLERANCES: .XX ± .01 .XXX ± .005				2. REMOVE ALL SHARP EDGES, .005-.015.		DESIGNER K. MAILAND 23 FEB 2010	
ANGULAR ± 1.0°				3. DO NOT SCALE FROM DRAWING.		DRAFTER I ROMERO 24 OCT 2010	
MATERIAL 6061-T6 Al		FINISH 63 µinch Ra		NEXT ASSY D1000549		SIZE DWG. NO. B D1000409	
				SYSTEM ADVANCED LIGO SUB-SYSTEM AOS		REV. v3	
				CHECKER SEE DCN		SCALE: NOTE PROJECTION:	
				APPROVAL SEE DCN		SHEET 1 OF 1	

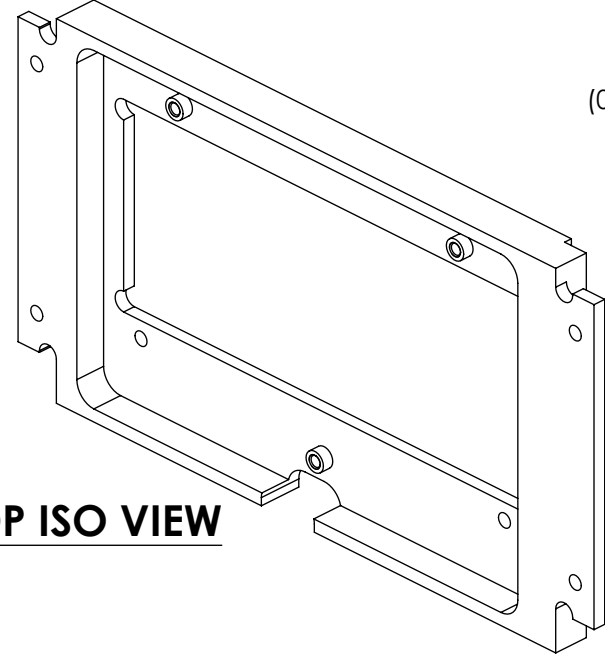
8 7 6 5 4 3 2 1

D1000410 QLIGO_OSUMS_INTERMEDIATE_SUPPORT_LEFT_SIDE_TRAY, PART PDM REV: X-182, DRAWING PDM REV: X-020

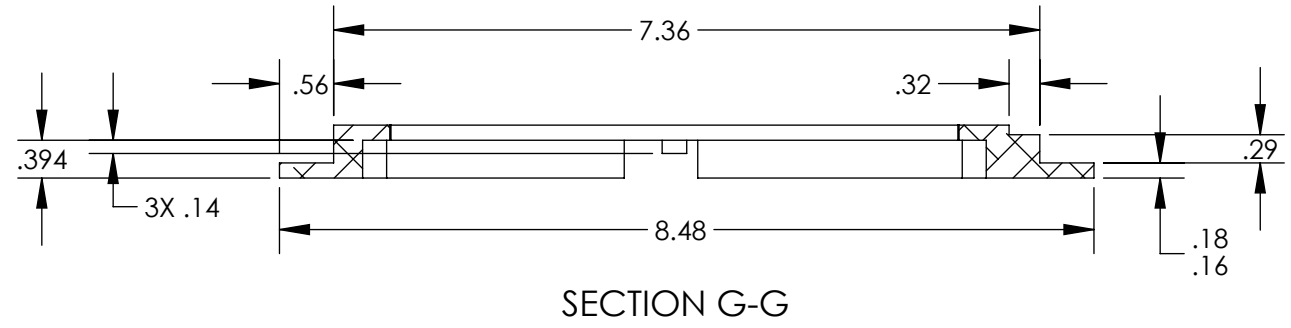
REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



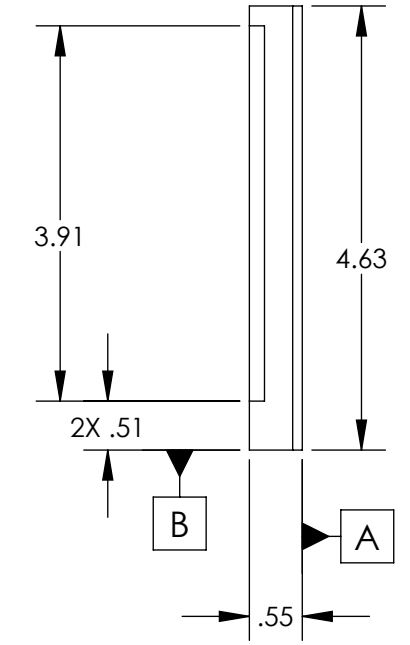
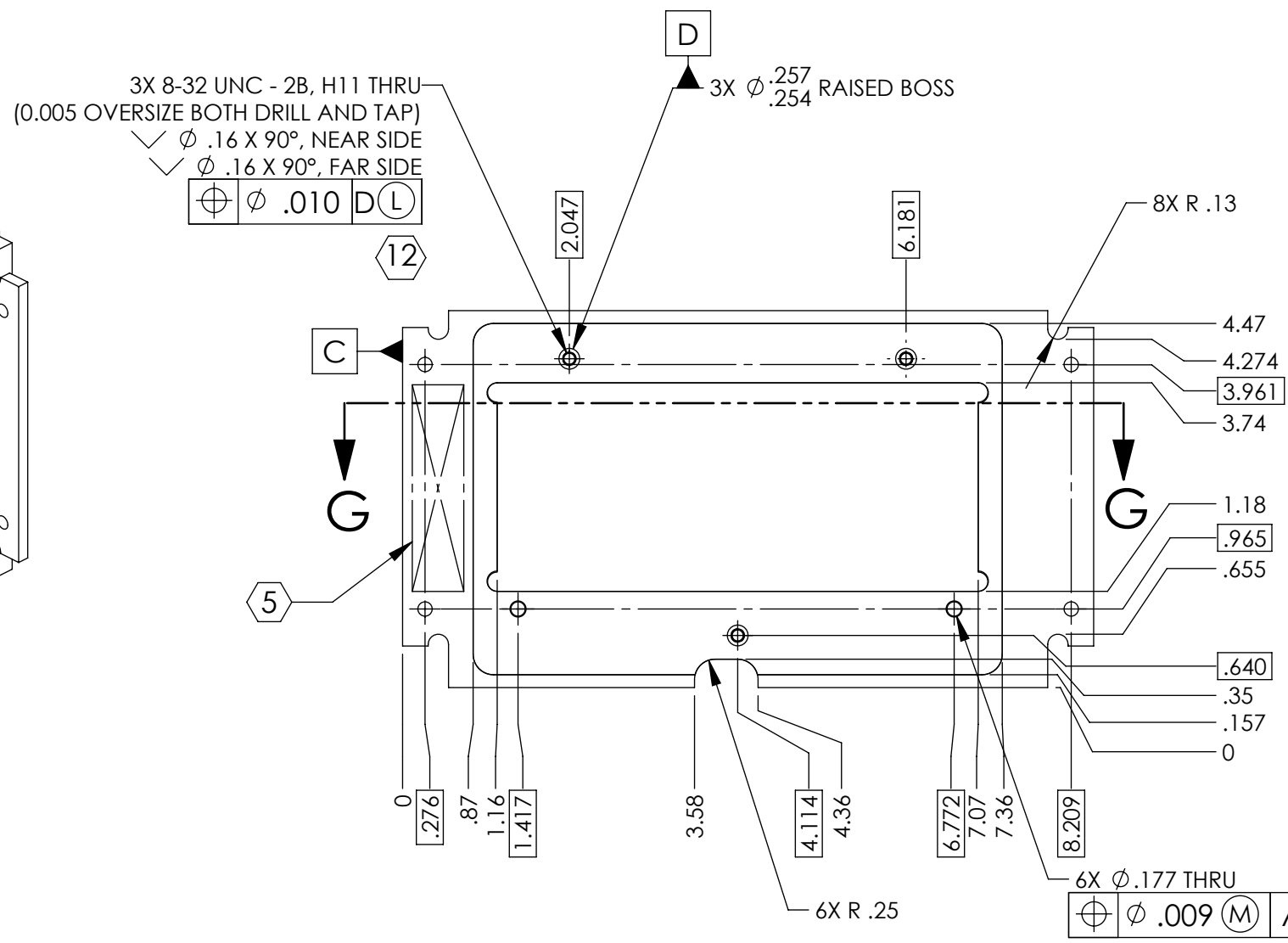
BOTTOM ISO VIEW



TOP ISO VIEW



SECTION G-G

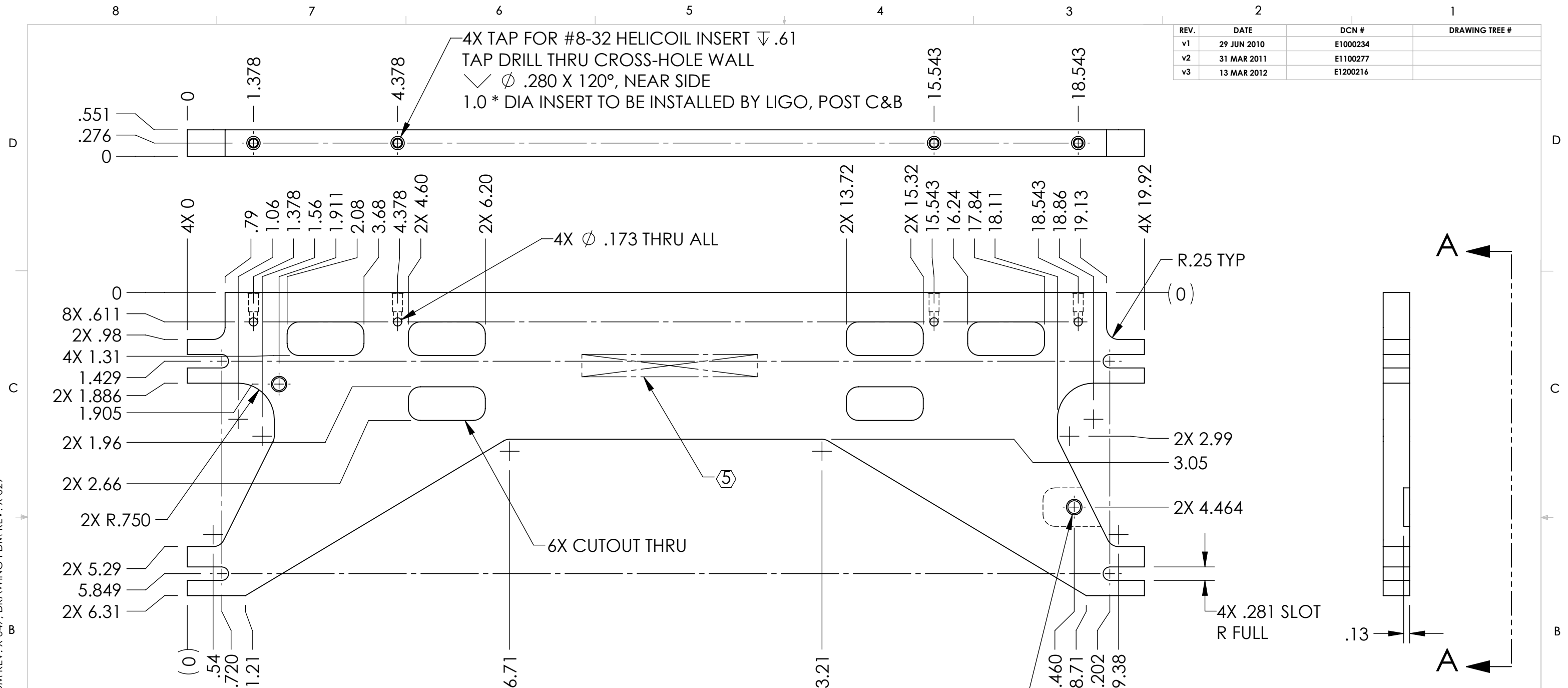


- NOTES (CONTINUED):**
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
 - SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.
 - MASS: 256 G [0.564 LB].
 - MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
 - ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
 - ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.
 - ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.
 - ALL TAPPED HOLES: 0.005" OVERSIZE, BOTH DRILL AND TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING.		qLIGO OSUMS INTERMEDIATE SUPPORT LEFT SIDE TRAY	
MATERIAL		FINISH		NEXT ASSY		DESIGNER	DATE
6061-T6 Al		63 µinch Ra		D1000549		K. MAILAND	23 FEB 2010
				SYSTEM: ADVANCED LIGO SUB-SYSTEM: AOS		DRAWN	DATE
						I ROMERO	23 OCT 2010
						CHECKER	DATE
						SEE DCN	
						APPROVAL	DATE
						SEE DCN	
						SIZE	DWG. NO.
						B	D1000410
						SCALE: NONE	PROJECTION:
						REV.	
							v3
						SHEET 1 OF 1	

D1000411 TMS Intermediate OSUM Support Plate, Rear, PART PDM REV: X-047, DRAWING PDM REV: X-029

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	

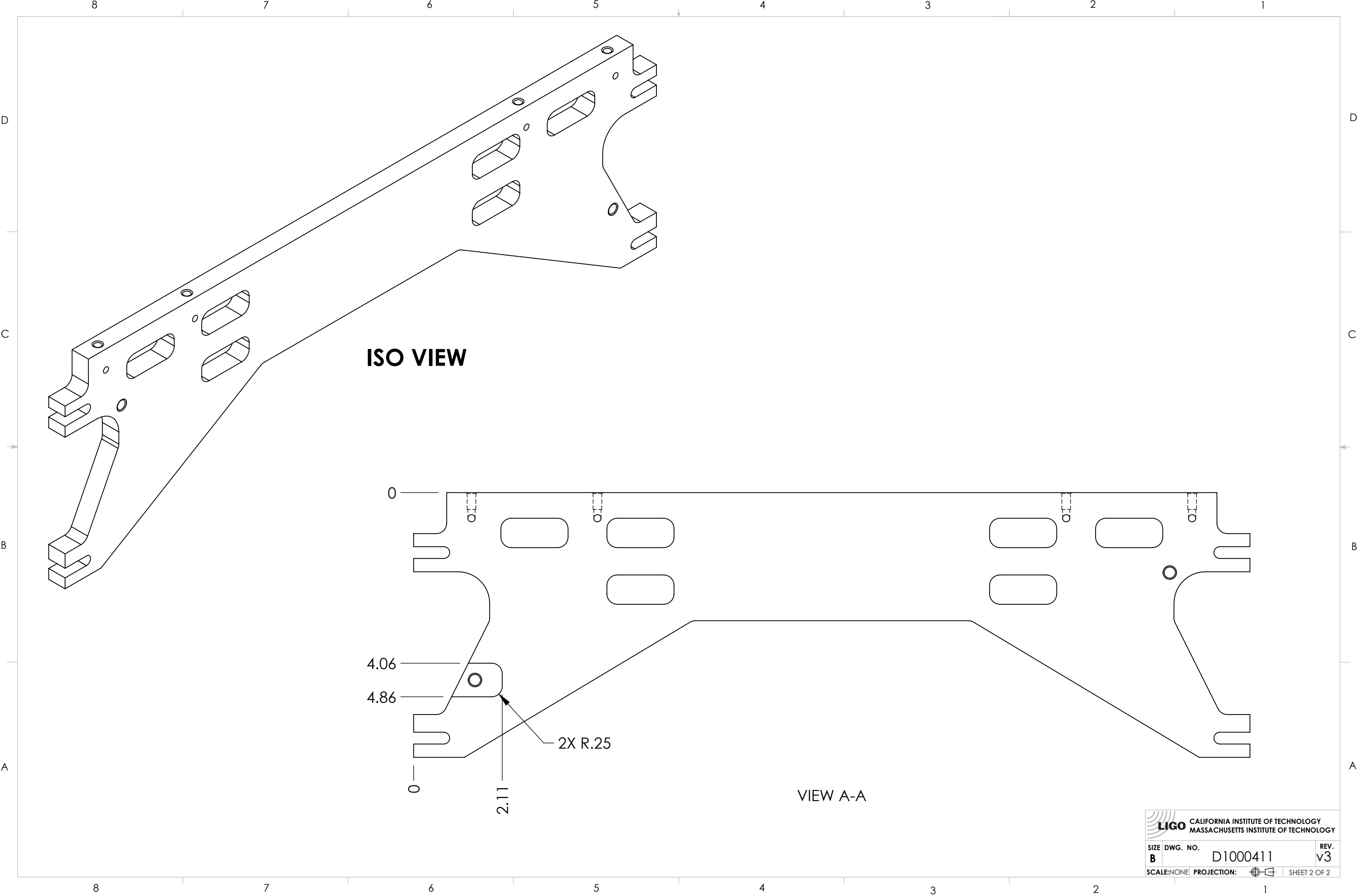


- NOTES (CONTINUED):**
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
 - SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.
 - MASS: 1.640 KG [3.616 LB].
 - MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
 - ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
 - ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.
 - ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)	
DIMENSIONS ARE IN INCHES	
TOLERANCES: .XX \pm .01 .XXX \pm .005 ANGULAR \pm 0.1°	
MATERIAL	6061-T6 Al
FINISH	63 μ inch Ra

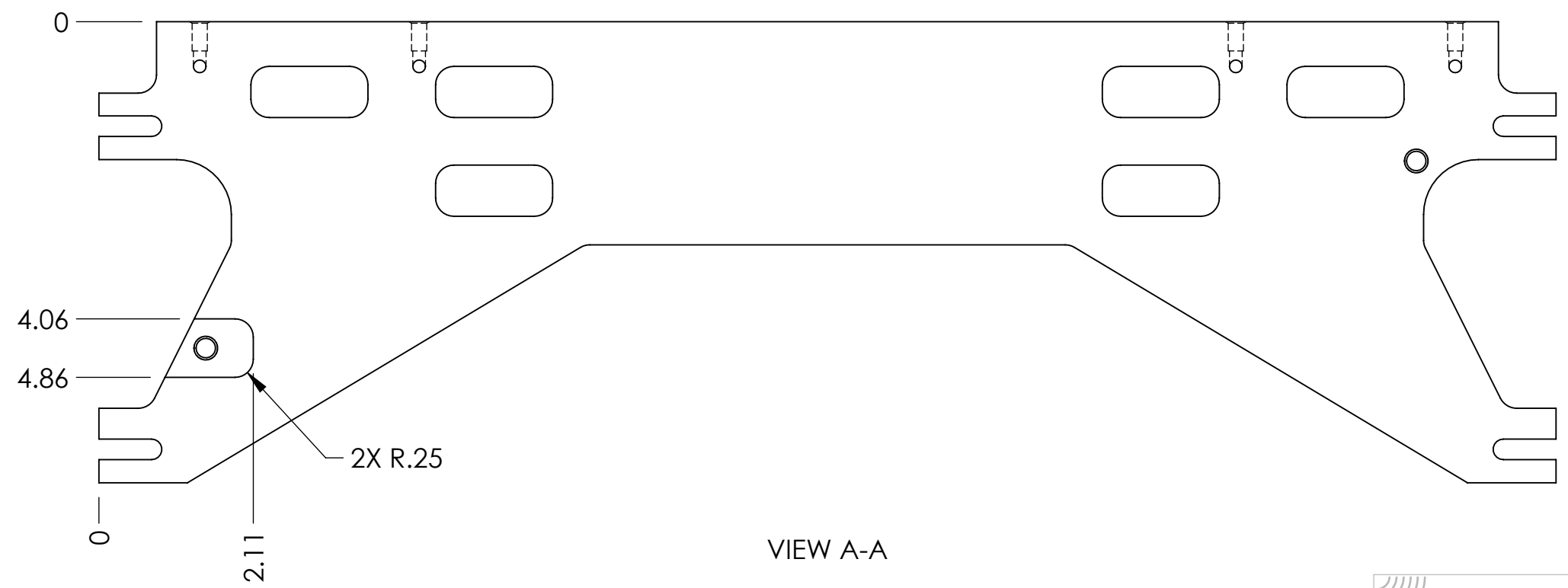
CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME TMS INTERMEDIATE OSUM SUPPORT PLATE, REAR	
SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER K. MAILAND	DATE 04 FEB 2010
DRAFTER I ROMERO	DATE 29 JUN 2010	SIZE DWG. NO. B D1000411	REV. v3
CHECKER SEE DCN	APPROVAL SEE DCN	SCALE: NONE	PROJECTION:
NEXT ASSY D1000549		SHEET 1 OF 2	


D1000411 TMS Intermediate OSUM Support Plate, Rear, PART PDM REV: X-047, DRAWING PDM REV: X-029



ISO VIEW

VIEW A-A



 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE	DWG. NO.	REV.
B	D1000411	v3
SCALE: NONE	PROJECTION:	SHEET 2 OF 2

4

3

2

1

NOTES CONTINUED:

5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 101 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.

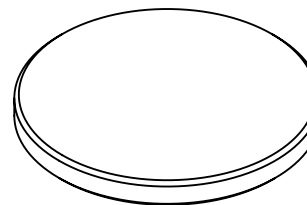
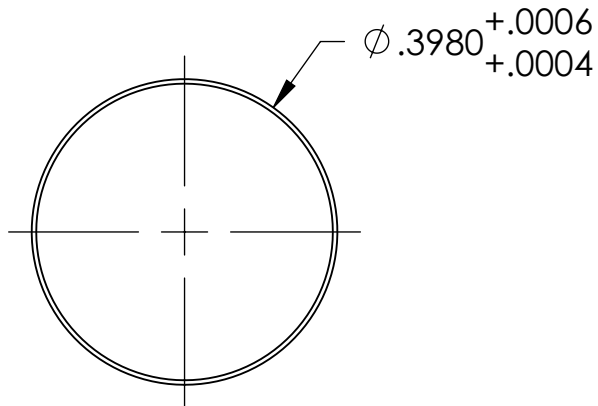
EXAMPLE (PART): XXX-v1
 EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD

6. APPROXIMATE WEIGHT = 0.644g

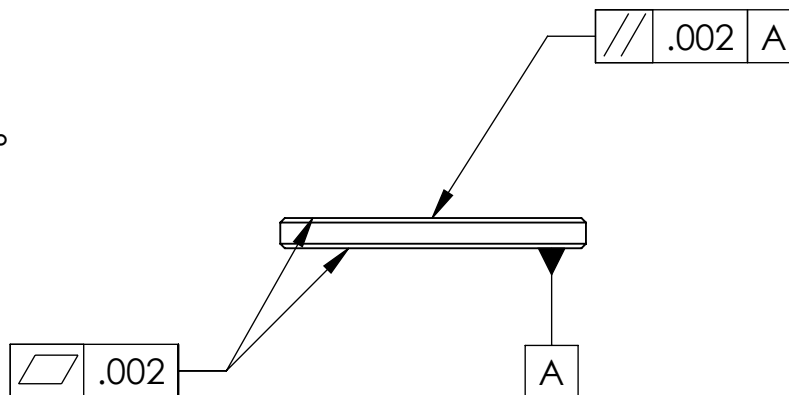
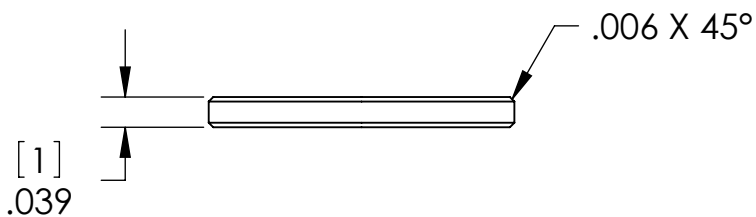
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

REV.	DATE	DCN #	DRAWING TREE #
v1	09 JUL 2010	E0900501	E0900353
-	-	-	-
-	-	-	-



ISOMETRIC VIEW



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
 .XX ± .03
 .XXX ± .005

ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, R.02 MIN.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL 416 SSSL FINISH 32 μinch



SYSTEM ADVANCED LIGO SUB-SYSTEM SUS

NEXT ASSY MULTIPLE ASSY

PART NAME			MAGNETIC PLUG		
DESIGNER	M. MEYER	14 JUN 2010	SIZE	DWG. NO.	REV.
DRAFTER	B. MOORE	14 JUN 2010	A	D1001534	v1
CHECKER	M. MEYER	16 JUN 2010	SCALE: 4:1	PROJECTION:	SHEET 1 OF 1
APPROVAL					

4

3

2

1

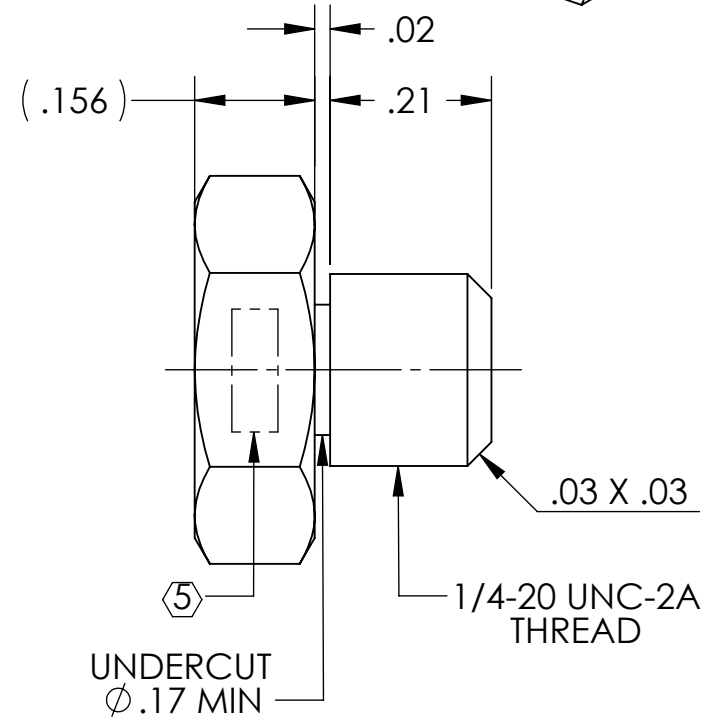
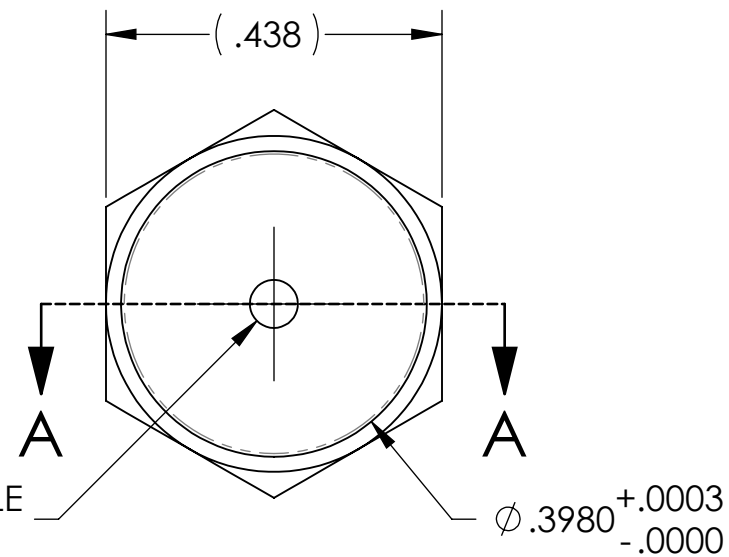
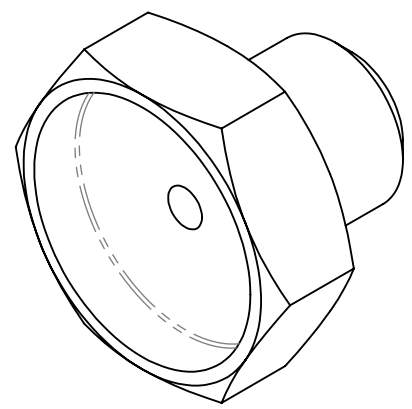
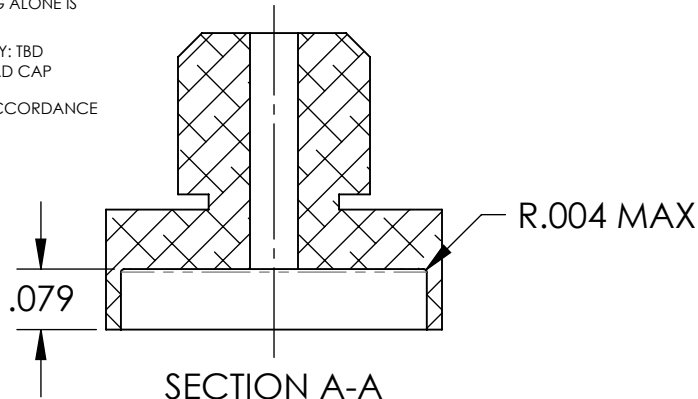
NOTES CONTINUED:

5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.

EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD

6. PART IS TO BE MADE FROM STOCK HEX HEAD CAP SCREW, 1/4-20 UNC-2A, FULLY THREADED.

7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .01
.XXX ± .005
ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, R.02 MIN.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.
MATERIAL 316 SSSL
FINISH 32 μinch

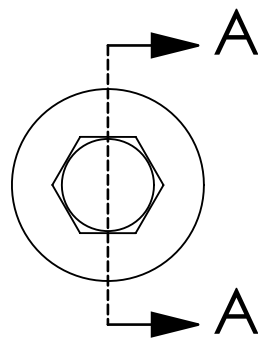
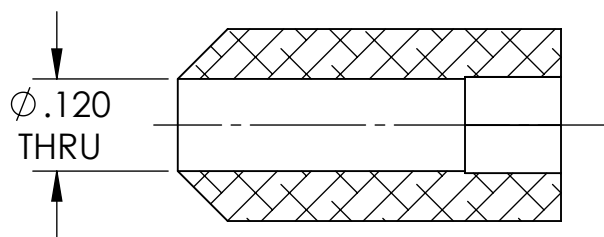
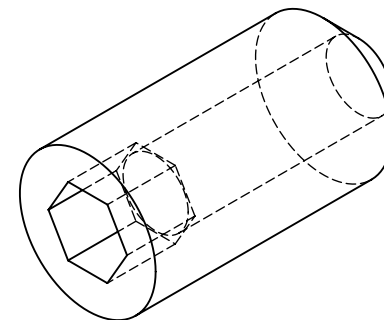
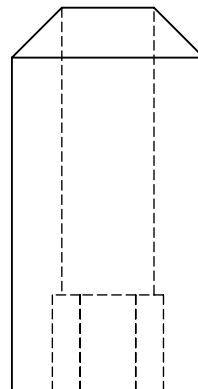
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SYSTEM ADVANCED LIGO SUB-SYSTEM SUS
NEXT ASSY MULTIPLE ASSYS

PART NAME MAGNET RETAINER, BOSEM
DESIGNER D. BRIDGES 13 JUL 2010
DRAFTER D. BRIDGES 14 JUL 2010
CHECKER M. MEYER 16 JUL 2010
APPROVAL
SIZE DWG. NO. A D1001697
REV. v1
SCALE: 4:1 PROJECTION: SHEET 1 OF 1

NOTES CONTINUED:

- 5. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, AND SERIAL NUMBER. SERIAL NUMBERS START AT 001 (UNLESS OTHERWISE SPECIFIED) FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY.
EXAMPLE:
DXXXXXX-vY
S/N-001
 - 6. APPROXIMATE WEIGHT = .003 LB [1.27 G].
 - 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- Ⓢ MAKE FROM:
TICO TITANIUM INC.
WWW.TICOTITANIUM.COM
P/N SS142012 (1/4-20 UNC X 1/2" SOCKET SET SCREW, COMMERCIAL PURE TITANIUM, GRADE 2) OR APPROVED EQUIVALENT.

REV.	DATE	DCN #	DRAWING TREE #
v1	24 FEB 2011	E1100080-v1	-
-	-	-	-
-	-	-	-



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:

.XX ± .01
.XXX ± .005

ANGULAR ± 0.5°

- 1. INTERPRET DRAWING PER ASME Y14.5-1994.
- 2. REMOVE ALL SHARP EDGES .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS.
- 3. DO NOT SCALE FROM DRAWING.
- 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL



FINISH

N/A μinch



SYSTEM
ADVANCED LIGO

SUB-SYSTEM
AOS

NEXT ASSY
D1001160

PART NAME

TMS TELESCOPE MASS ATTACHMENT SCREW

DESIGNER C. CONLEY 24 FEB 2011

DRAFTER C. CONLEY 24 FEB 2011

CHECKER

APPROVAL

SIZE DWG. NO.

A

D1100358

REV.

v1

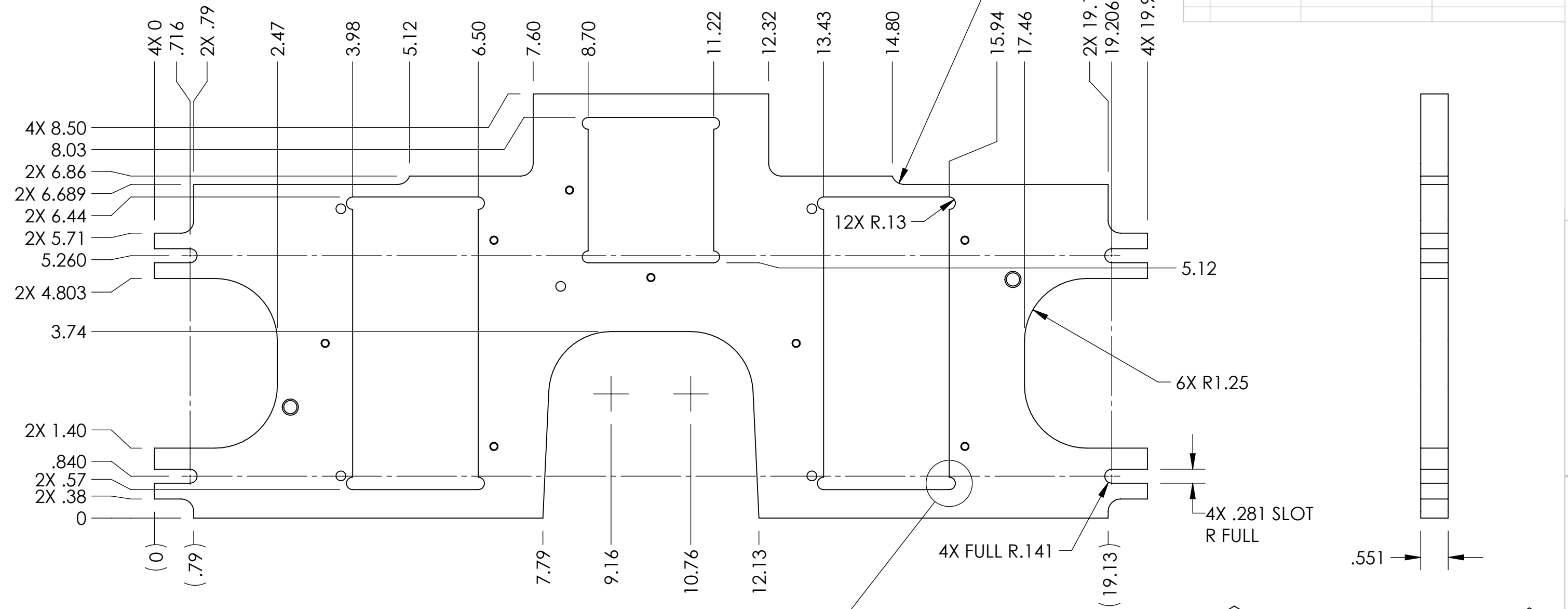
SCALE: NONE PROJECTION:



SHEET 1 OF 1

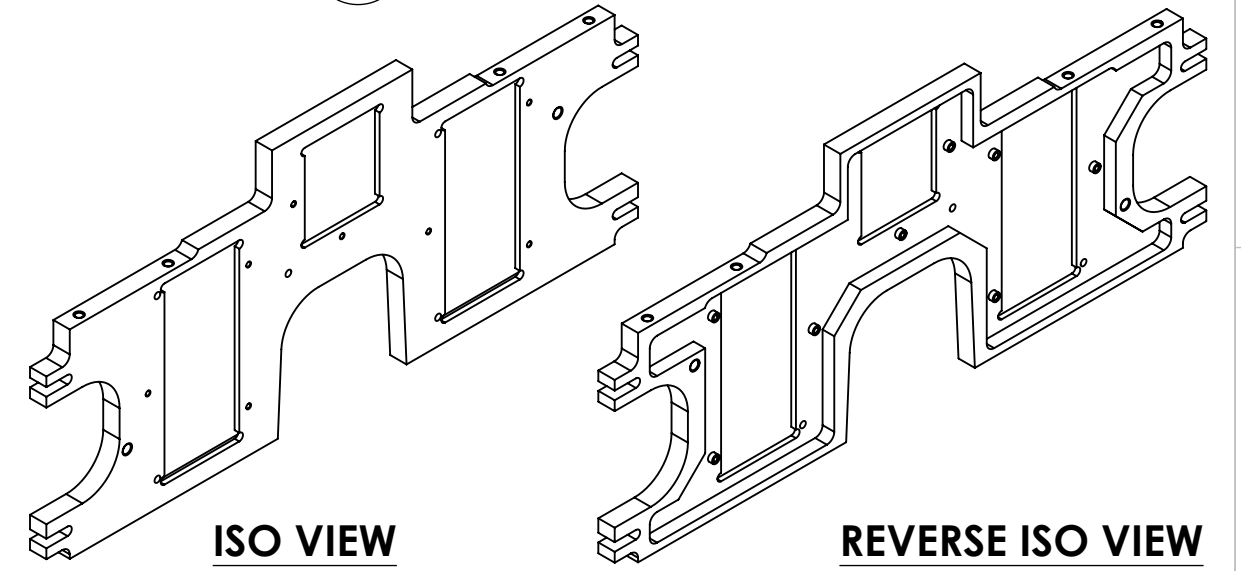
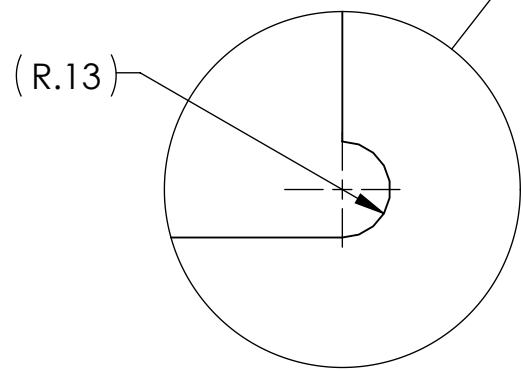
D1100421 aLIGO AOS, TMS Suspension Tablecloth Plate, Front, PART PDM REV: X-039, DRAWING PDM REV: X-018

REV.	DATE	DCN #	DRAWING TREE #
v1	14 MAR 2012	E1200216	-



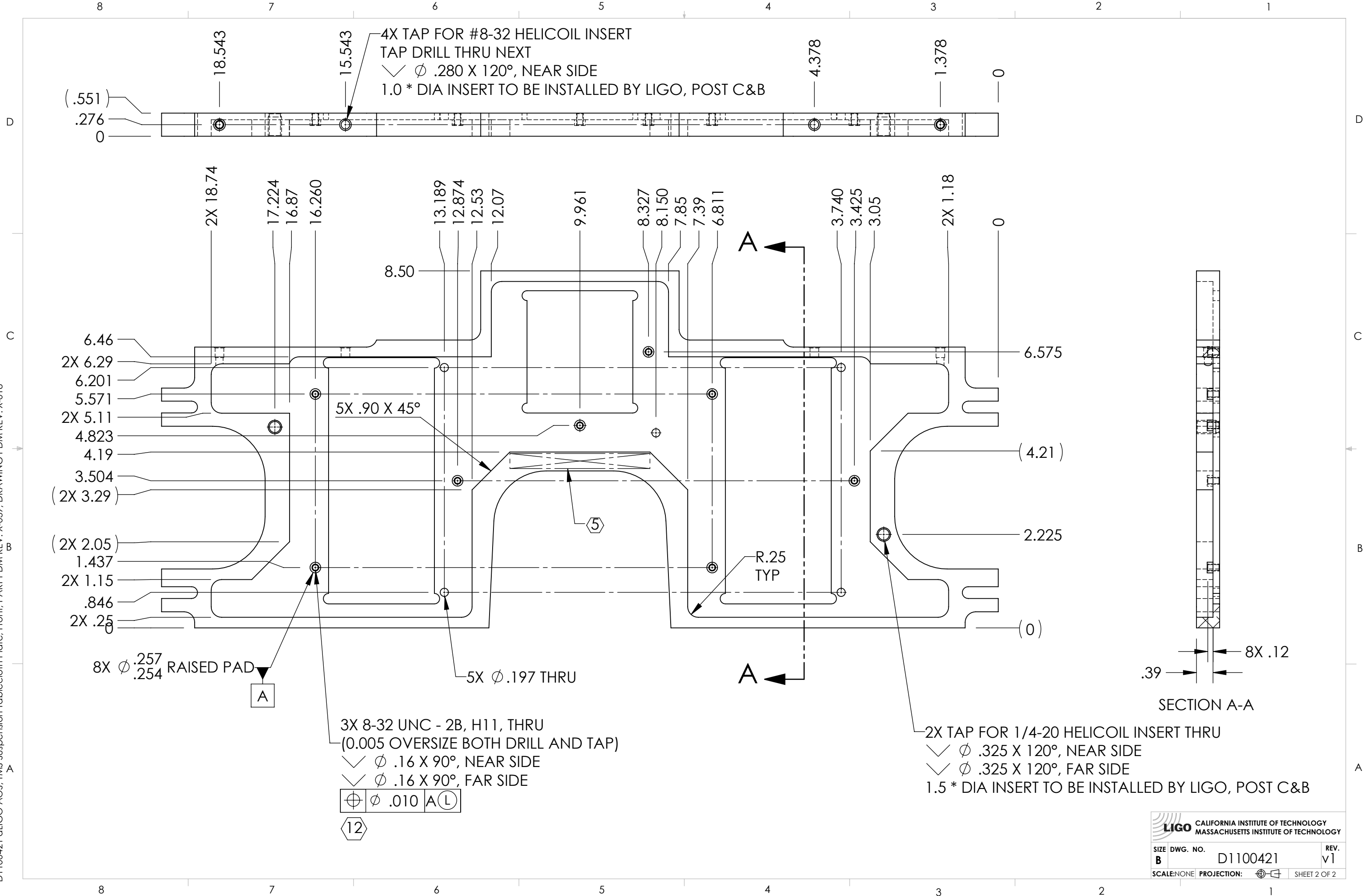
NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.
 5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.
 6. MASS: 0.960 KG [2.117 LB].
 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.
 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.
 10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.
 11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABORATORY. REFER TO LIGO-E0900364.
12. ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				PART NAME	
DIMENSIONS ARE IN INCHES				TMS SUSPENSION TABLECLOTH PLATE, FRONT	
TOLERANCES: .XX ± .015 .XXX ± .005				SIZE DWG. NO. B D1100421	
ANGULAR ± .5°				REV. v1	
1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING.				SCALE: NONE PROJECTION:	
MATERIAL 6061-T6 Al		FINISH 63 μinch Ra		NEXT ASSY D1000549	
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		ADVANCED LIGO		SUB-SYSTEM AOS	
DESIGNER C. CONLEY 04 MAR 2011		DRAFTER M. HILLARD 14 MAR 2012		CHECKER SEE DCN	
APPROVAL SEE DCN				SHEET 1 OF 2	

D1100421 dLIGO AOS, TMS Suspension Tablecloth Plate, Front, PART PDM REV: X-039, DRAWING PDM REV: X-018

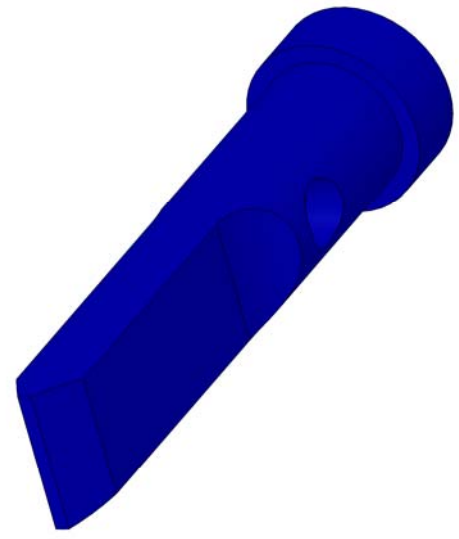
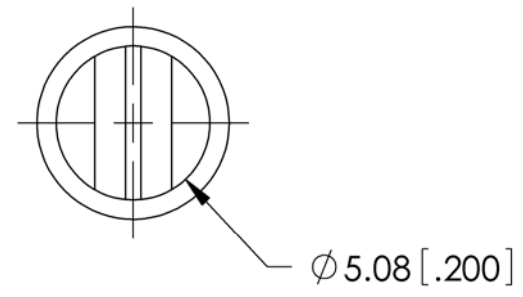
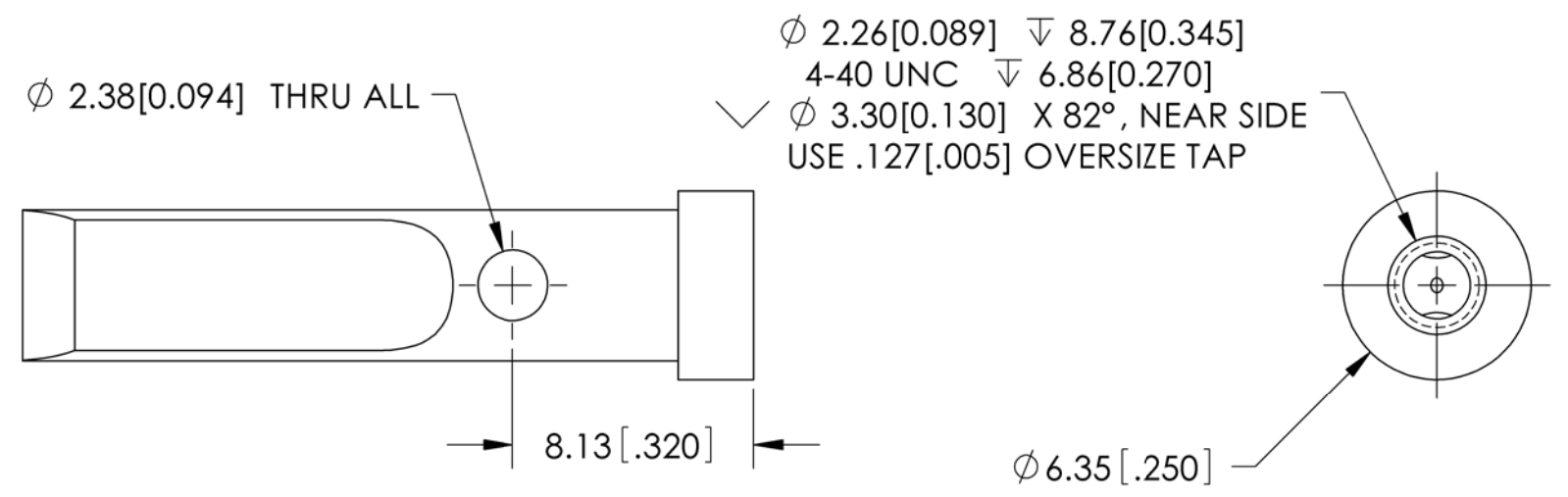
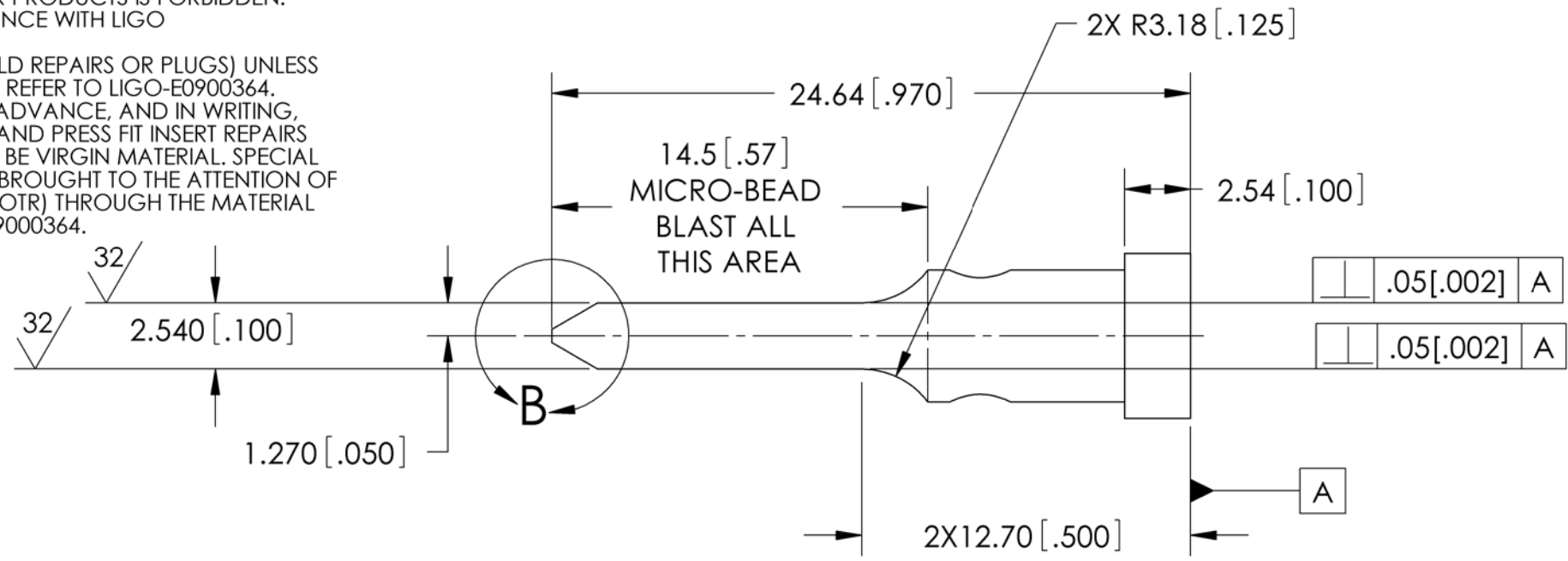
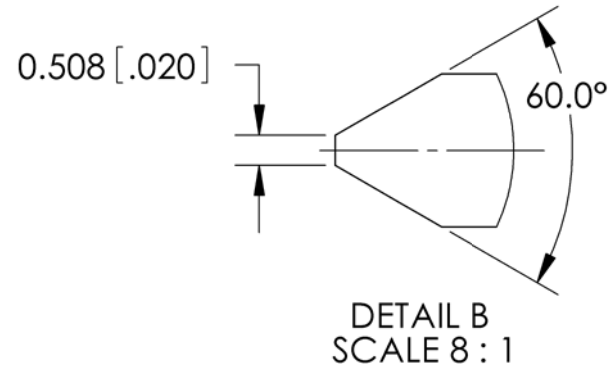


CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
SIZE	DWG. NO.
B	D1100421
SCALE: NONE	PROJECTION:
REV.	SHEET 2 OF 2
v1	

NOTES CONTINUED:

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE.
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IFF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
EXAMPLE (PART) : 001-V1
EXAMPLE (TAG) DXXXXXXX-VY, TYPE-XX, S/N XXX QTY:TBD.
6. APPROXIMATE WEIGHT = 0.97 LB.
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES (INCLUDING SANDING OR SCOURING FOR MATTE FINISH) IS NOT ALLOWED. USE OF SCOTCH-BRITE OR SIMILAR PRODUCTS IS FORBIDDEN.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. ALL MATERIAL TO BE VIRGIN MATERIAL, (I.E. NOT WELD REPAIRS OR PLUGS) UNLESS APPROVED IN ADVANCE AND IN WRITING BY LIGO, REFER TO LIGO-E0900364.
10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE. THE MATERIAL USED MUST BE VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF AND WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH THE MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E09000364.

REV.	DATE	DCN #	DRAWING TREE #
v5	23 May 2011	E1100500	E1100450



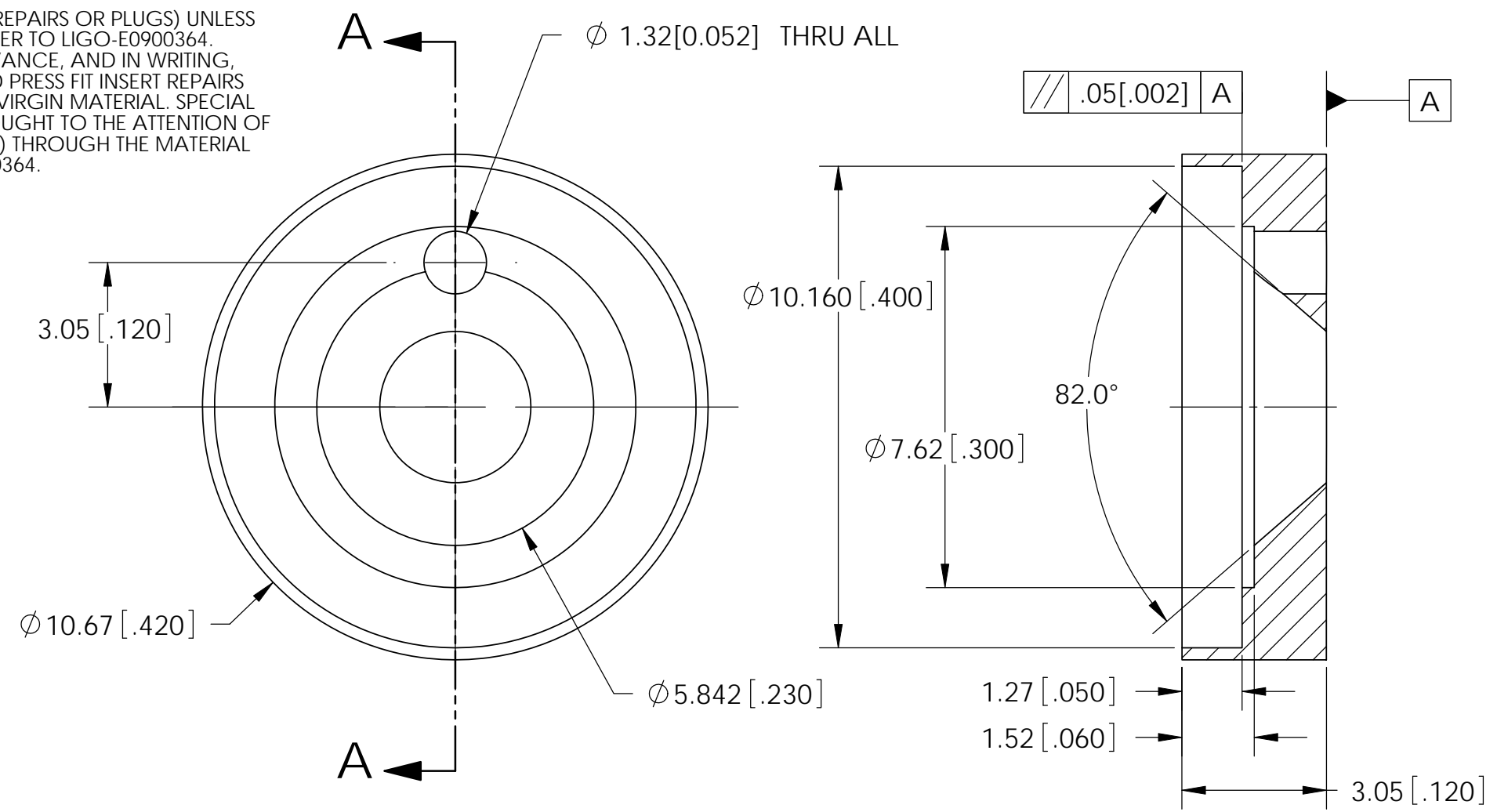
DIMENSIONS ARE IN MM [INCHES]		NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
TOLERANCES: .XX ± .38 [0.015] .XXX ± .127 [0.005] ANGULAR ± .5°		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .76 [0.03] x 45°. 3. DO NOT SCALE FROM DRAWING.		ADVANCED LIGO SUB-SYSTEM SUS		BOSEM FLAG , αLIGO SUS	
MATERIAL 6061-T6 Al		FINISH 63 μinch		NEXT ASSY D1100937		DESIGNER M.EVANS 31 Mar, 2011	SIZE DWG. NO. B D1100573
						DRAFTER M.HILLARD 23 May 2011	REV. v5
						CHECKER J.LEWIS 23 May 2011	
						APPROVAL J.ROMIE 23 May 2011	SCALE: 4:1 PROJECTION: SHEET 1 OF 1

D1100573, PART PDM REV: X-006, DRAWING PDM REV: X-015

REV.	DATE	DCN #	DRAWING TREE #
v3	23 May 2011	E1100500	E1100450

NOTES CONTINUED:

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE.
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
EXAMPLE (PART) : 001-V1
EXAMPLE (TAG) DXXXXXXX-VY, TYPE-XX, S/N XXX QTY:TBD.
6. APPROXIMATE WEIGHT = 1.06 grams.
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES (INCLUDING SANDING OR SCOURING FOR MATTE FINISH) IS NOT ALLOWED. USE OF SCOTCH-BRITE OR SIMILAR PRODUCTS IS FORBIDDEN.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. ALL MATERIAL TO BE VIRGIN MATERIAL, (I.E. NOT WELD REPAIRS OR PLUGS) UNLESS APPROVED IN ADVANCE AND IN WRITING BY LIGO, REFER TO LIGO-E0900364.
10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE. THE MATERIAL USED MUST BE VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF AND WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH THE MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E09000364.



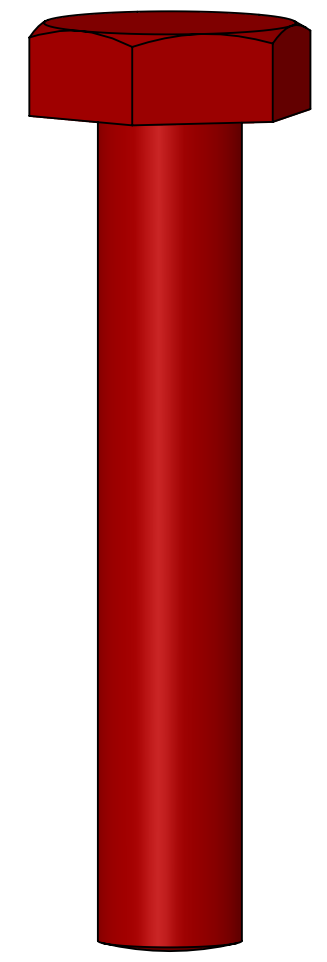
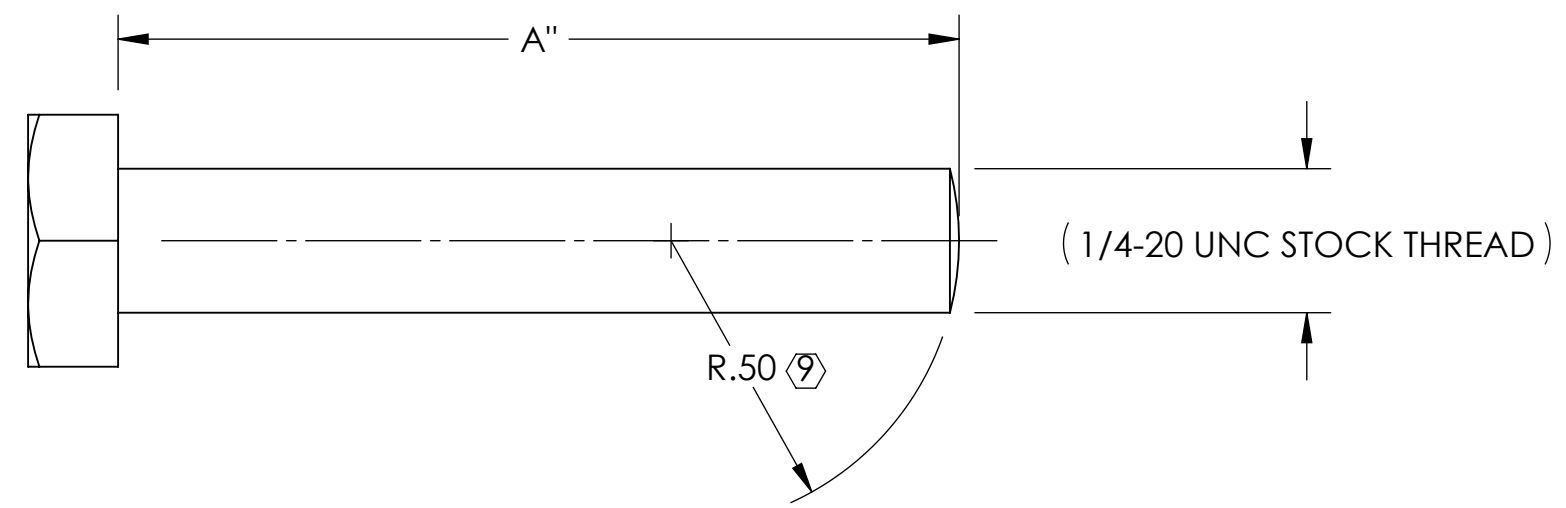
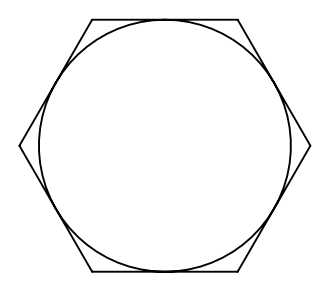
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME				
DIMENSIONS ARE IN MM [INCHES]		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .76[.03] x 45°. 3. DO NOT SCALE FROM DRAWING.		ADVANCED LIGO SUB-SYSTEM SUS		BOSEM FLAT FLAG DISK aLIGO SUS				
TOLERANCES: .XX ± .381[.015] .XXX ± .127[.005]		MATERIAL 416 SSSL		FINISH 63 μinch		NEXT ASSY D1100937		DESIGNER M.EVANS 31 Mar 2011	SIZE DWG. NO. B D1100574	REV. v3
ANGULAR ± .5°						CHECKER J.LEWIS 23 May 2011		SCALE: 8:1 PROJECTION: 1st Angle		SHEET 1 OF 1
						APPROVAL J.ROMIE 23 May 2011				

D1100574, PART PDM REV: X-006, DRAWING PDM REV: X-009

8 7 6 5 4 3 2 1

- NOTES CONTINUED:**
- 5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXX-VY, QTY: X, LOT S/N 001.
 - 6. MASS
 -01: 19 G [0.042 LB]
 -02: 12.5 G [0.028 LB]
 - 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - Ⓢ MAKE FROM: McMASTER-CARR P/N 93190A552 OR EQUIVALENT PER ASME B18.2.1.
 (HEX HEAD CAP SCREW, 1/4-20 UNC-2A FULLY THREADED, 316 STAINLESS STEEL)
 - Ⓢ 63 μINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACE, STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	28 APR 2011	E1100351	-
v2	21 MAR 2012	E1101214	-
-	-	-	-



TYPE	DIM 'A' (+0/- .04)
-01	2.50
-02	1.50

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)	
DIMENSIONS ARE IN INCHES	
TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	
1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.	
MATERIAL	FINISH
Ⓢ	63 μinch Ra Ⓢ

CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
SYSTEM	SUB-SYSTEM	TMS EARTHQUAKE STOP SCREW	
ADVANCED LIGO	AOS	DESIGNER	C. CONLEY 18 APR 2011
NEXT ASSY	VARIOUS	DRAFTER	M. MILLER 29 APR 2011
		CHECKER	SEE DCN
		APPROVAL	SEE DCN
		SIZE	DWG. NO.
		B	D1100712
		REV.	v2
		SCALE: NONE	PROJECTION:
			SHEET 1 OF 1

D1100712 TMS Earthquake Stop Screw, PART PDM REV: X-022, DRAWING PDM REV: X-015

8 7 6 5 4 3 2 1

NOTES CONTINUED:

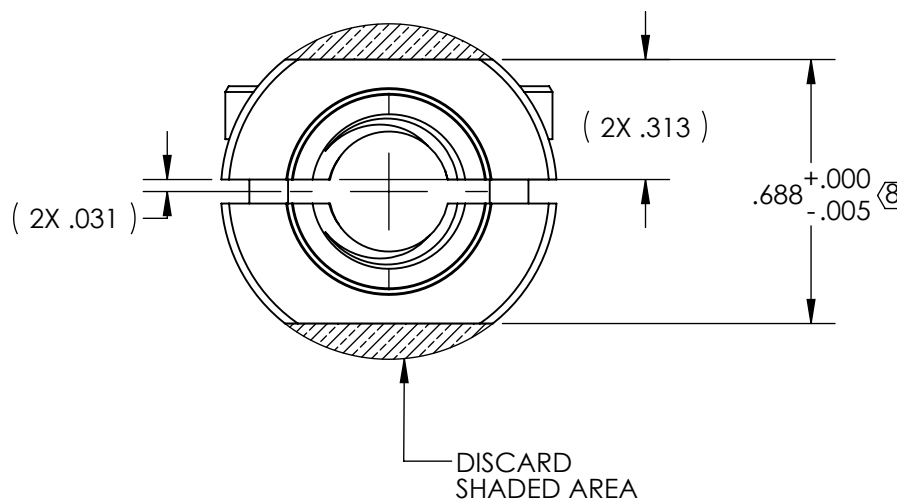
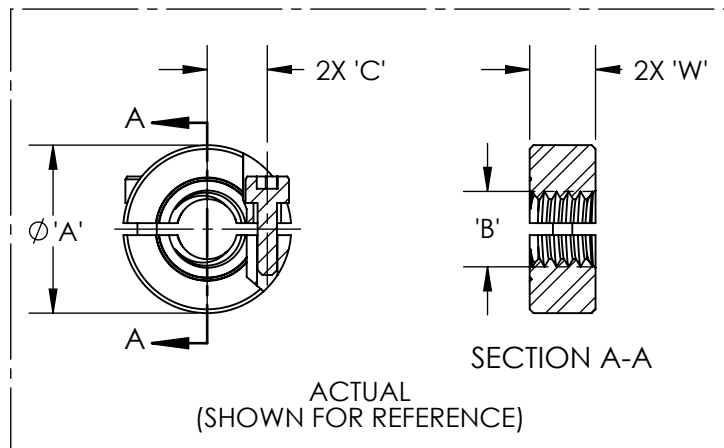
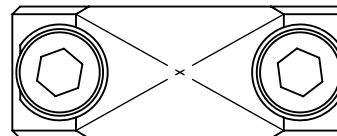
5. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY.
EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD

6. MAKE FROM: RULAND
PART NO. TSP-6-16-SS
THREADED SHAFT COLLAR (TWO PIECE)

7. SURFACE FINISH TO BE AS-PROCESSED FROM MILL/SUPPLIER, FREE FROM SCRATCHES OR GOUGES.

8. WHILE CLAMPED ON A 3/8-16 UNC-2A FASTENER.

REV.	DATE	DCN #	DRAWING TREE #
v1	24 MAY 2011	E1100462-x0	-
-	-	-	-
-	-	-	-



TWO-PIECE SHAFT COLLAR SPECIFICATIONS
(DIMENSIONS SHOWN FOR REFERENCE)

'A' (OUTER DIAMETER)	'B' (BORE)	'W' (WIDTH)	'C' (SCREW LOCATION)	FORGED CLAMP SCREW	MATERIAL
Ø .88	3/8-16	.343	.313	6-32 X .38 LG.	SSTL

ALTERED ITEM DRAWING

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:

.XX ± .01
.XXX ± .005

ANGULAR ± .5°

- INTERPRET DRAWING PER ASME Y14.5-1994.
- REMOVE ALL SHARP EDGES .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS.
- DO NOT SCALE FROM DRAWING.
- ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL AS NOTED (SEE SPEC.) FINISH N/A μinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO SUB-SYSTEM SUS
NEXT ASSY N/A

PART NAME ALIGO, SUS, QUAD, E. STOP SCREW, SPLIT SHAFT COLLAR

DESIGNER	E.SANCHEZ	24 MAY 2011	SIZE	DWG. NO.	REV.
DRAFTER	E.SANCHEZ	24 MAY 2011	A	D1100980	v1
CHECKER	J.LEWIS	24 MAY 2011	SCALE: 1:1	PROJECTION:	SHEET 1 OF 1
APPROVAL					

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- NOTES CONTINUED:**
- 5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXX-VY, QTY: X, LOT S/N 001.
 - 6. APPROXIMATE WEIGHT = .11 LB [49 G].
 - ⑦ MAKE FROM: MCMASTER-CARR P/N 92185A712 OR EQUIVALENT. (SOCKET HEAD CAP SCREW, 1/2-13 UNC-3A, 316 STAINLESS STEEL)
 - ⑧ ENGRAVE "E/P" APPROXIMATELY WHERE SHOWN. CHARACTER HEIGHT .13" MINIMUM.
 - ⑨ ELECTRO-POLISH PER LIGO SPECIFICATION E0900364, SECTION 5.2.2.2, FOR 5.5 MINUTES.

REV.	DATE	DCN #	DRAWING TREE #
v1	27 JUN 2011	E1100351-v1	-
-	-	-	-
-	-	-	-

D

D

C

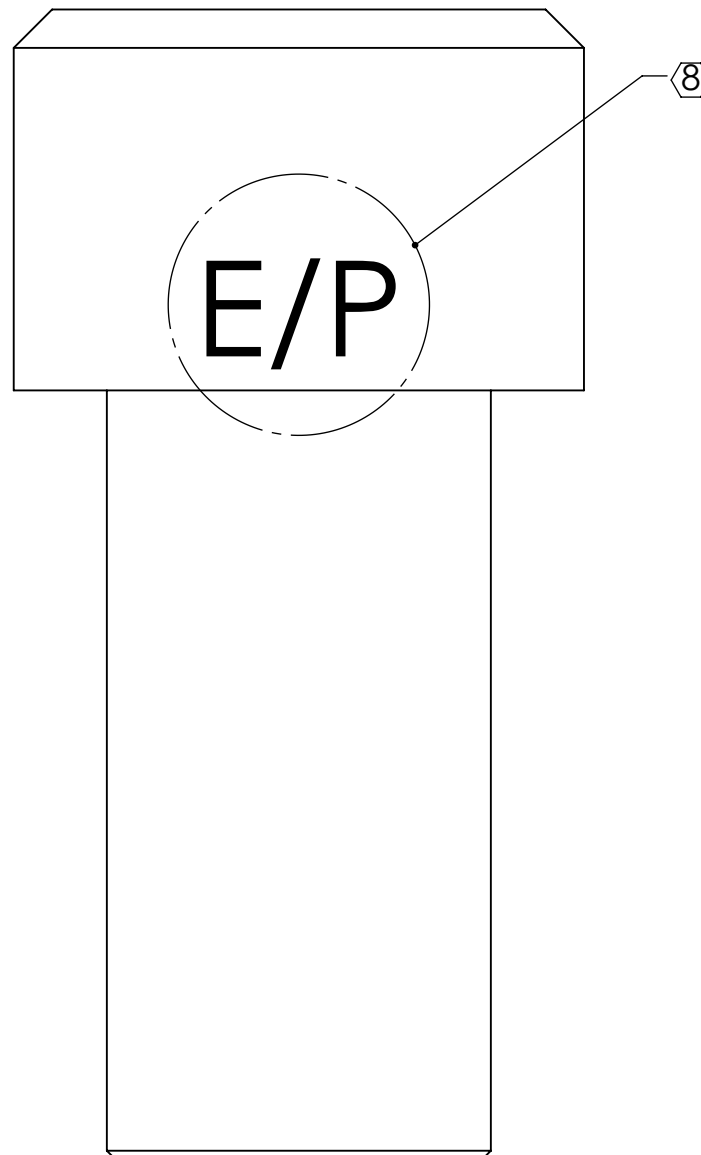
C

B

B

A

A



D1101186 aLIGO SUS .500-13 X 1 SHCS Modified, PART PDM REV: X-003, DRAWING PDM REV: X-001

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, R.02 MIN. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		ADVANCED LIGO		aLIGO SUS .500-13 X 1 SHCS MODIFIED	
TOLERANCES: .XX ± .XXX ±		MATERIAL		SUB-SYSTEM		DESIGNER	
ANGULAR ± °		FINISH		SUS		K. MAILAND 27 JUN 2011	
⑦		⑨		NEXT ASSY		DRAFTER	
				D1000549		C. CONLEY 27 JUN 2011	
						CHECKER	
						APPROVAL	
						SIZE DWG. NO.	
						B D1101186	
						REV.	
						v1	
						SCALE: NONE PROJECTION:	
						SHEET 1 OF 1	

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NOTES CONTINUED:

5 SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 51.4 G [0.113 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10 PREPARE HELICOIL TAPPED HOLE ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.

11 INTERNAL NOTE: HELICOIL TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

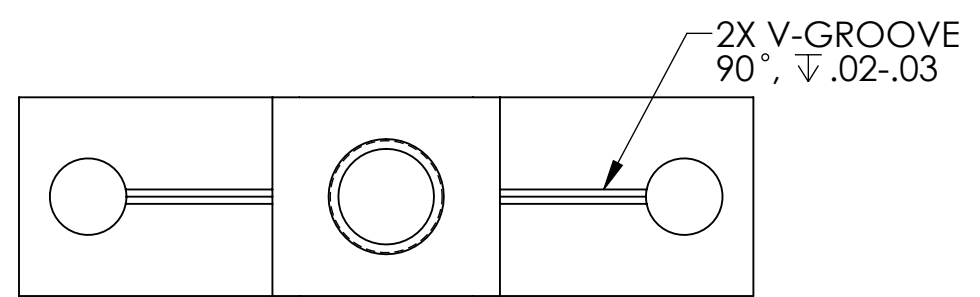
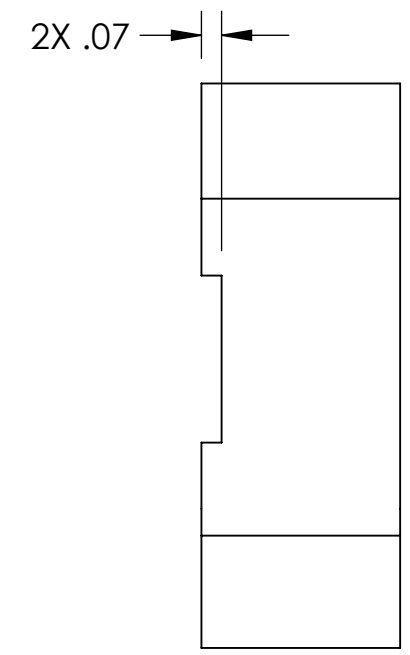
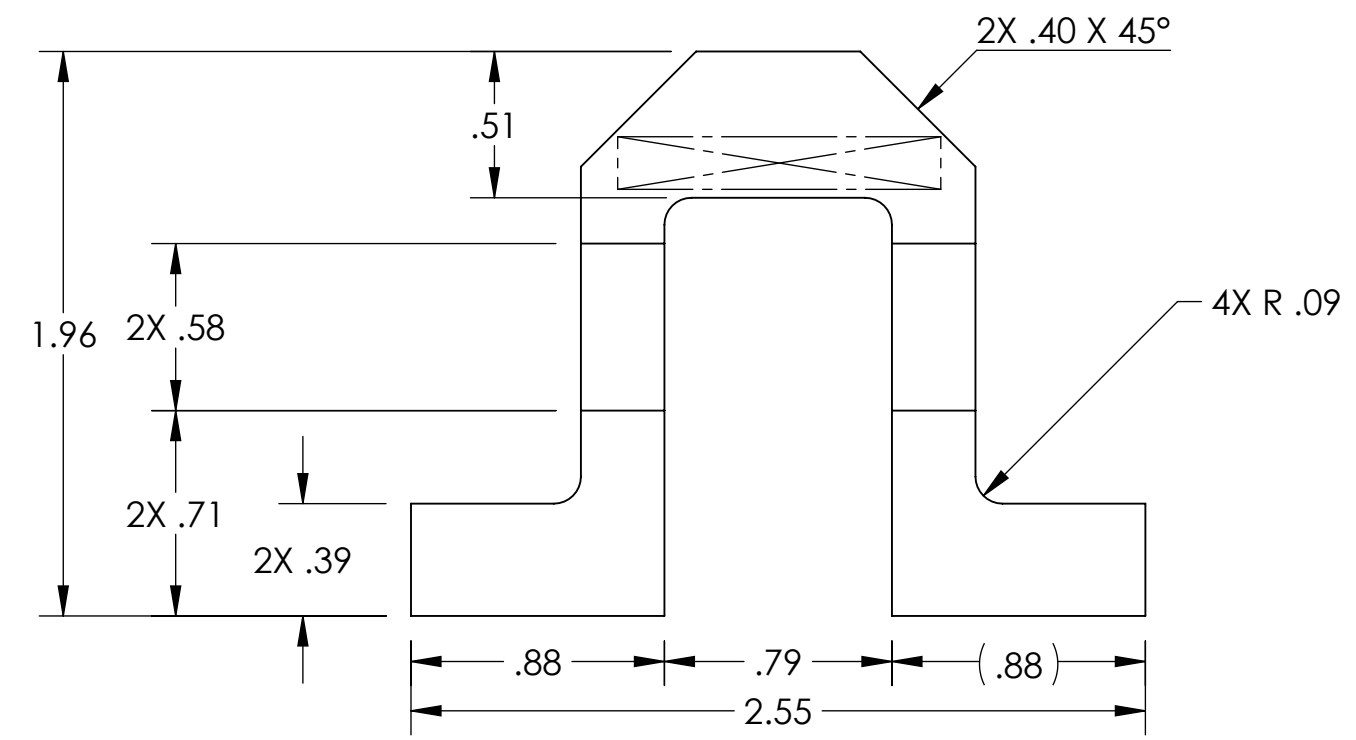
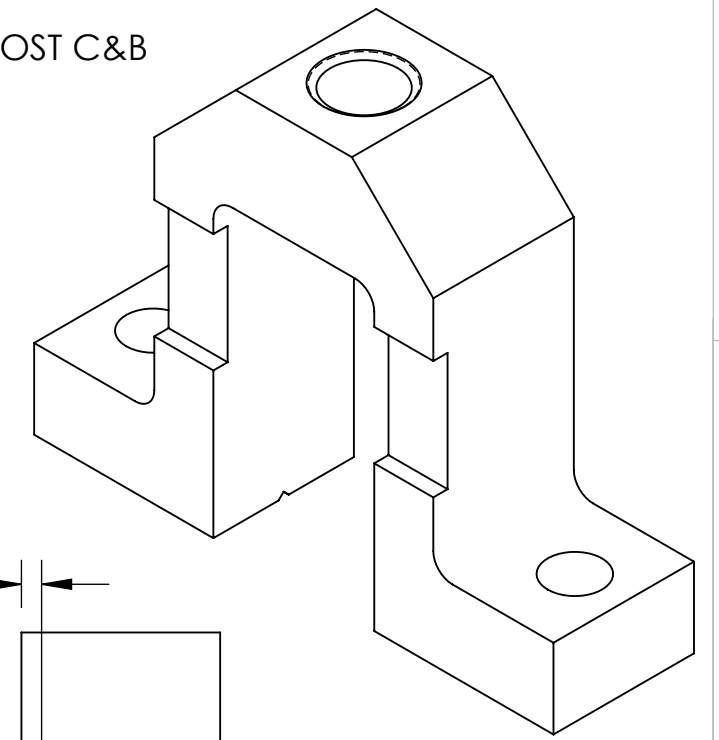
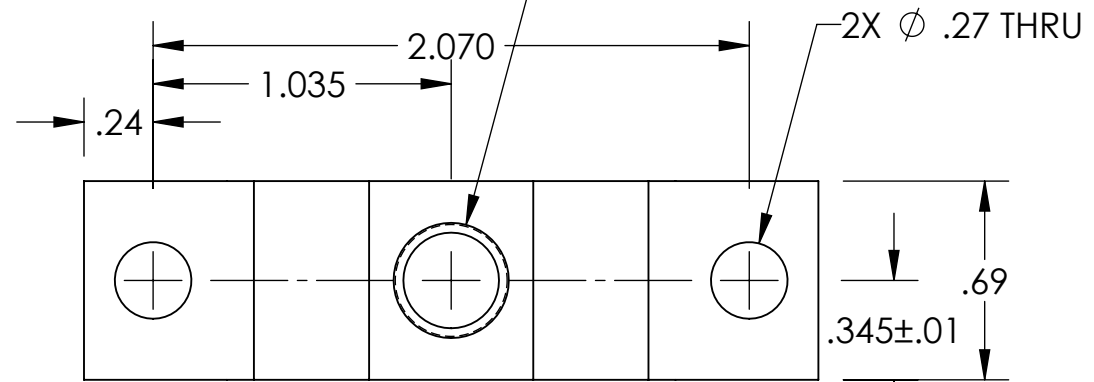
TAP FOR 5/16-18 HELICOIL INSERT THRU

✓ ϕ .40 X 120°, NEAR SIDE

✓ ϕ .40 X 120°, FAR SIDE

1.5 * DIA INSERT TO BE INSTALLED BY LIGO, POST C&B

10 11



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES
 TOLERANCES:
 .XX \pm .01
 .XXX \pm .005
 ANGULAR \pm 1.0°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
 2. REMOVE ALL SHARP EDGES, .005-.015.
 3. DO NOT SCALE FROM DRAWING.
 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL: 6061-T6 Al
 FINISH: 63 μ inch Ra

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO
 SUB-SYSTEM: AOS
 NEXT ASSY: D1101527

PART NAME		aLIGO SUS TOP MASS STOP BRIDGE		DESIGNER	C. CONLEY	21 FEB 2012	SIZE	DWG. NO.	REV.
DRAFTER	J. TERRAZAS	20 MAR 2012	B	D1101273	v1				
CHECKER	SEE DCN								
APPROVAL	SEE DCN								
SCALE: NONE		PROJECTION:		SHEET 1 OF 1					

D1101273_alIGO SUS TOP MASS STOP BRIDGE, PART PDM REV: X-018, DRAWING PDM REV: X-005

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NOTES (CONTINUED):

5 SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 2.427 KG [5.351 LB].

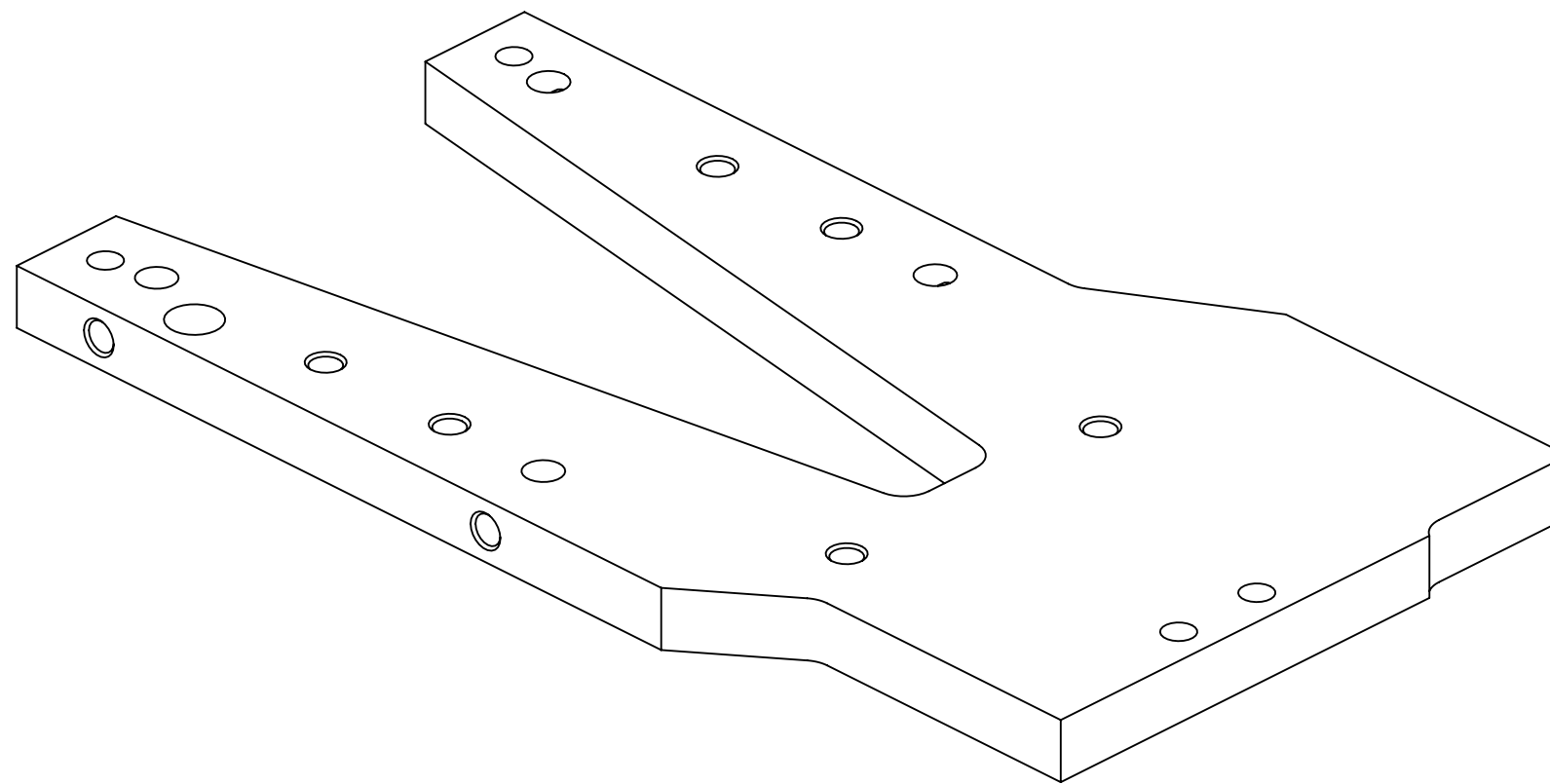
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10 ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	



D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010

D

C

B

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D

C

B

A

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES
 TOLERANCES:
 .XX ± .01
 .XXX ± .005
 ANGULAR ± 1.0°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.

MATERIAL 304 SSSL FINISH 63 µinch Ra

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO SUB-SYSTEM AOS
 NEXT ASSY D1101527

PART NAME			aLIGO TMS INTERMEDIATE MASS TOP PLATE	
DESIGNER	K. MAILAND	19 MAR 2012	SIZE DWG. NO.	D1101511
DRAFTER	C. CONLEY	25 MAR 2012	B	
CHECKER	SEE DCN			
APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:

REV. v1

SHEET 1 OF 3

8

7

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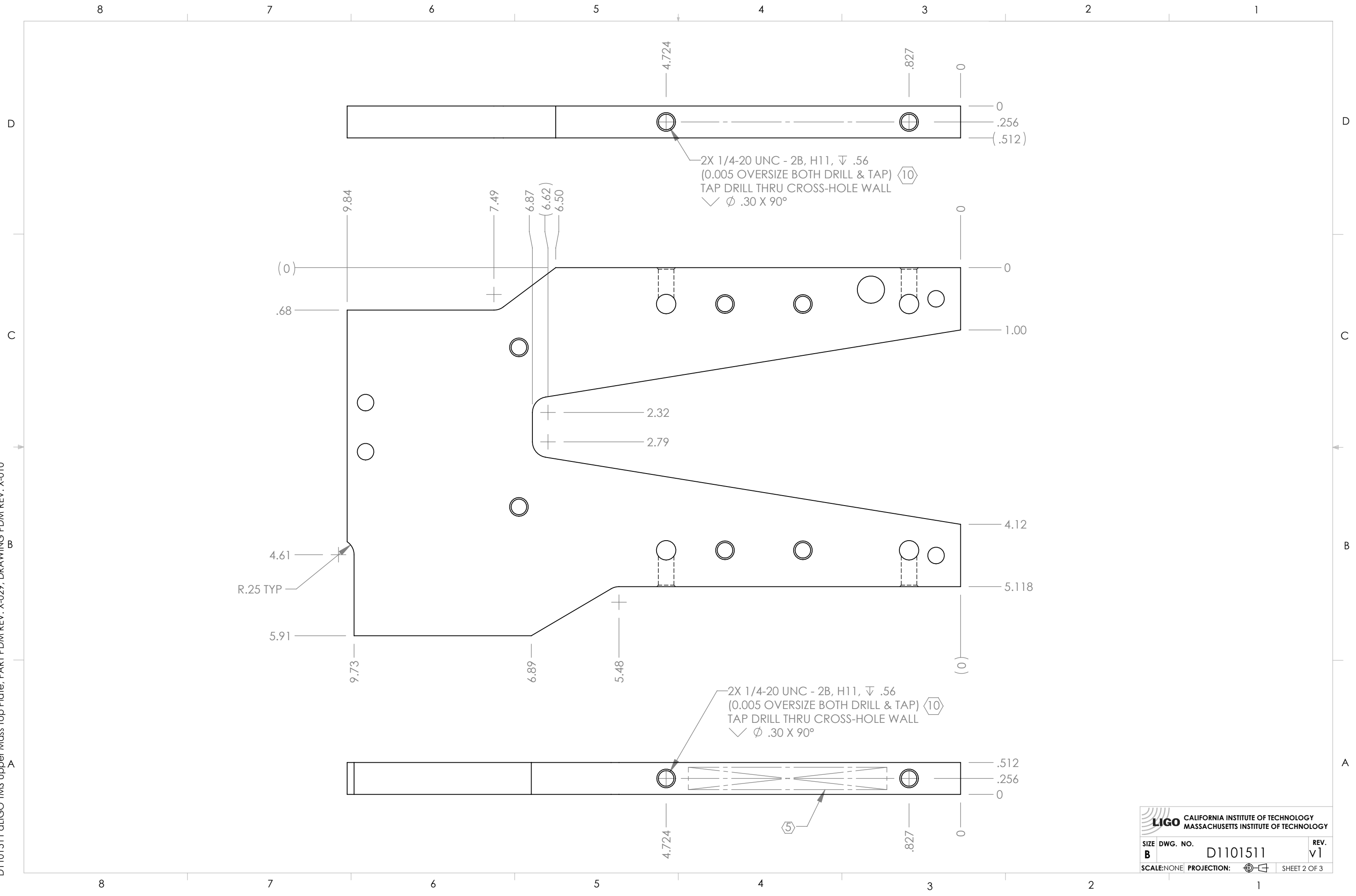
4

3

2

1

D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

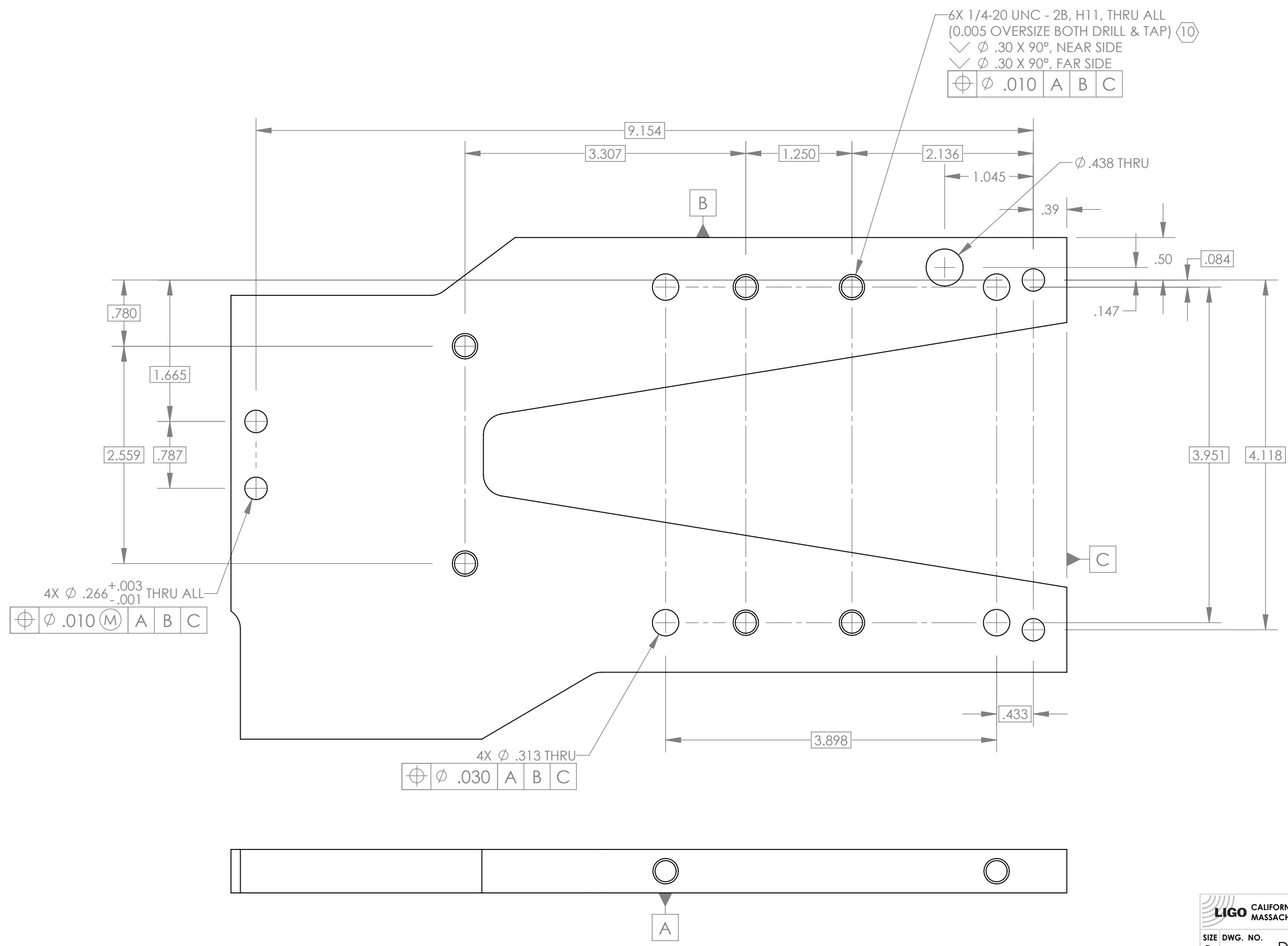
SIZE	DWG. NO.	REV.
B	D1101511	v1
SCALE: NONE	PROJECTION:	SHEET 2 OF 3

D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010

8 7 6 5 4 3 2 1

D
C
B
A

D
C
B
A



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101511	v1
SCALE: NONE	PROJECTION:	SHEET 3 OF 3

8 7 6 5 4 3 2 1

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NOTES (CONTINUED):

5 SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 5.399 KG [11.903 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

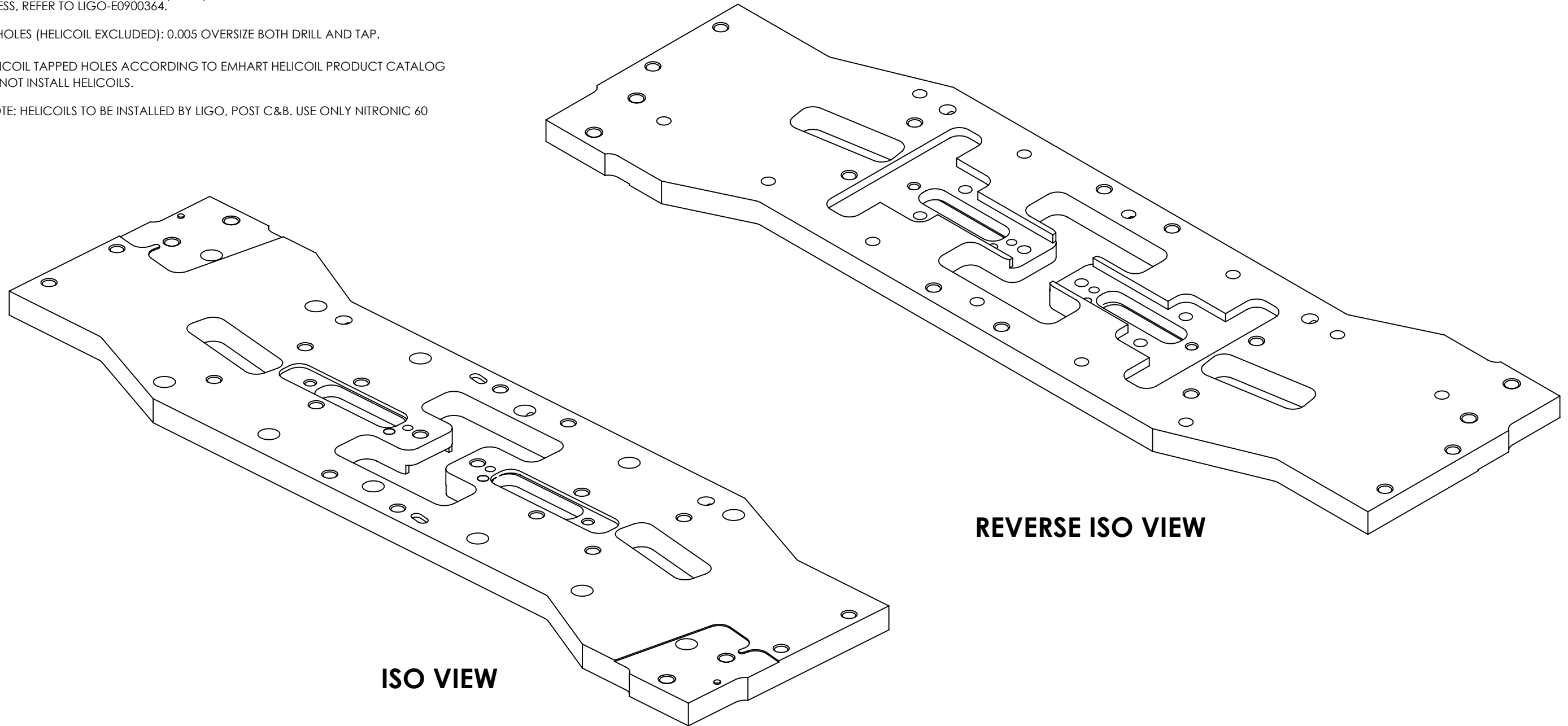
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS. REFER TO LIGO-E0900364.

10 ALL TAPPED HOLES (HELICOIL EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.

11 PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.

12 INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	



ISO VIEW

REVERSE ISO VIEW

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME					
DIMENSIONS ARE IN INCHES				1. INTERPRET DRAWING PER ASME Y14.5-1994.		aLIGO TMS UPPER MASS BOTTOM PLATE					
TOLERANCES:				2. REMOVE ALL SHARP EDGES, .005-.015.		SYSTEM		SUB-SYSTEM		DESIGNER	
.XX ± .01				3. DO NOT SCALE FROM DRAWING.		ADVANCED LIGO		AOS		K. MAILAND	
.XXX ± .005				4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		NEXT ASSY		D1200469		28 JUL 2011	
ANGULAR ± 0.1°				MATERIAL		304 SSSL		FINISH		63 μinch Ra	
										SIZE DWG. NO.	
										B D1101512	
										REV.	
										v1	
										SCALE: NONE PROJECTION:	
										SHEET 1 OF 6	

8

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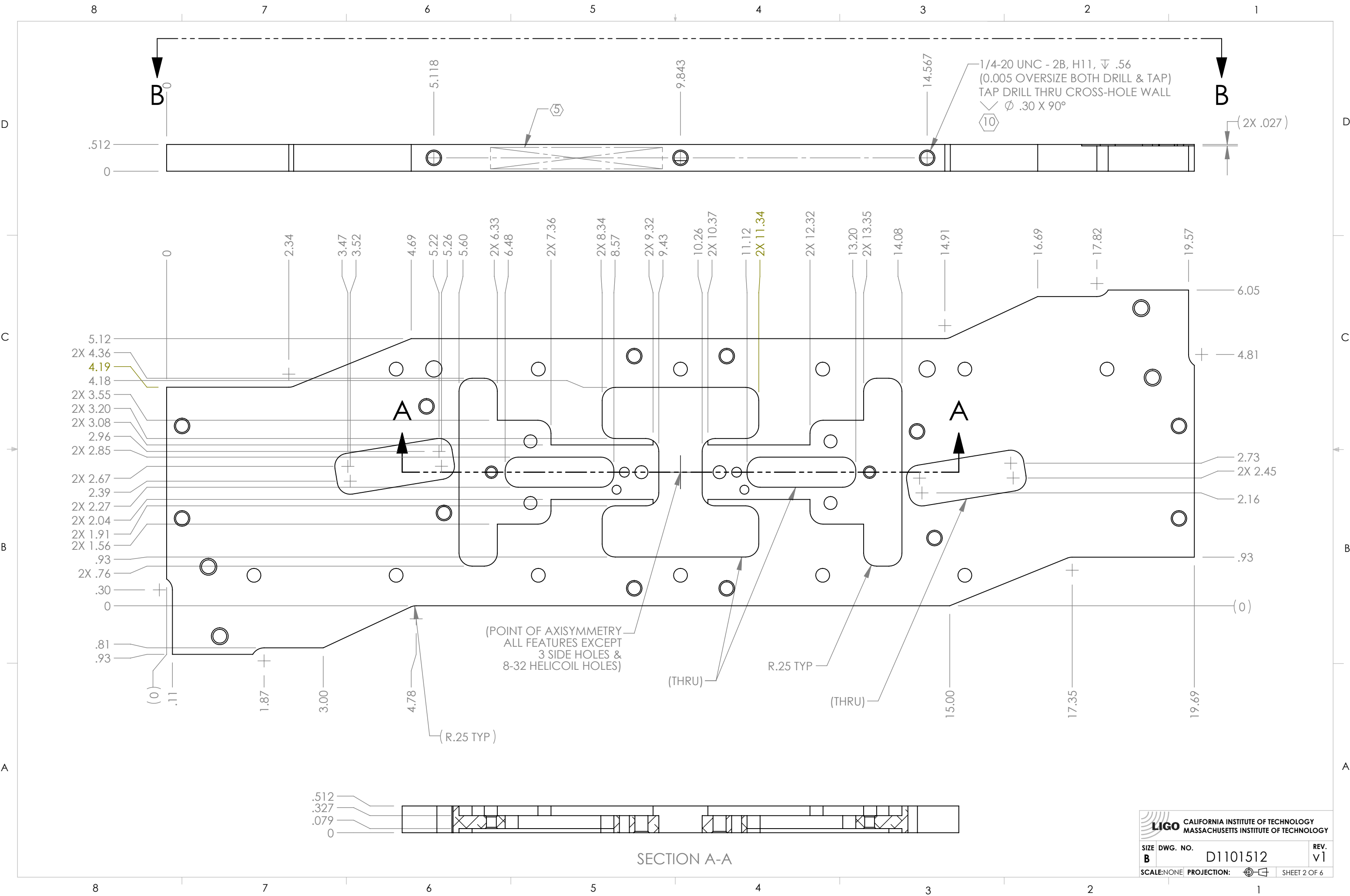
4

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D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101512	v1
SCALE: NONE	PROJECTION:	SHEET 2 OF 6

SECTION A-A

D1101512 Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021

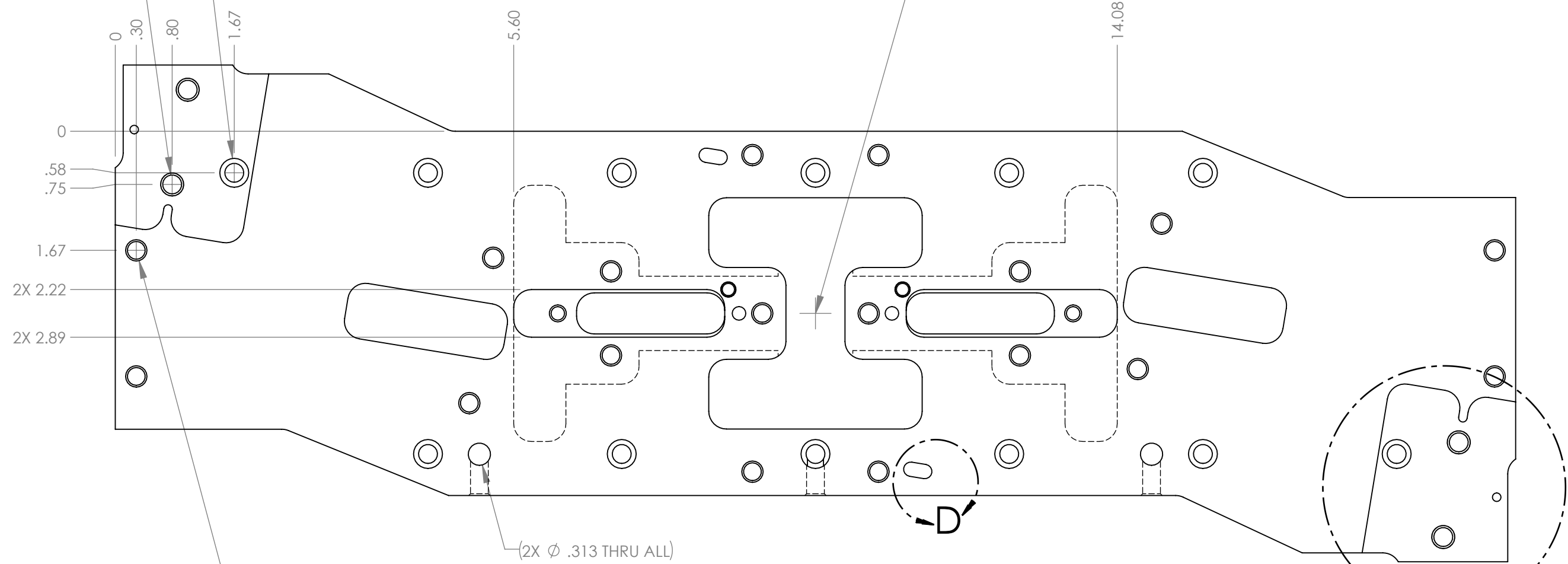
8 7 6 5 4 3 2 1

D
C
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(4X ϕ .266 THRU ALL
 \sphericalangle ϕ .33 X 120°, NEAR SIDE
TAP FOR 1/4-20 HELICOIL INSERT = 1.5 * DIA.
 \sphericalangle ϕ .33 X 120°, FAR SIDE

(12X ϕ .266^{+.003}/_{-.001} THRU ALL
 \sphericalangle ϕ .406 ∇ .31

(POINT OF AXISYMMETRY
ALL FEATURES EXCEPT
3 SIDE HOLES &
8-32 HELICOIL HOLES)



0
.30
.80
1.67
0
.58
.75
1.67
2X 2.22
2X 2.89

5.60
(2X ϕ .313 THRU ALL)

14.08

(18X 1/4-20 UNC - 2B, H11, THRU ALL
(0.005 OVERSIZE BOTH DRILL & TAP)
 \sphericalangle ϕ .30 X 90°, NEAR SIDE
 \sphericalangle ϕ .30 X 90°, FAR SIDE

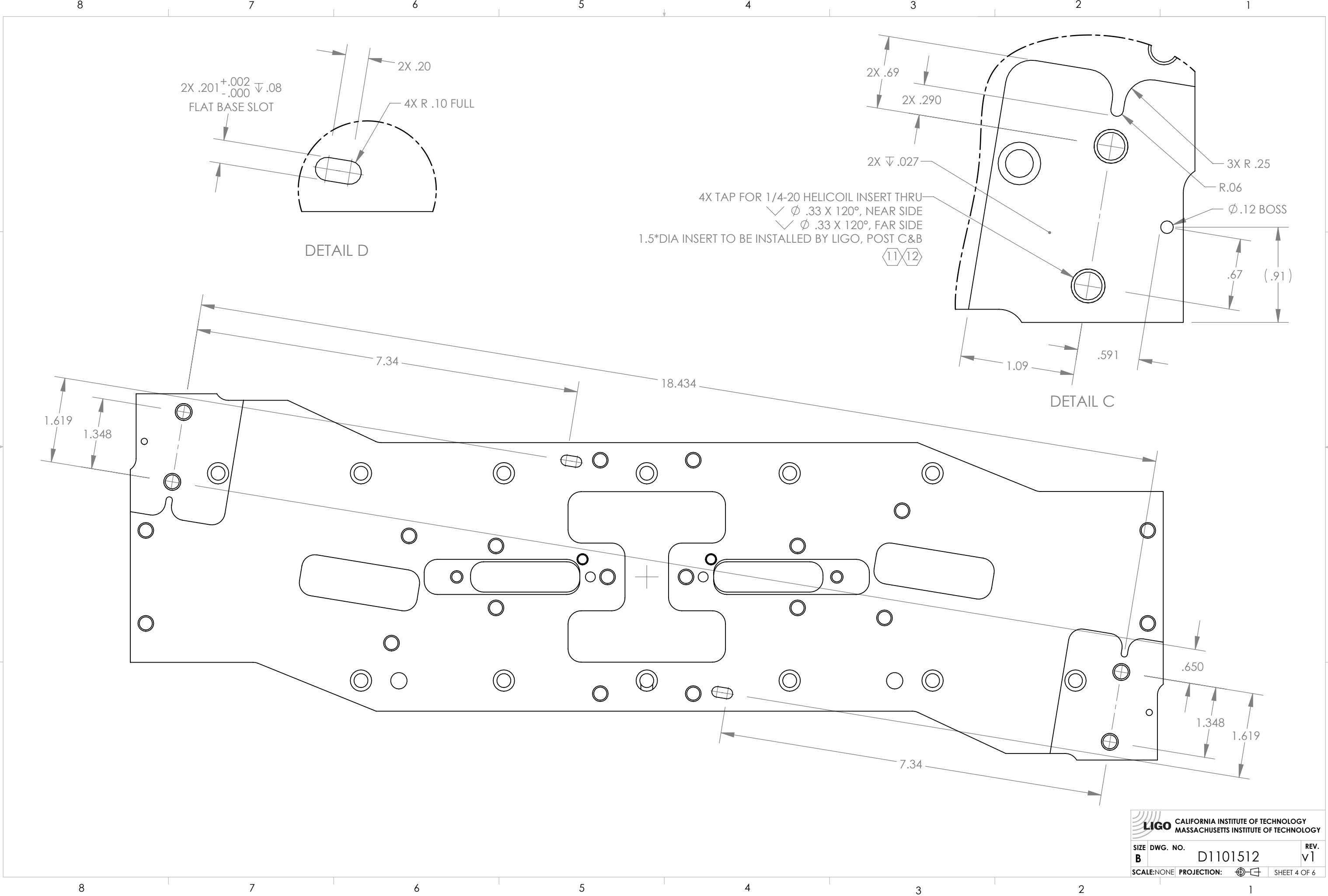
VIEW B-B

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101512	v1
SCALE: NONE		PROJECTION:
		SHEET 3 OF 6

8 7 6 5 4 3 2 1

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



2X .201 $\begin{matrix} +.002 \\ -.000 \end{matrix}$ ∇ .08
FLAT BASE SLOT

DETAIL D

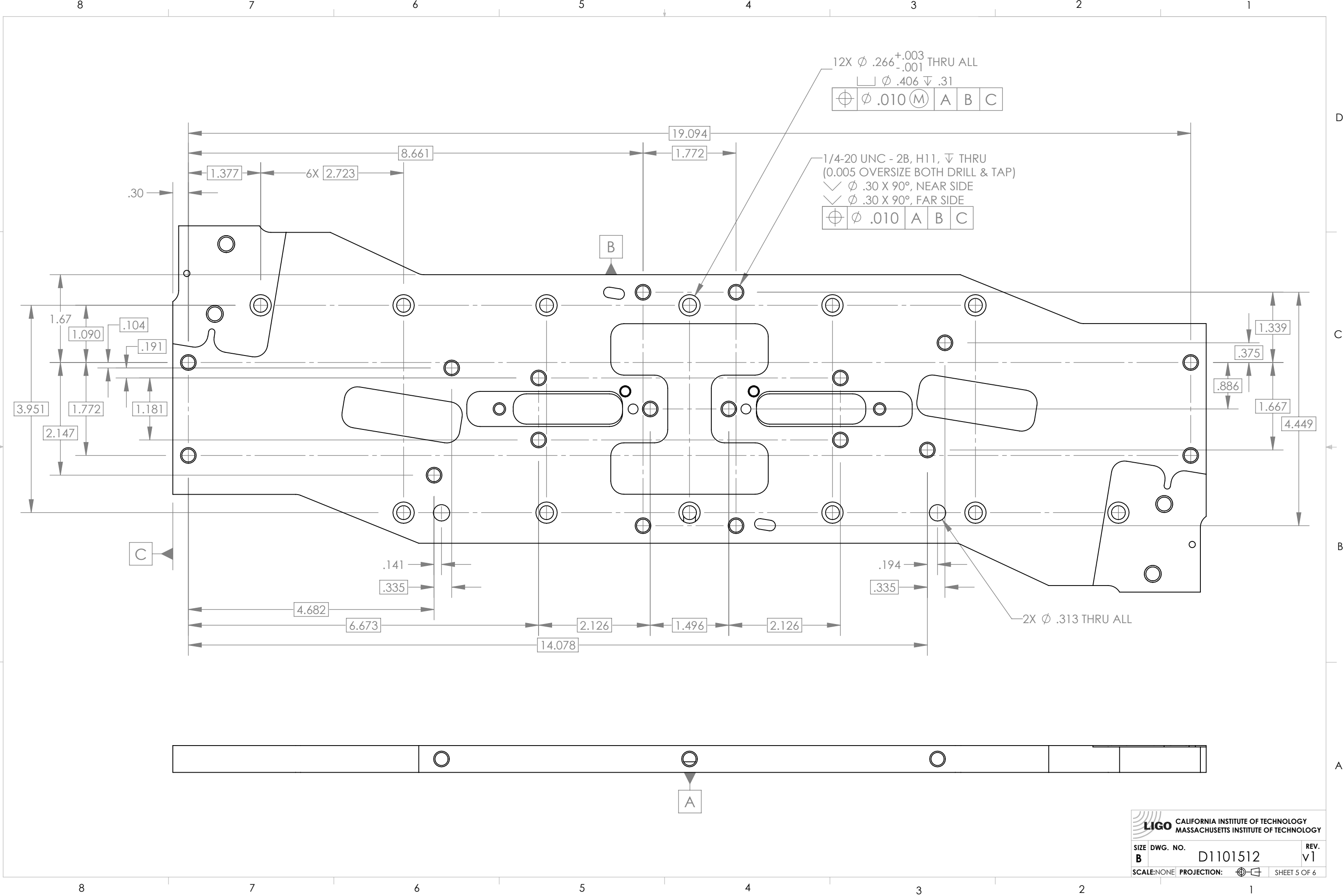
4X TAP FOR 1/4-20 HELICOIL INSERT THRU
 ∇ ϕ .33 X 120°, NEAR SIDE
 ∇ ϕ .33 X 120°, FAR SIDE
1.5*DIA INSERT TO BE INSTALLED BY LIGO, POST C&B
 ∇ 11X12

DETAIL C

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101512	v1
SCALE: NONE	PROJECTION:	SHEET 4 OF 6

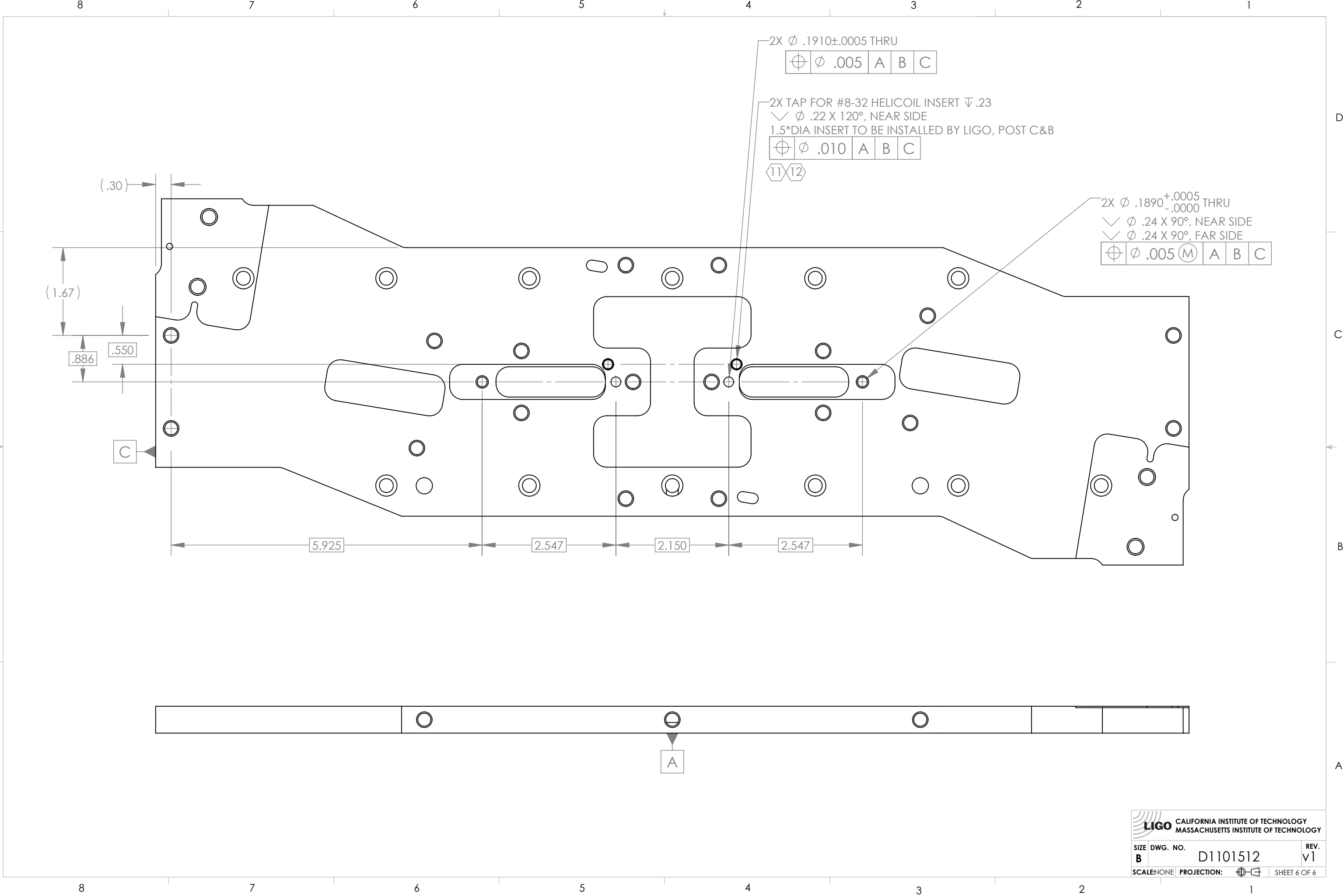
D1101512 LIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101512	v1
SCALE: NONE	PROJECTION:	SHEET 5 OF 6

D1101512 TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101512	v1
SCALE	PROJECTION:	SHEET 6 OF 6

8

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NOTES (CONTINUED):

5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 2.914 KG [6.425 LB].

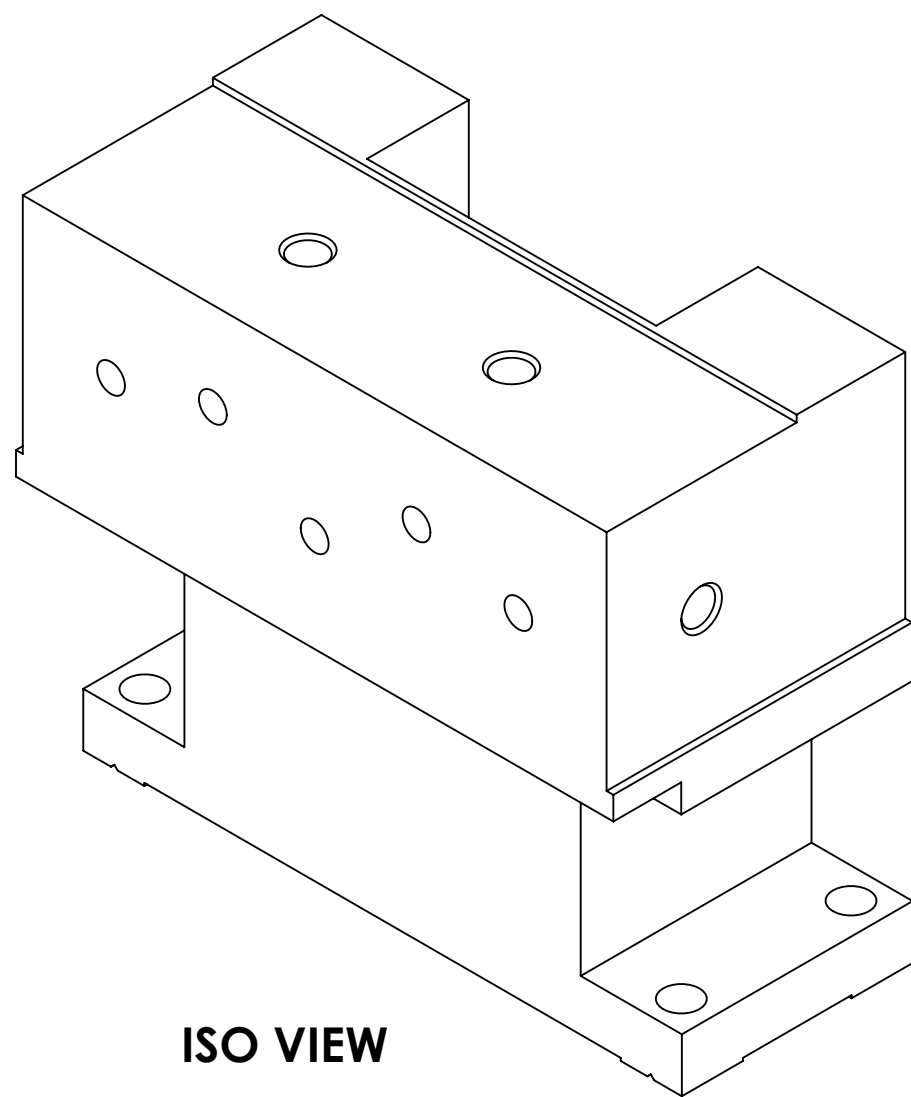
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

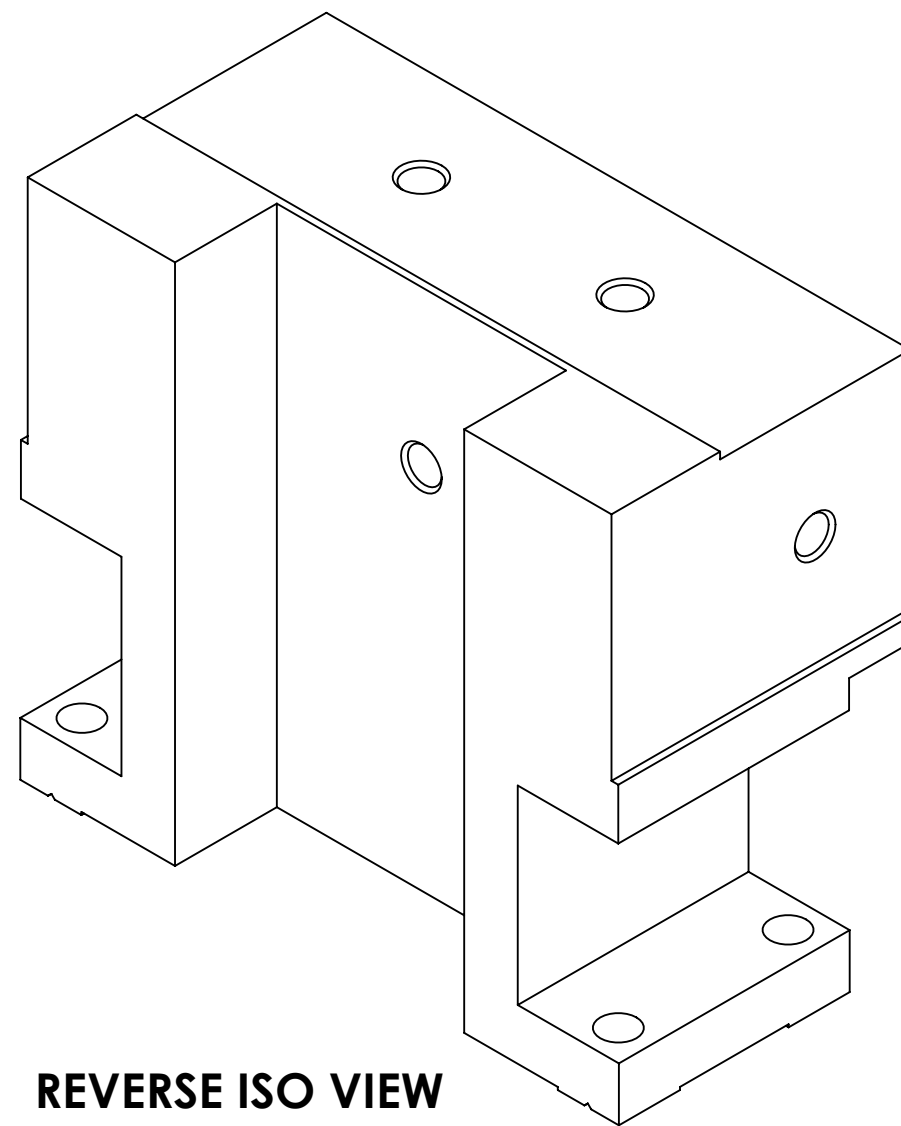
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10) ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	22 MAR 2012	E1101214	



ISO VIEW

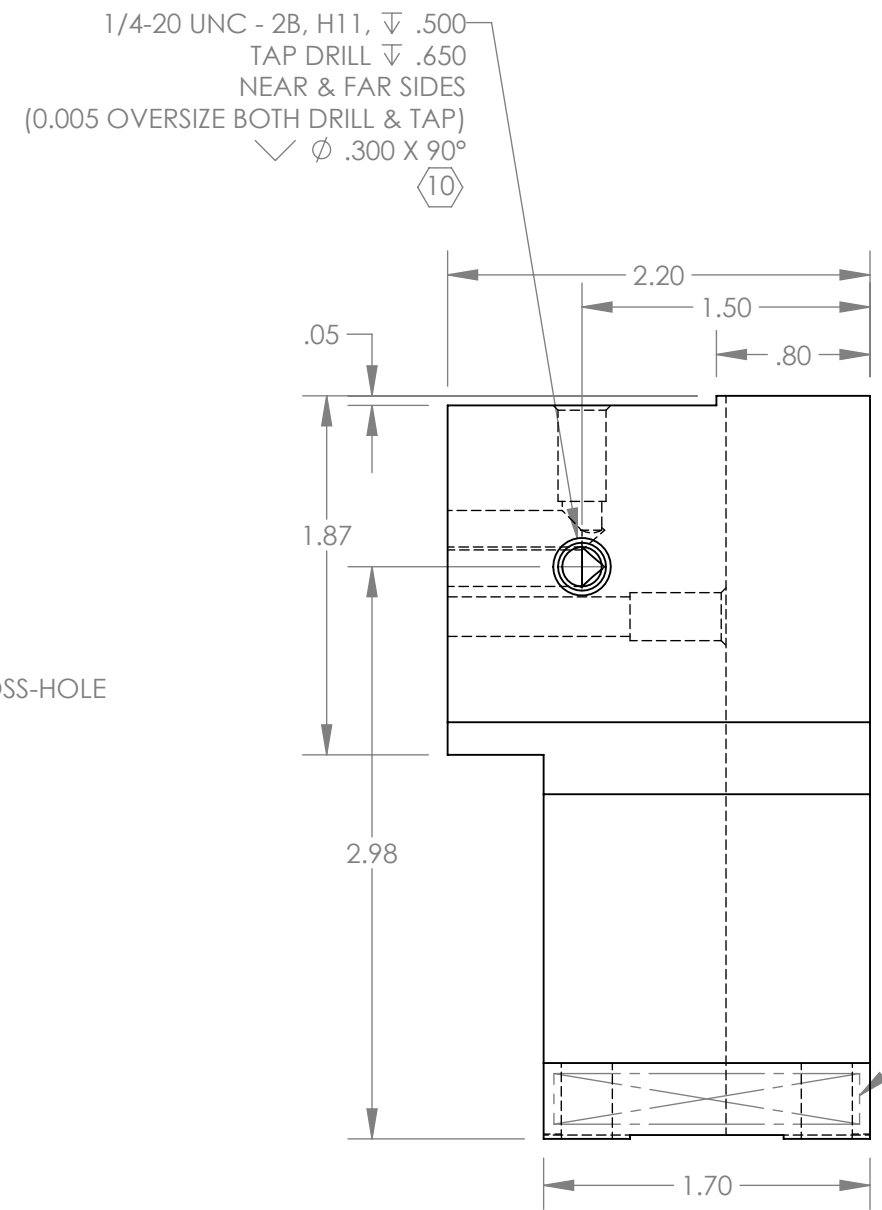
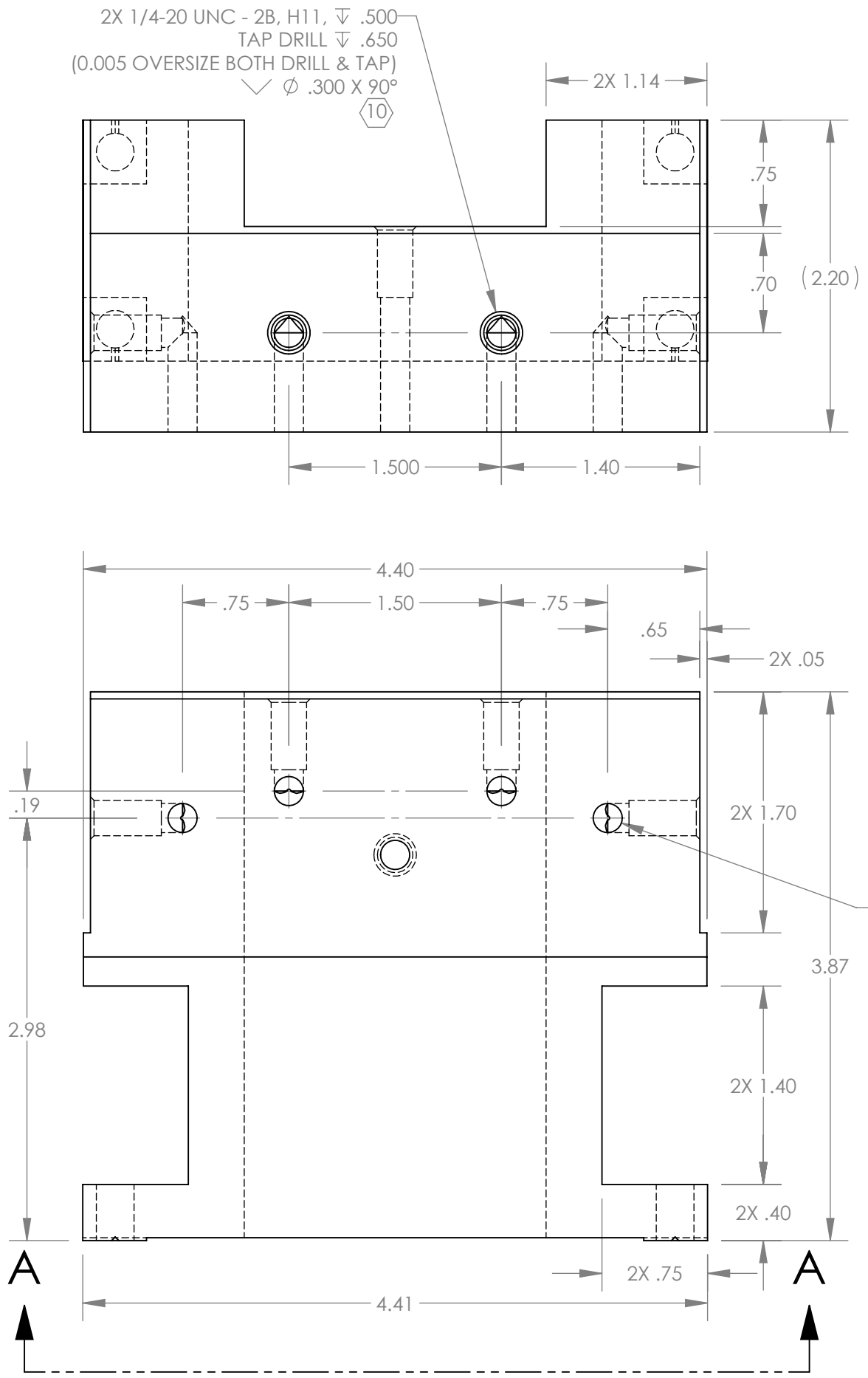


REVERSE ISO VIEW

D1101519 aLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS TOP ADD MASS TOWER	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER	K. MAILAND 28 JUL 2011
ANGULAR ± 0.1°				NEXT ASSY D1101526		DRAFTER	C. CONLEY 22 MAR 2012
MATERIAL 304 SSSL				FINISH 63 µinch Ra		CHECKER	SEE DCN
						APPROVAL	SEE DCN
						SIZE	DWG. NO. B D1101519
						REV.	v1
						SCALE	NONE PROJECTION: SHEET 1 OF 3

D1101519 dLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000



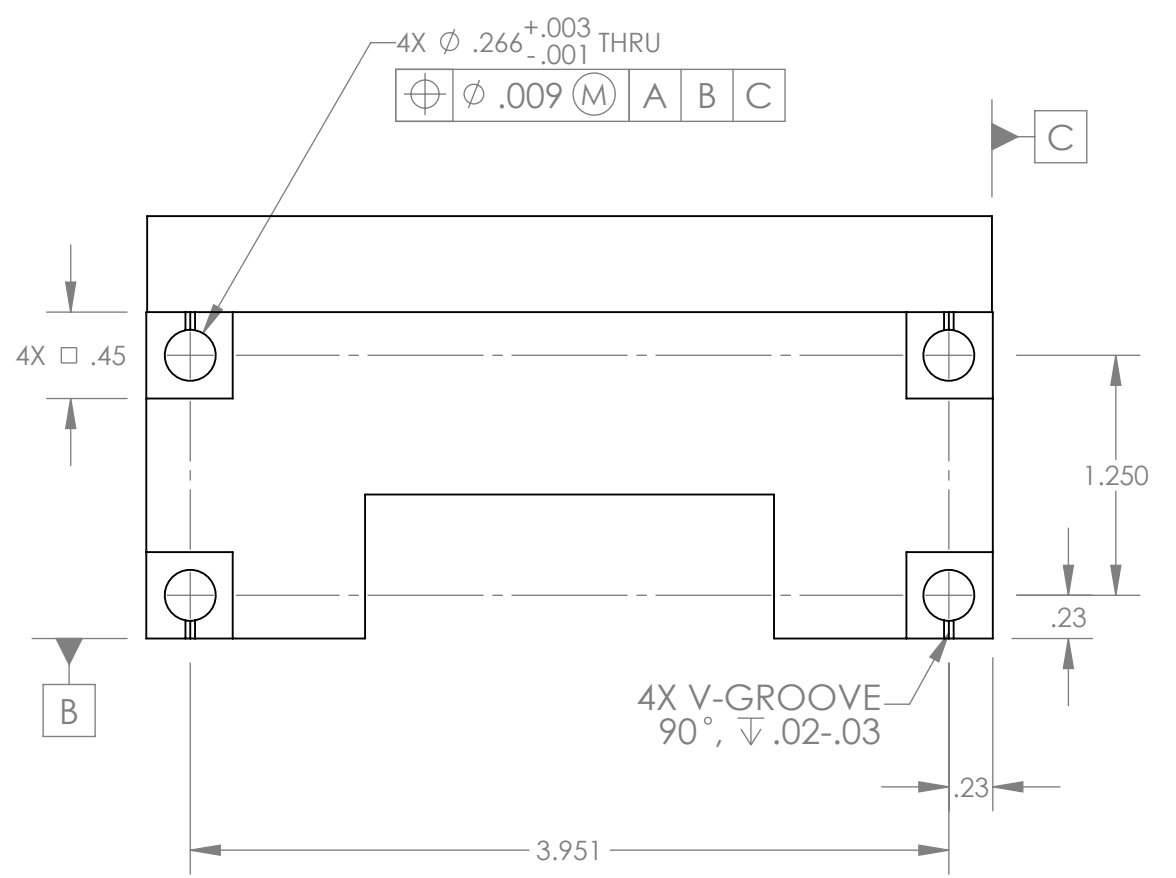
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101519	v1
SCALE: NONE		PROJECTION:
		SHEET 2 OF 3

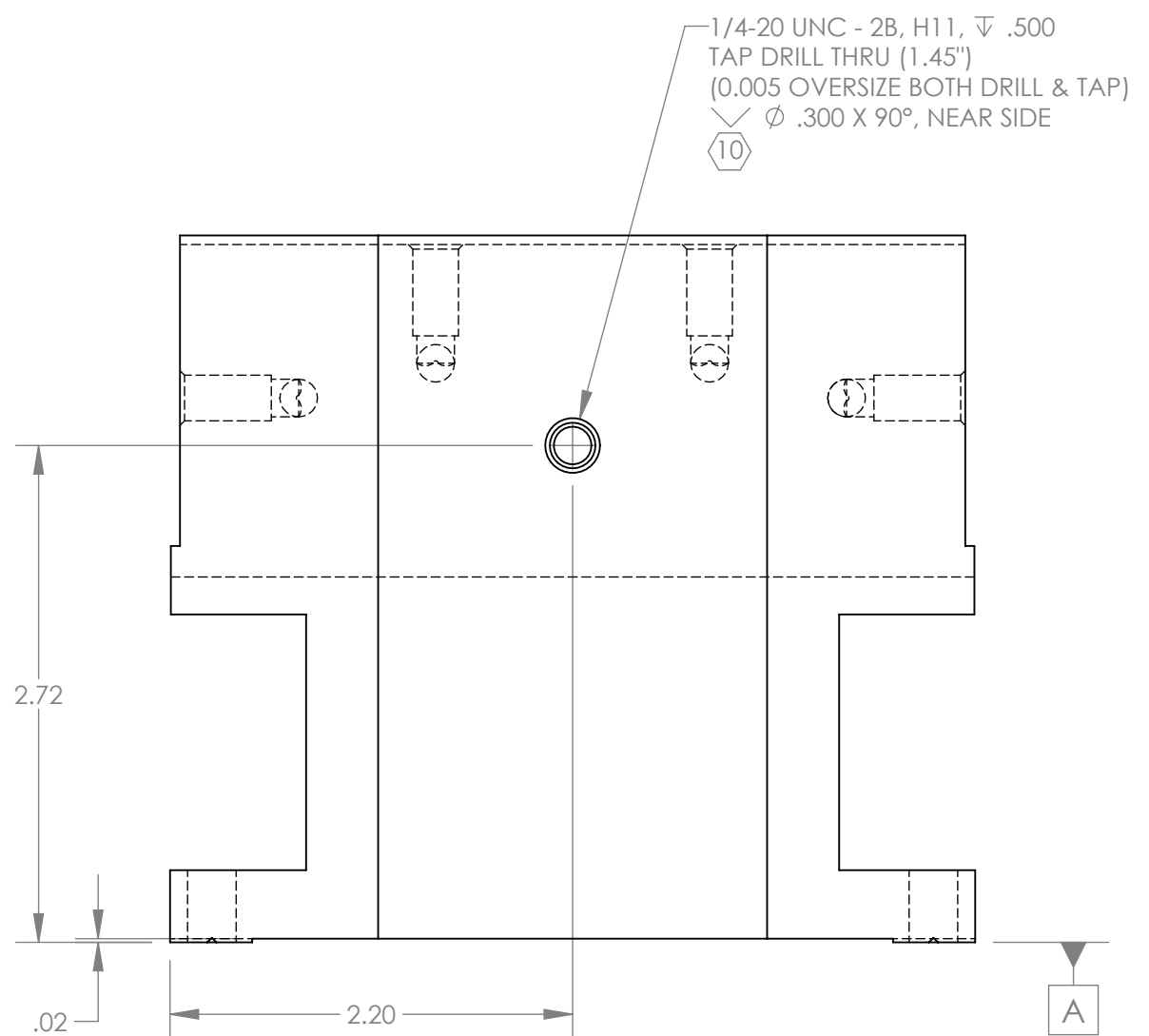
D1101519 dLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000

8 7 6 5 4 3 2 1

D
C
B
A



VIEW A-A



VIEW B-B

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101519	v1
SCALE: NONE		PROJECTION:
SHEET 3 OF 3		

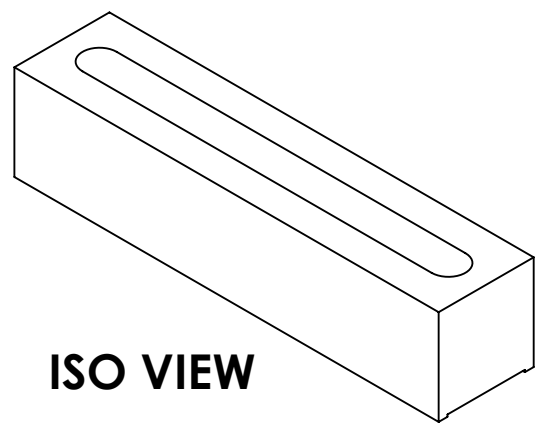
8 7 6 5 4 3 2 1

D
C
B
A

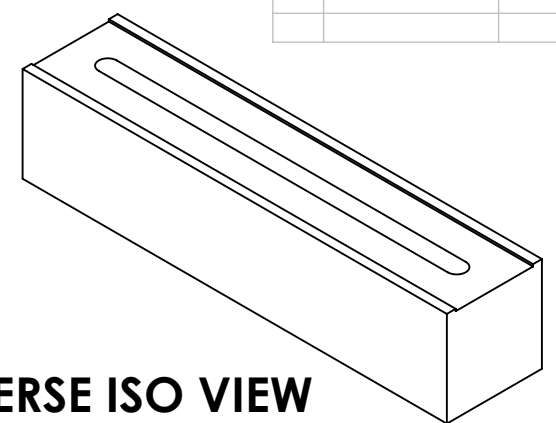
NOTES (CONTINUED):

- 5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS: 1.199 KG [2.643 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS. REFER TO LIGO-E0900364.

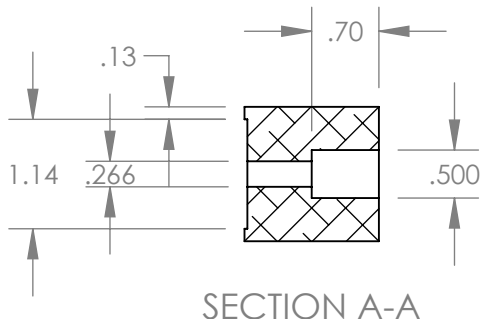
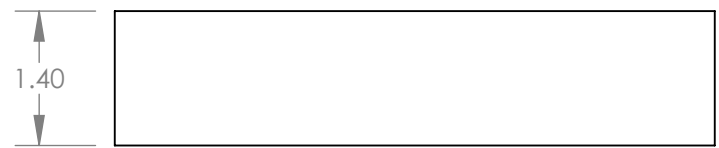
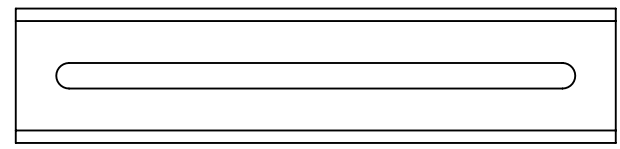
REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	



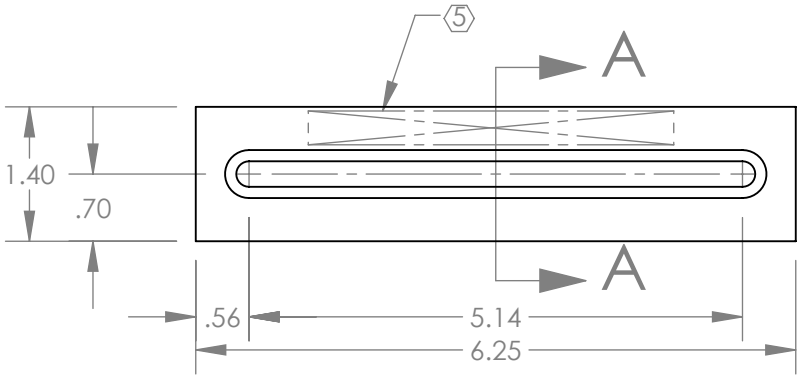
ISO VIEW



REVERSE ISO VIEW



SECTION A-A



D1101520 aLIGO TMS Upper Roll Trim Mass, PART PDM REV: X-012, DRAWING PDM REV: X-002

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		aLIGO TMS UPPER ROLL TRIM MASS	
MATERIAL 304 SSSL		FINISH 63 μinch Ra		SYSTEM ADVANCED LIGO SUB-SYSTEM AOS		DESIGNER K. MAILAND 28 JUL 2011	
NEXT ASSY D1101526		DRAFTER C. CONLEY 23 MAR 2012		CHECKER SEE DCN		SIZE DWG. NO. B D1101520	
		APPROVAL SEE DCN		SCALE: NONE PROJECTION:		REV. v1	
				SHEET 1 OF 1			

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NOTES (CONTINUED):

5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 8.269 KG [18.229 LB].

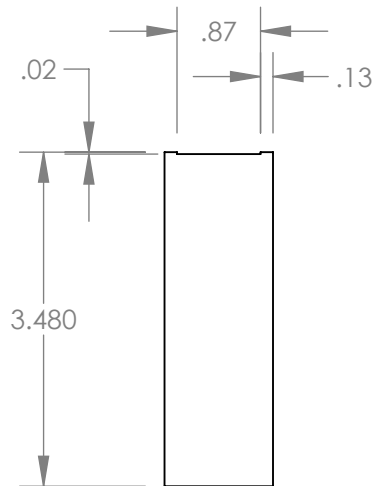
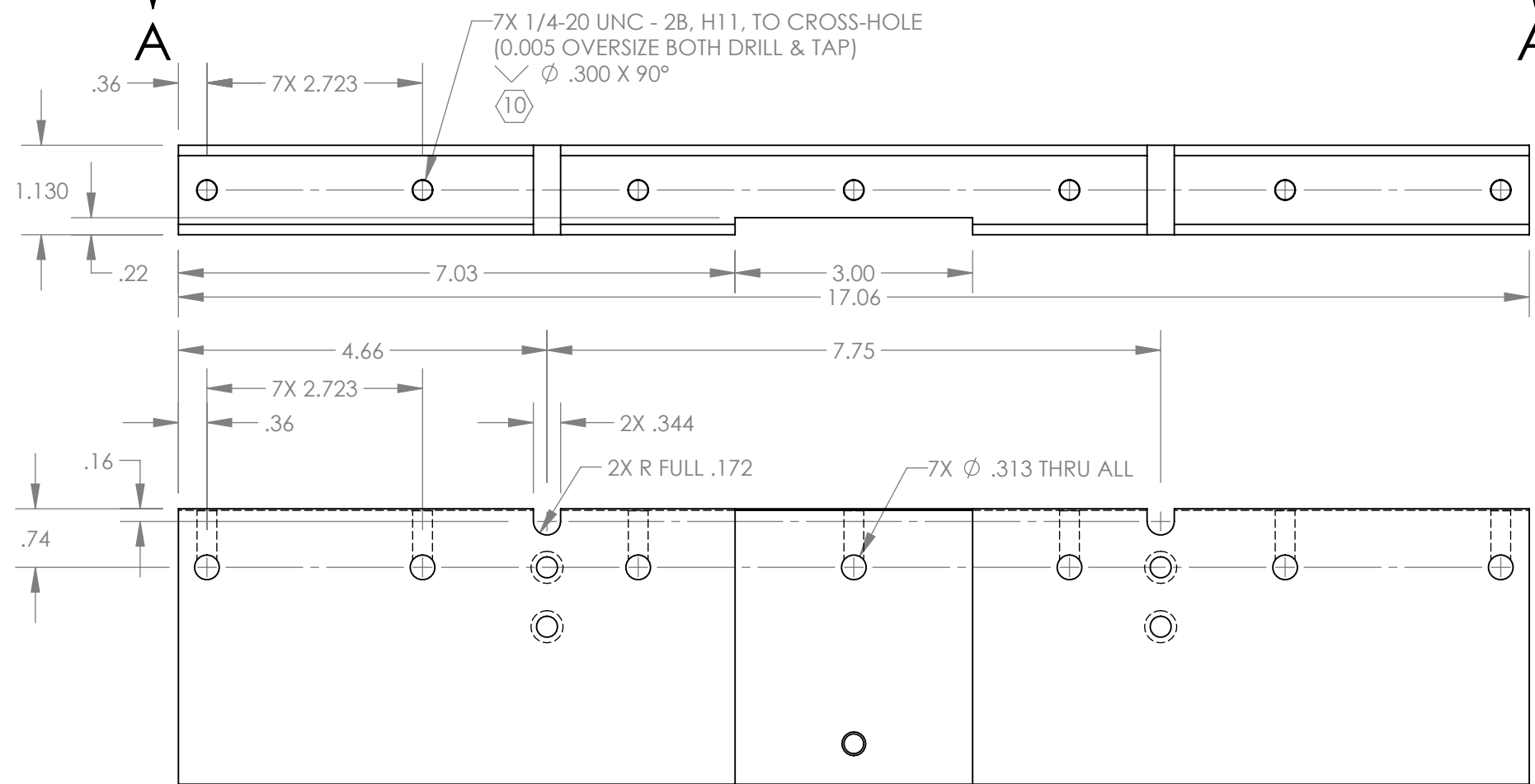
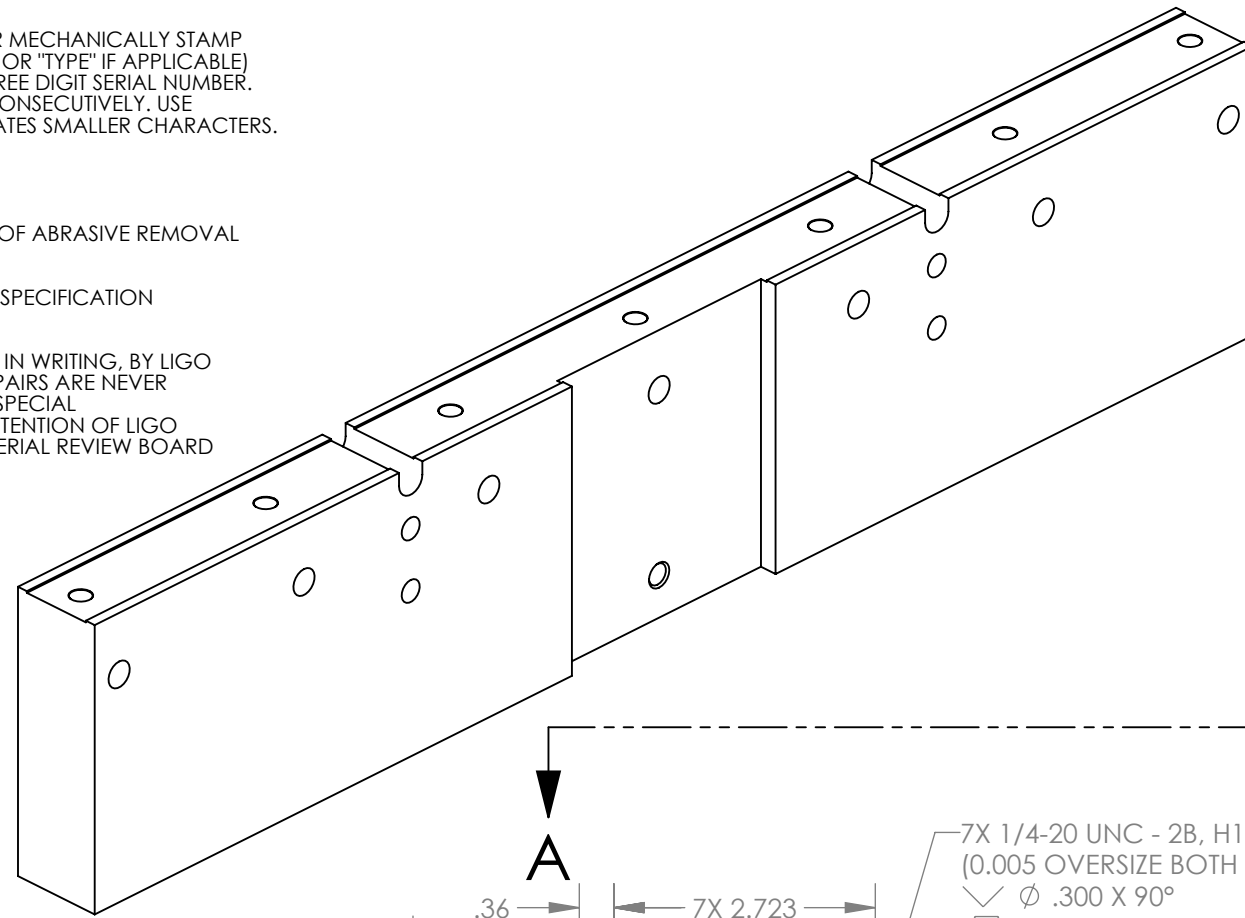
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10) ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .01
.XXX ± .005
ANGULAR ± 0.1°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.
MATERIAL 304 SSSL
FINISH 63 μ inch Ra

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SYSTEM ADVANCED LIGO SUB-SYSTEM AOS
NEXT ASSY D1101526

PART NAME α LIGO TMS TOP ADD MASS BAR
DESIGNER K. MAILAND 21 FEB 2012
DRAFTER C. CONLEY 23 MAR 2012
CHECKER SEE DCN
APPROVAL SEE DCN
SIZE DWG. NO. B D1200312
REV. v1
SCALE: NONE PROJECTION: SHEET 1 OF 2

D1200312 α LIGO TMS Top Add Mass Bar, PART PDM REV: X-026, DRAWING PDM REV: X-002

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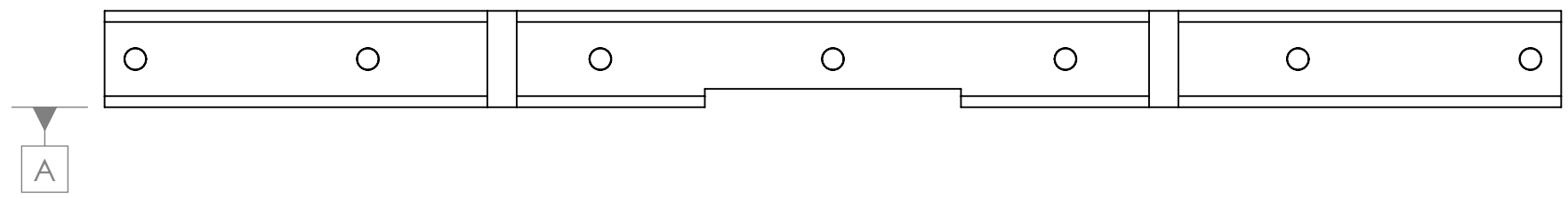
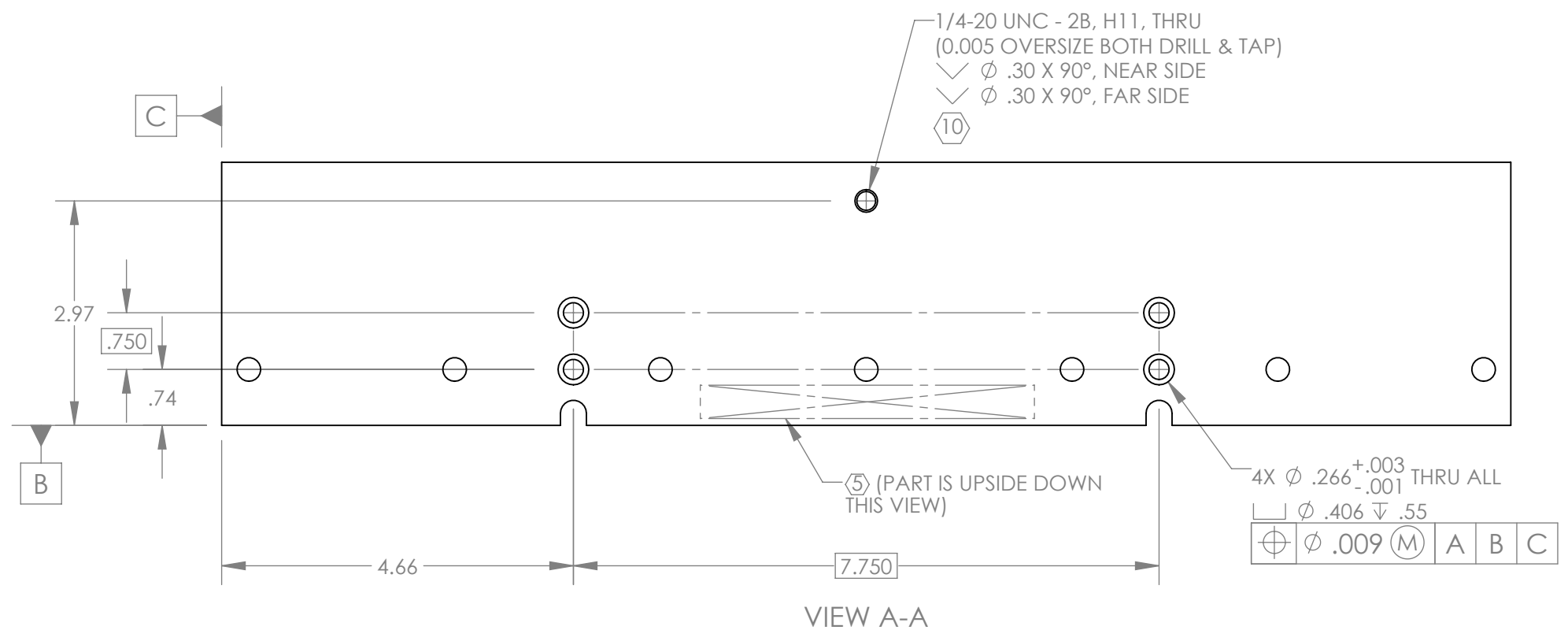
4

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D1200312 dLIGO TMS Top Add Mass Bar, PART PDM REV: X-026, DRAWING PDM REV: X-002



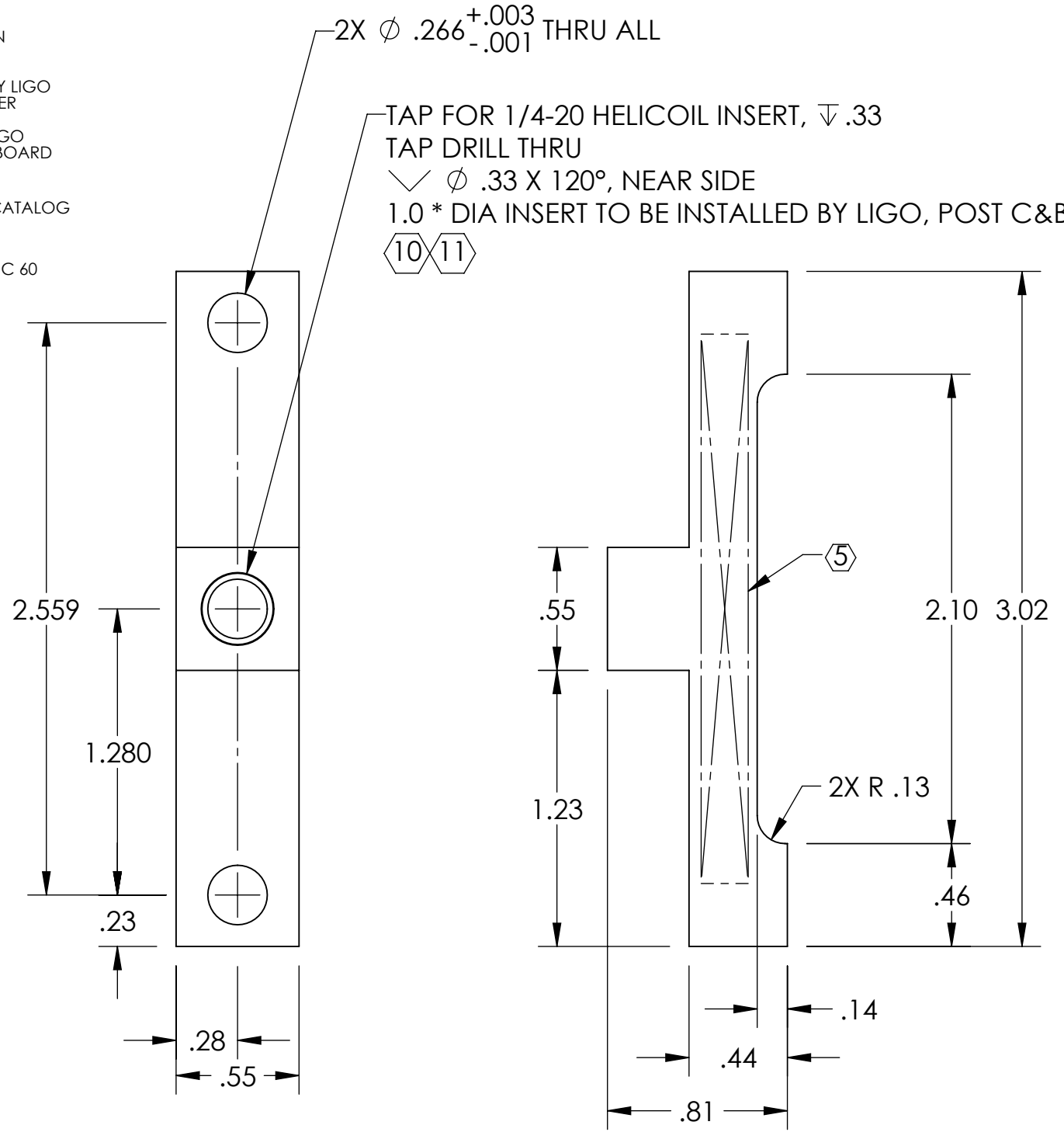
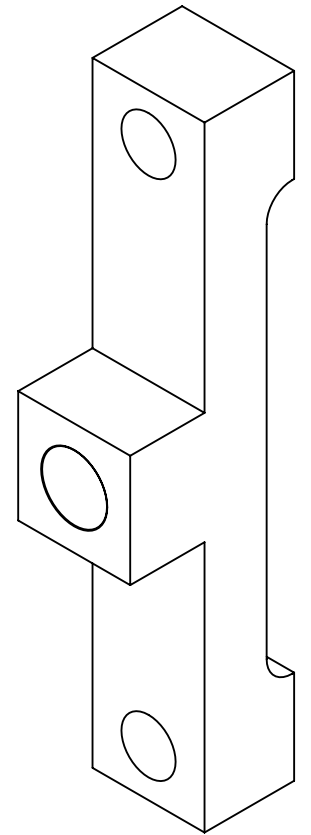
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1200312	v1
SCALE: NONE	PROJECTION:	SHEET 2 OF 2

NOTES CONTINUED:

- 5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS: 26.3 G [0.058 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
- 10. PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOIL.
- 11. INTERNAL NOTE: HELICOIL TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO SUS BOSEM FLAG BRACKET	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER	C. CONLEY
ANGULAR ± 1.0°				NEXT ASSY		DRAFTER	J. TERRAZAS
MATERIAL 6061-T6 Al				FINISH 63 μinch Ra		CHECKER	SEE DCN
				D1101527		APPROVAL	SEE DCN
						DESIGNER	C. CONLEY
						DRAFTER	J. TERRAZAS
						CHECKER	SEE DCN
						APPROVAL	SEE DCN
						DATE	28 FEB 2012
						DATE	23 MAR 2012
						SIZE	B
						DWG. NO.	D1200327
						REV.	v1
						SCALE	NONE
						PROJECTION	AS SHOWN
						SHEET 1 OF 1	

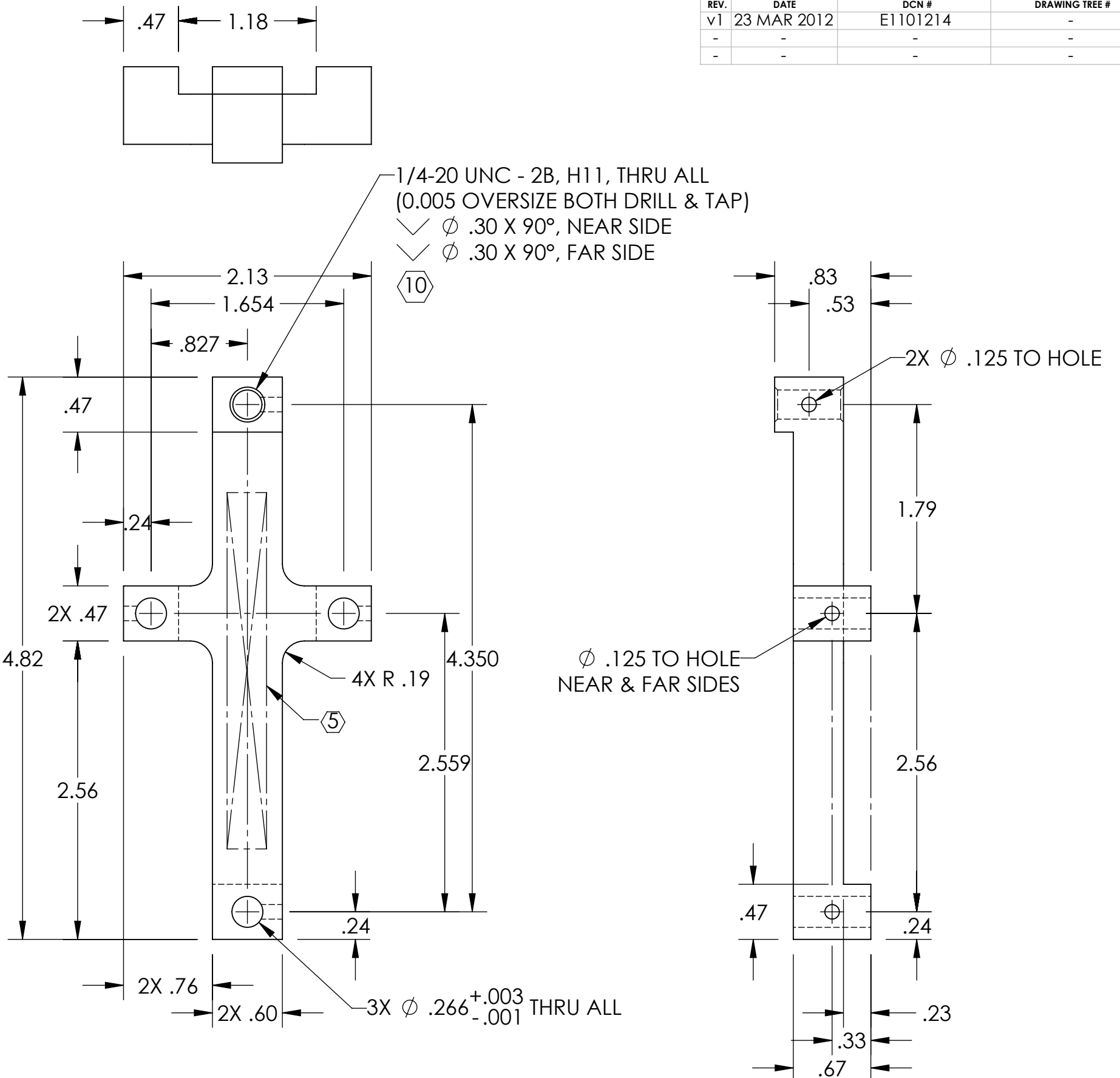
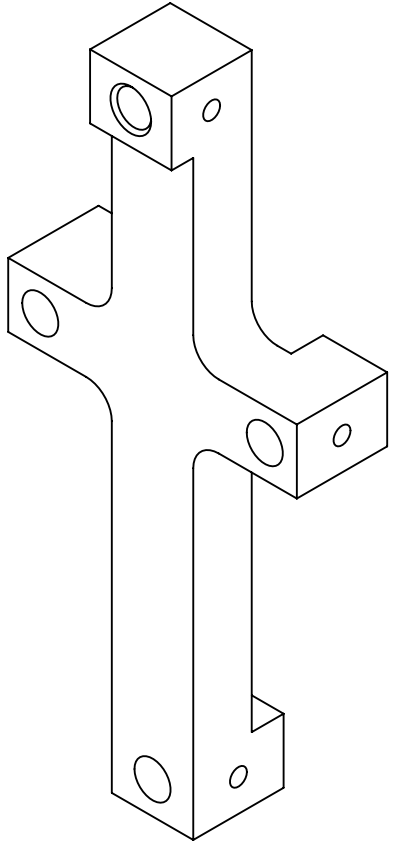
D1200327 aLIGO SUS BOSEM Flag Bracket, PART PDM REV: X-014, DRAWING PDM REV: X-003

NOTES CONTINUED:

- 5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS: 72.5 G [0.160 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				1. INTERPRET DRAWING PER ASME Y14.5-1994.		aLIGO SUS BOSEM FLAG CENTER BRACKET	
TOLERANCES: .XX ± .01 .XXX ± .005				2. REMOVE ALL SHARP EDGES, .005-.015.		SIZE DWG. NO.	
ANGULAR ± 1.0°				3. DO NOT SCALE FROM DRAWING.		B D1200328	
MATERIAL 6061-T6 Al				4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		REV. v1	
FINISH 63 μinch Ra				SYSTEM ADVANCED LIGO		SCALE: 1:1	
				SUB-SYSTEM AOS		PROJECTION:	
				NEXT ASSY D1101527		SHEET 1 OF 1	
				DESIGNER J. O'dell 28 FEB 2012			
				DRAFTER C. CONLEY 23 MAR 2012			
				CHECKER SEE DCN			
				APPROVAL SEE DCN			

D1200328 aLIGO SUS BOSEM Flag Center Bracket, PART PDM REV: X-014, DRAWING PDM REV: X-001

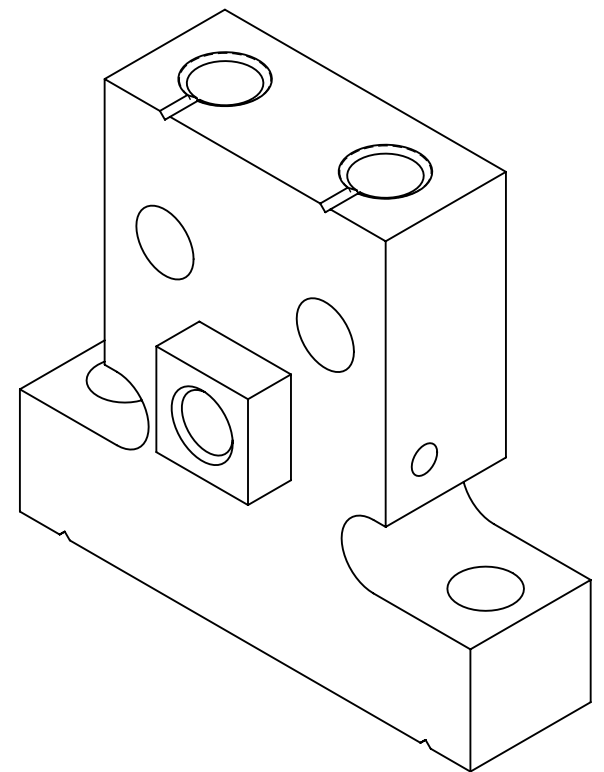
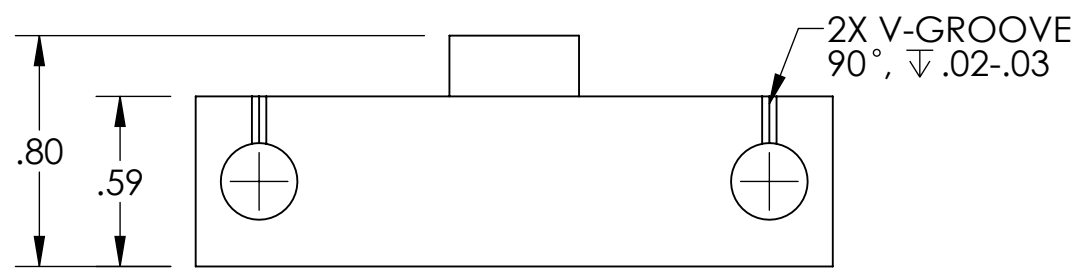
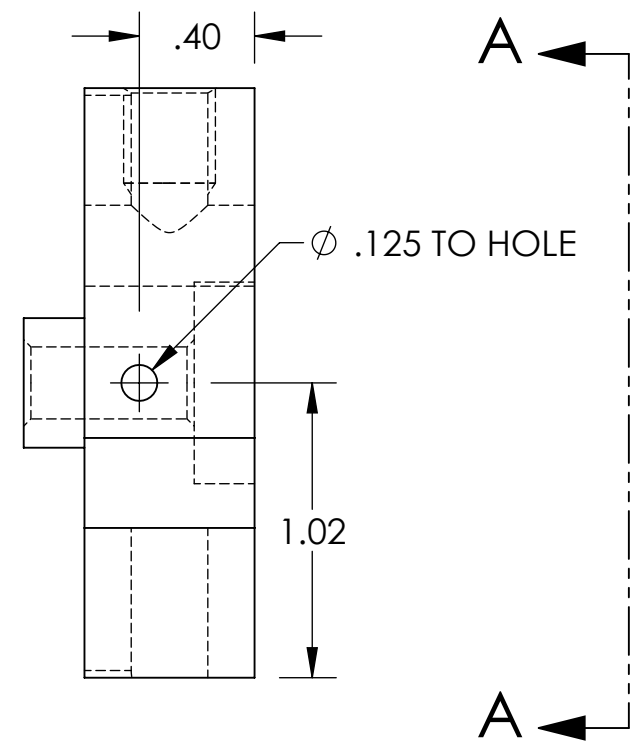
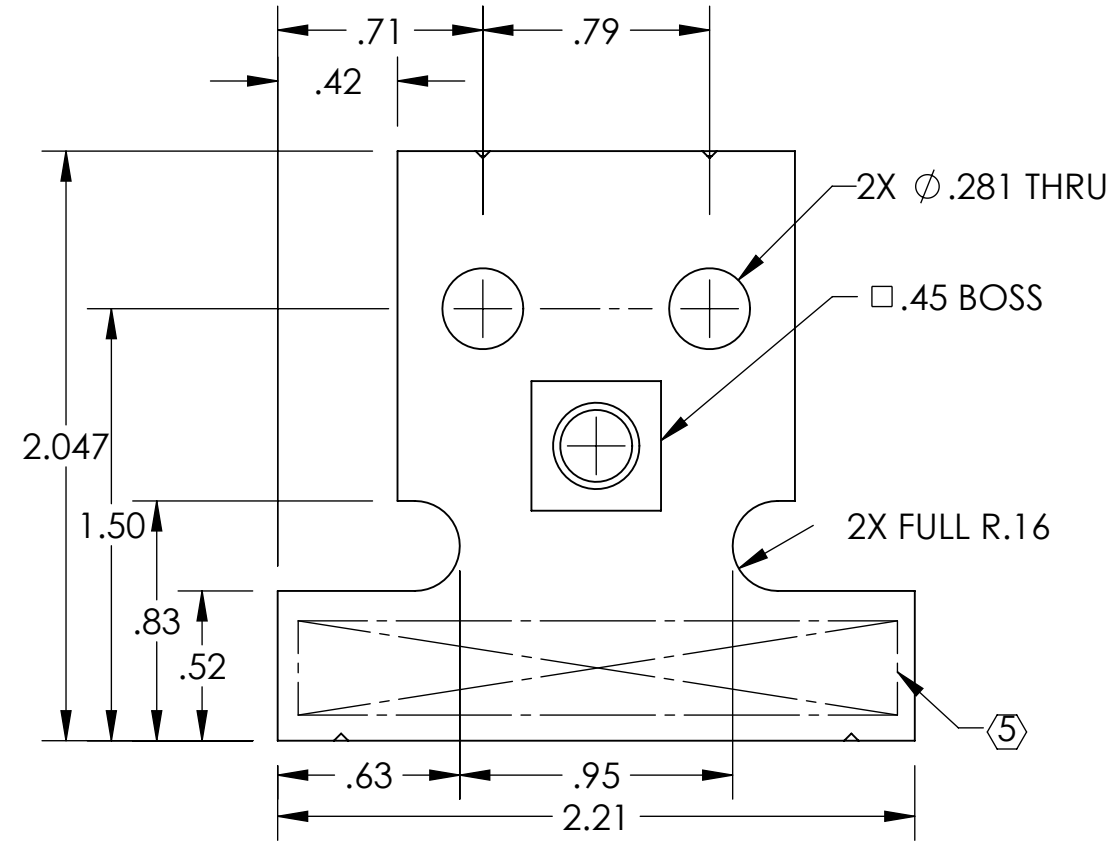
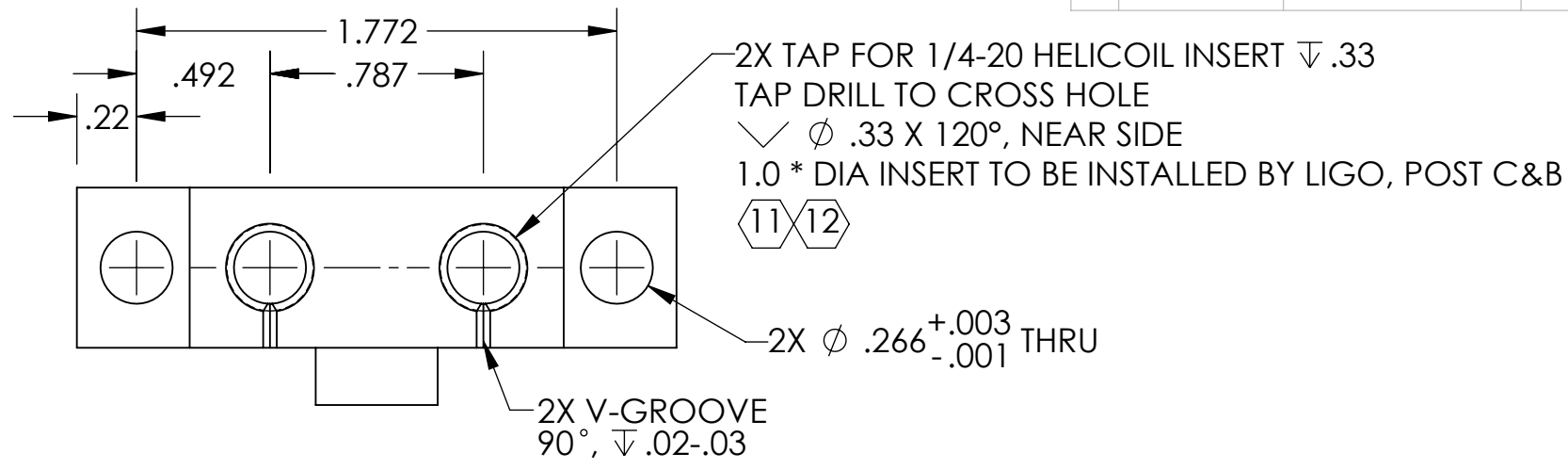
NOTES CONTINUED:

⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

- 6. MASS: 70.7 G [0.156 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

- ⑩ TAPPED HOLE (HELICOILS EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.
- ⑪ PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.
- ⑫ INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

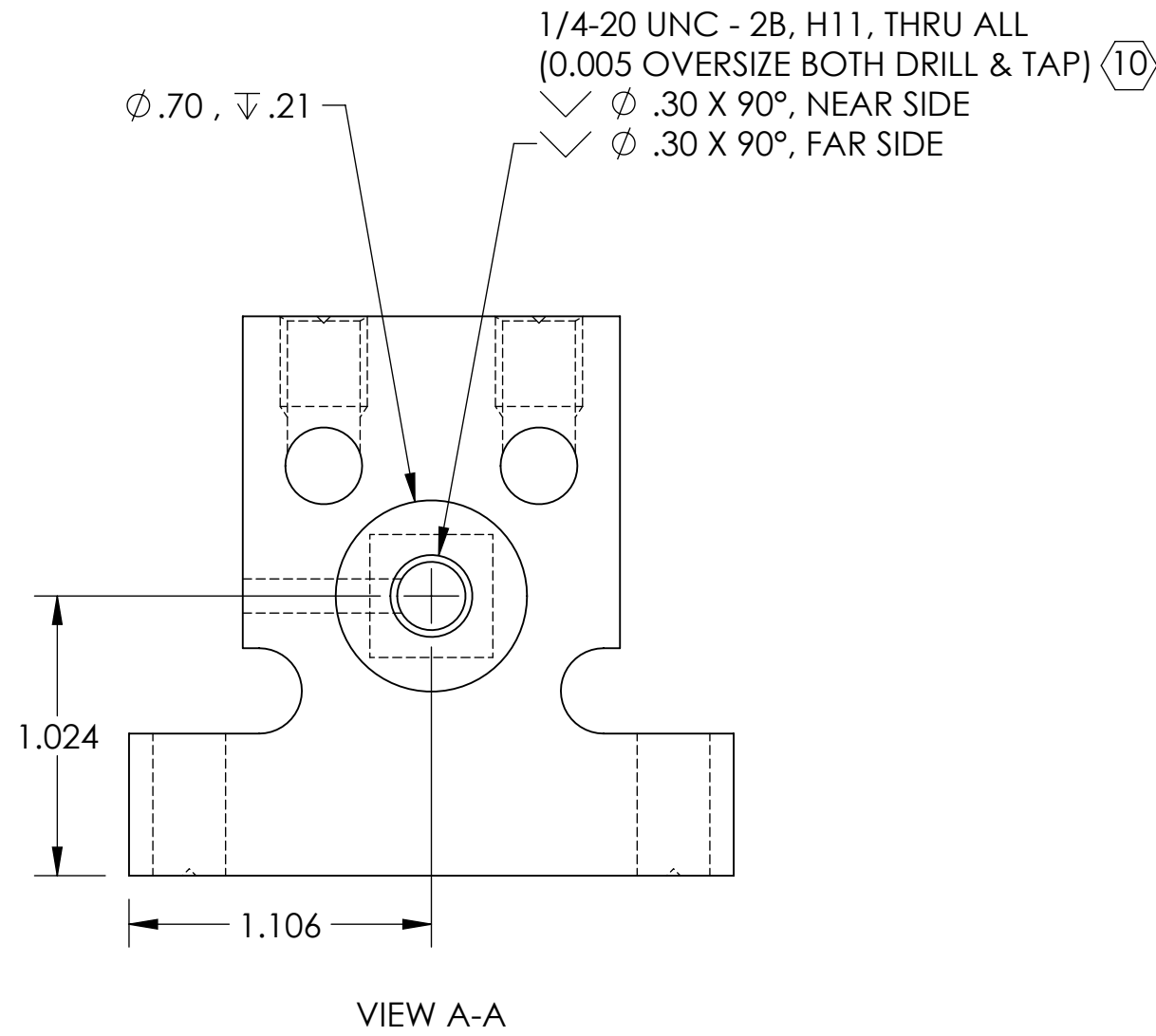
REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS MASS SPACER	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER C. CONLEY 29 FEB 2012	
ANGULAR ± 1.0°				NEXT ASSY D1101527		DRAFTER J. TERRAZAS 23 MAR 2012	
MATERIAL 6061-T6 Al				FINISH 63 μ inch Ra		CHECKER SEE DCN	
						APPROVAL SEE DCN	
						SIZE DWG. NO. B D1200356	
						REV. v1	
						SCALE: NONE PROJECTION: SHEET 1 OF 2	

D1200356 aLIGO TMS Mass Spacer, PART PDM REV: X-011, DRAWING PDM REV: X-003

D1200356 dLIGO TMS Mass Spacer, PART PDM REV: X-011, DRAWING PDM REV: X-003

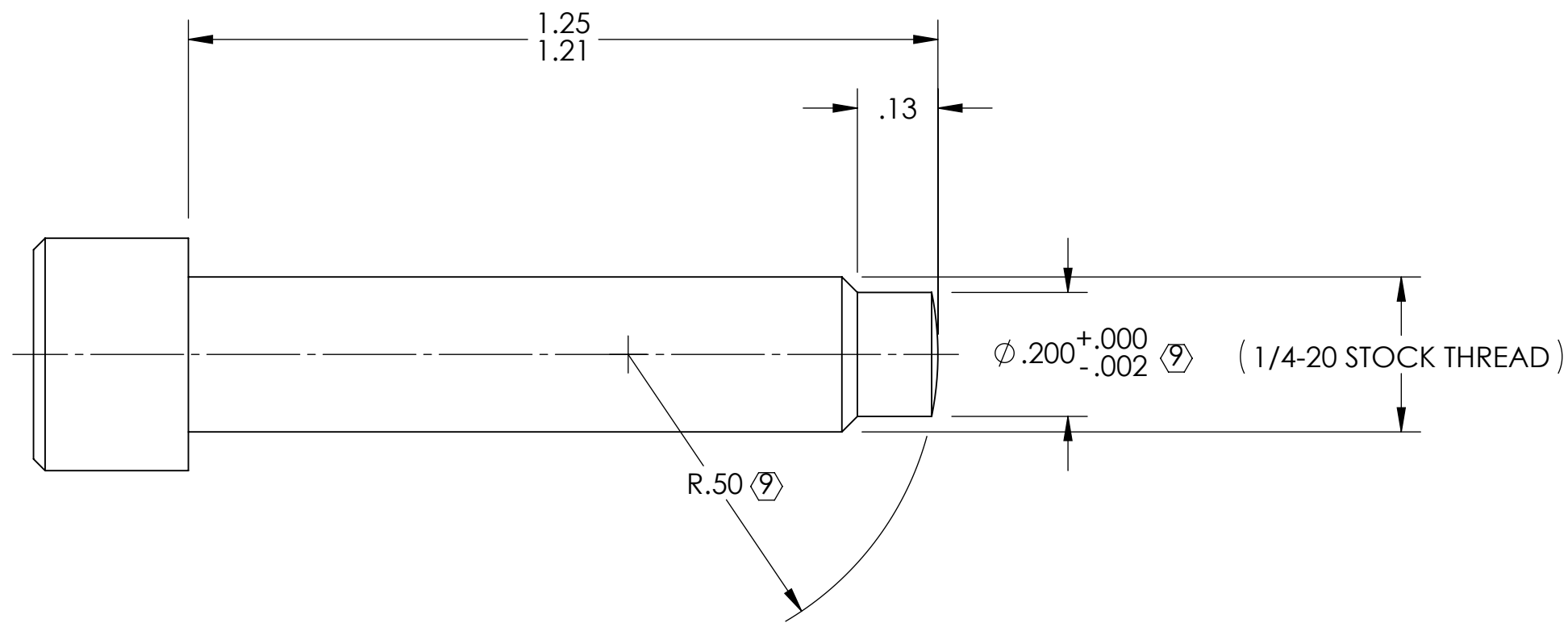
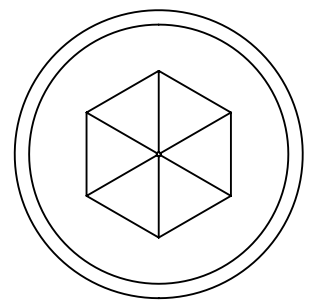
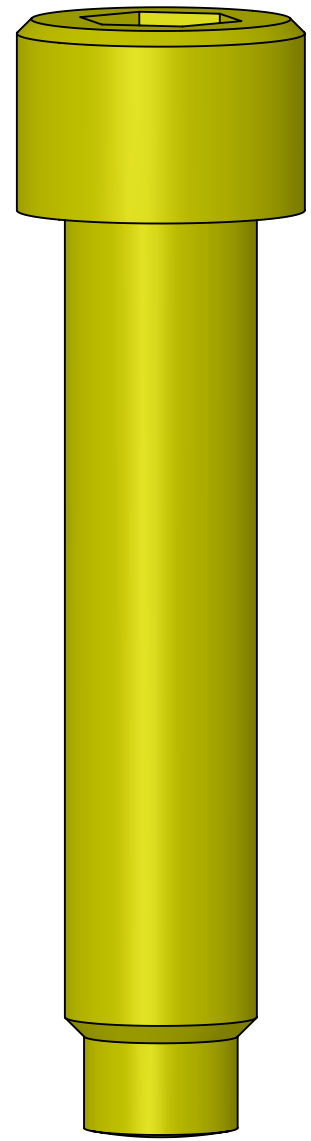


 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE	DWG. NO.	REV.
B	D1200356	v1
SCALE: NONE	PROJECTION:	SHEET 2 OF 2

8 7 6 5 4 3 2 1

- NOTES CONTINUED:**
- 5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXX-VY, QTY: X, LOT S/N 001.
 - 6. MASS: 0.023 LB [10.5 G].
 - 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - 8. MAKE FROM: McMASTER-CARR P/N 92200A544 OR EQUIVALENT PER MS16995. (SOCKET HEAD CAP SCREW, 1/4-20 UNC-3A FULLY THREADED, 300 SERIES STAINLESS STEEL)
 - 9. 63 μINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACES. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



D1200404 qLIGO TMS Lower Stage Spring Adjuster Screw, PART PDM REV: X-003, DRAWING PDM REV: X-004

D C B A

D C B A

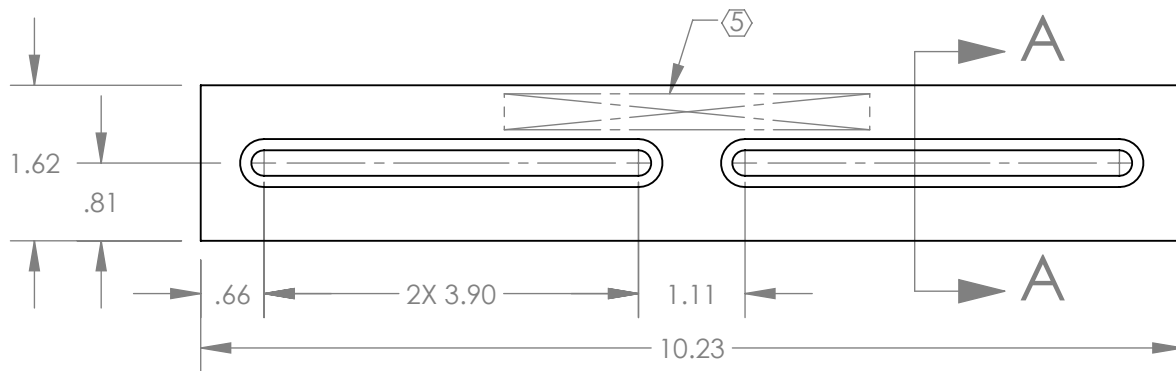
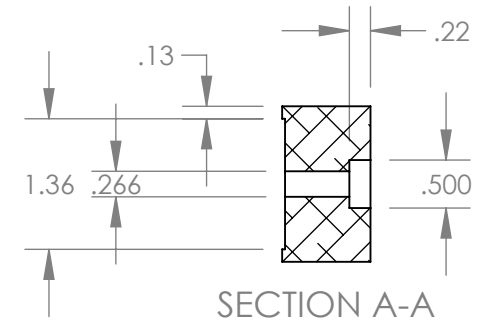
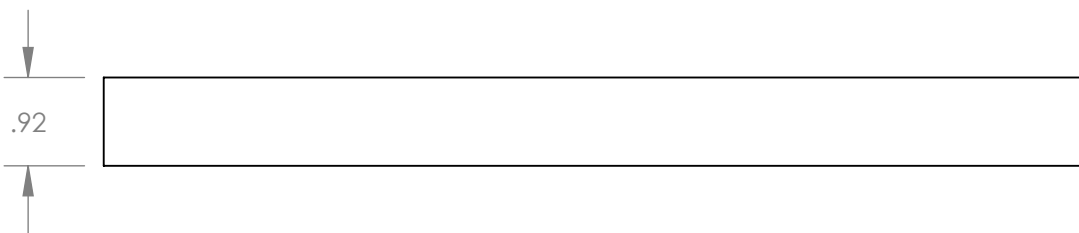
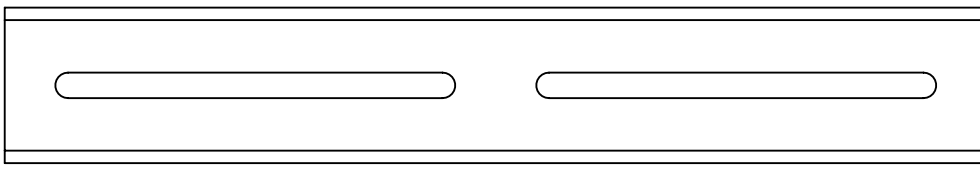
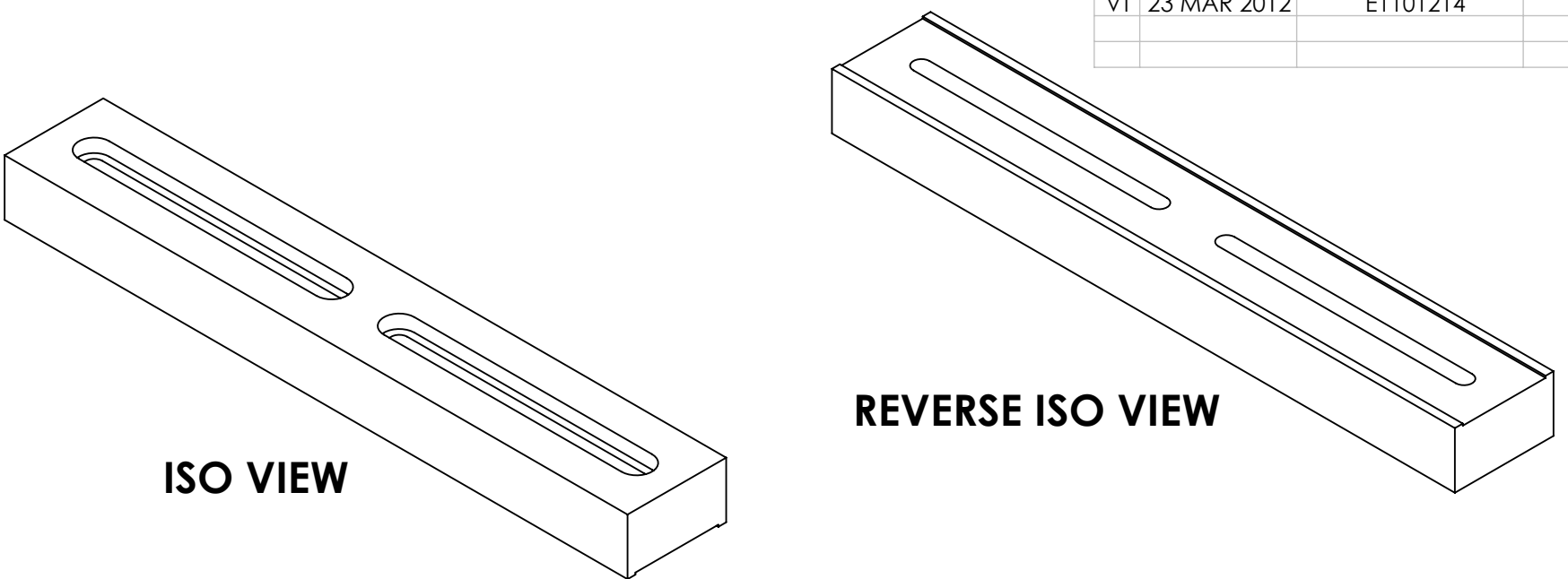
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		SYSTEM		SUB-SYSTEM	
TOLERANCES: .XX ± .01 .XXX ± .005		MATERIAL		ADVANCED LIGO		AOS	
ANGULAR ± 1.0°		FINISH		NEXT ASSY		DESIGNER	
		63 μinch Ra		D1101527		C. CONLEY 03 MAR 2012	
						DRAPER	
						C. CONLEY 20 MAR 2012	
						CHECKER	
						SEE DCN	
						APPROVAL	
						SEE DCN	
						SIZE DWG. NO.	
						B D1200404	
						REV.	
						v1	
						SCALE: NONE PROJECTION:	
						SHEET 1 OF 1	

8 7 6 5 4 3 2 1

NOTES (CONTINUED):

- 5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS: 1.628 KG [3.590 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	



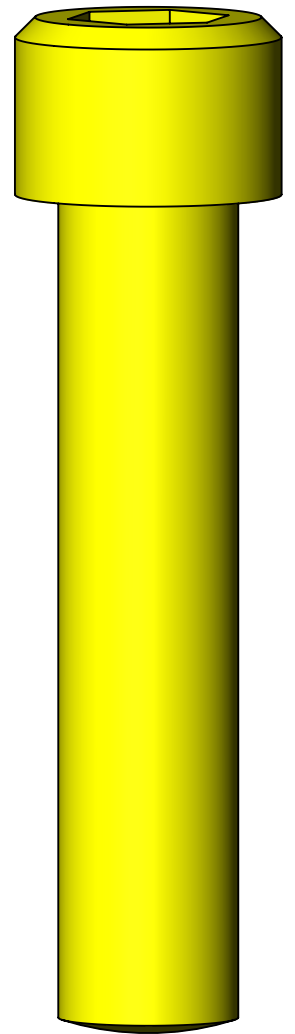
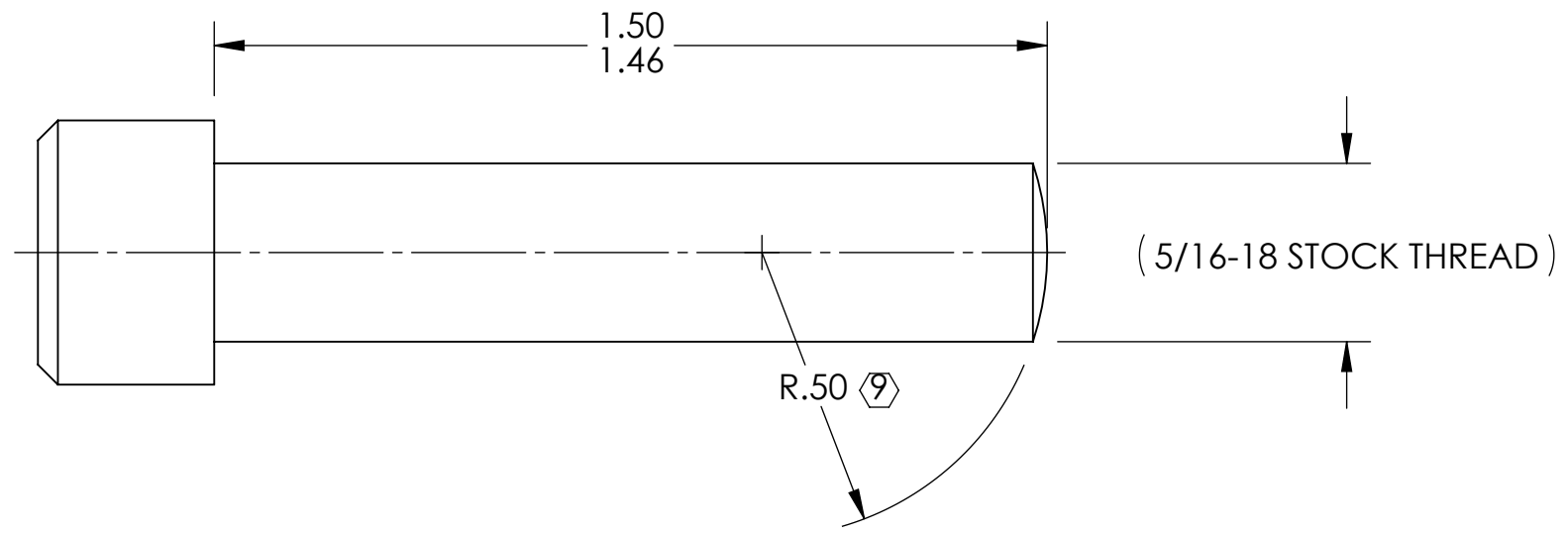
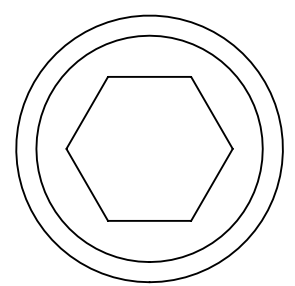
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		αLIGO TMS UPPER PITCH TRIM MASS	
MATERIAL		FINISH		NEXT ASSY		DESIGNER	
304 SSSL		63 μinch Ra		D1101526		K. MAILAND 07 MAR 2012	
						DRAPER	
						C. CONLEY 23 MAR 2012	
						CHECKER	
						SEE DCN	
						APPROVAL	
						SEE DCN	
				SYSTEM		SUB-SYSTEM	
				ADVANCED LIGO		AOS	
				SIZE		DWG. NO.	
				B		D1200405	
				REV.		v1	
				SCALE: NONE		PROJECTION:	
						SHEET 1 OF 1	

D1200405 αLIGO TMS Upper Pitch Trim Mass, PART PDM REV: X-007, DRAWING PDM REV: X-003

8 7 6 5 4 3 2 1

- NOTES CONTINUED:**
- 5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXX-VY, QTY: X, LOT S/N 001.
 - 6. MASS: 20 G [0.044 LB]
 - 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
 - 8. MAKE FROM: MCMASTER-CARR P/N 92200A634 OR EQUIVALENT PER MS16995.
(SOCKET HEAD CAP SCREW, 5/16-18 UNC-3A FULLY THREADED, 300 SERIES STAINLESS STEEL)
 - 9. 63 μINCH R_a FINISH APPLIES ONLY TO MACHINED SURFACE. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



D1200406 aLIGO TMS Spring Stop Screw, PART PDM REV: X-002, DRAWING PDM REV: X-004

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES		1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		ADVANCED LIGO		aLIGO TMS SPRING STOP SCREW	
TOLERANCES: .XX ± .01 .XXX ± .005		MATERIAL 8		SUB-SYSTEM AOS		DESIGNER C. CONLEY 07 MAR 2012	
ANGULAR ± 1.0°		FINISH 63 μinch Ra 9		NEXT ASSY D1101527		DRAFTER M. MILLER 20 MAR 2012	
						CHECKER SEE DCN	
						APPROVAL SEE DCN	
						SIZE DWG. NO. B D1200406	
						REV. v1	
						SCALE: NONE PROJECTION: SHEET 1 OF 1	

8 7 6 5 4 3 2 1

8

7

6

5

4

3

2

1

NOTES (CONTINUED):

5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 21.5 G [0.047 LB].

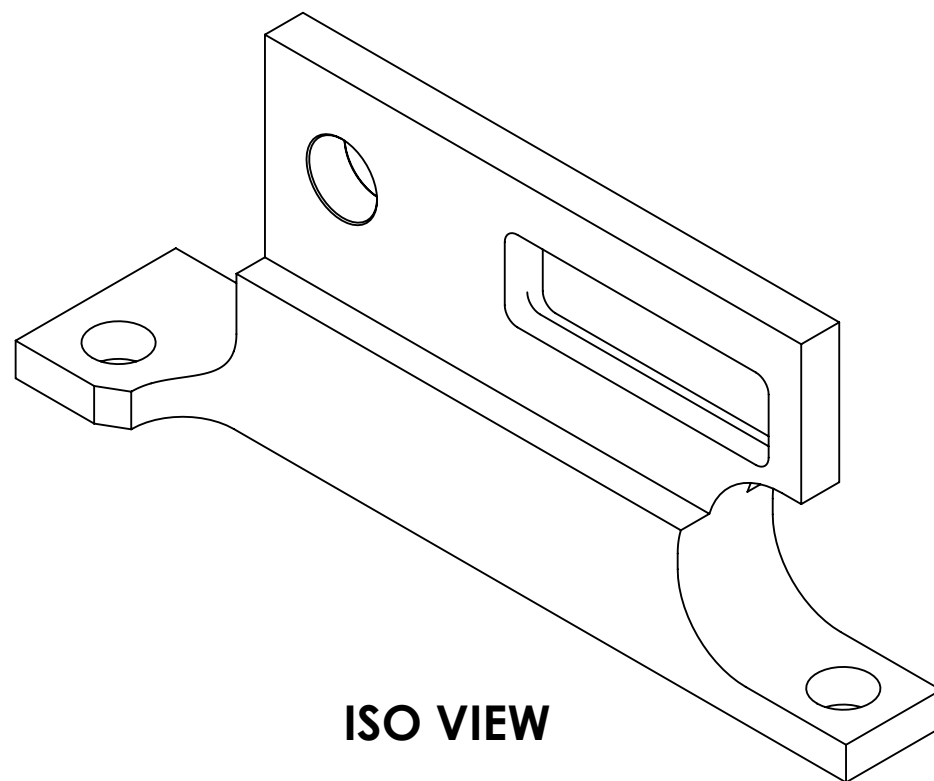
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

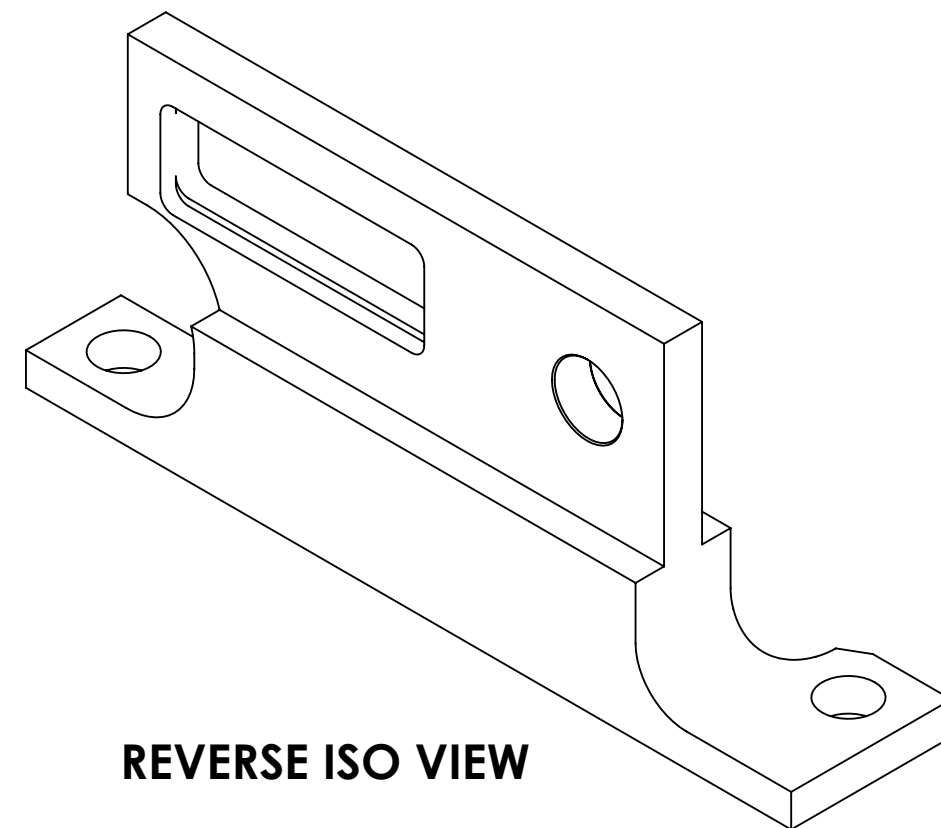
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10) TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



ISO VIEW



REVERSE ISO VIEW

D1200420 aLIGO TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS MASS CABLE CLAMP BRACKET	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER C. CONLEY	08 MAR 2012
ANGULAR ± 1.0°				NEXT ASSY D1200421		DRAFTER C. CONLEY	23 MAR 2012
MATERIAL 6061-T6 Al				FINISH 63 µinch Ra		CHECKER SEE DCN	SIZE DWG. NO. B D1200420
						APPROVAL SEE DCN	REV. v1
						SCALE: NONE PROJECTION: SHEET 1 OF 3	

8

7

6

5

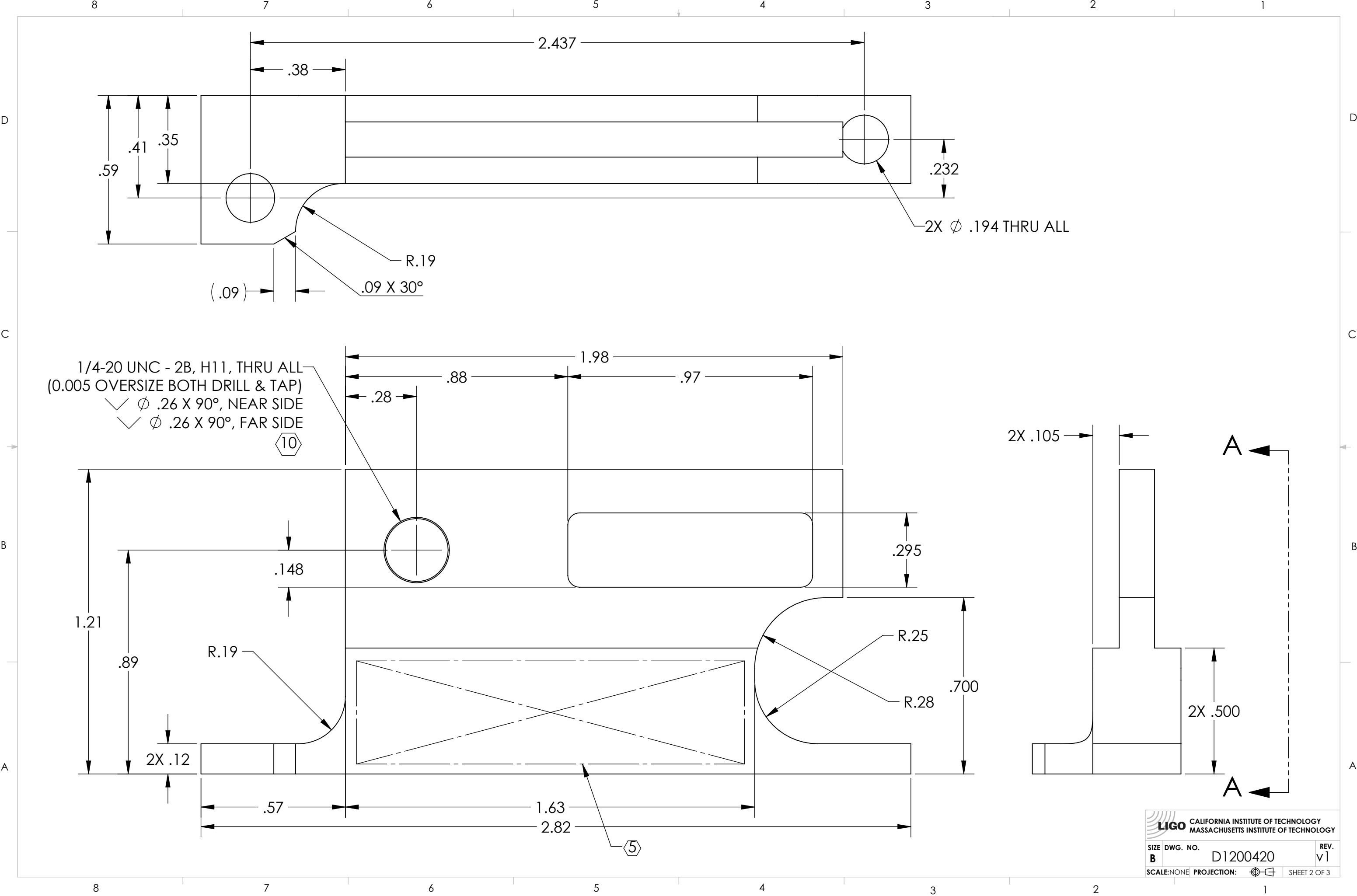
4

3

2

1

D1200420 aLIGO TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008



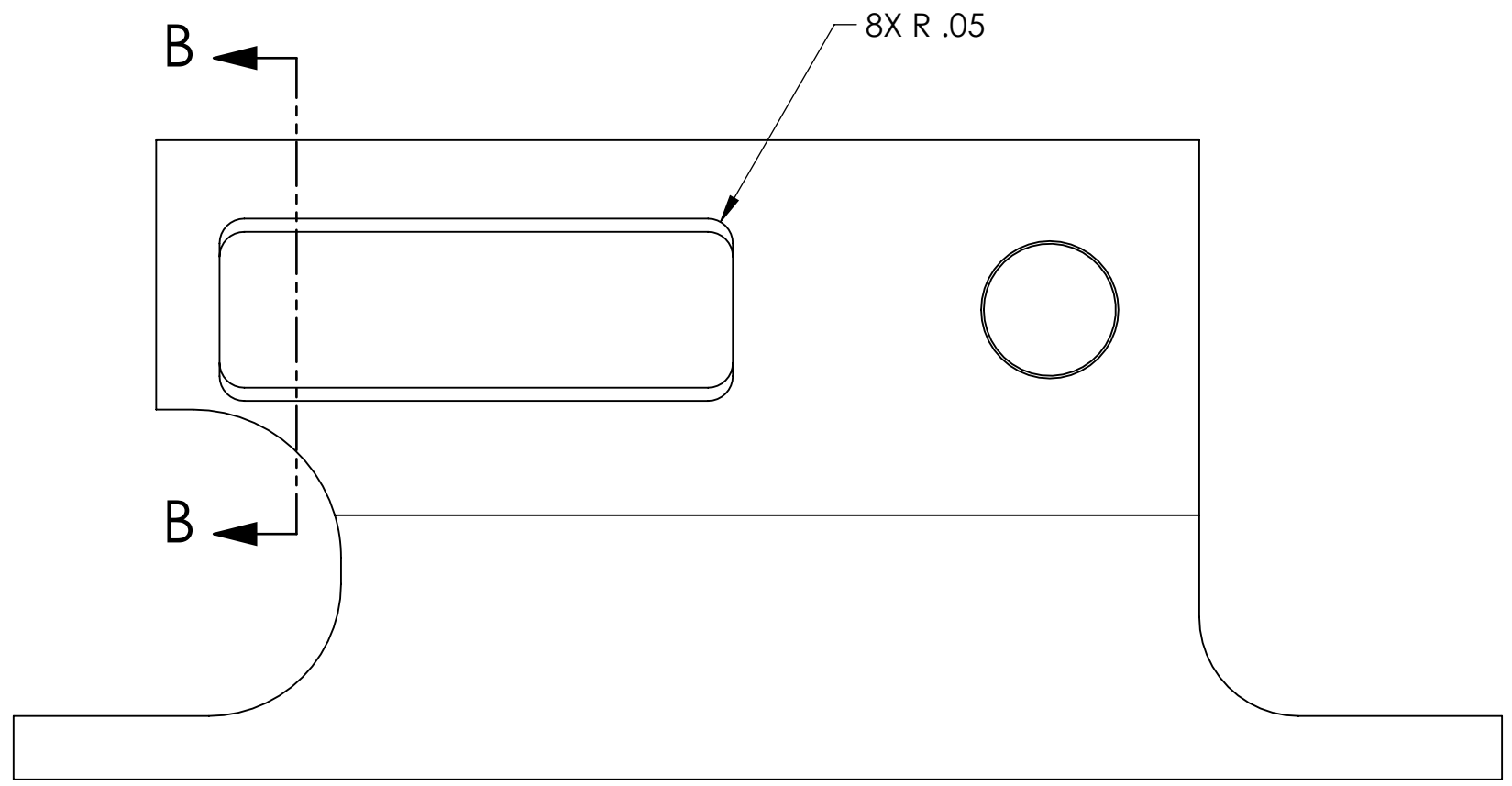
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1200420	v1
SCALE: NONE	PROJECTION:	SHEET 2 OF 3

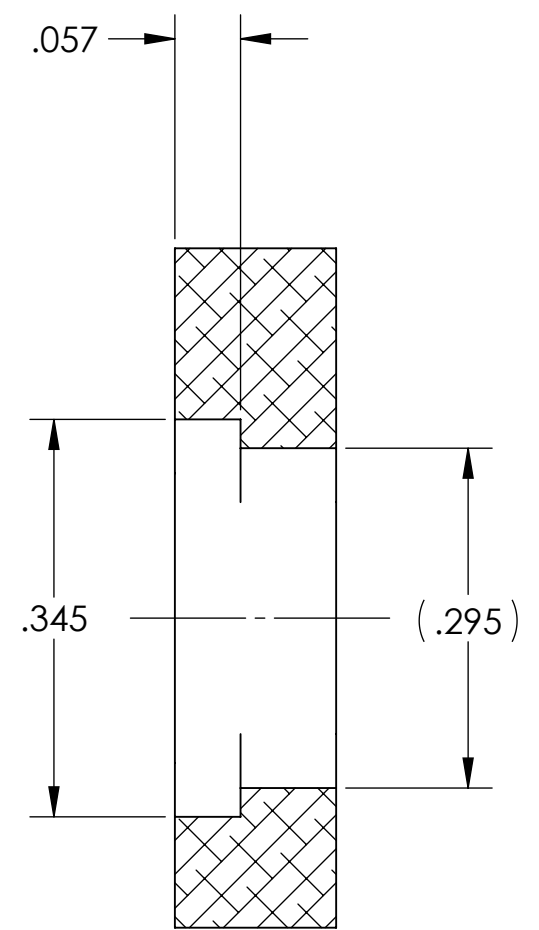
D1200420 TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008

8 7 6 5 4 3 2 1

D
C
B
A



VIEW A-A



SECTION B-B

 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE	DWG. NO.	REV.
B	D1200420	v1
SCALE: NONE	PROJECTION:	SHEET 3 OF 3

8 7 6 5 4 3 2 1

D
C
B
A

NOTES (CONTINUED):

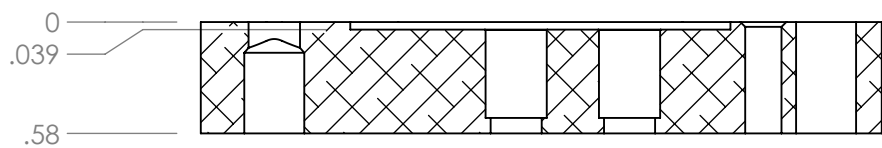
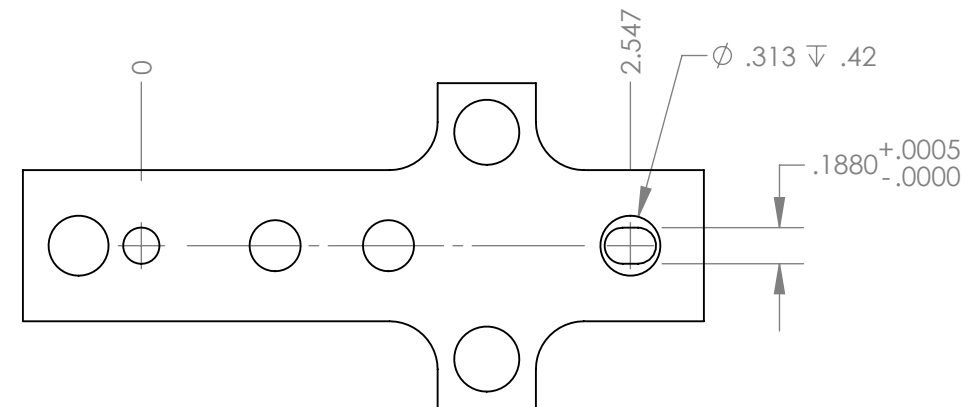
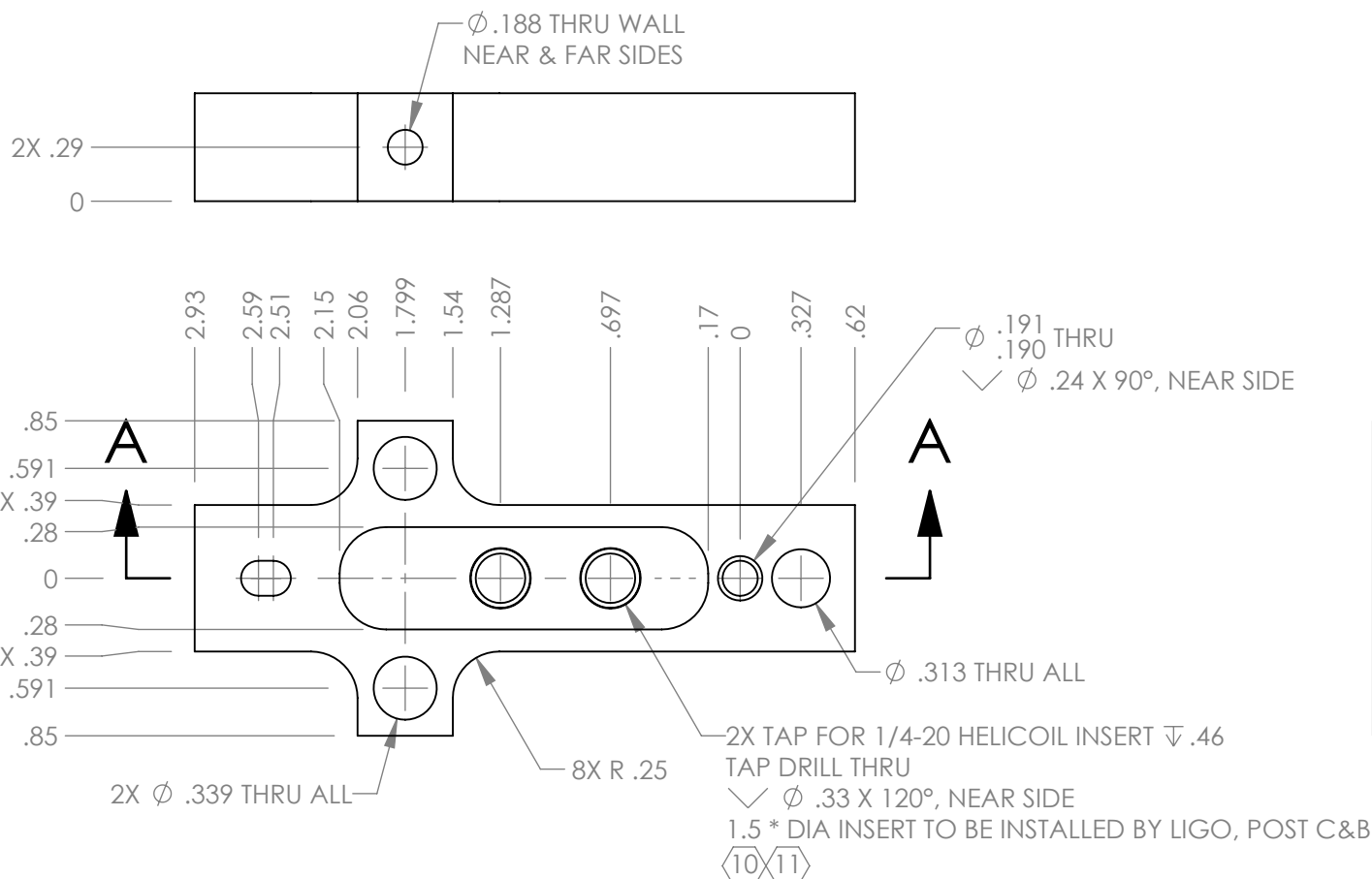
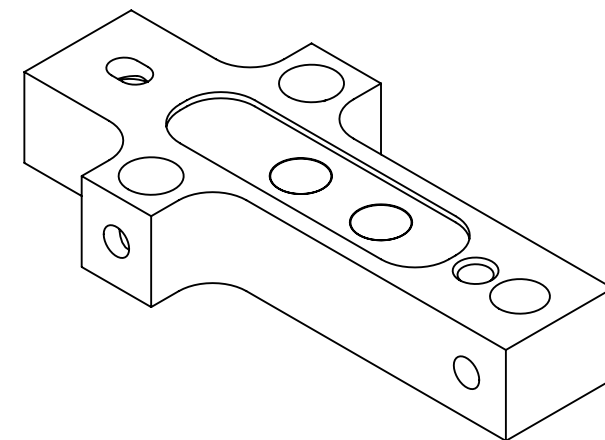
⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX

- 6. MASS: 5.410 KG [11.927 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

⑩ PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.

⑪ INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	



SECTION A-A

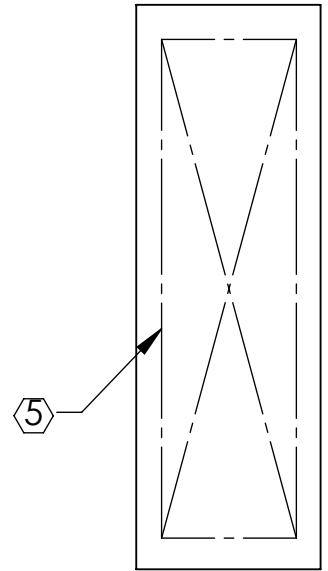
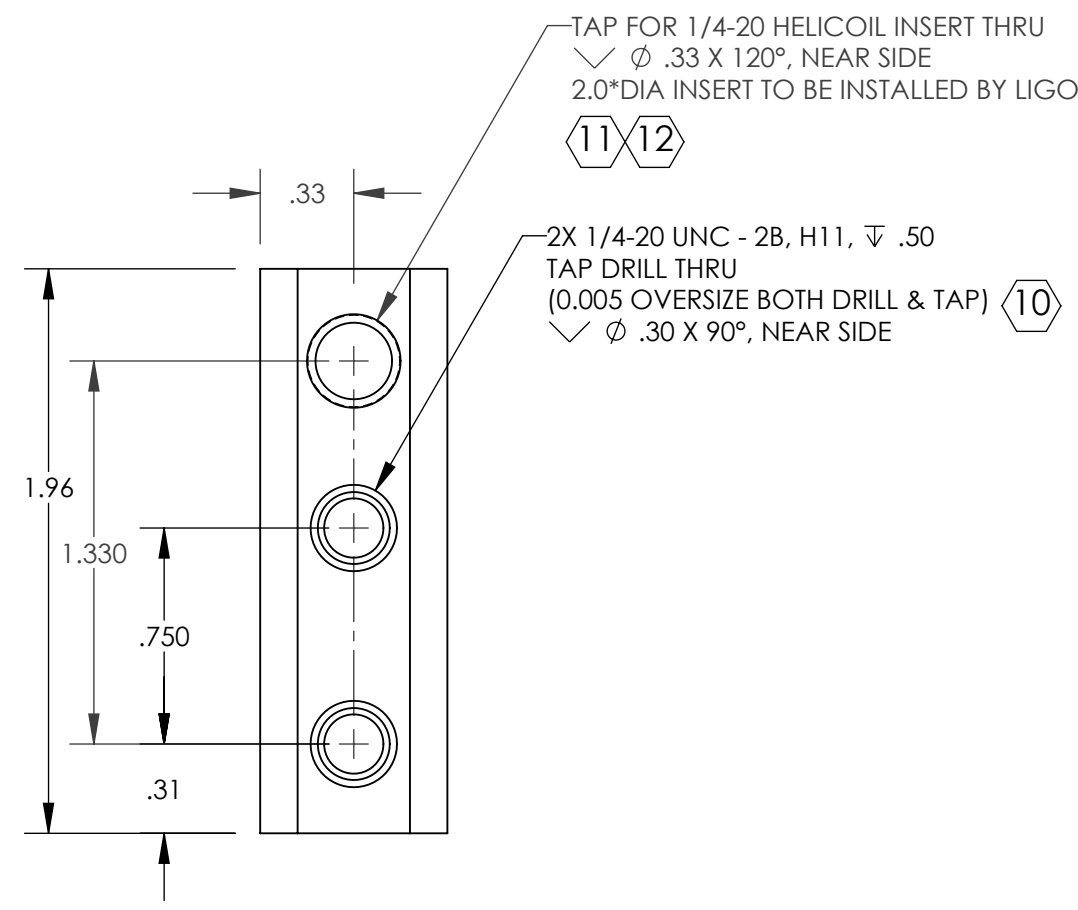
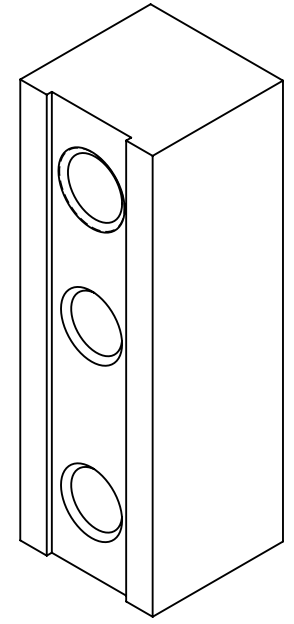
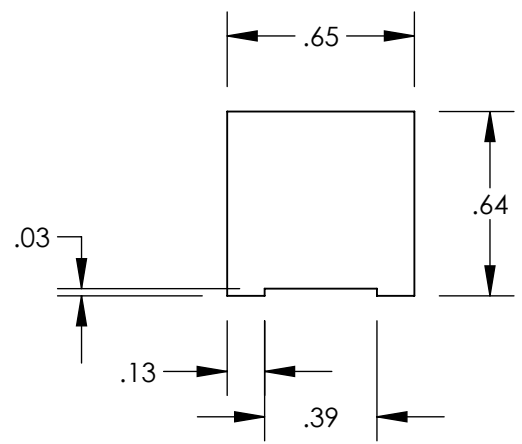
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				SYSTEM		SUB-SYSTEM		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		gLIGO TMS MASS WIRE CLAMP ADJUSTMENT BLOCK	
MATERIAL 6061-T6 Al				FINISH 63 µinch Ra		NEXT ASSY D1101527		DESIGNER C. CONLEY 08 MAR 2012	
						ADVANCED LIGO		AOS	
						DRAFTER C. CONLEY 23 MAR 2012		SIZE DWG. NO. B D1200426	
						CHECKER SEE DCN		REV. v1	
						APPROVAL SEE DCN		SCALE: NONE PROJECTION: SHEET 1 OF 1	

D1200426 gLIGO TMS Mass Wire Clamp Adjustment Block, PART PDM REV: X-013, DRAWING PDM REV: X-004

NOTES CONTINUED:

- ⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS: 31.2 G [0.069 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
- ⑩ TAPPED HOLES (HELICOIL EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.
- ⑪ PREPARE HELICOIL TAPPED HOLE ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOIL.
- ⑫ INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



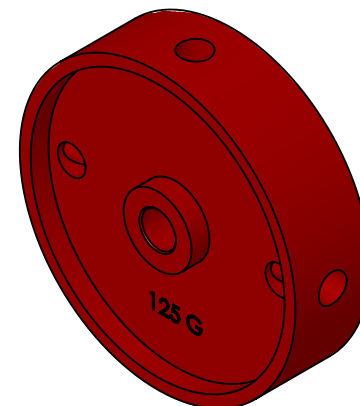
D1200427 aLIGO TMS Upper SUS Wire Adjuster, PART PDM REV: X-012, DRAWING PDM REV: X-003

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO TMS UPPER SUS WIRE ADJUSTER	
MATERIAL		FINISH		SYSTEM		SUB-SYSTEM	
6061-T6 Al		63 μinch Ra		ADVANCED LIGO		AOS	
NEXT ASSY				DESIGNER		DATE	
D1101526				C. CONLEY		08 MAR 2012	
D1101526				DRAFTER		25 MAR 2012	
D1101526				CHECKER		SEE DCN	
D1101526				APPROVAL		SEE DCN	
SCALE: NONE				PROJECTION:		SHEET 1 OF 1	

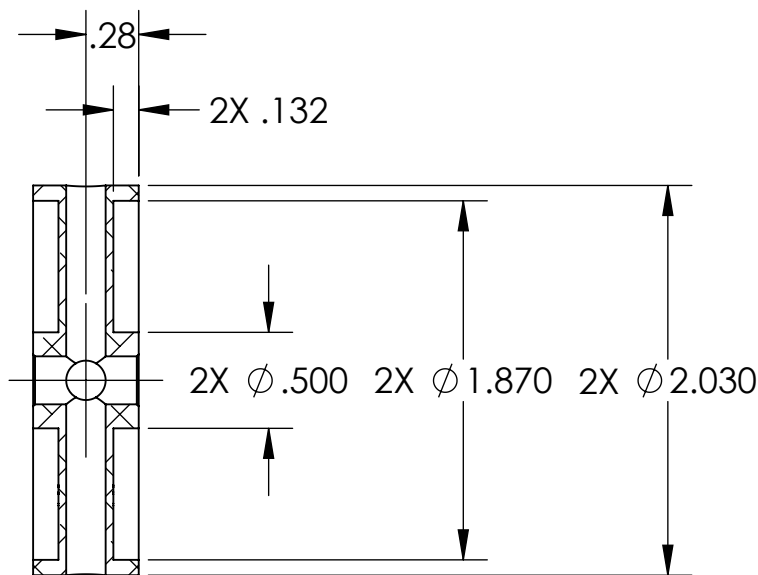
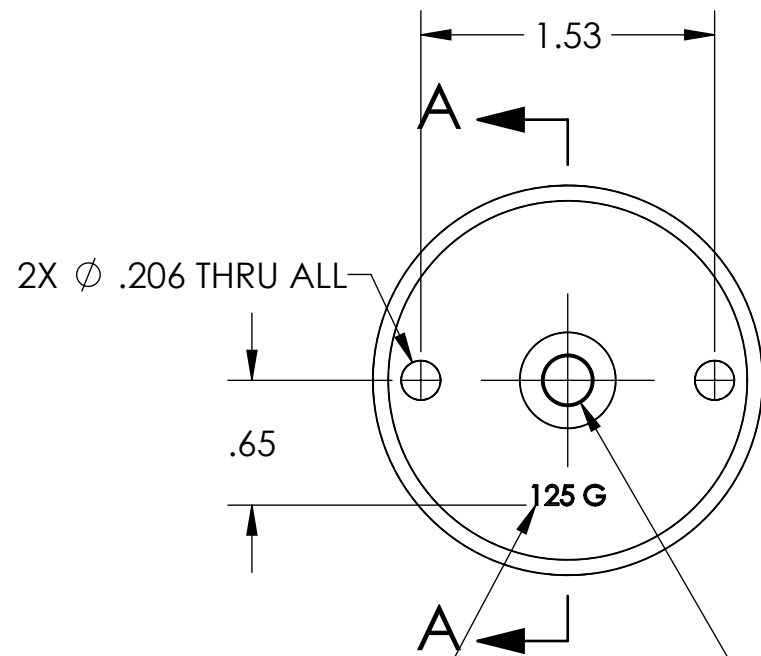
NOTES CONTINUED:

- ⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXX-VY, TYPE-XX, S/N XXX
- 6. MASS:
-01: 125 G [0.275 LB]
-02: 250 G [0.550 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NOT WELD REPAIRS OR PLUGS UNLESS APPROVED IN ADVANCE IN WRITING BY LIGO, REFER TO LIGO-E0900364.
- 10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
- ⑪ TAPPED HOLES: .005 OVERSIZE BOTH DRILL AND TAP.
- ⑫ SCRIBE, ENGRAVE, LASER MARK, OR MECHANICALLY STAMP (NO INKS OR DYES), "125 G" FOR -01, "250 G" FOR -02, APPROXIMATELY CENTER JUSTIFIED AS SHOWN. CHARACTER HEIGHT 0.10-0.18. NEAR & FAR SIDES.

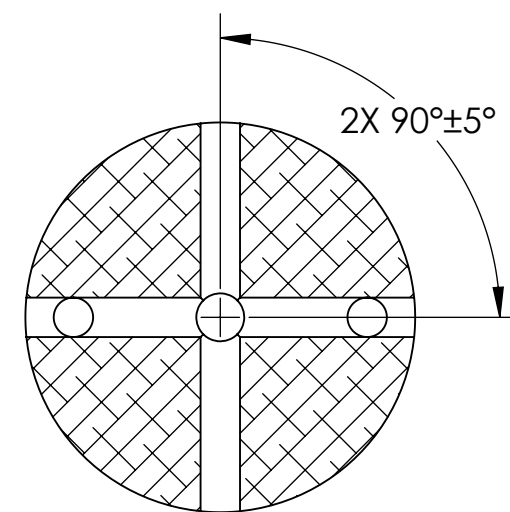
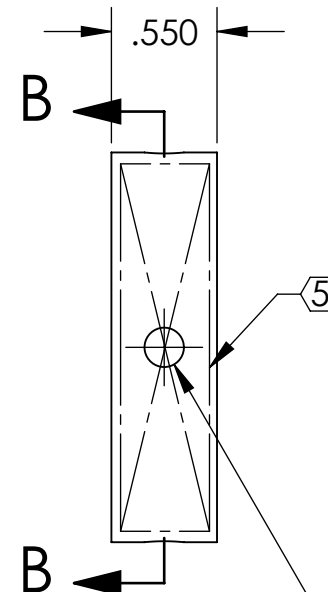
REV.	DATE	DCN #	DRAWING TREE #
v1	19 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



-01



SECTION A-A



SECTION B-B

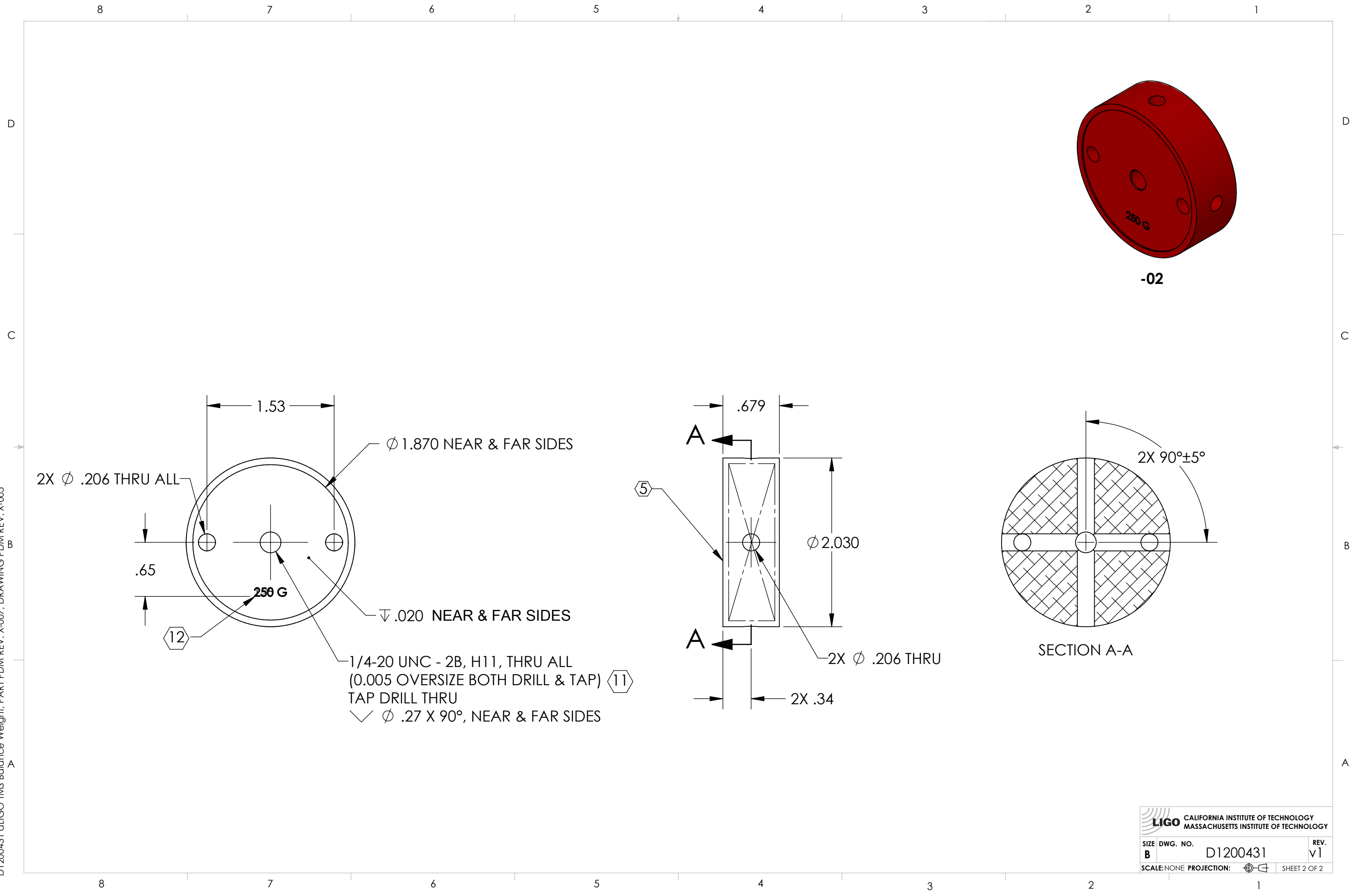
⑫ NEAR & FAR SIDES

1/4-20 UNC - 2B, H11, THRU ALL
(0.005 OVERSIZE BOTH DRILL & TAP) ⑪
TAP DRILL THRU
✓ φ .27 X 90°, NEAR & FAR SIDES

D1200431 aLIGO TMS Balance Weight, PART PDM REV: X-007, DRAWING PDM REV: X-005

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS BALANCE WEIGHT	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER C. CONLEY 11 MAR 2012	
ANGULAR ± 1.0°				NEXT ASSY VARIOUS		DRAFTER C. CONLEY 19 MAR 2012	
MATERIAL 304 SSSL				FINISH 63 μinch Ra		SIZE DWG. NO. B D1200431	
						REV. v1	
						SCALE: NONE PROJECTION: SHEET 1 OF 2	

D1200431 aLIGO TMS Balance Weight, PART PDM REV: X-007, DRAWING PDM REV: X-005



LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1200431	v1
SCALE: NONE PROJECTION:		SHEET 2 OF 2

8

7

6

5

4

3

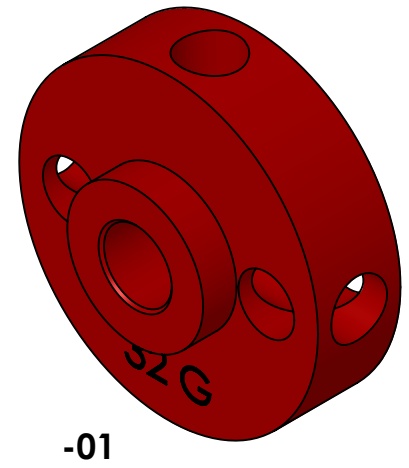
2

1

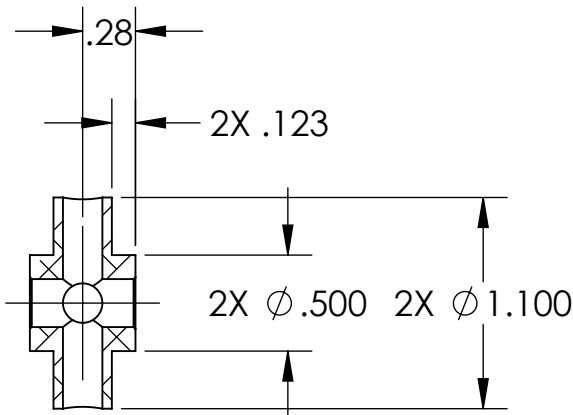
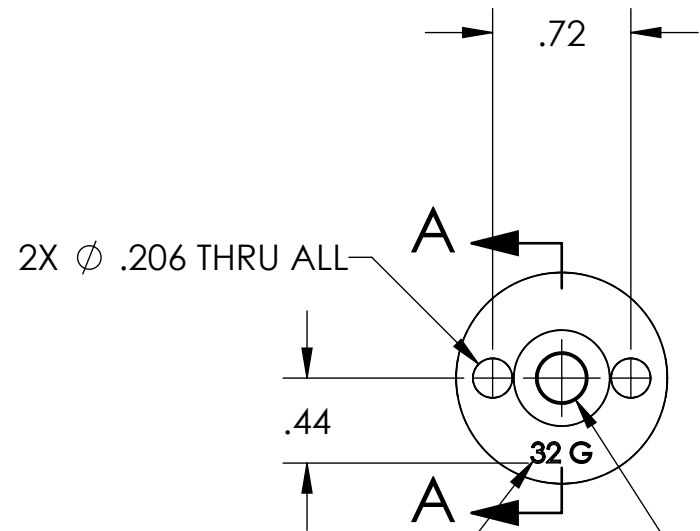
NOTES CONTINUED:

- 5 LASER MARK A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART IN THE NOTED AREA. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG ITEMS WITH THEIR PART NUMBER, REVISION, VARIANT OR "TYPE", AND QUANTITY.
EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-v1, TYPE-01, QTY: TBD
- 6. MASS:
-01; 32 G [0.07 LB]
-02; 63 G [0.14 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH. USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NOT WELD REPAIRS OR PLUGS UNLESS APPROVED IN ADVANCE IN WRITING BY LIGO, REFER TO LIGO-E0900364.
- 10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
- 11 TAPPED HOLES: .005 OVERSIZE BOTH DRILL AND TAP.
- 12 SCRIBE, ENGRAVE, LASER MARK, OR MECHANICALLY STAMP (NO INKS OR DYES), "32 G" FOR -01, "63 G" FOR -02, APPROXIMATELY CENTER JUSTIFIED AS SHOWN. CHARACTER HEIGHT 0.10-0.18. NEAR & FAR SIDES.

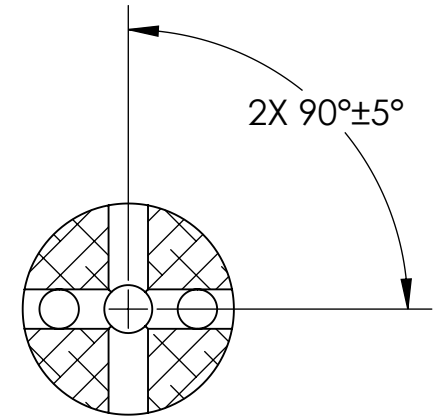
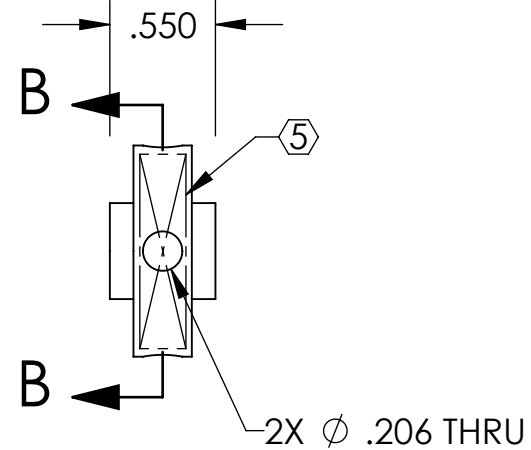
REV.	DATE	DCN #	DRAWING TREE #
v1	19 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



-01



SECTION A-A



SECTION B-B

NEAR & FAR SIDES

1/4-20 UNC - 2B, H11, THRU ALL
(0.005 OVERSIZE BOTH DRILL & TAP) 11
✓ φ .27 X 90°, NEAR & FAR SIDES 12

D1200432 aLIGO TMS Small Balance Weight, PART PDM REV: X-011, DRAWING PDM REV: X-006

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS SMALL BALANCE WEIGHT	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER	C. CONLEY
ANGULAR ± 1.0°				NEXT ASSY VARIOUS		DRAFTER	C. CONLEY
MATERIAL 304 SSSL				FINISH 63 μinch Ra		CHECKER	SEE DCN
						APPROVAL	SEE DCN
						DATE	12 MAR 2012
						SIZE	DWG. NO.
							B D1200432
						REV.	v1
						SCALE	NONE
						PROJECTION	1st Angle
						SHEET 1 OF 2	

8

7

6

5

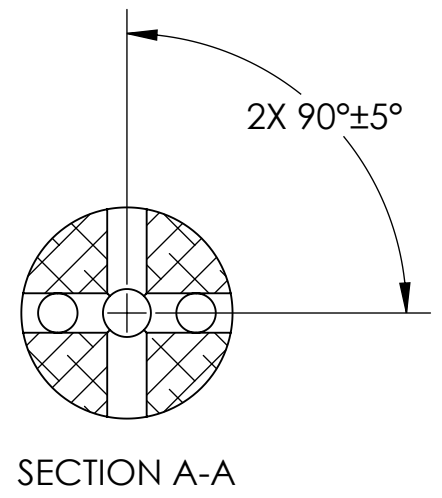
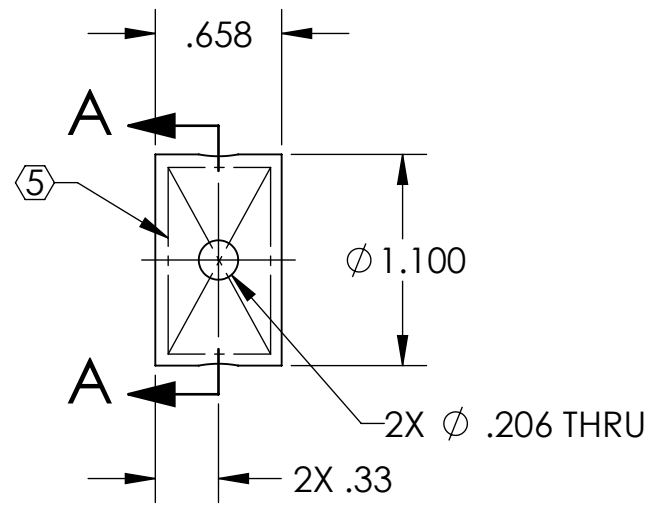
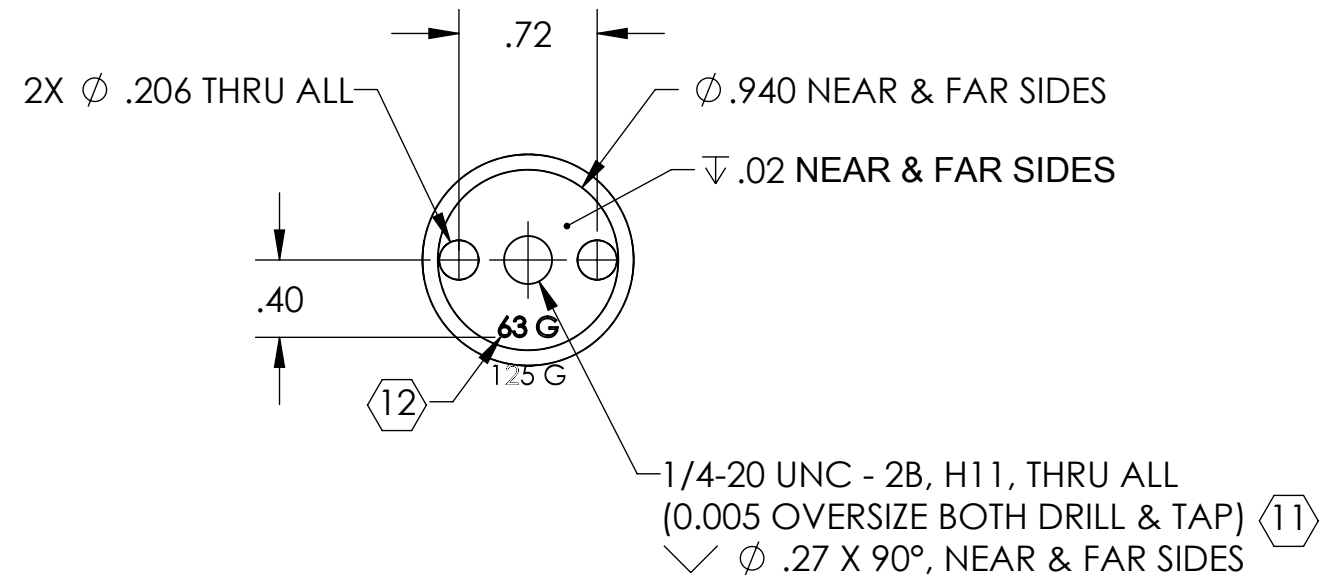
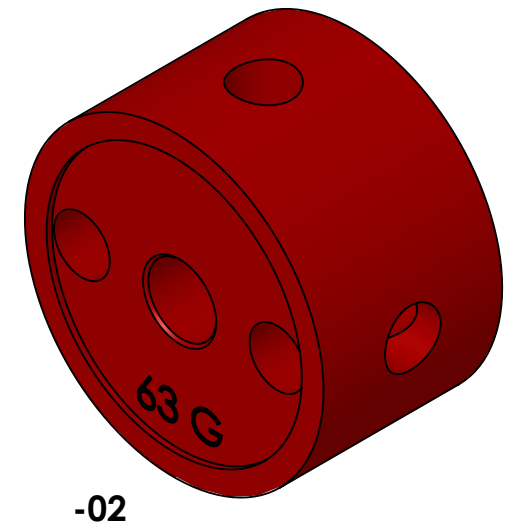
4

3

2

1

D1200432 dLIGO TMS Small Balance Weight, PART PDM REV: X-011, DRAWING PDM REV: X-006



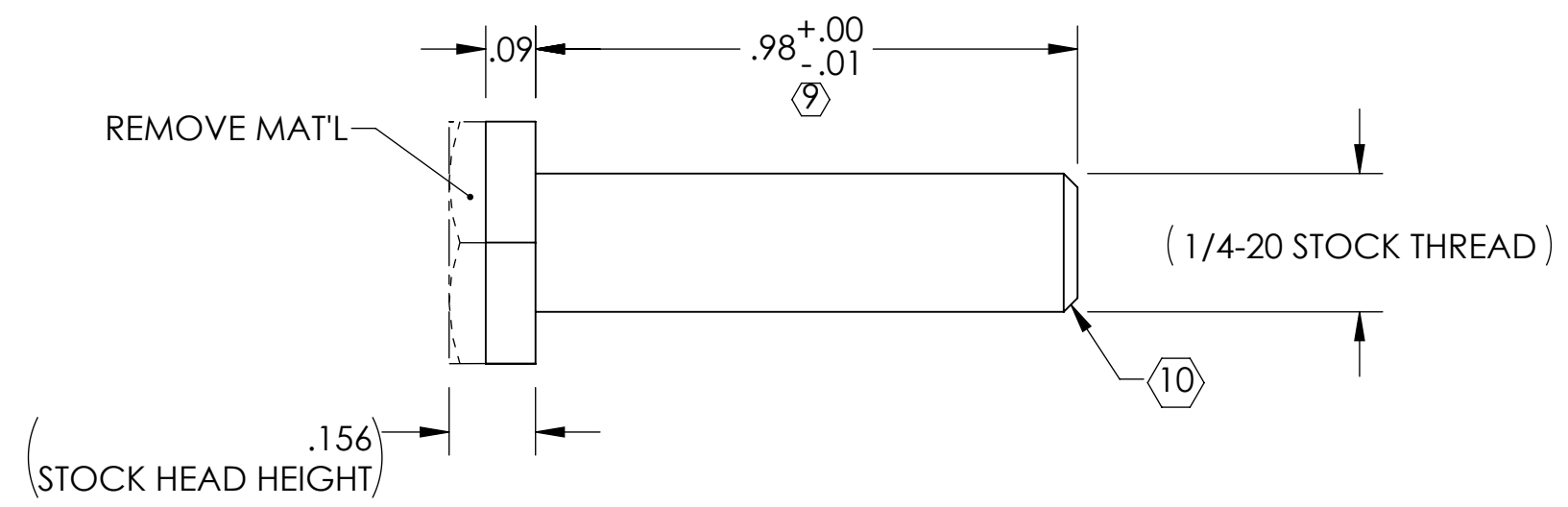
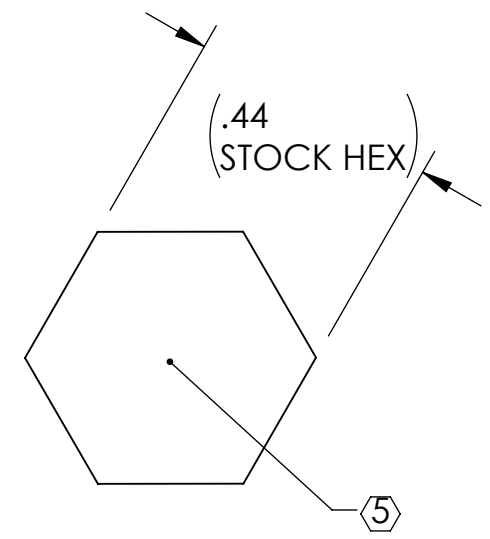
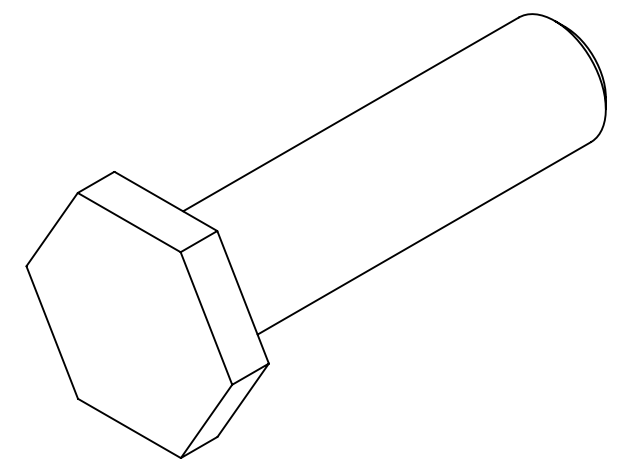
		CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
SIZE	DWG. NO.	REV.	
B	D1200432	v1	
SCALE: NONE		PROJECTION:	SHEET 2 OF 2

D1200476 aLIGO TMS Mass Cable Clamp Screw, PART PDM REV: X-012, DRAWING PDM REV: X-007

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

NOTES CONTINUED:

- ⑤ SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT. EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD
- 6. MASS: 8.1 G [0.018 LB]
- 7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- ⑧ MAKE FROM: 1/4-20 HEX HEAD CAP SCREW PER MS35307.
(300 SERIES STAINLESS STEEL)
- ⑨ MACHINE TO SPECIFIED LENGTH, IF REQUIRED, TO MEET NOTED DIMENSION.
- ⑩ IF LENGTH MACHINING IS REQUIRED, CHAMFER END 45° TO THE THREAD MINOR DIAMETER.
- ⑪ 63 MINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACE. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.



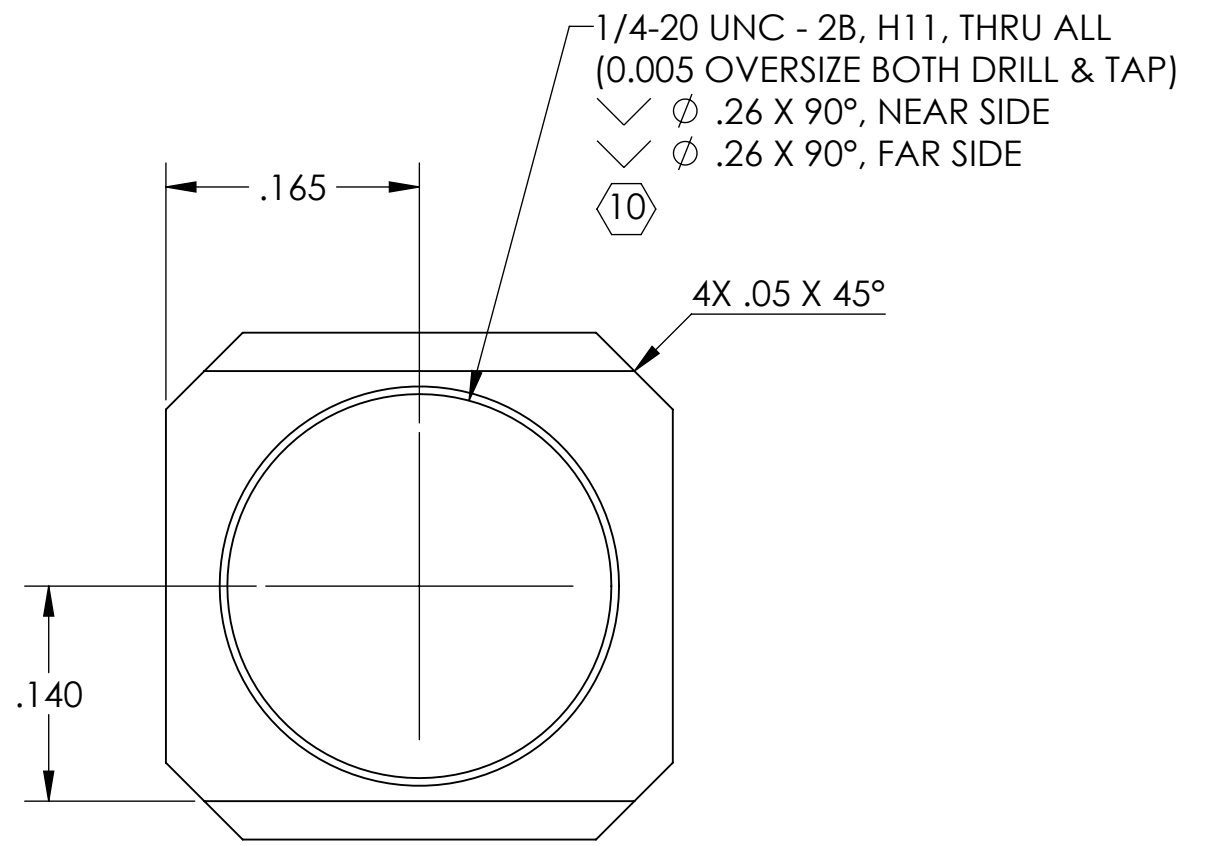
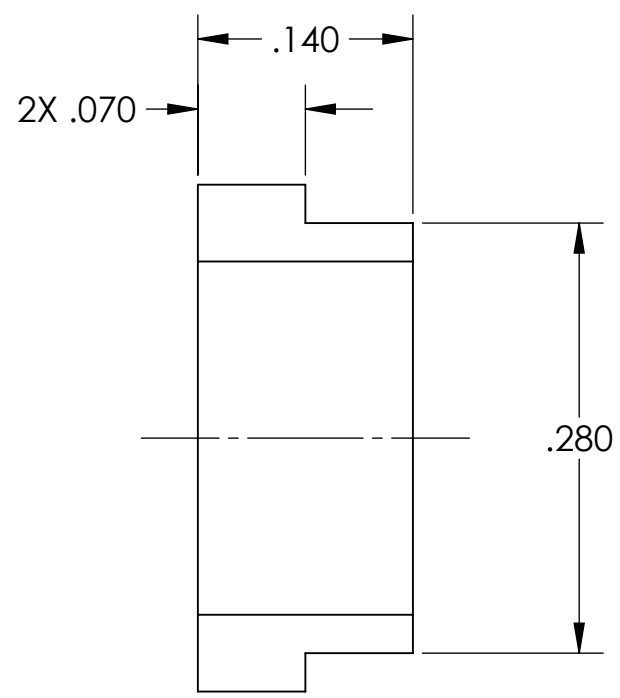
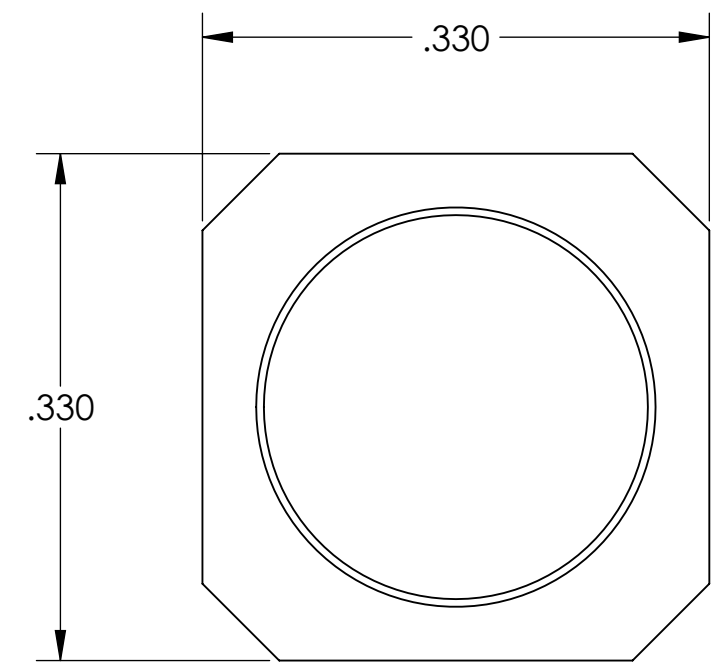
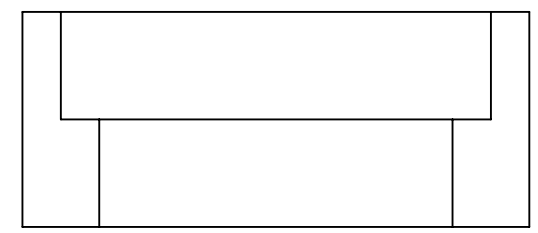
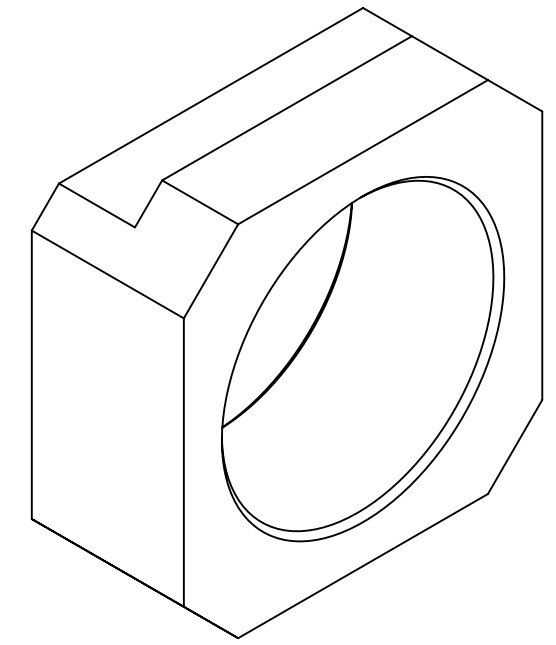
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°				1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		aLIGO TMS MASS CABLE CLAMP SCREW	
MATERIAL ⑧		FINISH 63 μinch Ra ⑪		SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER C. CONLEY	DATE 19 MAR 2012
NEXT ASSY D1200421				CHECKER SEE DCN	APPROVAL SEE DCN	SIZE B	DWG. NO. D1200476
						REV. v1	SHEET 1 OF 1

8 7 6 5 4 3 2 1

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

NOTES (CONTINUED):

- 5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT. EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXX-VY, TYPE-XX, QTY: TBD
- 6. MASS: 0.981 G [0.002 LB].
- 7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
- 8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
- 9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS. REFER TO LIGO-E0900364.
- 10. TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.



D1200477 aLIGO TMS Mass Cable Clamp Nut, PART PDM REV: X-009, DRAWING PDM REV: X-005

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)				LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	
DIMENSIONS ARE IN INCHES				ADVANCED LIGO		aLIGO TMS MASS CABLE CLAMP NUT	
TOLERANCES: .XX ± .01 .XXX ± .005				SUB-SYSTEM AOS		DESIGNER C. CONLEY	08 MAR 2012
ANGULAR ± 1.0°				MATERIAL NICKEL-COPPER ALLOY 400		DRAFTER C. CONLEY	23 MAR 2012
FINISH 63 μinch Ra				NEXT ASSY D1200421		CHECKER SEE DCN	SIZE DWG. NO. B
						APPROVAL SEE DCN	D1200477
						SCALE: NONE	PROJECTION:
						SHEET 1 OF 1	

8 7 6 5 4 3 2 1