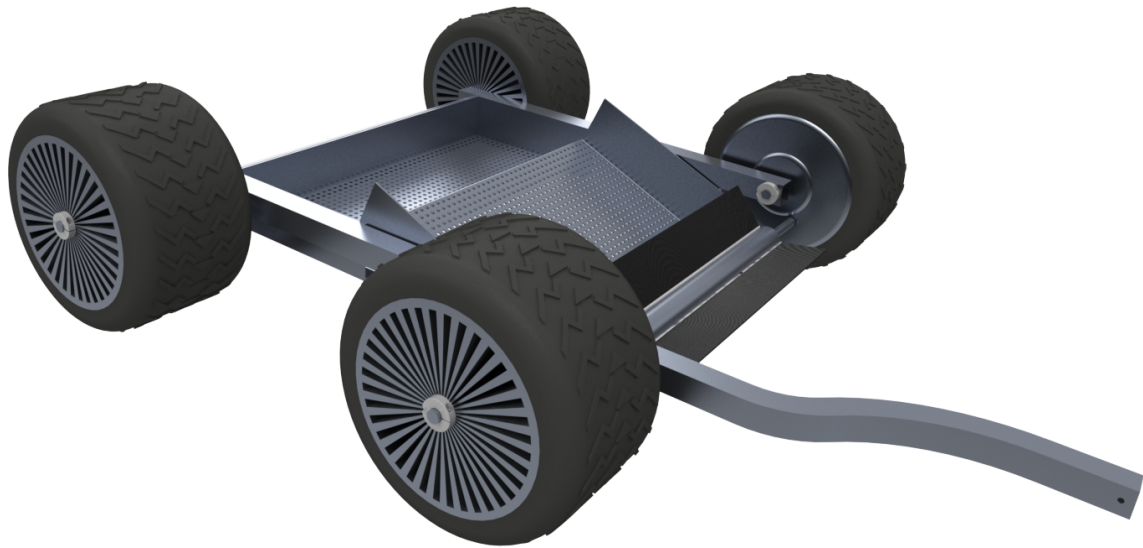


Beach Cleanup Crew

Beach Cleaner Drawings



EMA 469: Senior Design
Engineering Mechanics and Astronautics
Department of Engineering Physics
University of Wisconsin – Madison

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Index

[Link to Solid Models](#)

1. BC300 ASSEMBLY, FULL
2. BC001 BIKE CONNECTION
3. BC101 ROLLER
4. BC102 WHEEL COVER W/ DEAD AXLE
5. BC103 FRONT AND BACK TIRE
6. BC104 BASE FRAME
7. BC105 BACK L-BRACKET
8. BC106 SIFTER SHEET
9. BC107 FRONT RIM
10. BC111 NYLON BRISTLES AND RETAINER
11. BC121 BACK AXLE
12. BC132 BACK RIM
13. BC201 ASSEMBLY ROLLER AND BRISTLES
14. BC202 BACK WHEEL
15. BC204 BASKET
16. BC205 FRONT WHEEL
17. BC206 BRUSH WITH COVER AND PINION
18. BC401 PINION GEAR
19. BC402 INTERNAL GEAR
20. BC403 BEARING
21. BC404 COLLAR

6

5

4

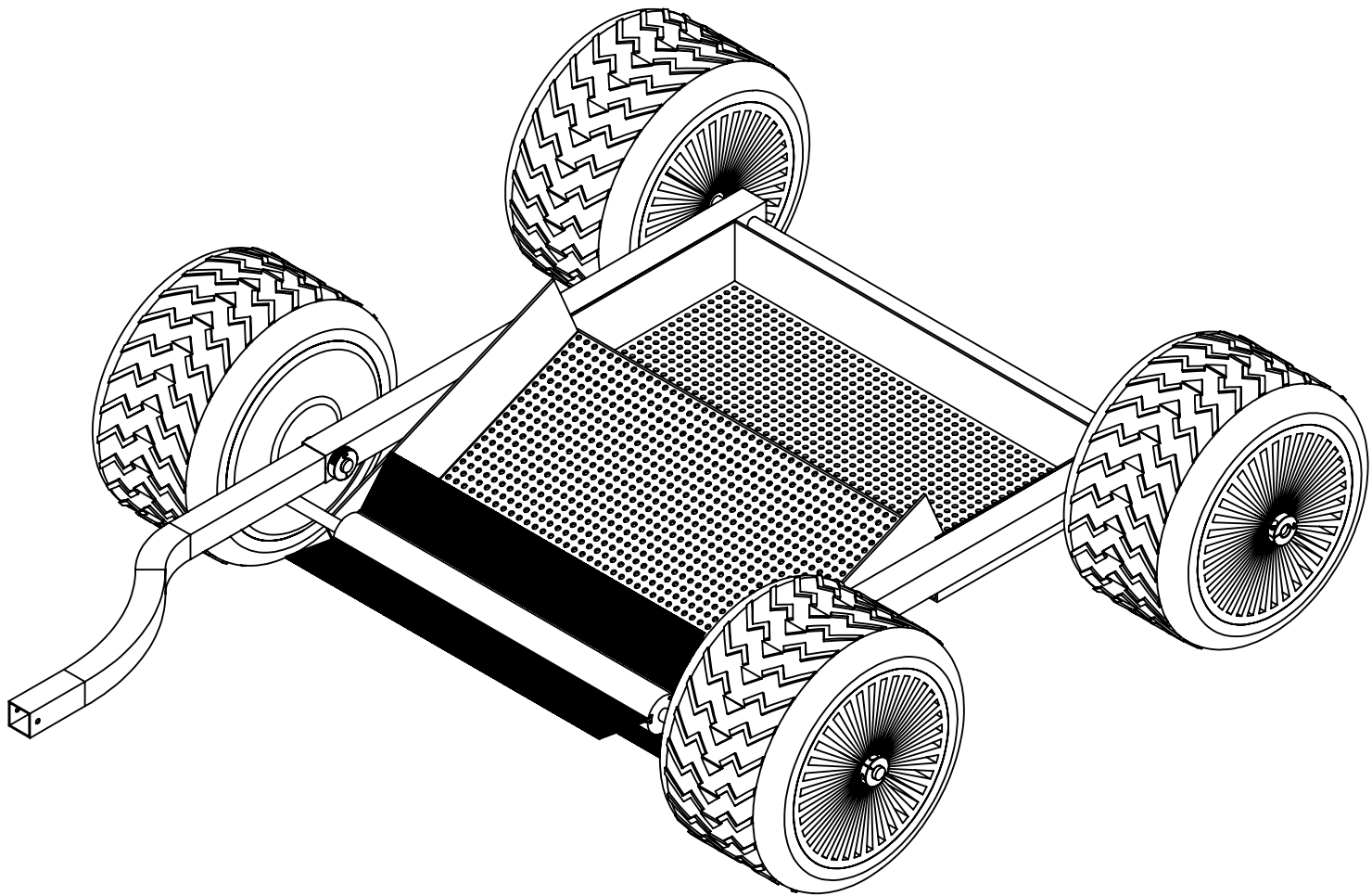
3

2

1

USED ON	PART NUMBER	TITLE	QTY.
BC300	BC205	FRONT WHEEL	2
BC300	BC204	BASKET	1
BC300	BC206	BRUSH WITH COVER AND PINION	1
BC300	BC202	BACK WHEEL	2
BC300	BC131	BACK AXLE	1
BC300	BC001	BIKE CONNECTION	1
BC300	BC404	COLLAR	6
BC300	BC300	ASSEMBLY, FULL	1

ISOMETRIC VIEW
FOR REFERENCE ONLY



NOTES:

1.

INSPECT FOR VISUAL CLEANLINESS BEFORE AND AFTER ASSEMBLY

2.

FIT CLASS RC8 BETWEEN BC101 AND BC111 PER STANDARD

1

FIT CLASS RC4 BETWEEN BC 131 AND BC202(BEARINGS), BC 206(DEAD AXLE) AND BC205(BEARINGS).

2

FIT CLASS LC BETWEEN BC 131 AND BC204, BC 206(DEAD AXLE) AND BC204) ON BOTH SIDES

3


FIT CLASS LC BETWEEN BC 205 (TIRE) AND BC204(COVER) ON BOTH SIDES

4

FIT CLASS LN BETWEEN BC001 AND BC204(ALUMINUM TUBING).

5

COLLARS TO BE SCREWED TIGHT FIT CLASS FN1

	NAME	DATE	 BEACH CLEANUP CREW	
DRAWN	AY	12/13	TITLE: <div>ASSEMBLY, FULL</div>	
CHECKED	NH	12/13		
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005				
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09 DO NOT SCALE DRAWING				
SIZE	DWG. NO.		REV	
B	BC300		-	
SCALE:1:8		WEIGHT:		SHEET 1 OF 3

6

5

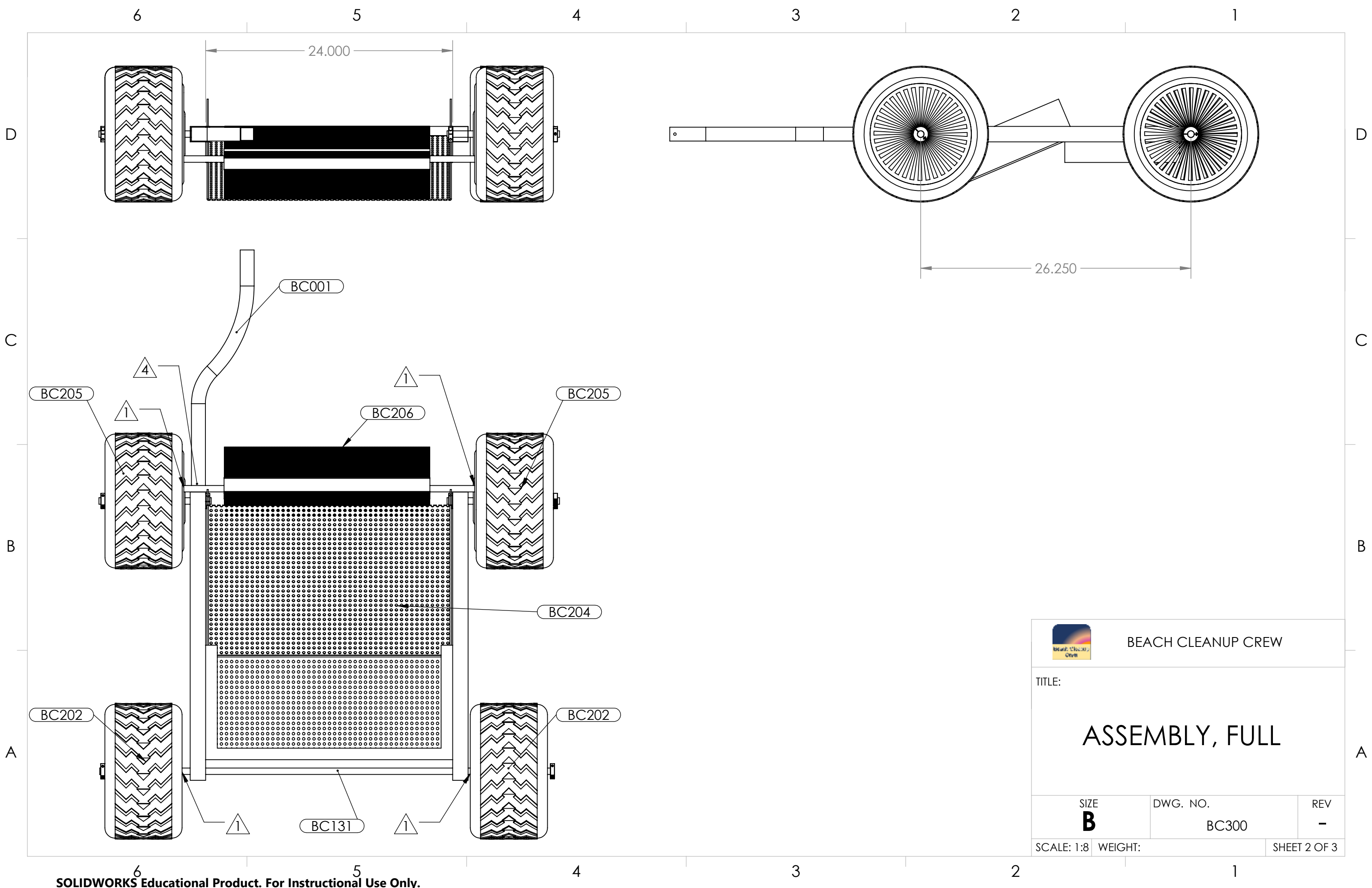
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3

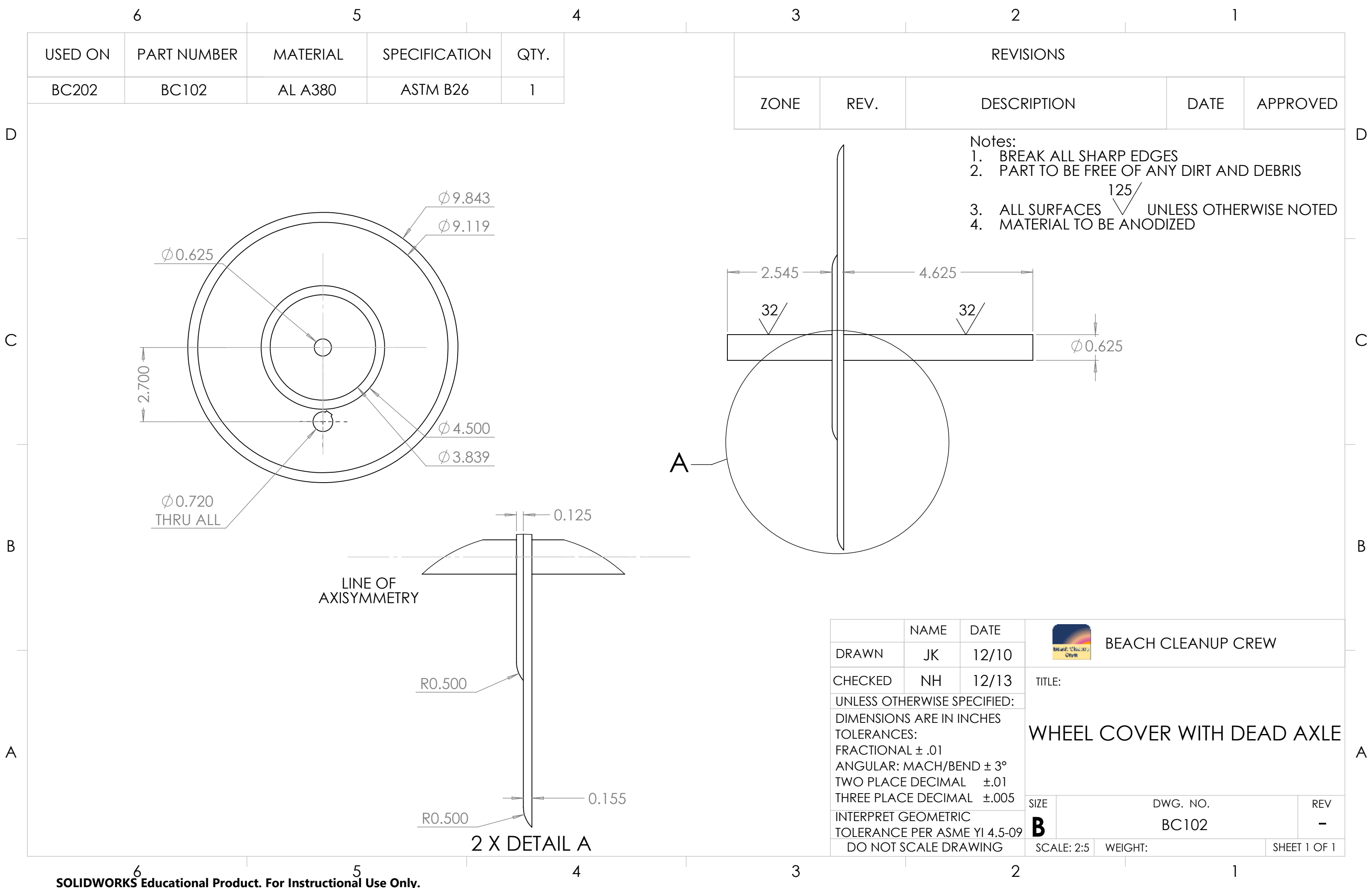
2

1

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 BEACH CLEANUP CREW		
TITLE: ASSEMBLY, FULL		
SIZE B	DWG. NO. BC300	REV -
SCALE: 1:8 WEIGHT:		SHEET 2 OF 3

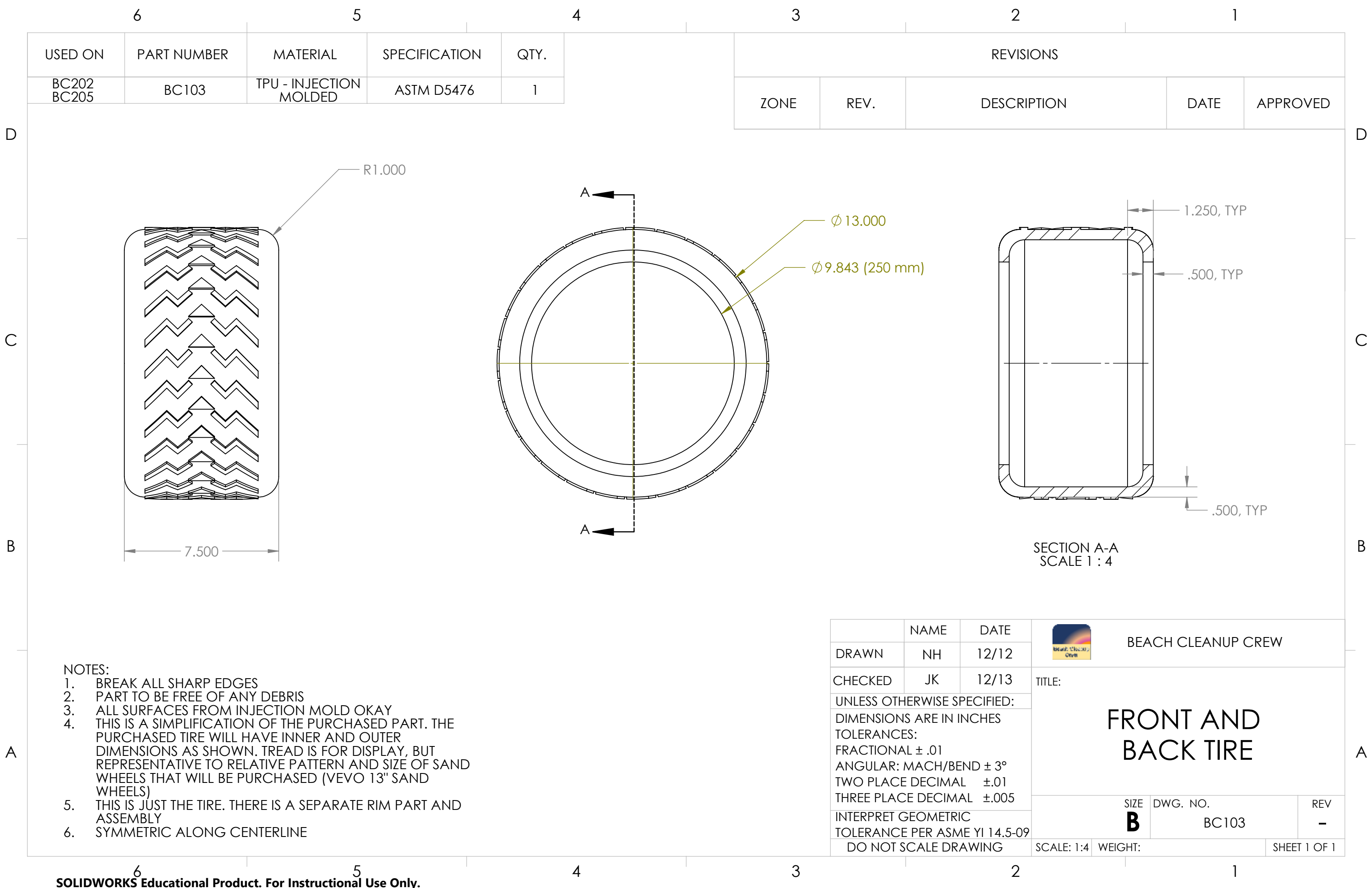


USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.
BC202	BC102	AL A380	ASTM B26	1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED

- Notes:
- BREAK ALL SHARP EDGES
 - PART TO BE FREE OF ANY DIRT AND DEBRIS
 - ALL SURFACES $\sqrt{125}$ UNLESS OTHERWISE NOTED
 - MATERIAL TO BE ANODIZED

	NAME	DATE	 BEACH CLEANUP CREW					
DRAWN	JK	12/10	TITLE: WHEEL COVER WITH DEAD AXLE					
CHECKED	NH	12/13						
UNLESS OTHERWISE SPECIFIED:								
DIMENSIONS ARE IN INCHES								
TOLERANCES:								
FRACTIONAL ± .01		SIZE			DWG. NO.		REV	
ANGULAR: MACH/BEND ± 3°								
TWO PLACE DECIMAL ±.01								
THREE PLACE DECIMAL ±.005								
INTERPRET GEOMETRIC								
TOLERANCE PER ASME Y1 4.5-09		B		BC102		-		
DO NOT SCALE DRAWING		SCALE: 2:5		WEIGHT:			SHEET 1 OF 1	

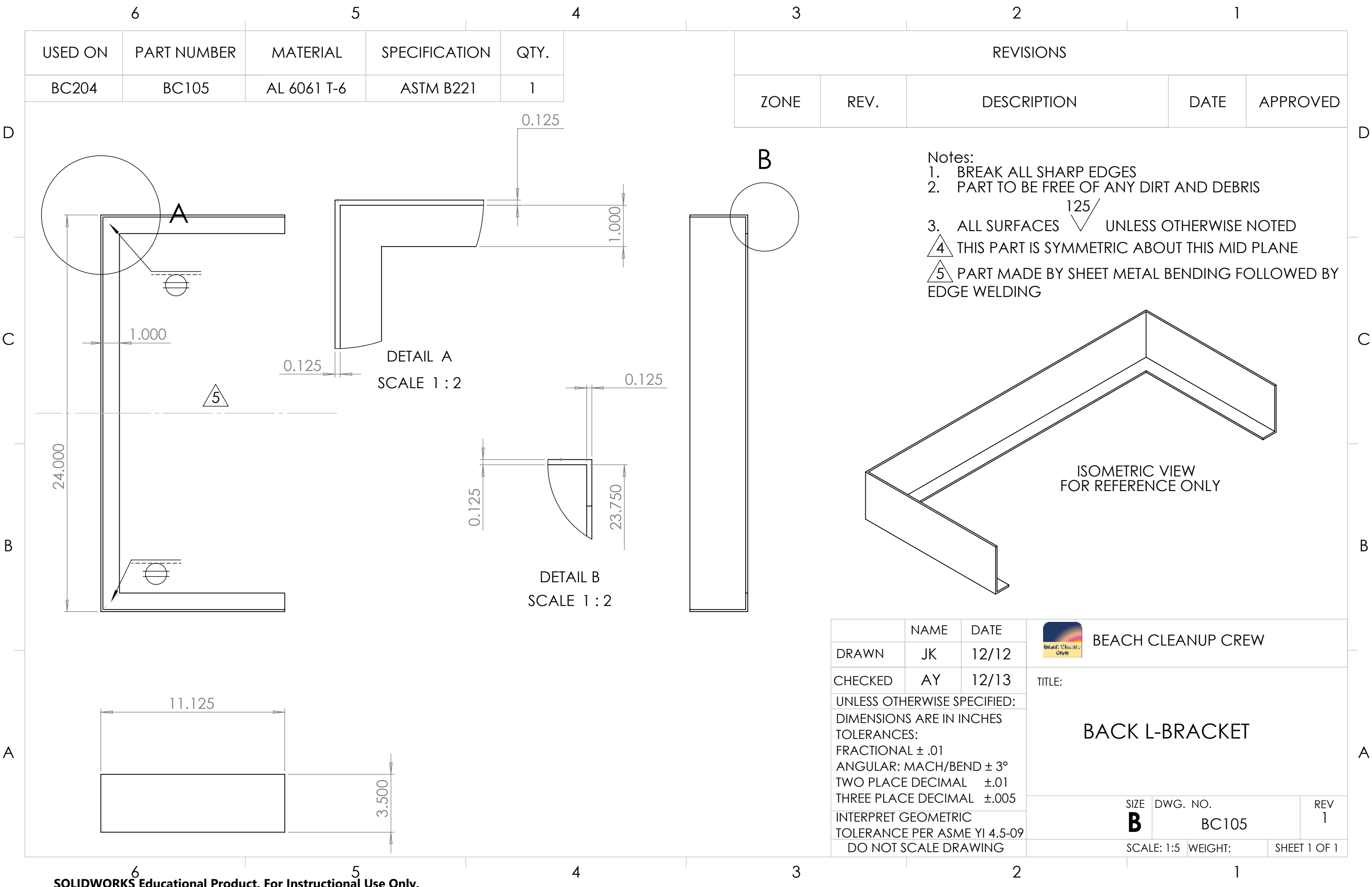



USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.
BC202 BC205	BC103	TPU - INJECTION MOLDED	ASTM D5476	1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED

- NOTES:
- BREAK ALL SHARP EDGES
 - PART TO BE FREE OF ANY DEBRIS
 - ALL SURFACES FROM INJECTION MOLD OKAY
 - THIS IS A SIMPLIFICATION OF THE PURCHASED PART. THE PURCHASED TIRE WILL HAVE INNER AND OUTER DIMENSIONS AS SHOWN. TREAD IS FOR DISPLAY, BUT REPRESENTATIVE TO RELATIVE PATTERN AND SIZE OF SAND WHEELS THAT WILL BE PURCHASED (VEVO 13" SAND WHEELS)
 - THIS IS JUST THE TIRE. THERE IS A SEPARATE RIM PART AND ASSEMBLY
 - SYMMETRIC ALONG CENTERLINE

	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	NH	12/12	TITLE: FRONT AND BACK TIRE		
CHECKED	JK	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09		SIZE B		DWG. NO. BC103	REV -
DO NOT SCALE DRAWING		SCALE: 1:4	WEIGHT:		SHEET 1 OF 1



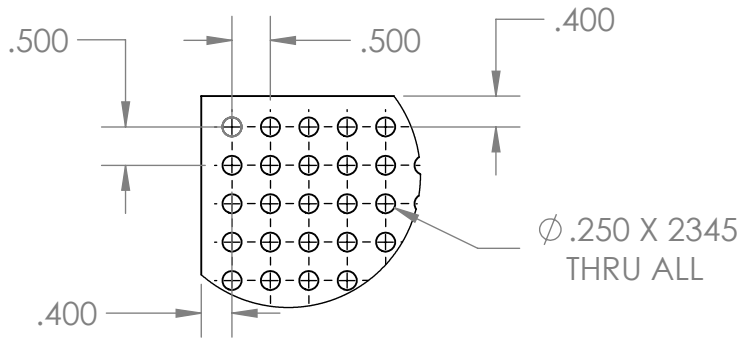
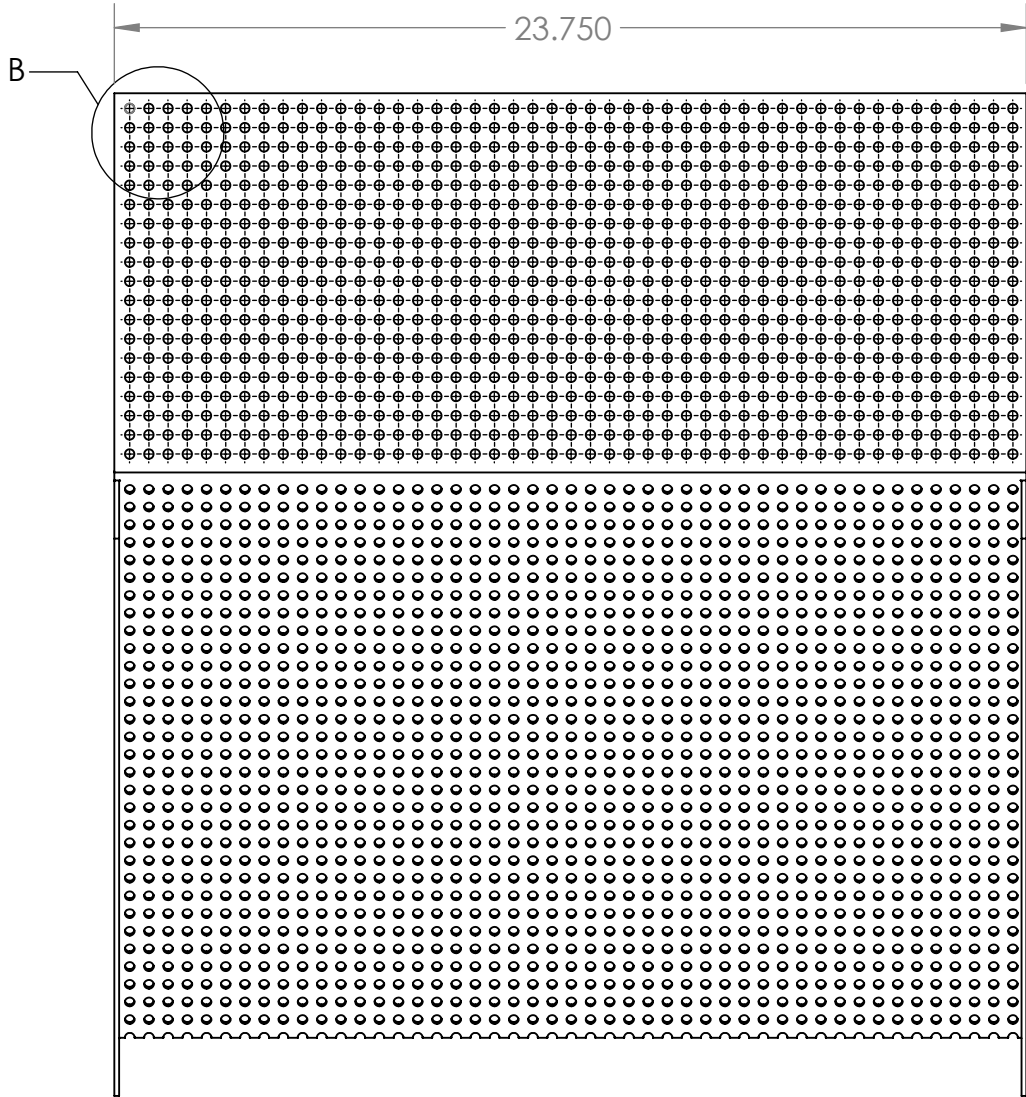
6		5			4		3		2		1	
USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.		REVISIONS						
BC204	BC106	AL 6061-T6	ASTM B209	1		ZONE	REV.	DESCRIPTION	DATE	APPROVED		

D

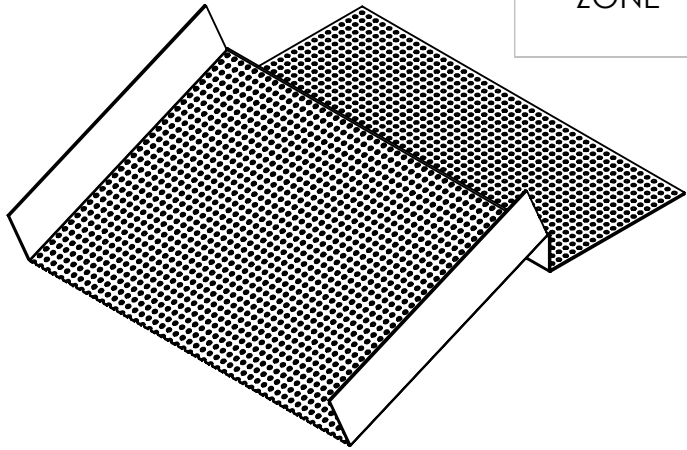
C

B

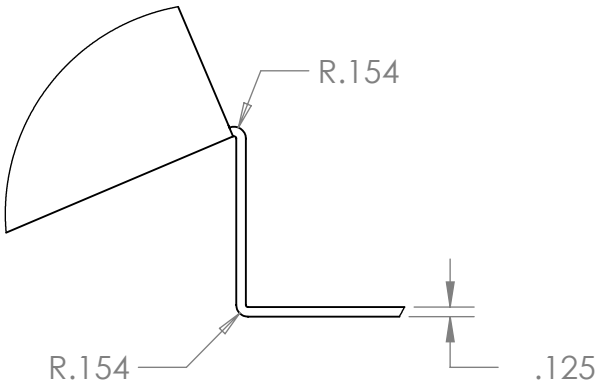
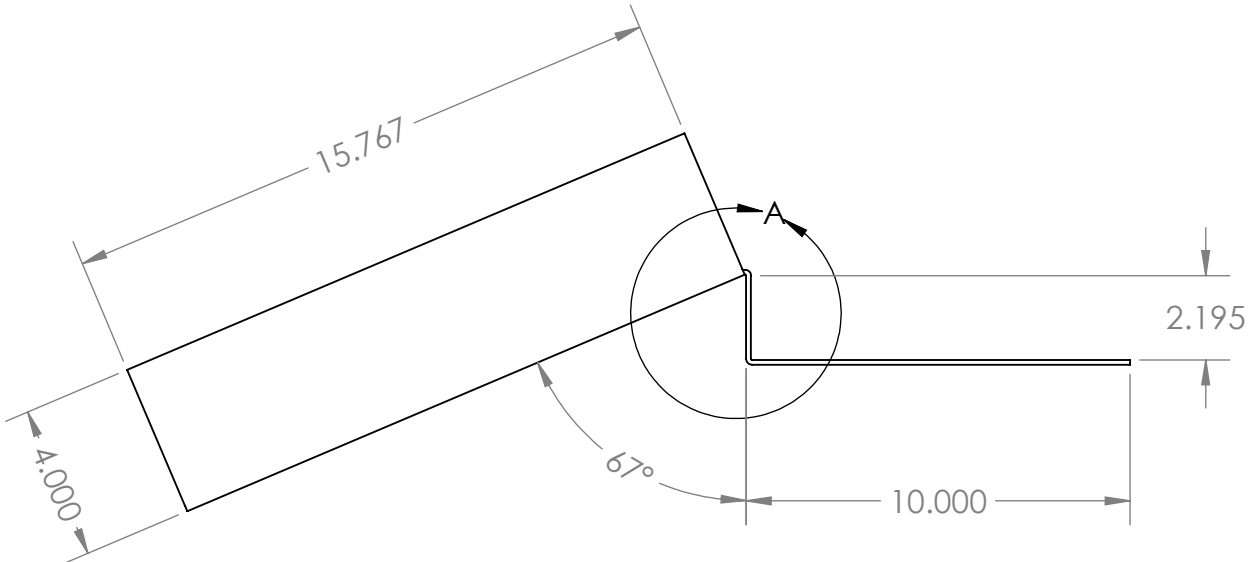
A



DETAIL B
SCALE 2:5



ISOMETRIC VIEW
FOR REFERENCE ONLY



DETAIL A
SCALE 2:5

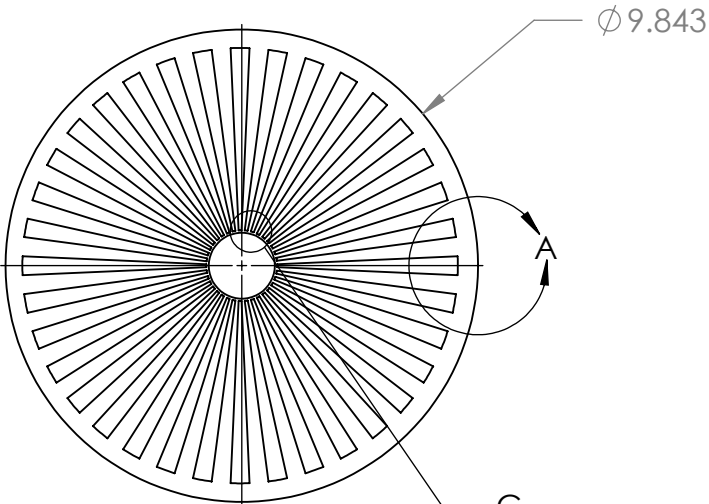
- NOTES:
1. BREAK ALL SHARP EDGES
 2. HIDDEN LINES NOT SHOWN
 3. PART TO BE FREE OF ANY DEBRIS
 4. ALL SURFACES ¹²⁵ UNLESS OTHERWISE SPECIFIED
 5. SHEET HOLES ARE CUT TO SPECIFICATIONS AND THEN BENT TO SPECIFICATIONS
 6. THICKNESS OF SHEET CONSISTENT THROUGHOUT
 7. ALL HOLES FOLLOW LINEAR PATTERN WITH SPECIFIED DISTANCES

	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	NH	12/13	TITLE: <h1>SIFTER SHEET</h1>		
CHECKED	JK	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09		SIZE	DWG. NO.		REV
DO NOT SCALE DRAWING		B	BC106		-
		SCALE:1:5	WEIGHT:		SHEET 1 OF 1

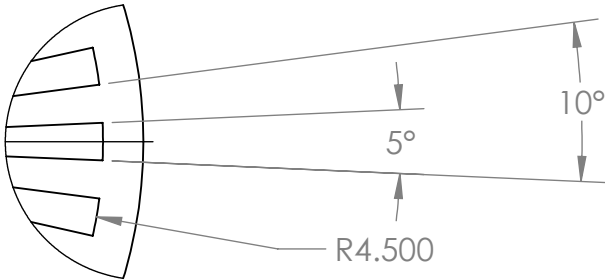
USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.
BC202	BC107	AL A380	ASTM B26	1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED

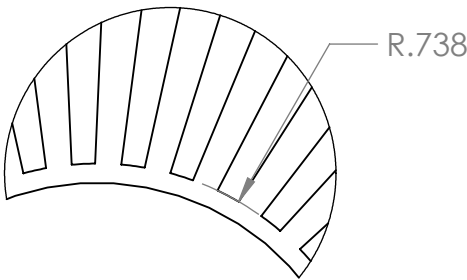
- NOTES:
- BREAK ALL SHARP EDGES
 - PART TO BE FREE OF ANY DEBRIS
 - ALL SURFACES UNLESS OTHERWISE SPECIFIED
 - PART TO BE MADE FROM A SAND CAST.
 - THE PART IS SYMMETRIC IN THE SECTION VIEW ABOUT THE AXIS



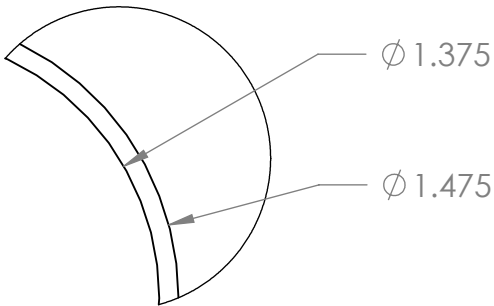
BACK VIEW



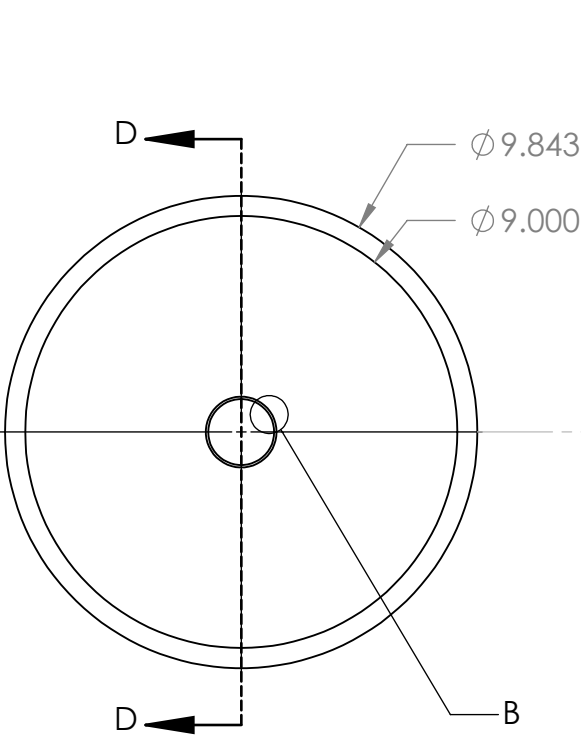
DETAIL A
SCALE 1 : 2



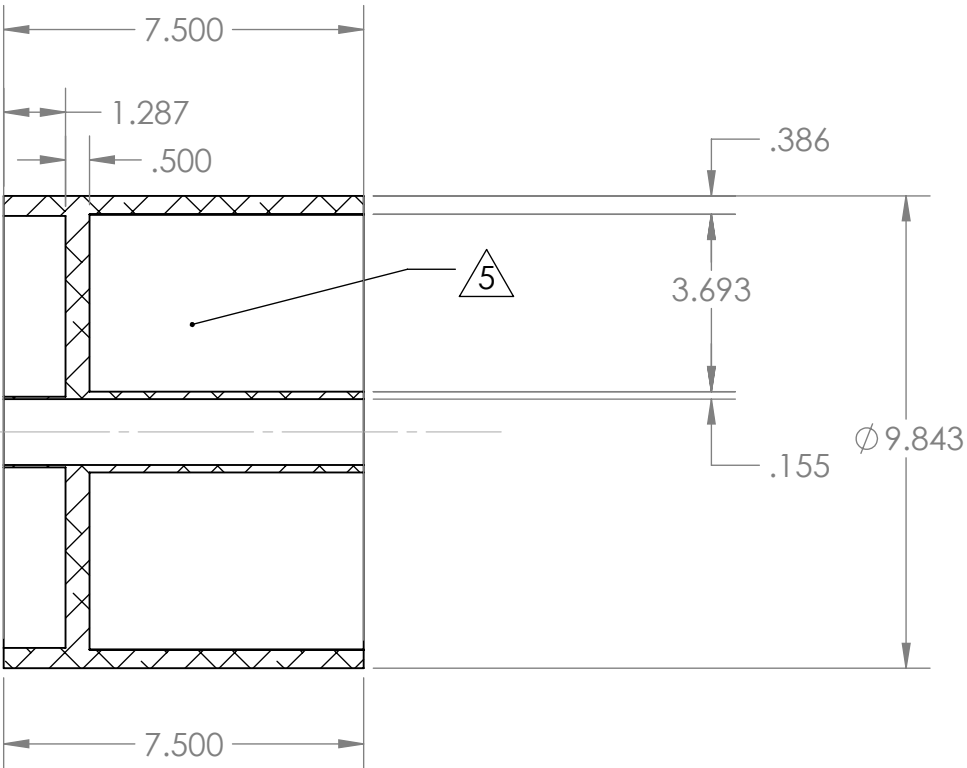
DETAIL C
SCALE 2 : 1



DETAIL B
SCALE 2 : 1




FRONT VIEW



SECTION D-D

A380

	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	AY	12/12	TITLE: <h1>FRONT RIM</h1>		
CHECKED	NH	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES					
TOLERANCES:					
FRACTIONAL ± .01					
ANGULAR: MACH/BEND ± 3°					
TWO PLACE DECIMAL ±.01					
THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC					
TOLERANCE PER ASME Y1 14.5-09					
DO NOT SCALE DRAWING					
SCALE: 1:2		WEIGHT:		SHEET 1 OF 1	

654321

USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.	REVISIONS				
BC203	BC121	Al7075-T6	ASTM B221M-21	1	ZONE	REV.	DESCRIPTION	DATE	APPROVED

Notes:
1. BREAK ALL SHARP EDGES
2. HIDDEN LINES NOT SHOWN
3. PART TO BE FREE OF ANY DIRT AND DEBRIS
4. ALL SURFACES $\sqrt{125}$ UNLESS OTHERWISE NOTED

43.000

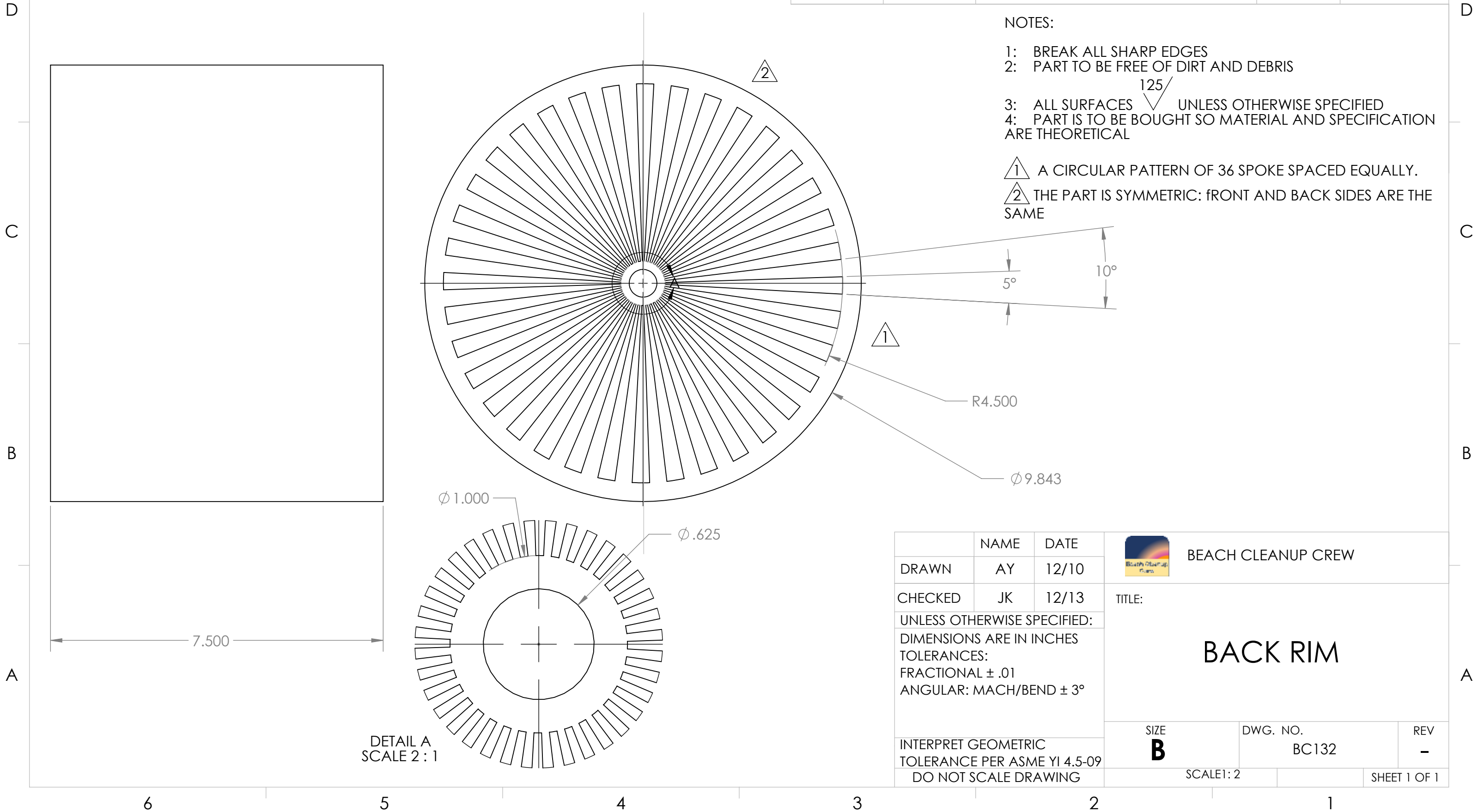
ϕ .625

	NAME	DATE	 BEACH CLEANUP CREW	
DRAWN	NH	12/10	TITLE: <div>BACK AXLE</div>	
CHECKED	JH	12/13		
UNLESS OTHERWISE SPECIFIED:				
DIMENSIONS ARE IN INCHES				
TOLERANCES:				
FRACTIONAL \pm .01		SIZE B	DWG. NO. BC121	REV -
ANGULAR: MACH/BEND \pm 3°				
TWO PLACE DECIMAL \pm .01				
THREE PLACE DECIMAL \pm .005		SCALE: 1:3	WEIGHT:	SHEET 1 OF 1
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09				
DO NOT SCALE DRAWING				

654321

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6		5		4	3	2		1		
USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.		REVISIONS				
BC203	BC132	AL 6061	ASTM B26	1		ZONE	REV.	DESCRIPTION	DATE	APPROVED



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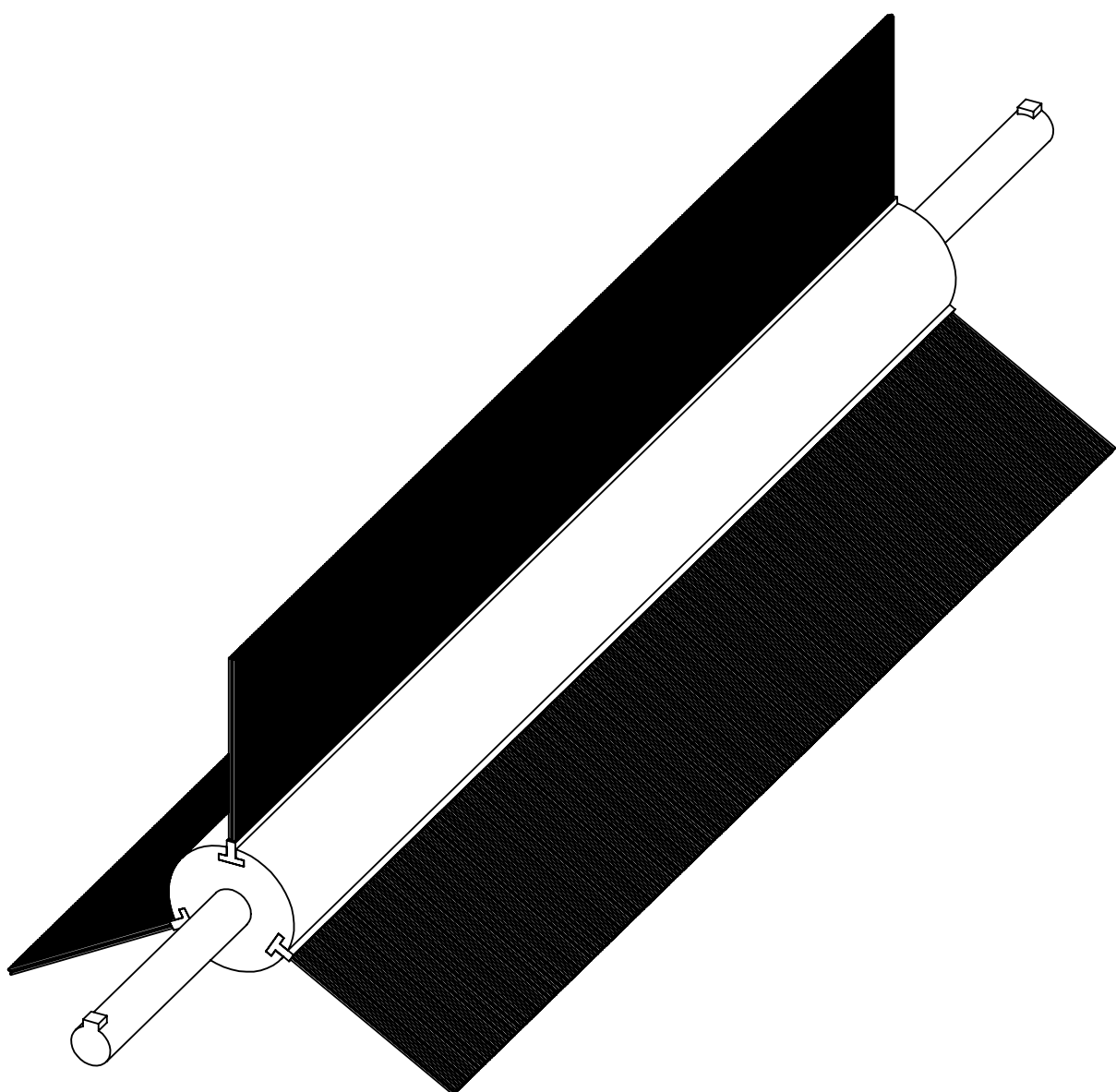
1

USED ON	PART NUMBER	TITLE	QTY.	REVISIONS				
BC201	BC101	ROLLER	1	ZONE	REV.	DESCRIPTION	DATE	APPROVED
BC201	BC111	BRISTLES	3					
BC300	BC201	ASSEMBLY, ROLLER & BRISTLES	1					

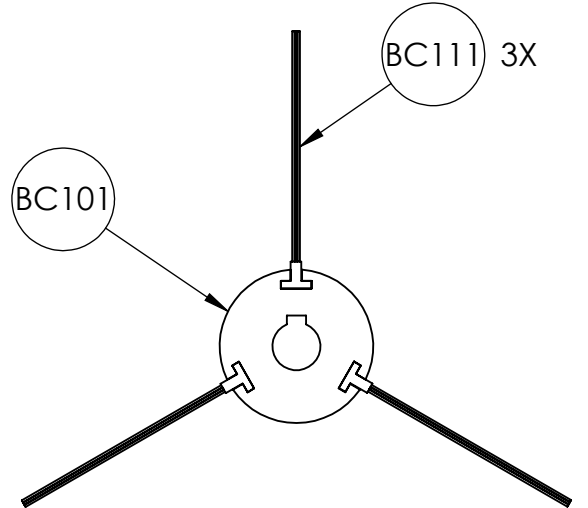
NOTES:

1. INSPECT FOR VISUAL CLEANLINESS BEFORE AND AFTER ASSEMBLY

2. FIT CLASS RC8 BETWEEN BC101 AND BC111 PER STANDARD




ISOMETRIC VIEW
FOR REFERENCE ONLY



BC101

BC111 3X

	NAME	DATE	 BEACH CLEANUP CREW
DRAWN	JK	12/11	TITLE: ASSEMBLY, ROLLER & BRISTLES
CHECKED	NH	12/13	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005			
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09 DO NOT SCALE DRAWING			
SCALE: 2:5 WEIGHT: SHEET 1 OF 2			

SIZE
B

DWG. NO.
BC201

REV
-

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6

5

4

3

2

1

A

B

C

D

A

B

C

D

6

5

4

3

2

1

USED ON	PART NUMBER	TITLE	QTY.
BC202	BC103	TYRE	1
BC202	BC132	BACK RIM	1
BC202	BC403	BEARING	2
BC300	BC202	BACK WHEEL	1

BC403

BC403

BC103

BC132

1

REVISIONS

ZONE	REV.	DESCRIPTION	DATE	APPROVED
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NOTES:

1. INSPECT FOR VISUAL CLEANLINESS BEFORE AND AFTER ASSEMBLY

2. THE TIRE SHOULD SLIDE ON TO THE RIM AND THEN EPOXYED FOR STABILITY.

3. THIS IS A SIMPLIFICATION OF A PURCHAED PART. ACTUAL TIRE SHOULD BE 13IN DIAMETER, SHOULD BE COMPATIBLE WITH AN AXLE OF 5/8IN DIAMETER, AND SHOULD BE 7.5IN WIDE.

4. FIT CLASS FN BETWEEN BC403 AND BC132 PER ANSI B4.1

BC403

BC403

BC103

BC132

1

	NAME	DATE	<div><div></div><div>BEACH CLEANUP CREW</div></div>
DRAWN	AY	12/13	
CHECKED	JH	12/13	TITLE:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005			SIZE B
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09			
DO NOT SCALE DRAWING			
SCALE: 1:3		WEIGHT:	

BACK WHEEL

DWG. NO.
BC202

REV
-

SHEET 1 OF 1

6

5

4

3

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1

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6

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2

1

USED ON	PART NUMBER	TITLE	QTY.
BC205	BC103	FRONT AND BACK TIRE	1
BC205	BC107	FRONT RIM	1
BC205	BC402	INTERNAL GEAR	1
BC205	BC403	BEARING	2
BC300	BC205	FRONT WHEEL	1

NOTES:

1. INSPECT FOR VISUAL CLEANLINESS BEFORE AND AFTER ASSEMBLY

2. FIT CLASS RC8 BETWEEN BC101 AND BC111 PER STANDARD

3. BC403 (BEARING) AND BC402 (INNER GEAR) ARE PURCHASED PARTS

4. BC402 AND BC107 ARE EDGE WELDED TOGETHER ALL AROUND.

5. BC107 AND BC403 ARE FIT USING FIT CLASS RC1

EXPLODED VIEW

BC403

BC402

BC107

BC403

BC103

FRONT VIEW

BACK VIEW

ZONE	REV.	DESCRIPTION	DATE	APPROVED

BEACH CLEANUP CREW

FRONT WHEEL

SIZE

SCALE1:4

DWG. NO.

WEIGHT:

REV

SHEET 1 OF 1

6

5

4

3

2

1

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6

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4

3

2

1

USED ON	PART NUMBER	TITLE	QTY.
BC206	BC201	ASSEMBLY, ROLLER & BRISTLES	1
BC206	BC401	PINION GEAR	2
BC206	BC102	WHEEL COVER WITH DEAD AXLE	2
BC300	BC206	BRUSH WITH COVER AND PINION	1

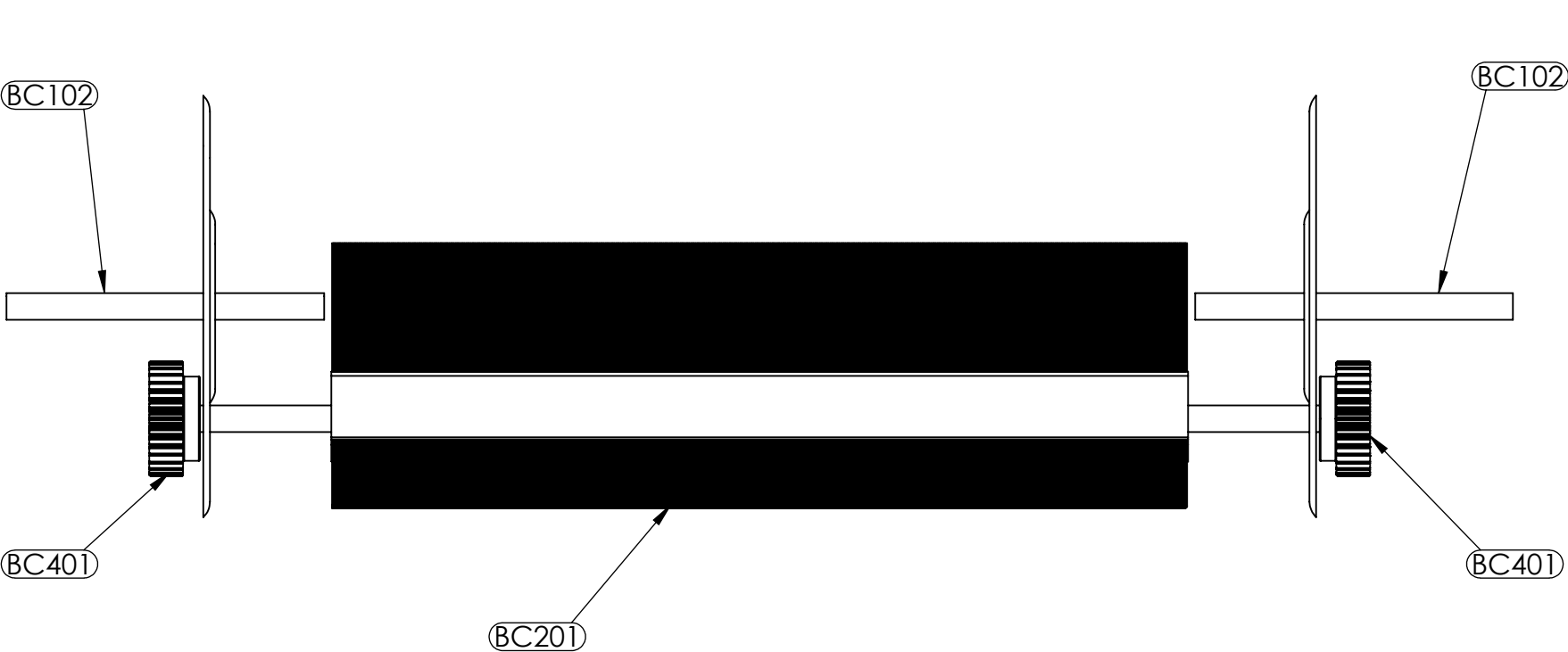
NOTES:

- INSPECT FOR VISUAL CLEANLINESS BEFORE AND AFTER ASSEMBLY
- PROPERLY LUBRICATE PINION GEAR FACES
- THIS IS AN IMPORTANT STEP IN ASSEMBLY. BY ITSELF, IT IS NOT SUPPORTED. IT WILL BE SUPPORTED BY COLLARS (BC404) AND REST OF FRAME INCLUDING FRONT WHEEL SYSTEM. THIS CAN BE SEEN IN FINAL ASSEMBLY (BC300)

BC102

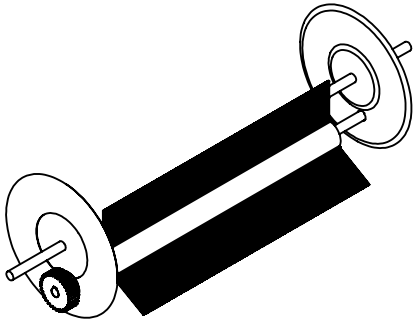
BC401

BC201




BC102

BC401



ISOMETRIC VIEW
FOR REFERENCE ONLY
SCALE 1:12

	NAME	DATE	 BEACH CLEANUP CREW
DRAWN	NH	12/13	TITLE: BRUSH WITH COVER AND PINION
CHECKED	JH	12/13	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± .01 ANGULAR: MACH/BEND ± 3° TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005			
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09 DO NOT SCALE DRAWING			
SIZE B	DWG. NO. BC206		REV -
SCALE: 1:4		WEIGHT:	SHEET 1 OF 1

6

5

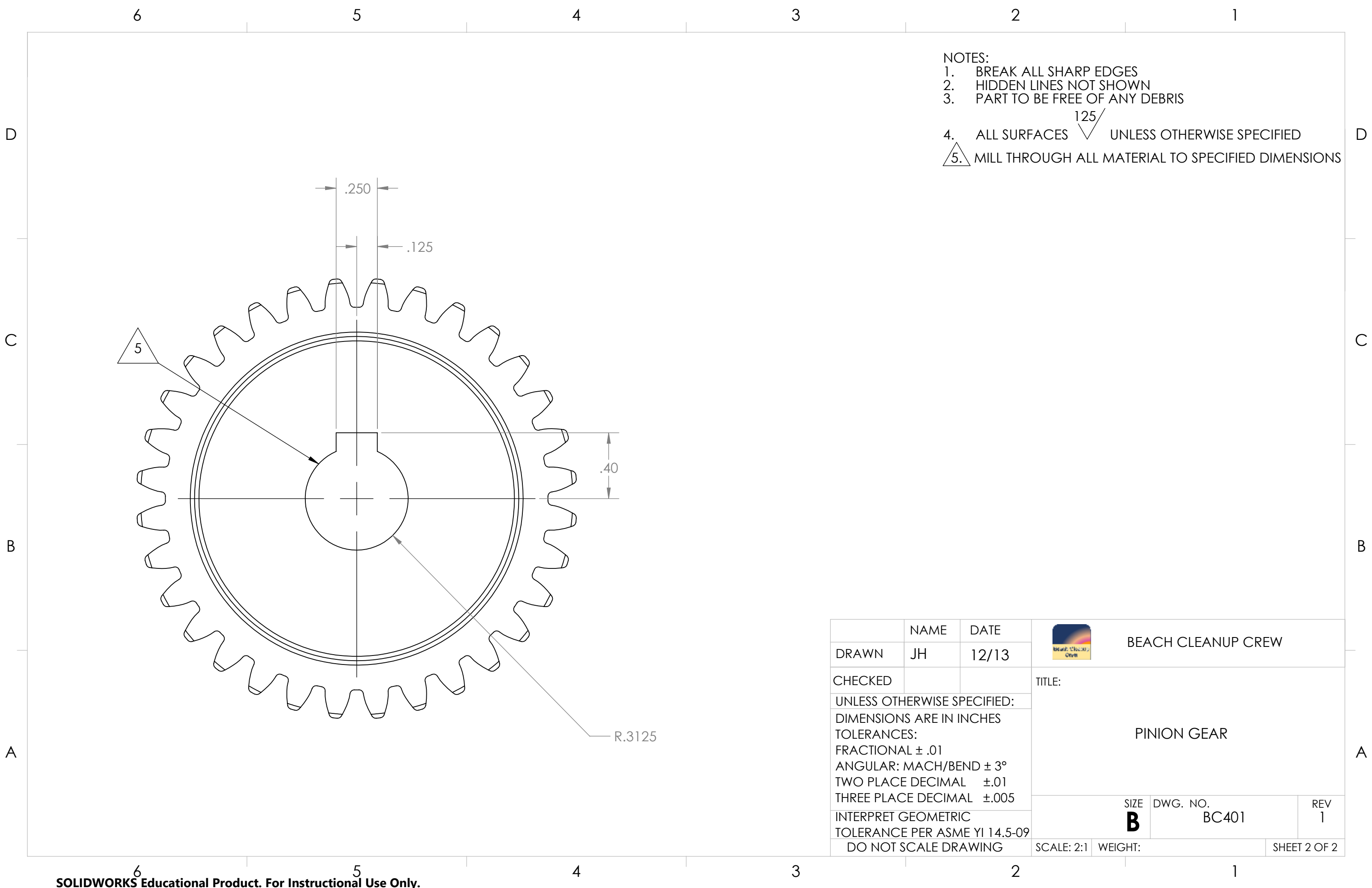
4


3

2

1

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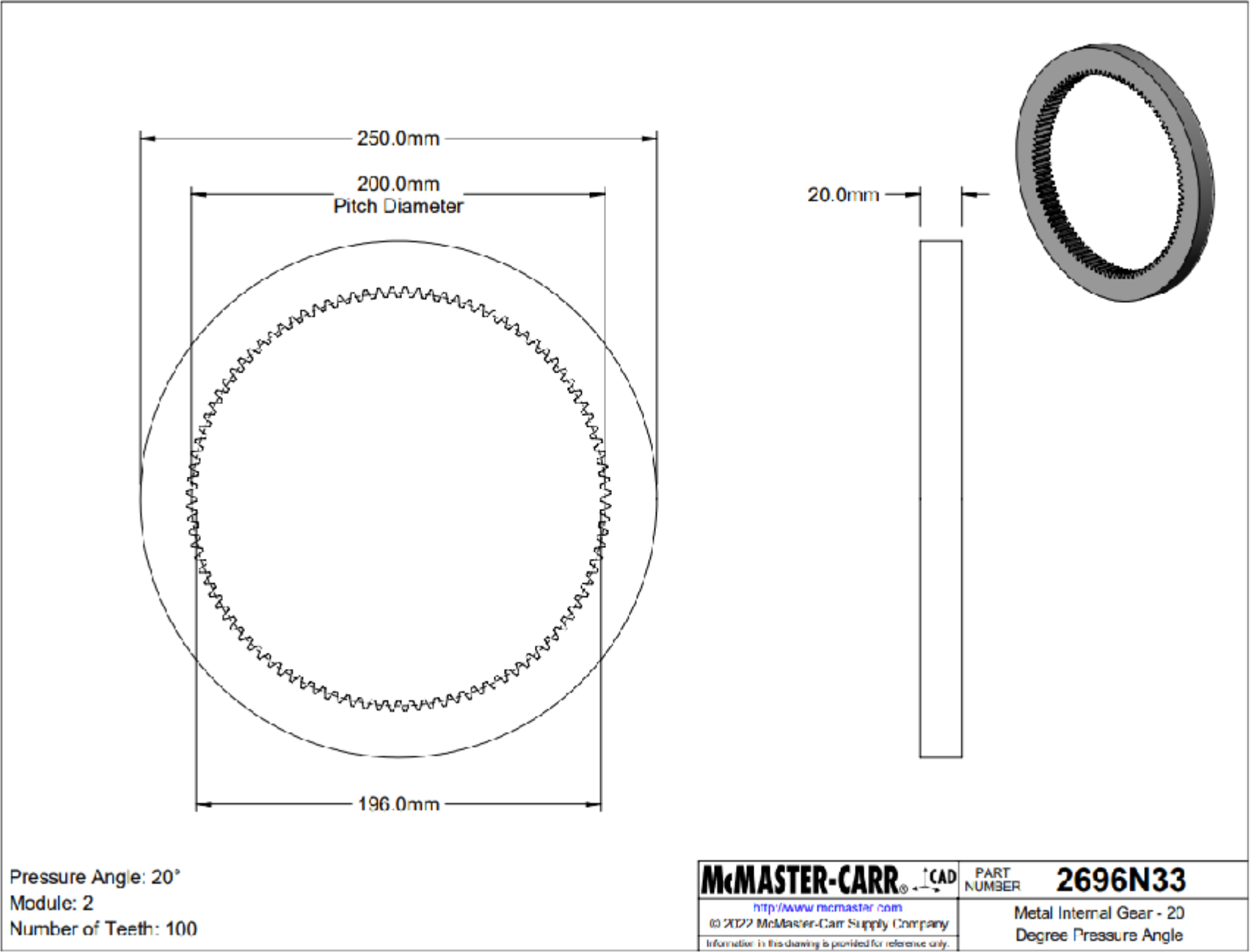



	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	JH	12/13	TITLE: PINION GEAR		
CHECKED					
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES					
TOLERANCES:					
FRACTIONAL ± .01					
ANGULAR: MACH/BEND ± 3°					
TWO PLACE DECIMAL ±.01			SIZE B		
THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC			DWG. NO. BC401		REV 1
TOLERANCE PER ASME Y1 14.5-09					
DO NOT SCALE DRAWING			SCALE: 2:1	WEIGHT:	SHEET 2 OF 2

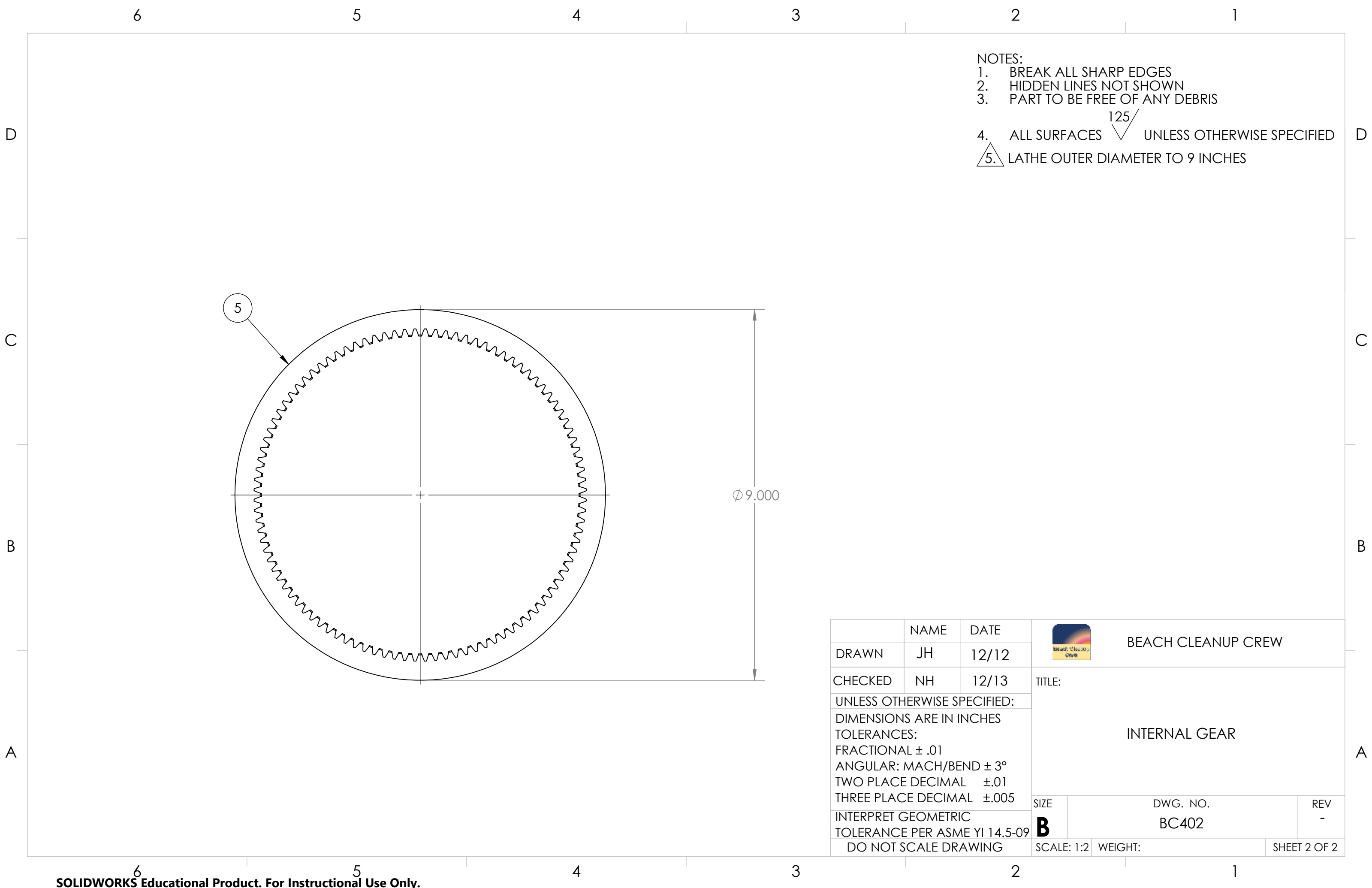
USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.
BC205	BC402	1045 CARBON STEEL	ASTM A711	1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED

- NOTES:
- 1. BREAK ALL SHARP EDGES
 - 2. HIDDEN LINES NOT SHOWN
 - 3. PART TO BE FREE OF ANY DEBRIS
 - 4. ALL SURFACES ¹²⁵✓ UNLESS OTHERWISE SPECIFIED



	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	JH	12/12	TITLE: INTERNAL GEAR		
CHECKED	NH	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES					
TOLERANCES:					
FRACTIONAL ± .01					
ANGULAR: MACH/BEND ± 3°					
TWO PLACE DECIMAL ±.01					
THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC TOLERANCE PER ASME Y1 14.5-09		SIZE	DWG. NO.		REV
DO NOT SCALE DRAWING		B	BC402		-
		SCALE: 1:5	WEIGHT:		SHEET 1 OF 2



- NOTES:
- 1. BREAK ALL SHARP EDGES
 - 2. HIDDEN LINES NOT SHOWN
 - 3. PART TO BE FREE OF ANY DEBRIS
 - 4. ALL SURFACES $\sqrt{125}$ UNLESS OTHERWISE SPECIFIED
 - 5. \triangle LATHE OUTER DIAMETER TO 9 INCHES

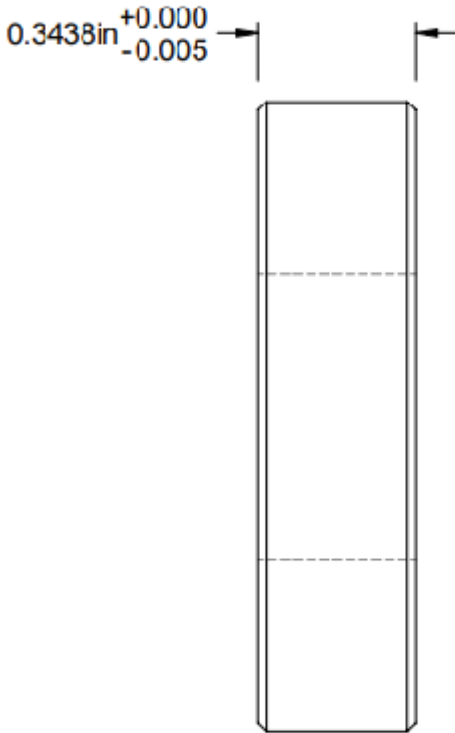
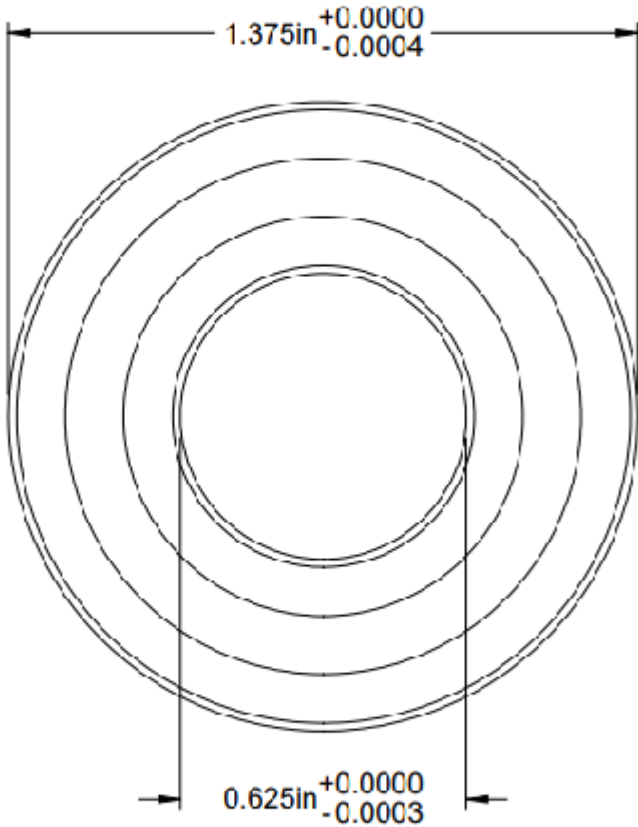
	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	JH	12/12	TITLE: INTERNAL GEAR		
CHECKED	NH	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES					
TOLERANCES:					
FRACTIONAL ± .01					
ANGULAR: MACH/BEND ± 3°					
TWO PLACE DECIMAL ±.01					
THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC		SIZE B	DWG. NO. BC402		REV -
TOLERANCE PER ASME Y1 14.5-09					
DO NOT SCALE DRAWING		SCALE: 1:2	WEIGHT:		SHEET 2 OF 2

USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.
BC202 BC205	BC403	1045 CARBON STEEL	ASTM A711	1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED



- NOTES:
- 1. BREAK ALL SHARP EDGES
 - 2. HIDDEN LINES NOT SHOWN
 - 3. PART TO BE FREE OF ANY DEBRIS
 - 4. ALL SURFACES ¹²⁵ UNLESS OTHERWISE SPECIFIED
 - 5. PART PURCHASED FROM MCMaster-CARR
 - 6. PART NUMBER 2342K187



Trade Number: R10-2RS

McMASTER-CARR

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CAD

PART NUMBER

2342K187

Permanently Lubricated Ball Bearing

	NAME	DATE	 BEACH CLEANUP CREW		
DRAWN	JH	12/13	TITLE: BEARING		
CHECKED	JK	12/13			
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES					
TOLERANCES:					
FRACTIONAL ± .01					
ANGULAR: MACH/BEND ± 3°					
TWO PLACE DECIMAL ±.01					
THREE PLACE DECIMAL ±.005					
INTERPRET GEOMETRIC					
TOLERANCE PER ASME Y1 14.5-09					
DO NOT SCALE DRAWING		SIZE	DWG. NO.		REV
		B	BC403		-
		SCALE: 1:5	WEIGHT:		SHEET 1 OF 1

6

5

4

3

2

1

USED ON	PART NUMBER	MATERIAL	SPECIFICATION	QTY.	REVISIONS				
BC300	BC404	1045 CARBON STEEL	ASTM A711	1	ZONE	REV.	DESCRIPTION	DATE	APPROVED

D

C

B

A

1 1/2"

5/8"

13/32"

#10-32 x 5/8"
Socket Head
Cap Screw

NOTES:

1. BREAK ALL SHARP EDGES

2. HIDDEN LINES NOT SHOWN

3. PART TO BE FREE OF ANY DEBRIS

4. ALL SURFACES

125/

 UNLESS OTHERWISE SPECIFIED

5. PURCHASED FROM MCMASTER-CARR

6. PART NUMBER 57145K53

NAME

DATE

DRAWN

JH

12/13

CHECKED

NH

12/13

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL ± .01

ANGULAR: MACH/BEND ± 3°

TWO PLACE DECIMAL ±.01

THREE PLACE DECIMAL ±.005

INTERPRET GEOMETRIC

TOLERANCE PER ASME Y1 14.5-09

DO NOT SCALE DRAWING

BEACH CLEANUP CREW

TITLE:

COLLAR

SIZE

B

DWG. NO.

BC404

REV

-

SCALE: 1:5

WEIGHT:

SHEET 1 OF 1

McMASTER-CARR

CAD

PART NUMBER

57145K53

6

5

4

3

2

1

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