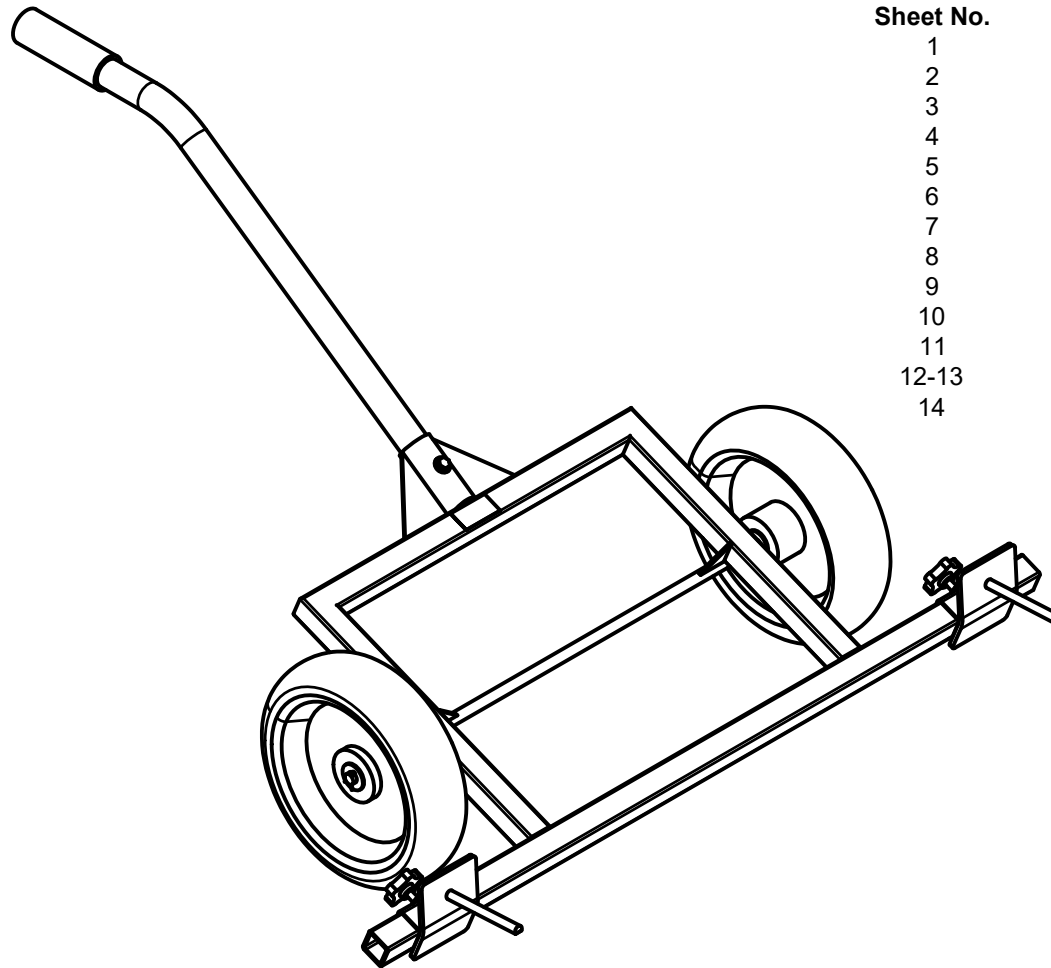


Department of Transportation State of Colorado

Project: Snow Plow Blade Installer Cart



Sheet No.	Index of Sheets
1	Title Sheet
2	General Notes
3	Stock List
4	Bill of Materials
5	Part Drawings: ST-1, ST-2, ST-4, & H-2
6	Part Drawings: H-1
7	Part Drawings: CF-2, CF-7, & ST-3
8	Part Drawings: CF-3, CF-4, & CF-5
9	Part Drawings: CF-1, CF-6
10	Subassembly Drawings: SA-1
11	Subassembly Drawings: SA-2
12-13	Subassembly Drawings: SA-3
14	Main Assembly Drawing: SPBIC-1

Revisions

Date:	Comments	Init.




COLORADO
Department of Transportation

Design By:	B. Manguso	Project:	Snow Plow Blade Installer Cart	
Drawing By:	J. McDowell	Subset:	Title Sheet	
Print Date:	12/08/2021	Subset Sheets:	1 of 1	Sheet Number: 1

General Notes

1. All dimensions are in the following units:
Linear: inches
Angular: degrees
2. Unless specified, the tolerances are as follows:
Linear: $\pm 1/16"$
Diametrical: $\pm 1/32"$
Angular: $\pm 1^\circ$
3. Dimensions labeled as approximate (e.g. $\sim 45^\circ$) do NOT need to be verified
4. The dimensions seen in Detail D on sheet two of Subassembly Drawings: SA-3 are tailored to Marastar's 13 5/16" flat-free wheel (item no. 46G089). If a different 13 5/16" flat-free wheel is selected, the Fabricator shall adjust the dimensions in Detail D to accommodate the selected wheel.
5. The edges of all cuts and drilled holes shall be deburred
6. Unless specified, the legs of all fillet welds measure 1/4" long
7. Unless specified, the exterior surfaces of SA-1, SA-2, and SA-3 shall be cleaned, primed, and painted after assembling each subassembly
8. For uncommon stock, a suggested manufacturer and/or supplier is provided. The manufacturer's drawings for these items can be found appended to the end of this set of plans

Revisions			 COLORADO Department of Transportation	Design By:	Project:	
Date:	Comments	Init.		B. Manguso	Snow Plow Blade Installer Cart	
				Drawing By:	Subset:	
				J. McDowell	General Notes	
			Print Date:	12/08/2021	Subset Sheets: 1 of 1	Sheet Number: 2

Stock List Notes

- The thread length of the 1/2"-13 partially threaded bolt should be kept as short as possible, to a minimum length of 1/2"
- For reference, the cross sectional dimensions of 1 1/2" schedule 10 mild steel pipe are as follows:
 OD: 1.900"
 ID: 1.682"
 Wall Thickness: 0.109"
- The warning label shall contain a message that warns users to exercise caution when loading and unloading plow blades on to and off of the cart, e.g. "CAUTION, Use care when mounting or dismounting"

Stock List

Stock Description	Qty	Units	Part ID	If n/a, Used as Material for:		Suggested Manufacturer/Supplier
				Part ID	Part Description	
1/2"-13 x 6" partially threaded hex bolt, grade 8 steel ^[1]	2	each	n/a	ST-1	Tine	
4" x 1/4" mild steel bar	12	in	n/a	ST-2	Face	
1 3/4" x 1 3/4" mild steel square tube, 0.083" thickness	8	in	n/a	ST-4	Slide	
1 5/8" ID rubber hose	6	in	n/a	H-2	Grip	
Ø1 5/8" mild steel round tube, 0.065" thickness	3	ft	n/a	H-1	Handle	
10 guage mild steel sheet	1	sq ft	n/a	CF-2 CF-7 ST-3	Axle brace Handle mount brace Face brace	
1 1/2" x 1 1/2" mild steel square tube, 1/8" thickness	10	ft	n/a	CF-3 CF-4 CF-5	Frame - forward member Frame - side member Frame - rear member	
Ø5/8" mild steel rod	3	ft	n/a	CF-1	Axle	
1 1/2" schedule 10 mild steel pipe ^[2]	6	in	n/a	CF-6	Handle mount	
3/8"-16 hex nut	2	each	S-1	n/a	n/a	
1/2"-13 hex nut	2	each	S-2	n/a	n/a	
5/8" washer	4	each	S-3	n/a	n/a	
Warning label ^[3]	1	each	S-4	n/a	n/a	
3/32" x 1" cotter pin	2	each	S-5	n/a	n/a	
13 5/16" flat-free wheel, 5/8" bore, 250lb+ load rating	2	each	S-6	n/a	n/a	Marastar/Grainger Item no. 46G089
3/8"-16 x 2 1/2" hex bolt	1	each	S-7	n/a	n/a	
3/8" washer	2	each	S-8	n/a	n/a	
3/8"-16 nylon insert lock nut	1	each	S-9	n/a	n/a	
Knob, 3/8"-16 threaded stud, 1" stud length	2	each	S-10	n/a	n/a	McMaster-Carr Item no. 59625K79
Self-etching primer, 12oz spray can	1	each	n/a	n/a	n/a	
Red enamel paint, 12oz spray can	1	each	n/a	n/a	n/a	

Revisions

Date:	Comments	Init.



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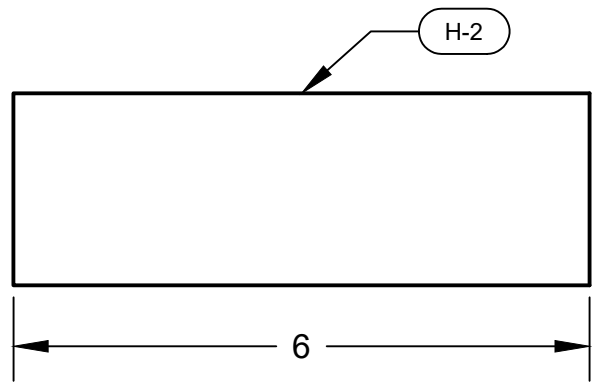
Design By:	B. Manguso	Project:	Snow Plow Blade Installer Cart
Drawing By:	J. McDowell	Subset:	Stock List
Print Date:	12/08/2021	Subset Sheets:	1 of 1
		Sheet Number:	3

Bill of Materials						
Part ID	Part Description		Subassy Qty	Main Assy Qty	Total Qty	Drawing on Sheet No.
SPBIC-1	Snow Plow Blade Installer Cart Main Assembly		n/a	n/a	1	14
	SA-1	Sliding Tine Subassembly	n/a	2	2	10
		ST-1 Tine	1	n/a	2	5
		ST-2 Face	1	n/a	2	5
		ST-3 Face brace	1	n/a	2	7
		ST-4 Slide	1	n/a	2	5
		S-1 3/8"-16 hex nut	1	n/a	2	n/a
		S-2 1/2"-13 hex nut	1	n/a	2	n/a
	SA-2	Handle Subassembly	n/a	1	1	11
		H-1 Handle	1	n/a	1	6
		H-2 Grip	1	n/a	1	5
	SA-3	Cart Frame Subassembly	n/a	1	1	12-13
		CF-1 Axle	1	n/a	1	9
		CF-2 Axle brace	2	n/a	2	7
		CF-3 Frame - forward member	1	n/a	1	8
		CF-4 Frame - side member	2	n/a	2	8
		CF-5 Frame - rear member	1	n/a	1	8
		CF-6 Handle mount	1	n/a	1	9
		CF-7 Handle mount brace	2	n/a	2	7
		S-3 5/8" washer	2	n/a	see S-3 below	n/a
		S-4 Warning label	1	n/a	1	n/a
	S-3	5/8" washer	n/a	2	4	n/a
	S-5	3/32" x 1" cotter pin	n/a	2	2	n/a
	S-6	13 5/16" flat-free wheel, 5/8" bore, 250lb+ load rating	n/a	2	2	n/a
	S-7	3/8"-16 x 2 1/2" hex bolt	n/a	1	1	n/a
	S-8	3/8" washer	n/a	2	2	n/a
	S-9	3/8"-16 nylon insert lock nut	n/a	1	1	n/a
	S-10	Knob, 3/8"-16 threaded stud, 1" stud length	n/a	2	2	n/a

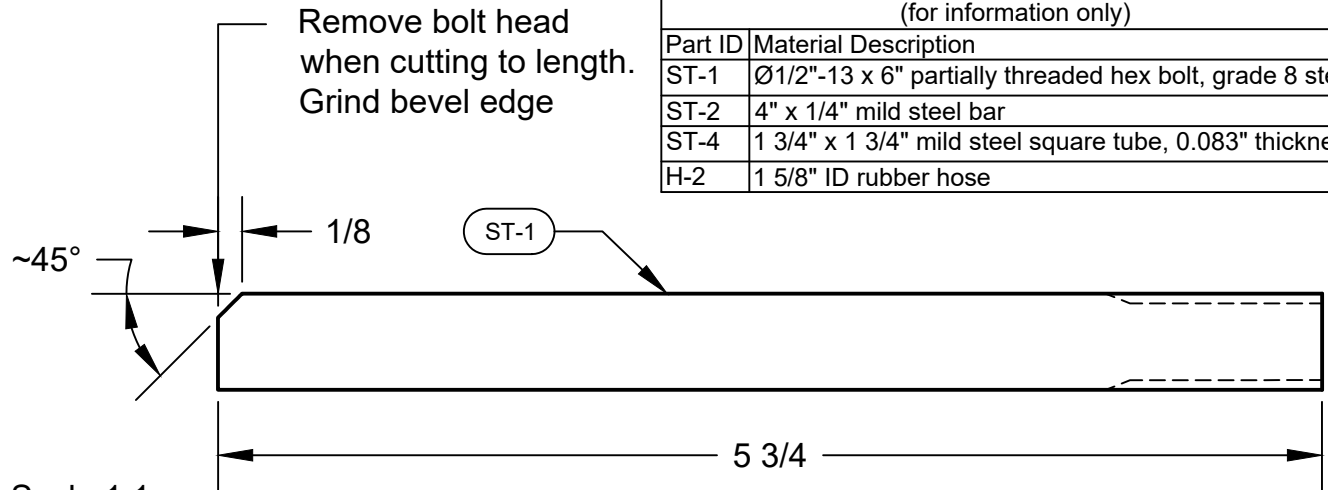
Revisions		
Date:	Comments	Init.



Design By:	B. Manguso	Project:	Snow Plow Blade Installer Cart	
Drawing By:	J. McDowell	Subset:	Bill of Materials	
Print Date:	12/08/2021	Subset Sheets:	1 of 1	Sheet Number: 4

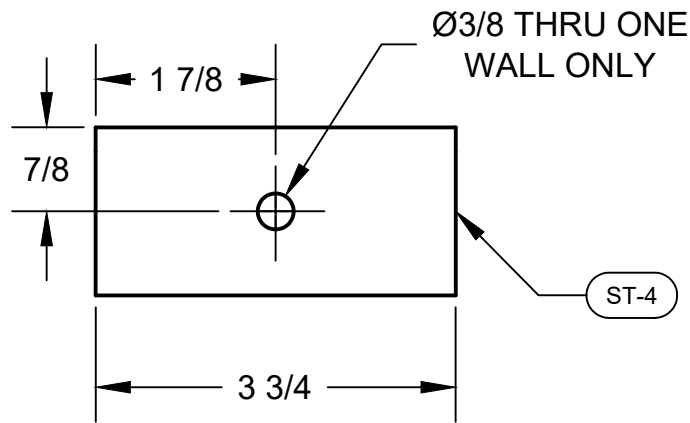


Scale 1:2

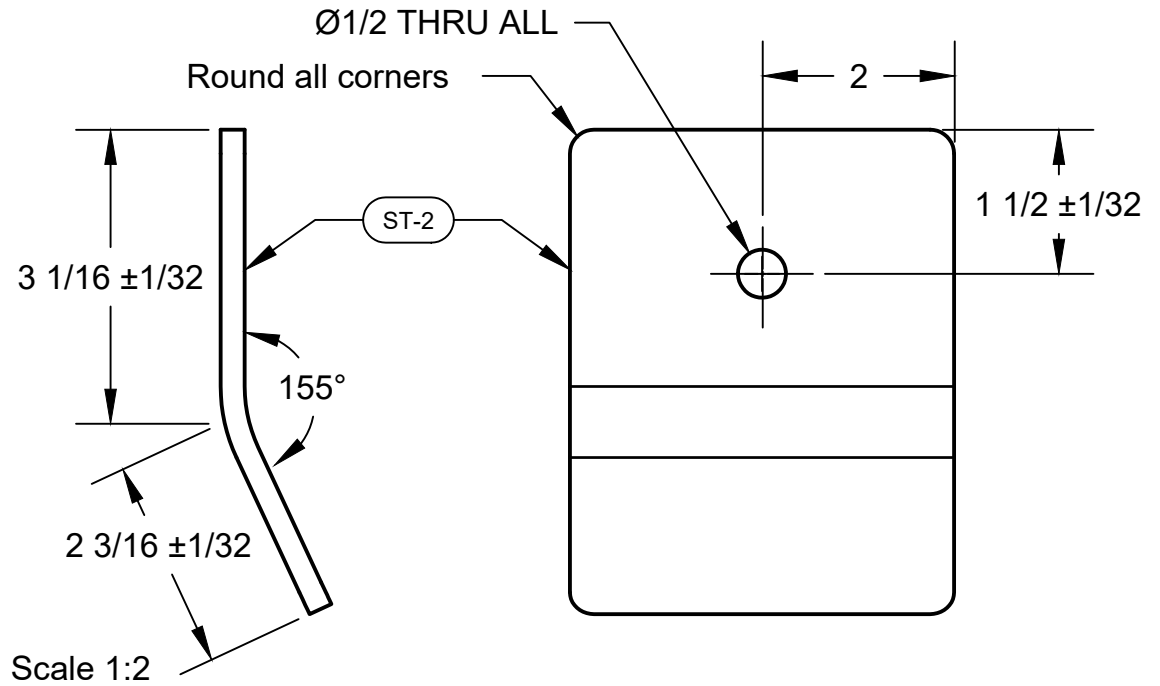


Scale 1:1

Stock Material (for information only)	
Part ID	Material Description
ST-1	Ø1/2"-13 x 6" partially threaded hex bolt, grade 8 steel
ST-2	4" x 1/4" mild steel bar
ST-4	1 3/4" x 1 3/4" mild steel square tube, 0.083" thickness
H-2	1 5/8" ID rubber hose



Scale 1:2



Scale 1:2

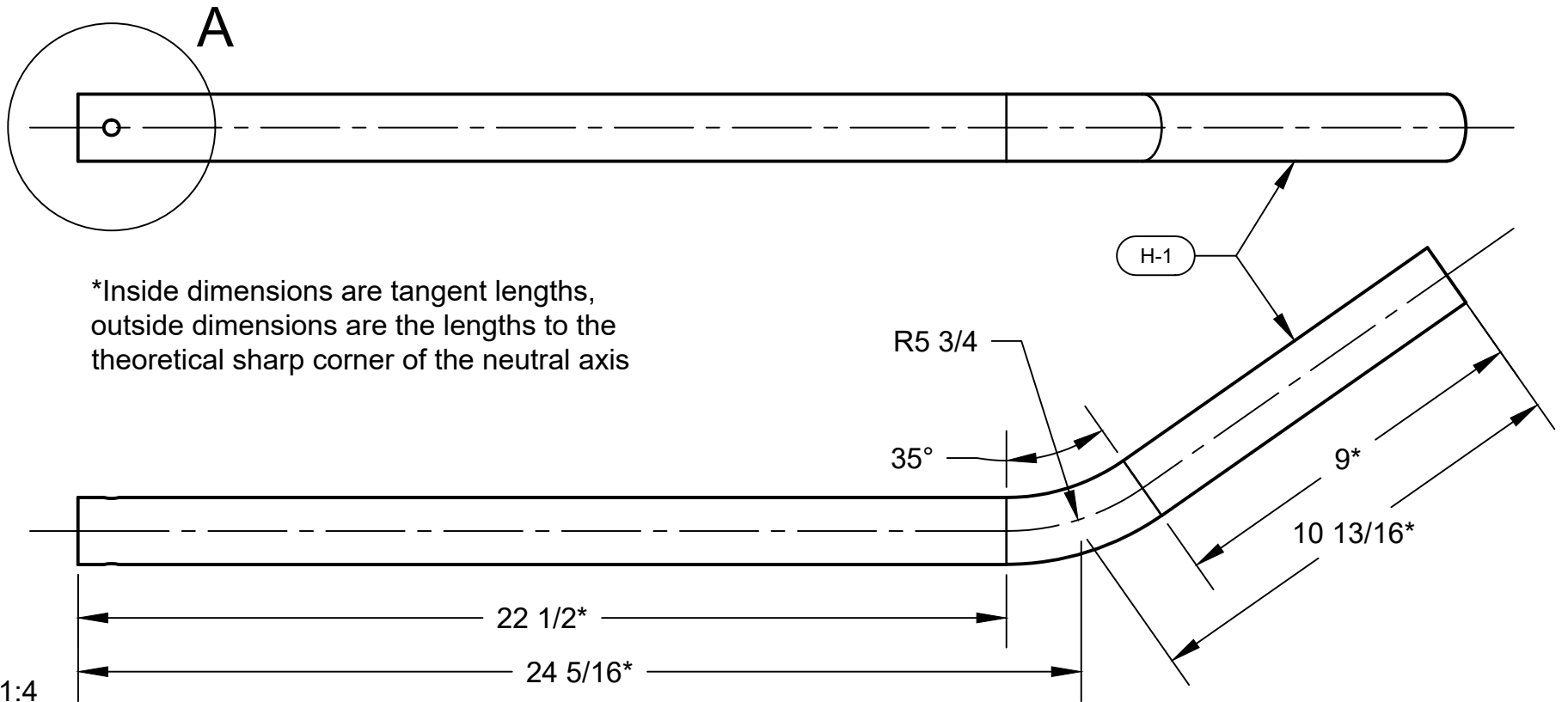
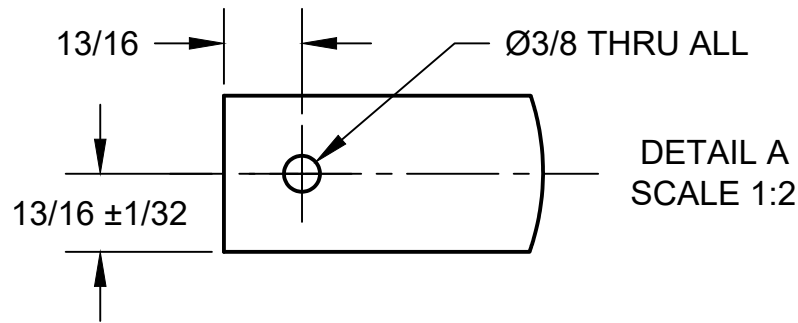
Revisions		
Date:	Comments	Init.



Design By:	B. Manguso	Project:	Snow Plow Blade Installer Cart
Drawing By:	J. McDowell	Subset:	Part Drawings: ST-1, ST-2, ST-4 & H-2
Print Date:	12/08/2021	Subset Sheets:	1 of 1 Sheet Number: 5

Stock Material
(for information only)

Part ID	Material Description
H-1	Ø1 5/8" mild steel round tube, 0.065" thickness



*Inside dimensions are tangent lengths,
outside dimensions are the lengths to the
theoretical sharp corner of the neutral axis

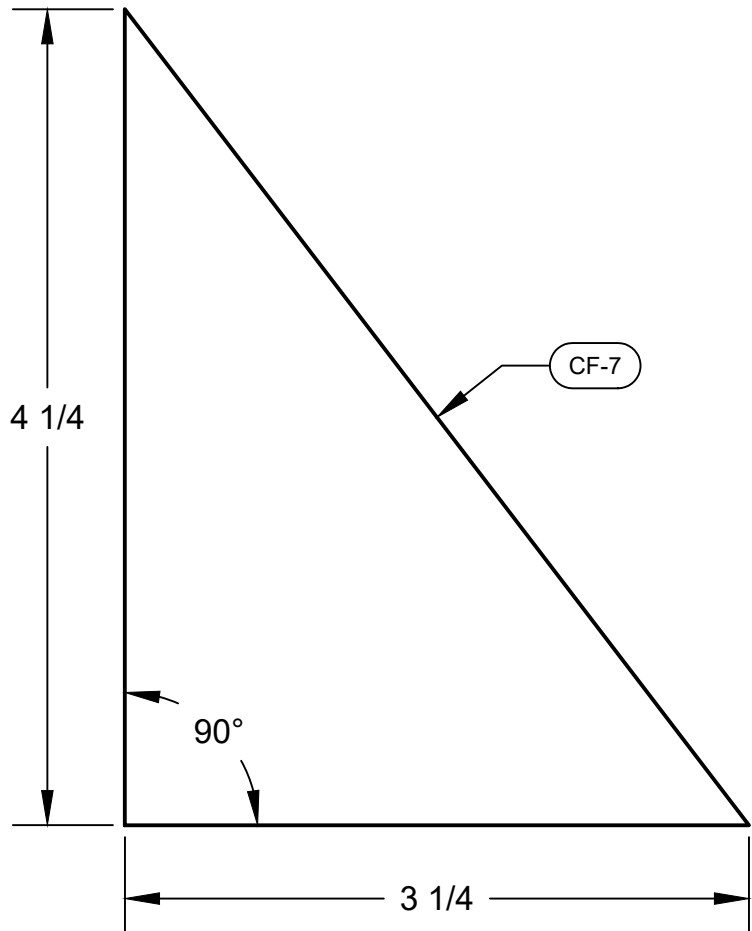
Revisions		
Date:	Comments	Init.



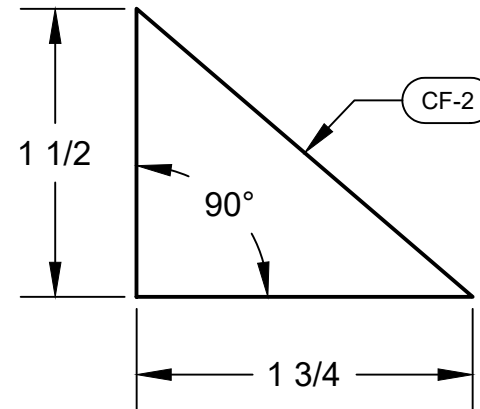
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Drawing By:	J. McDowell	Subset:	Part Drawings: H-1
Print Date:	12/08/2021	Subset Sheets:	1 of 1
		Sheet Number:	6

Stock Material
(for information only)

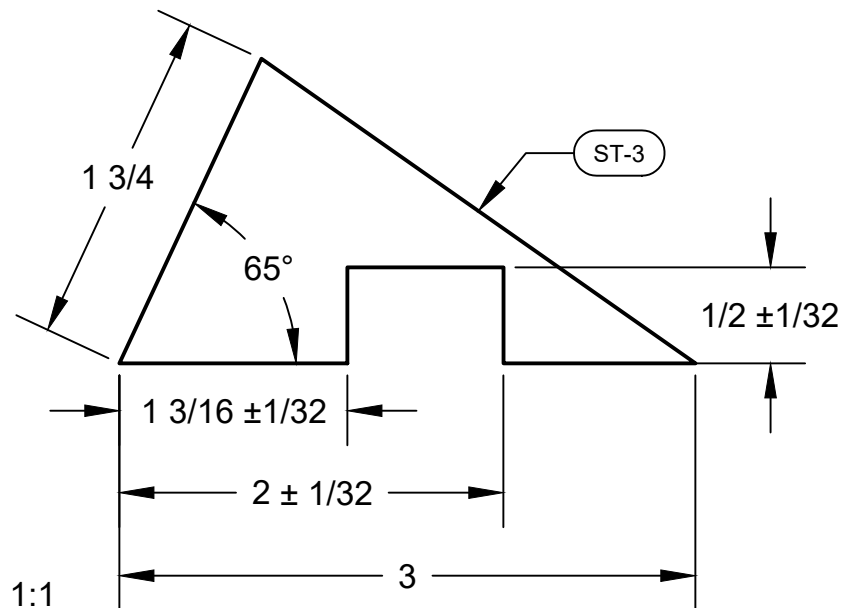
Part ID	Material Description
CF-2, CF-7, ST-3	10 guage mild steel sheet



Scale 1:1



Scale 1:1



Scale 1:1

Revisions

Date:	Comments	Init.



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Design By: B. Manguso

Project: Snow Plow Blade Installer Cart

Drawing By: J. McDowell

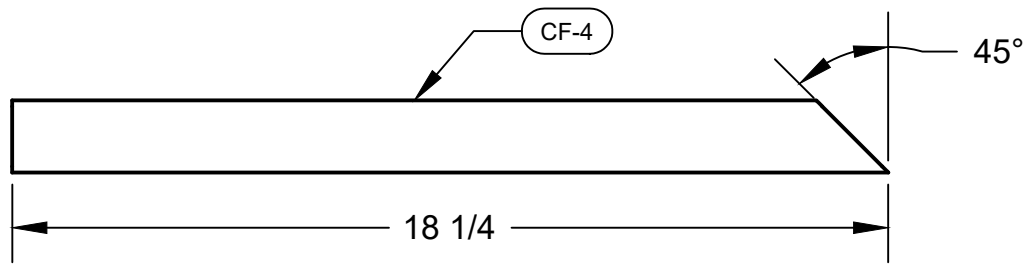
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Print Date: 12/08/2021

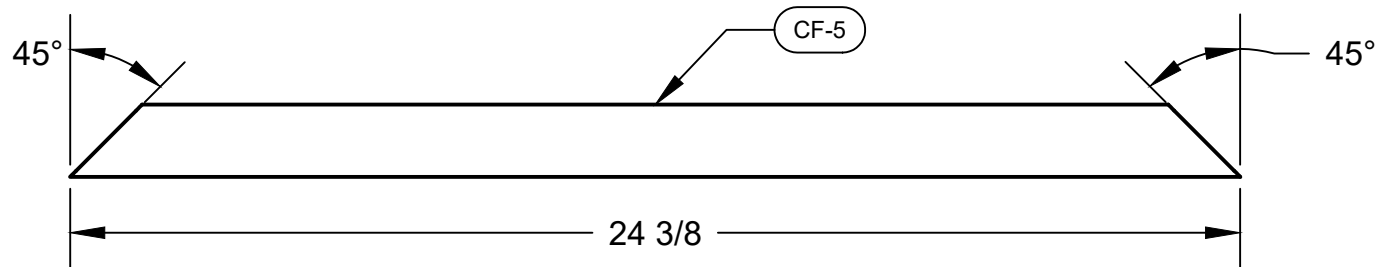
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Stock Material
(for information only)

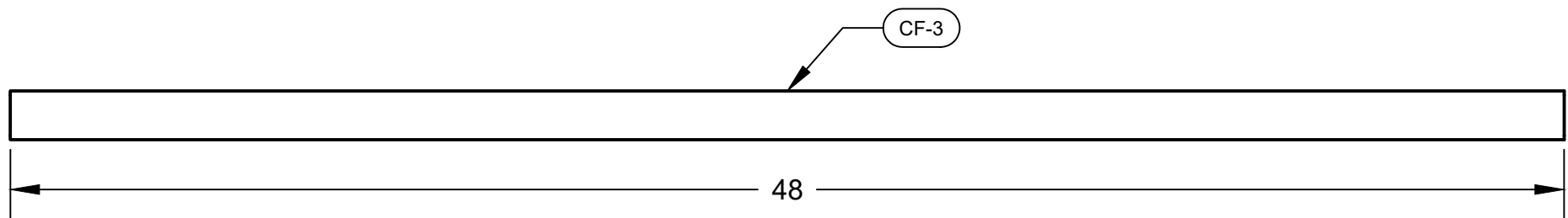
Part ID	Material Description
CF-3, CF-4, CF-5	1 1/2" x 1 1/2" mild steel square tube, 1/8" thickness



Scale 1:4



Scale 1:4



Scale 1:5

Revisions		
Date:	Comments	Init.

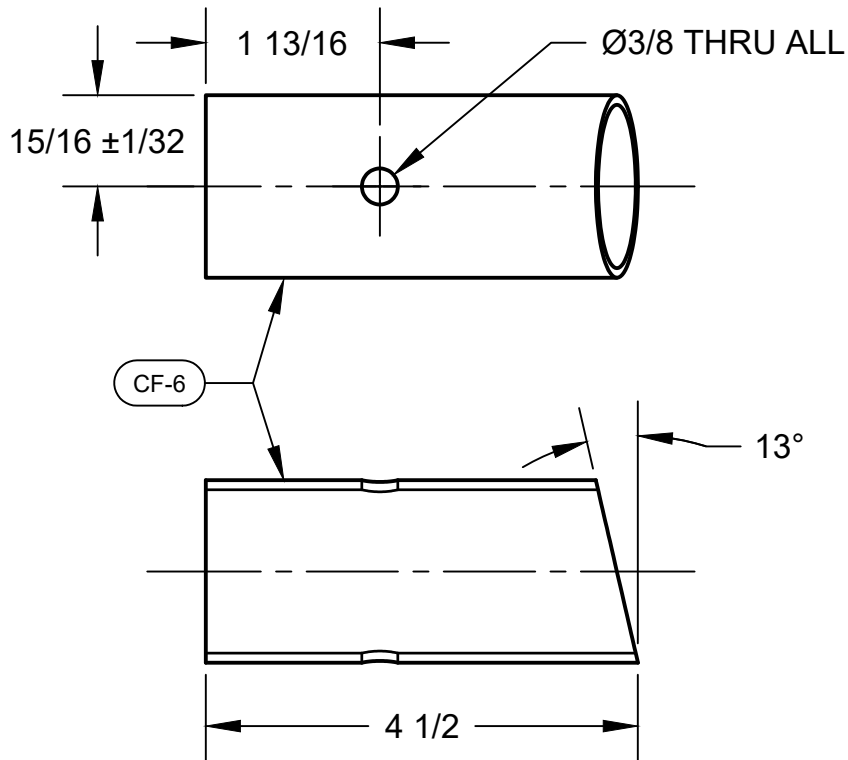


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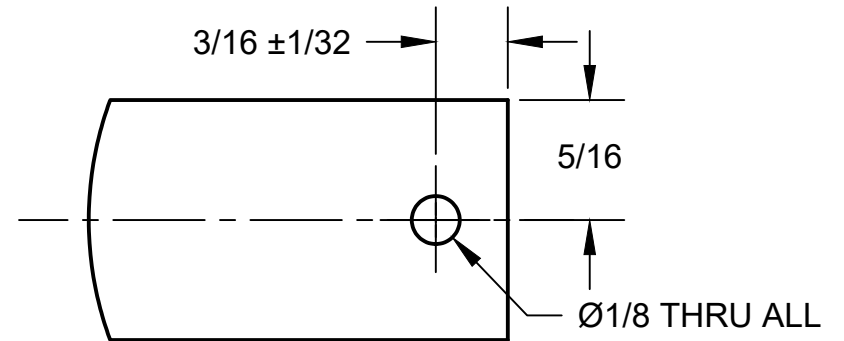
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Drawing By:	J. McDowell	Subset:	Part Drawings: CF-3, CF-4, & CF-5
Print Date:	12/08/2021	Subset Sheets:	1 of 1
		Sheet Number:	8

Stock Material
(for information only)

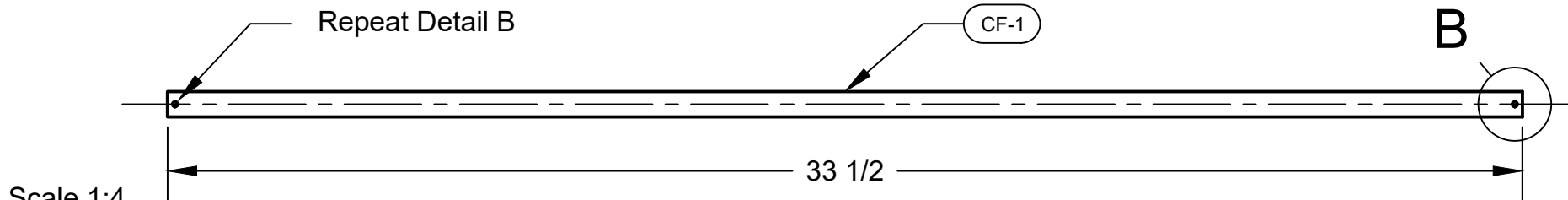
Part ID	Material Description
CF-1	Ø5/8" mild steel rod
CF-6	1 1/2" schedule 10 mild steel pipe



Scale 1:2



DETAIL B
SCALE 2:1



Scale 1:4

Revisions

Date:	Comments	Init.



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Design By: B. Manguso

Drawing By: J. McDowell

Print Date: 12/08/2021

Project: Snow Plow Blade Installer Cart

Subset: Part Drawings: CF-1 & CF-6

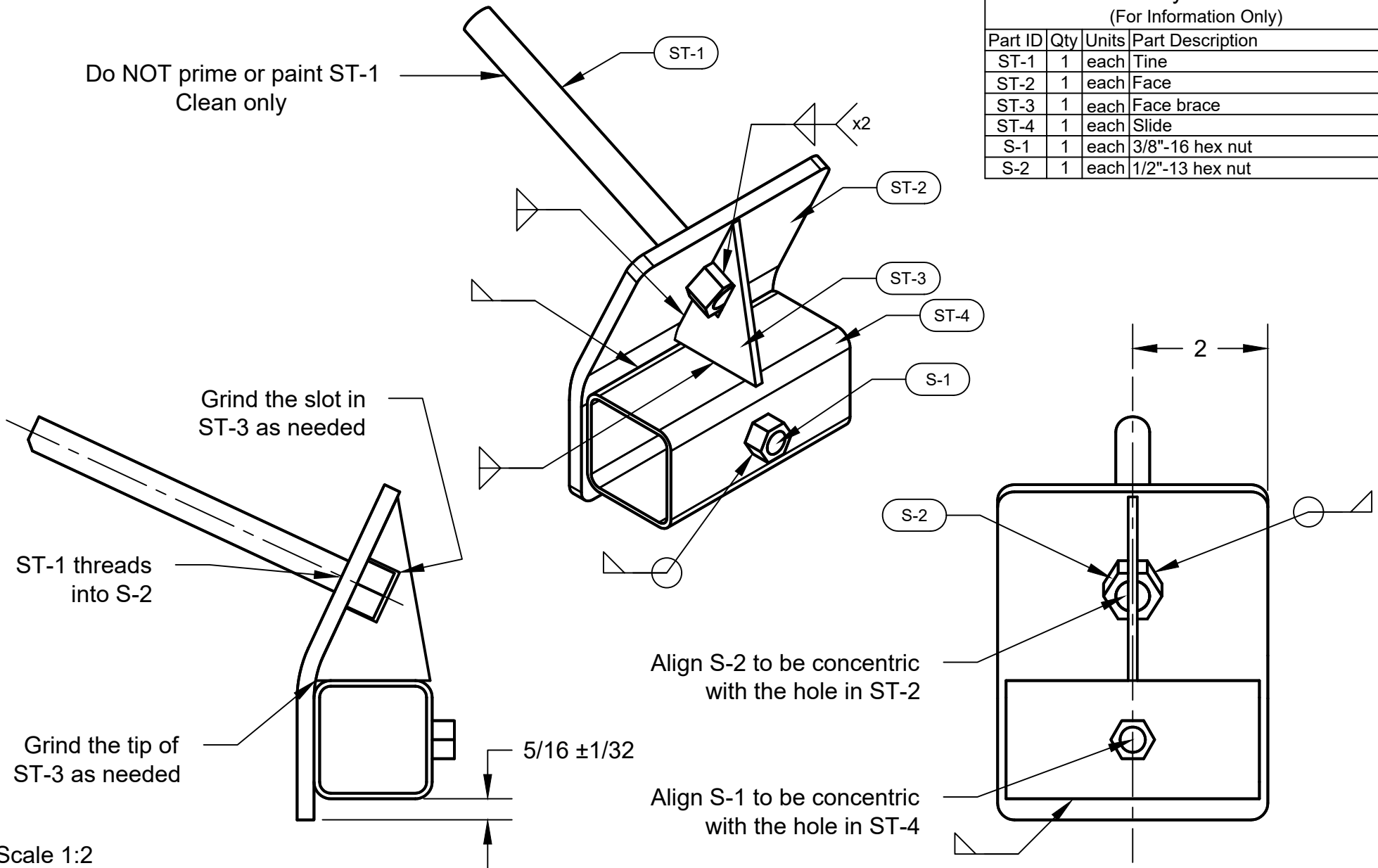
Subset Sheets: 1 of 1 Sheet Number: 9

Subassembly Bill of Materials

(For Information Only)

Part ID	Qty	Units	Part Description
ST-1	1	each	Tine
ST-2	1	each	Face
ST-3	1	each	Face brace
ST-4	1	each	Slide
S-1	1	each	3/8"-16 hex nut
S-2	1	each	1/2"-13 hex nut

Do NOT prime or paint ST-1
Clean only



Grind the slot in ST-3 as needed

ST-1 threads into S-2

Grind the tip of ST-3 as needed

5/16 ± 1/32

Align S-2 to be concentric with the hole in ST-2

Align S-1 to be concentric with the hole in ST-4

Scale 1:2

Revisions

Date:	Comments	Init.



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Design By: B. Manguso

Drawing By: J. McDowell

Print Date: 12/08/2021

Project: Snow Plow Blade Installer Cart

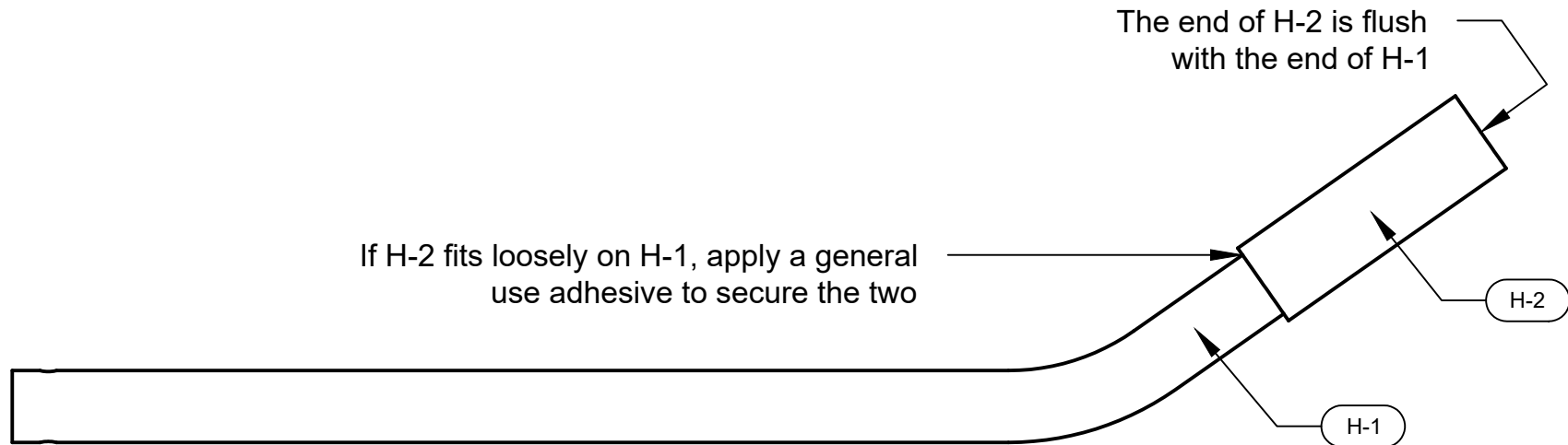
Subset: Subassembly Drawings: SA-1

Subset Sheets: 1 of 1 | Sheet Number: 10

Subassembly Bill of Materials
(For Information Only)

Part ID	Qty	Part Description
H-1	1	Handle
H-2	1	Grip

Clean, prime, and paint H-1 BEFORE assembling

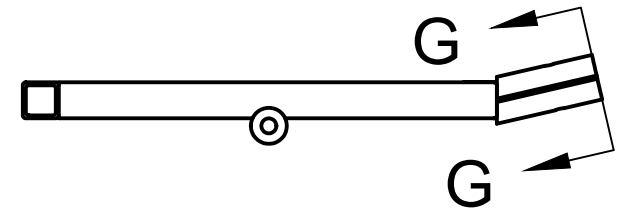
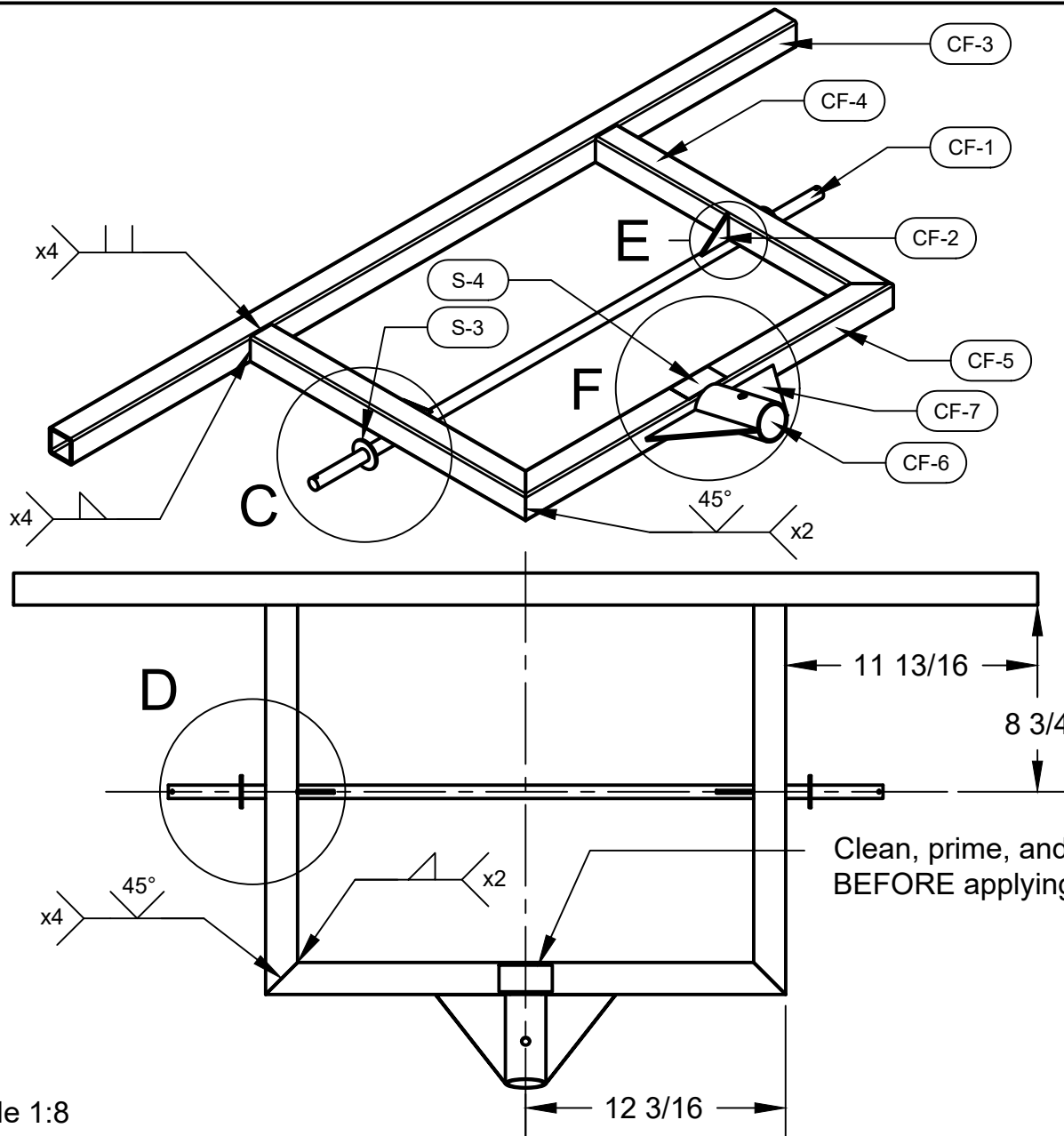


Scale 1:4

Revisions		
Date:	Comments	Init.



Design By:	B. Manguso	Project:	Snow Plow Blade Installer Cart
Drawing By:	J. McDowell	Subset:	Subassembly Drawings: SA-2
Print Date:	12/08/2021	Subset Sheets:	1 of 1
		Sheet Number:	11



For detail and section views, see
Subassembly Drawings: SA-3,
sheet two

Clean, prime, and paint SA-3
BEFORE applying S-4

Subassembly Bill of Materials (For Information Only)		
Part ID	Qty	Part Description
CF-1	1	Axle
CF-2	2	Axle brace
CF-3	1	Frame - forward member
CF-4	2	Frame - side member
CF-5	1	Frame - rear member
CF-6	1	Handle mount
CF-7	2	Handle mount brace
S-3	2	5/8" washer
S-4	1	Warning label

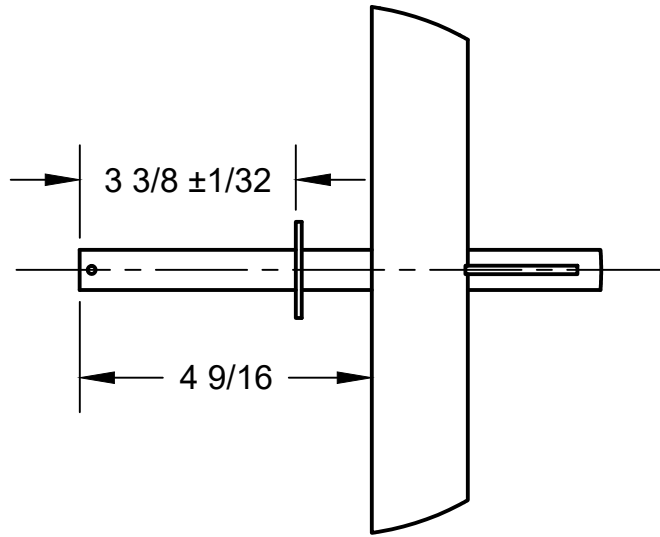
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Revisions		
Date:	Comments	Init.

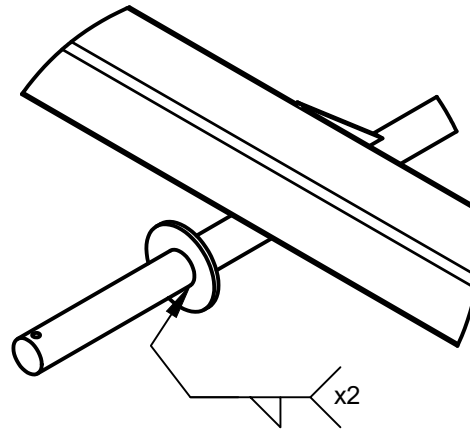
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Department of Transportation

Design By: **B. Manguso**
Drawing By: **J. McDowell**
Print Date: **12/08/2021**

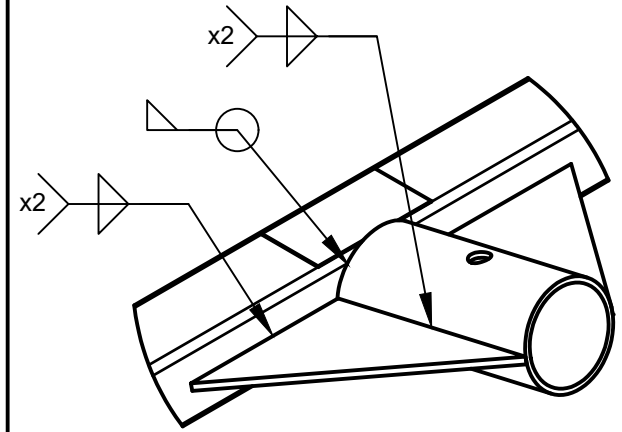
Project: **Snow Plow Blade Installer Cart**
Subset: **Subassembly Drawings: SA-3**
Subset Sheets: **1 of 2** Sheet Number: **12**



DETAIL D
SCALE 1:3

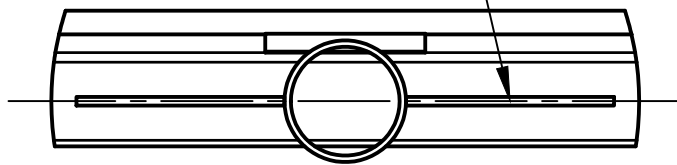


DETAIL C
SCALE 1:3

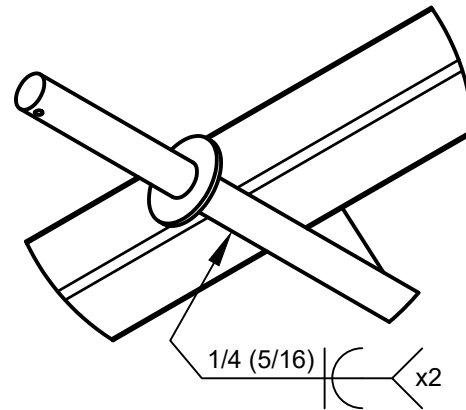


DETAIL F
SCALE 1:3

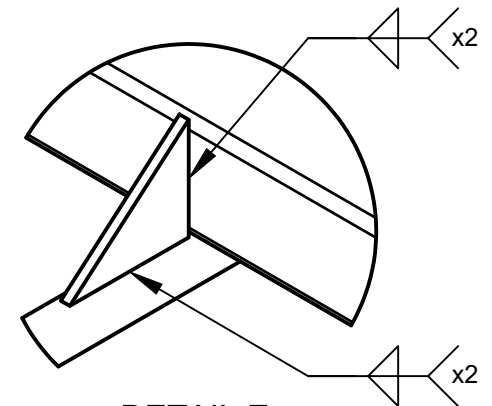
Align the centers of CF-6 and CF-7 with the center of the face of CF-5



REDUCED SECTION G-G
SCALE 1:3



DETAIL C, REVERSE SIDE
SCALE 1:3



DETAIL E
SCALE 1:2

Revisions

Date:	Comments	Init.



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Design By: B. Manguso

Drawing By: J. McDowell

Print Date: 12/08/2021

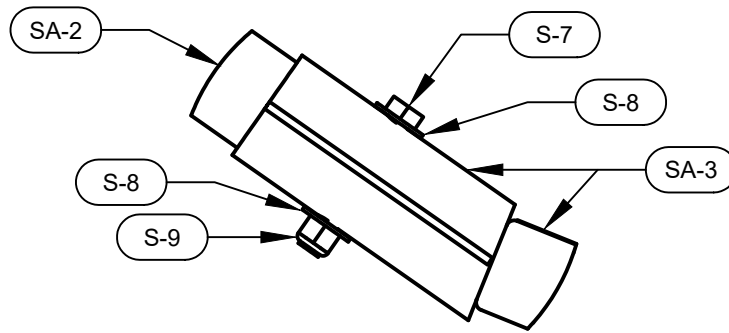
Project: Snow Plow Blade Installer Cart

Subset: Subassembly Drawings: SA-3

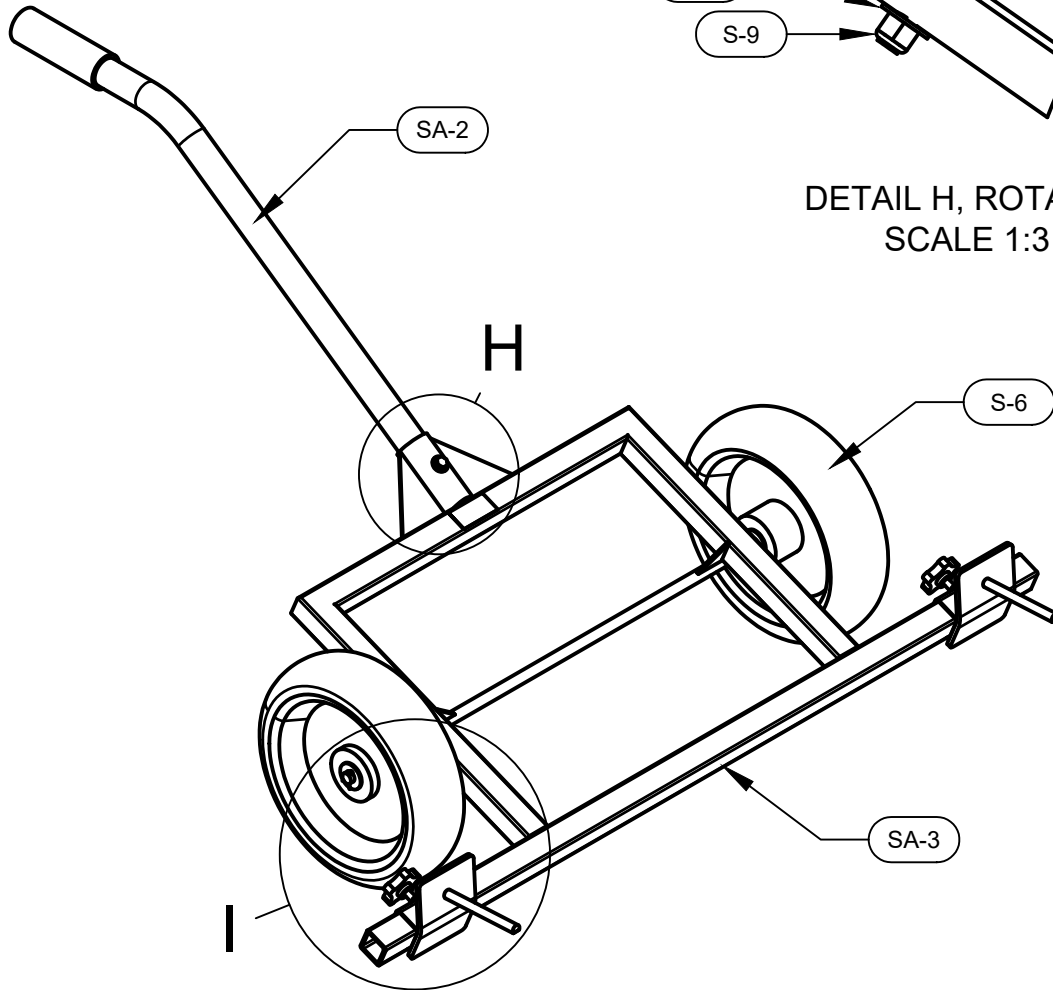
Subset Sheets: 2 of 2 Sheet Number: 13

Main Assembly Bill of Materials (For Information Only)

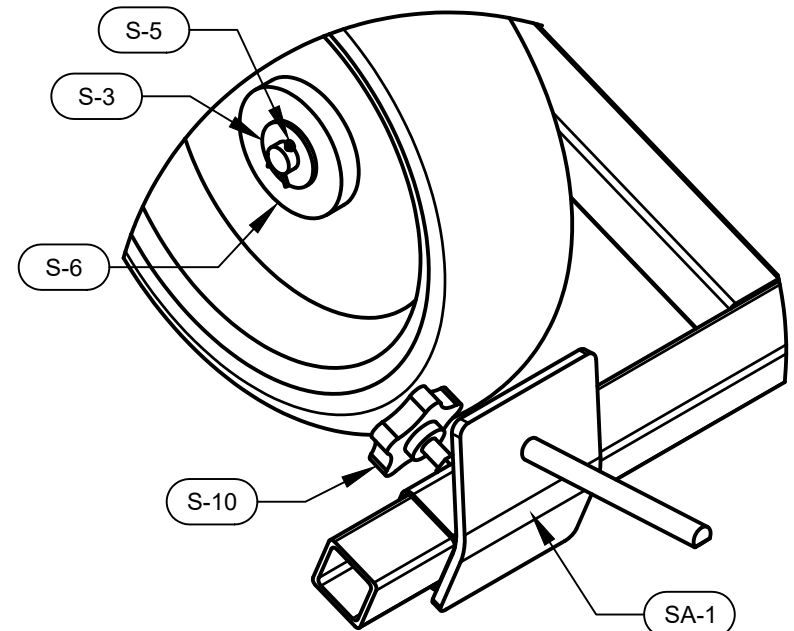
Part ID	Qty	Part Description
SA-1	2	Sliding Tine Subassembly
SA-2	1	Handle Subassembly
SA-3	1	Cart Frame Subassembly
S-3	2	5/8" washer
S-5	2	3/32" x 1" cotter pin
S-6	2	13 5/16" flat-free wheel, 5/8" bore, 250lb+ load rating
S-7	1	3/8"-16 x 2 1/2" hex bolt
S-8	2	3/8" washer
S-9	1	3/8"-16 nylon insert lock nut
S-10	2	Knob, 3/8"-16 threaded stud, 1" stud length



DETAIL H, ROTATED
SCALE 1:3



Scale 1:10



DETAIL I
SCALE 1:4

Revisions

Date:	Comments	Init.



COLORADO
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Design By: B. Manguso

Drawing By: J. McDowell

Print Date: 12/08/2021

Project: Snow Plow Blade Installer Cart

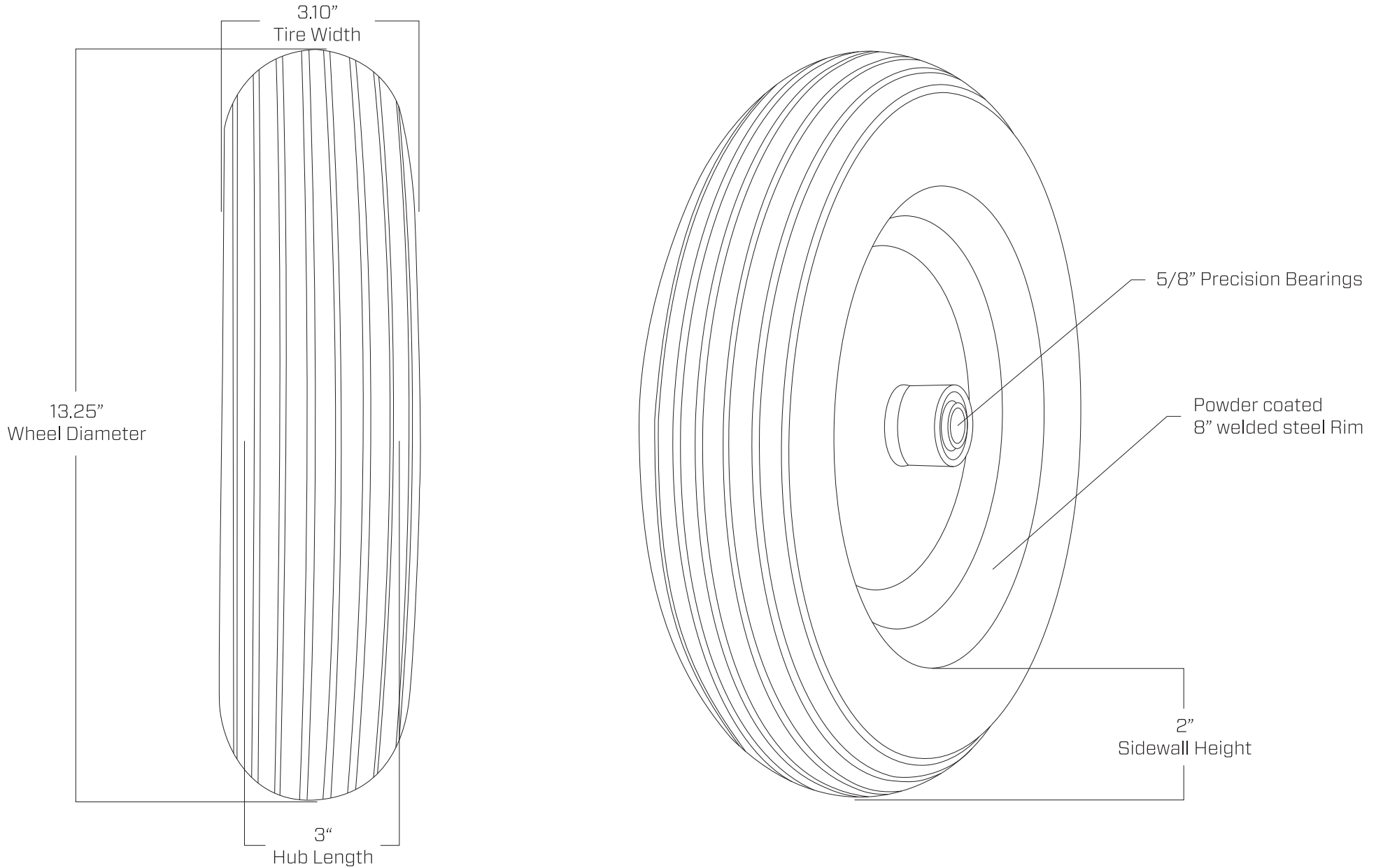
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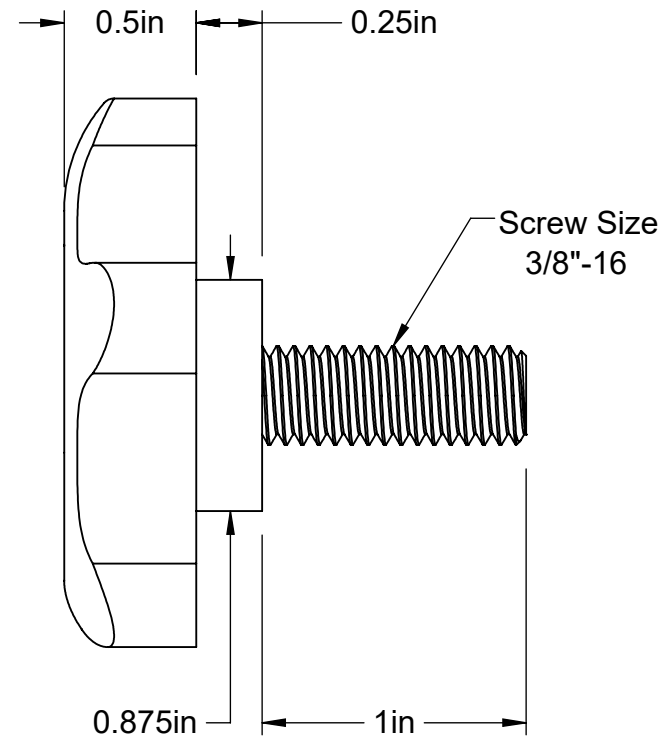
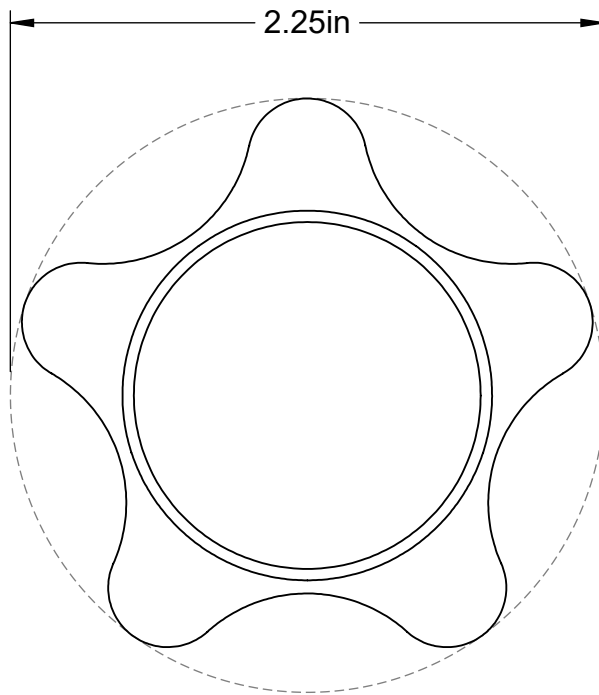
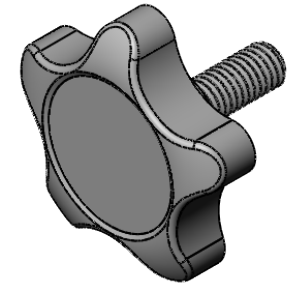
Subset Sheets: 1 of 1 Sheet Number: 14


Grainger Item number: 46G089
Marathon part number: 00081



Description: Flat Free PU Wheel, 3.50/2.50-8, 350 lb.





McMASTER-CARR 	PART NUMBER	59625K79
http://www.mcmaster.com		Plastic Five Arm Knob
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Information in this drawing is provided for reference only.		