

ROSCOMMON EQUIPMENT CENTER

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Flatbed & Water Tank Design for M1008 and Commercial Pickups

National Association of State Foresters
in Cooperation with
Michigan's Forest Fire Experiment Station

REC Project No. 66

Flatbed & Water Tank Design for M1008 and Commercial Pickups

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Roscommon Equipment Center
c/o Forest Fire Experiment Station
1337 East Robinson Lake Road
P.O. Box 68
Roscommon, Michigan 48653
Telephone: (989) 275-5211
Fax: (989) 275-8249
Email: info@RoscommonEquipmentCenter.com
Web Site: www.RoscommonEquipmentCenter.com

Disclaimer

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Introduction

The M1008 is the military version of General Motors 1980's pickup trucks. Rated at 5/4 Ton payload capacity, the M1008 is part of the military's commercial utility cargo vehicle (CUCV) family. This project converts an M1008 to a flatbed truck by removing the cargo box and fabricating a steel bed. The design can also be used with GM civilian trucks of that vintage. With minor changes, it can be used with virtually any standard size, 8 foot bed pickup. The flatbed offers three advantages over the cargo box.

- More area is available to mount fire equipment.
- The bed is more durable than the cargo box. When off road, it can better withstand brushes with objects such as trees.
- The sides are lower, making access easier.

The layout and photos show this concept with a 175 gallon polypropylene tank mounted to the bed. This tank was designed specifically for this application. The tank is wider than a typical pickup slip-on tank unit. This allowed a reduced height, making the top mounted hose reel easier to reach. It also allows the tank length to remain relatively short so that a pump and foam proportioner will fit at the back of the bed. The tank's water capacity was matched to the truck load capacity. Fully outfitted minus storage items, this unit weights about 88 percent of its

Gross Vehicle Weight Rating (GVWR). This allows for adequate storage weight plus a cushion to reduce the possibility of operating overweight.

Appendix A lists some slip-on tank references and custom tank sources. Appendix B details specifications for purchasing the polypropylene tank. Custom building of "poly" tanks can be done by manufacturers at a reasonable price. Plastic sheet is normally cut by computer controlled cutters. Because there are no special molds and part of the fabrication is automated, there is less advantage to mass production. The cost of the tank for this project should be about \$1,200. The model of pump and its placement will dictate the location of tank ports. Make sure their locations are specified properly.

This is not a true slip-on unit. The tank, pump, and most other appliances are mounted directly to the bed. They cannot be slipped off/on as one unit. Most of the accessories are available for purchase. The draft hose storage tubes are an exception. They are mounted by fabricated brackets and made of PVC pipe. A step and rocker panel guard ("Nerf" bar) was added under the cab. These bolt to the frame and provide a step and some protection to the cab's rocker panel. Trailer hitch, tow point, and tail light receptacles are incorporated into the rear panel of the bed.

Data Summary

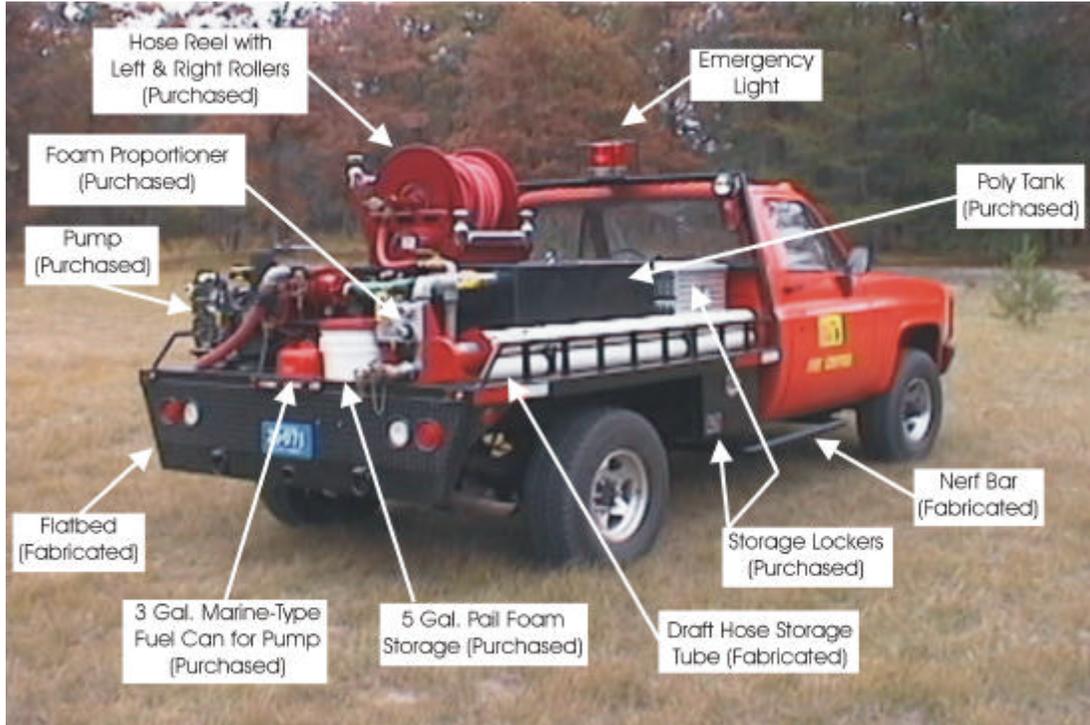
REC "Flatbed" Slip-on M1008

Weight of vehicle, including pump, proportioner, tank, reel, and storage trunk without stored items.

	Weight Rating	w/o Water	w/Water
Front Axle	3,800	3,405	3,495
Rear Axle	5,600	3,445	4,795
Total Vehicle	9,400	6,850	8,290

Wheelbase - 131.5 inches
Water Tank Capacity - 175 gallons
Water Tank Material - Polypropylene
Flatbed Material - Steel

Photos



The finished M1008 product with accessories that REC used.



The M1008 has an outside the frame fuel tank which should be guarded.

Fabricating the Flatbed

The final weight of the steel bed is just over 700 pounds. The overall dimensions will be about 8 feet x 6-1/2 feet. You will need to prepare an area large enough to build and turn over a structure of this size and weight.

The welding can be done with either stick electrode or wire-feed. The later will be faster. Most parts can be cut with a metal capable bandsaw. Plasma cutting is the easiest way to cut the large sheet steel openings. An alternative for those who do not have a plasma cutter or large shear is to have a steel

warehouse prepare the parts. Most have the equipment to do this efficiently. The extra fee may be well worth it.

NOTE: The holes drilled in the deck plate were made to accommodate specific accessories. Pattern, size, and quantity, will depend on specific equipment used.

The drawings call for welding the steel tube framework then adding the deck to the framework. The location of holes in deck with depend on the fire appliances used.

Attaching the Bed to the Truck Frame

The bed is attached by two bolts located at the rear of each frame rail and two rubber cushioned points in the front. Section A-A of Drawing 29-9817 shows the rear mount. This is a direct mount with a hole drilled in each frame rail and a 3/4 inch bolt, nut, and washer tightened to form the attachment

The "cushioned" points use two of the elastomer mounts from the removed cargo box. These elastomer mounts are shown as Item 24 on the

Assembly Drawing 29-9817. Detail A on that drawing shows the mounting which uses a 3/4 inch bolt and nut as the fastener and the existing frame hole used by the cargo box mount. This provides an isolated attachment in the front, allowing the truck frame to twist as it travels without undue interference from the bed. This allows the bed to "float" on the frame as the frame twists during travel. Appendix C discusses do and don't about drill holes and welding on frame rails.

Fuel Fill Location

When locating the vehicle's fuel fill opening, choose a location no lower than it was on the cargo box. If you are using this information as a concept for a purchased cab and chassis,

consult the manufacturer for the fill opening dimensions. These are found in their "Body Builders" publication.

Mounting the Tank and Accessories to the Bed

Because the bed plate is of substantial strength, accessories can be bolted directly to it. Auxiliary pump engines should be mounted on motor mounts to accommodate vibration. Study the

placement of these items to make sure the vehicle is balanced. More on this is found in the following section.

A Note About Vehicle Loads

The operating weight of the vehicle must be within the safe limits determined by the vehicle manufacturer. The manufacturer of each truck determines the Gross Vehicle Weight Rating (GVWR) for that vehicle. The GVWR is the maximum design load. The manufacturer also lists the Front Axle Weight Rating (FAWR) and Rear Axle Weight Rating (RAWR). These are the maximum design loads on each axle. None of these ratings should be exceeded. For wildfire control uses, it is good practice to reduce the load. A fire truck is fully loaded almost all the time. This is a heavier duty than the average pickup truck use profile. Loading the truck at 85 to 90 percent of the weight ratings will reduce operating costs, extend the life of the truck, and provide a margin to allow for some additional equipment beyond the standard compliment.

Weigh the final vehicle, fully loaded for operation, before putting it in service to assure that it does not exceed weight limits.

REC provides other resources related to this subject listed below. They can be found at www.RoscommonEquipmentCenter.com.

Project No. 61, Slip-On Water Tank Units: Discusses topics important to selecting and

installing a slip-on tank on a pickup truck. Much of this information relates to flatbed designs as well. The contents include material selection, securing the tank unit to the vehicle, and proper loading of the tank. There is a listing of other useful publications, designs, and tank retailers. The online version is downloadable using Adobe Acrobat Reader.

Newsnote No. 3, Guidelines for Designing Wildland Fire Engines: This is a primer for those planning to fabricate a fire truck. It includes basic design needs, legal, and safety requirements, and a list of other resources. The online version includes hyperlinks to other resources.

Slip-On Engine Weight Calculator: Located on REC's web site, this calculator provides a simplified version of the "Wildland Engine Weight Calculator" which is designed specifically for those installing a slip-on tank into a pickup truck cargo box. It also can be used during the design process to help determine the placement of components on the engine and to determine tank size. For this calculation, the user must enter the weight and location of the components to be added to the truck. An estimated finished weight is provided, plus a brief analysis of the viability of the load.

Drawing List

OVERALL ASSEMBLY

Drawing Number	Drawing Name
29-9817	5/4 Ton Bed and Nerf Bar A/C

TRUCK BED DETAILS

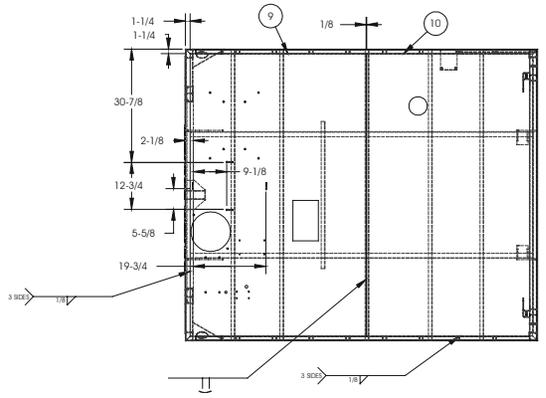
Drawing no. 29-0085 is the overall weld complete of the truck bed. It is followed by the Truck Bed Subweld, which is the skeletal framework for the complete bed. The detail prints of individual parts follow these two drawings in the order listed below.

Drawing Number	Drawing Name
29-0085	Truck Bed W/C
00-1381	Truck Bed S/W
00-0123	Tie Down
00-1355	End Rail
00-1356	Side Rail
00-1357	Crossmember, Long
00-1358	Crossmember, Short
00-1359	Frame Rail
00-1360	Headache, Vertical
00-1361	Headache, Angle
00-1362	Headache, Top
00-1363	Headache, Cross
00-1364	Bumper, Lower
00-1366	Gusset, Receiver
00-1367	Bumper, Angle
00-1368	Mount Bar, Rear
00-1369	Mount Bar, Front
00-1370	Gusset, Rear Mount
00-1371	Side Rail, Top
00-1372	Side Rail, Rear
00-1373	Side Rail, Vertical
00-1374	Bracket, Side Marker
00-1375	Deck, Rear
00-1376	Deck, Front
00-1377	Mount Pad, Front
00-1378	Gusset, Front Mount
00-1379	Cover, Rear LH
00-1380	Cover, Rear RH
00-1448	Fuel Tank Guard, Mount
00-1449	Fuel Tank Guard, Side
00-1450	Fuel Tank Guard, Rear
00-1452	Mount, Work Light
00-1453	Expanded Metal Headache Rack
00-1454	Receiver, Sides
00-1455	Receiver, Top-Bottom
00-1456	Receiver S/W
00-1457	Bracket, Fuel Fill
00-1467	Mount Tab
28-8007	Light Mount Bracket
29-0088	Tank Guard W/C

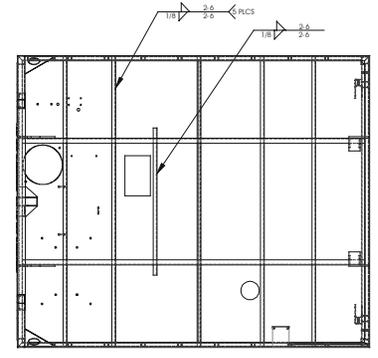
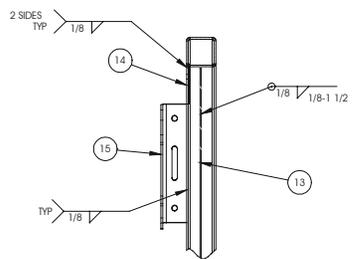
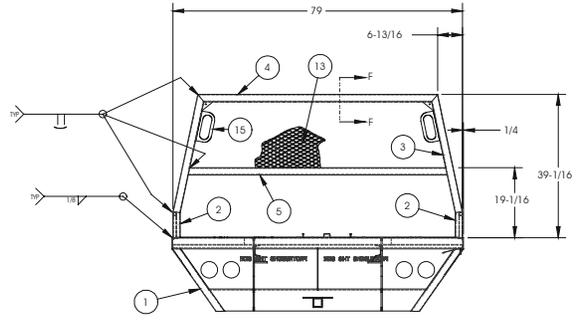
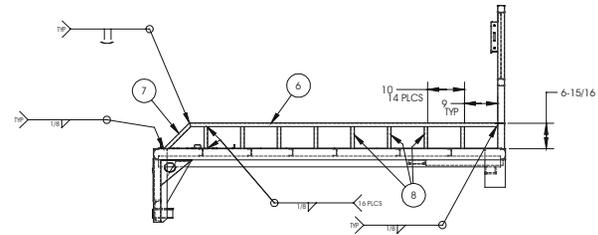
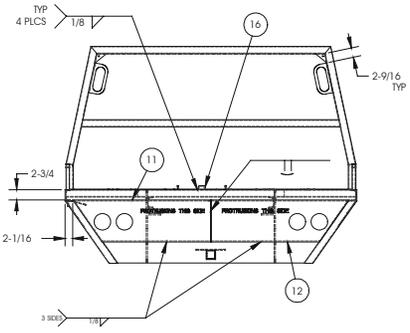
STEP AND ROCKER PANEL (NERF) GUARD

The step and rocker panel guard is an independent assembly and can be added or deleted from the project. Drawing 29-0086 shows the completed weldment with part details and subwelds following.

Drawing Number	Drawing Name
29-0086	Step, Rocker Panel Guard W/C
00-1435	Pipe, Front
00-1436	Pipe, Side
00-1437	Pipe, Rear
00-1438	Mount, Rear
00-1439	Gusset, Rear
00-1440	Mount, Front
00-1441	Gusset, Front
00-1442	Cap, Front Pipe Notch
00-1443	Stiffener, Rear Mount
00-1444	Top, Rear Bracket
00-1445	Vertical, Rear Bracket
00-1446	Bottom, Rear Bracket
00-1447	Stiffener, Rear Bracket
29-0087	Bracket, Rear W/C
29-0089	Spacer, Front
29-0090	Spacer, Rear



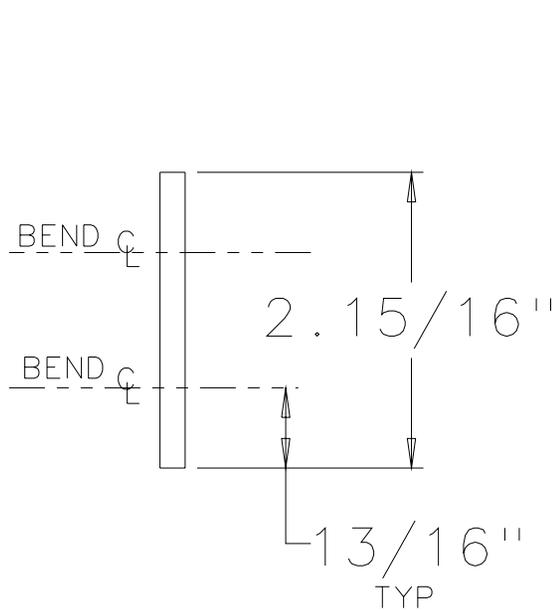
ITEM	PART NO.	DWG.	DESCRIPTION	QTY
1	00-1381	D	TRUCK BED S/W	1
2	00-1360	A	HEADACHE, VERTICAL	2
3	00-1361	A	HEADACHE, ANGLE	2
4	00-1362	A	HEADACHE, TOP	1
5	00-1363	A	HEADACHE, CROSS	1
6	00-1371	A	SIDE RAIL, TOP	2
7	00-1372	A	SIDE RAIL, REAR	2
8	00-1373	A	SIDE RAIL, VERTICAL	16
9	00-1375	C	DECK, REAR	1
10	00-1376	B	DECK, FRONT	1
11	00-1379	B	COVER, REAR LH	1
12	00-1380	B	COVER, REAR RH	1
13	00-1453	B	EXPANDED METAL HEADACHE RACK	1
14	00-1452	A	MOUNT, WORK LIGHT	2
15	28-8007	B	LIGHT MOUNTING BRACKET	2
16	00-0123	A	TIE DOWN	4



PART NO. 29-0085
EST. WT. 712.05 LBS

FRAC. NO.				DGP
FRAC. NO.				KBR
ANGULAR				
DECIMAL				
DATE - 14 May 2001	FOREST FIRE EXPERIMENT STATION			14 May 2001
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	TITLE	TRUCK BED W/C		29-0085



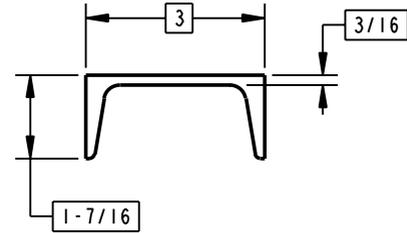
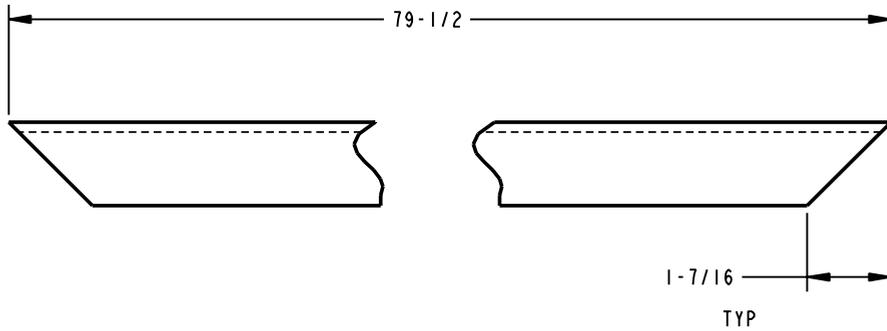


1/4" R
TYP

1/4" DIA
REF

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 UNS K02600
 FFES SPEC NO: AC-00025AG
 EST WT: 0.04 LBS

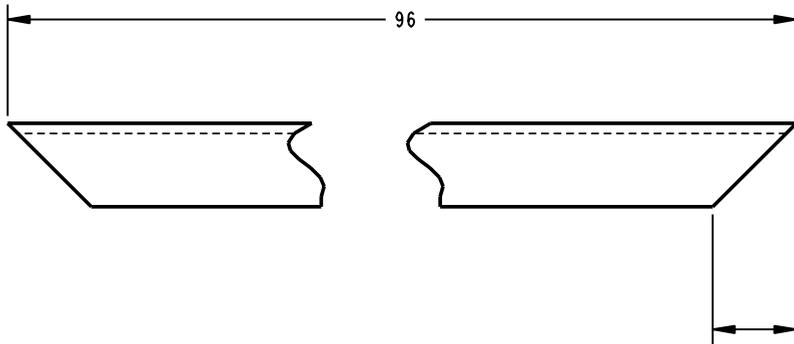
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DECIMAL: ANGULAR: 1 PLACE +- 0.1 +- 1 DEG 2 PLACE +- 0.01 3 PLACE +- 0.005		NO.	BY	DATE	REVISION	APPROVED:	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							PROJECT NO.: 87-3
TITLE: TIE DOWN					SCALE: 1/2	DATE: 2/28/89	DWG. NO. 00-0123A



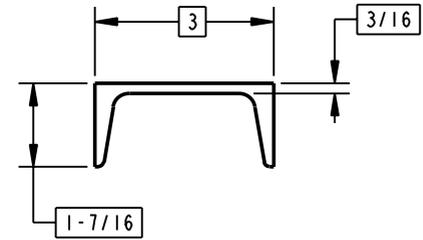
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 MAT'L: CHANNEL 3 x 4.1 #/FT
 K02600
 FFES SPEC NO: AH-03041AG
 EST WT: 25.33 LBS

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ANGULAR: ± .1 DEG.						APPROVED: *	
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PROJECT NO.: 00-6	TITLE: END RAIL					SCALE: 1/2	
						SIZE: B	

FOREST FIRE EXPERIMENT STATION
 P.O. BOX 68 ROSCOMMON, MICHIGAN 48653



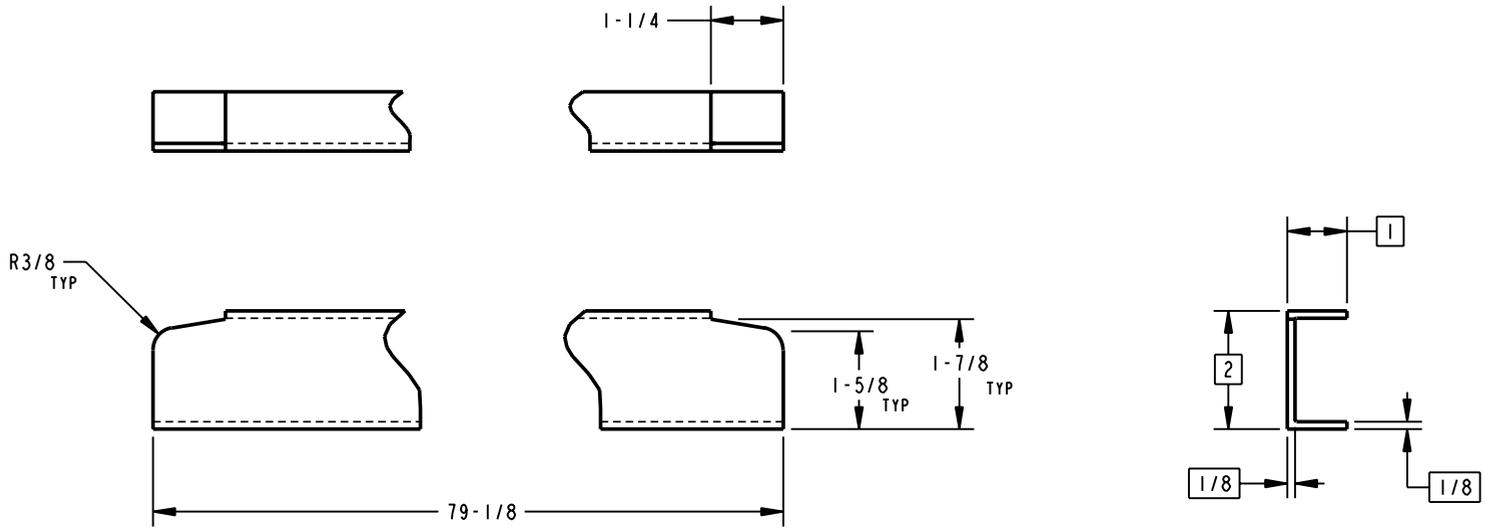
TYP



PART NO: 00-1356
 MAT'L: CHANNEL 3 x 4.1 #/FT
 K02600
 FFES SPEC NO: AH-03041AG
 EST WT: 30.64 LBS

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						SIZE: B	

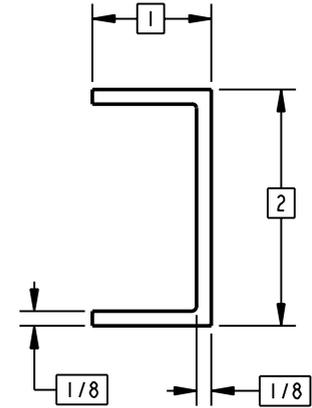
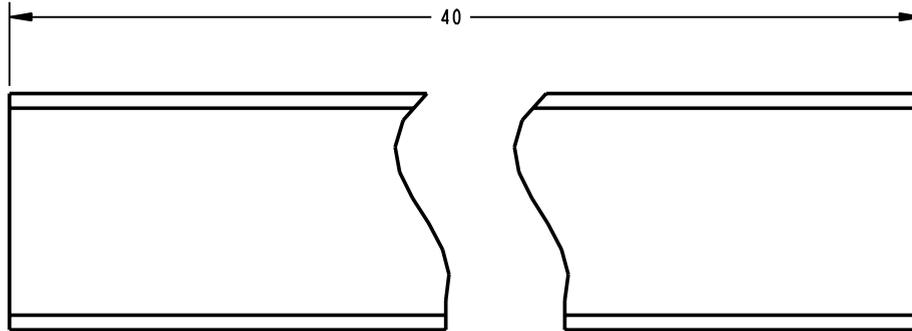
FOREST FIRE EXPERIMENT STATION
 P.O. BOX 68 ROSCOMMON, MICHIGAN 48653



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 FFES SPEC NO: AJ-02012AG
 EST WT: 10.407[.2] LBS

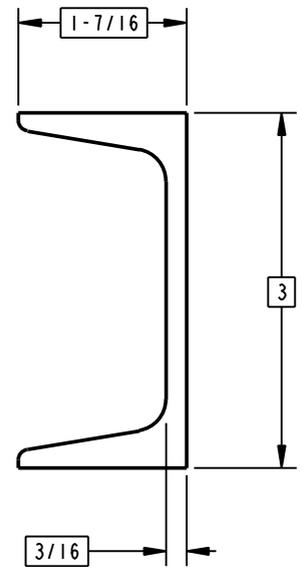
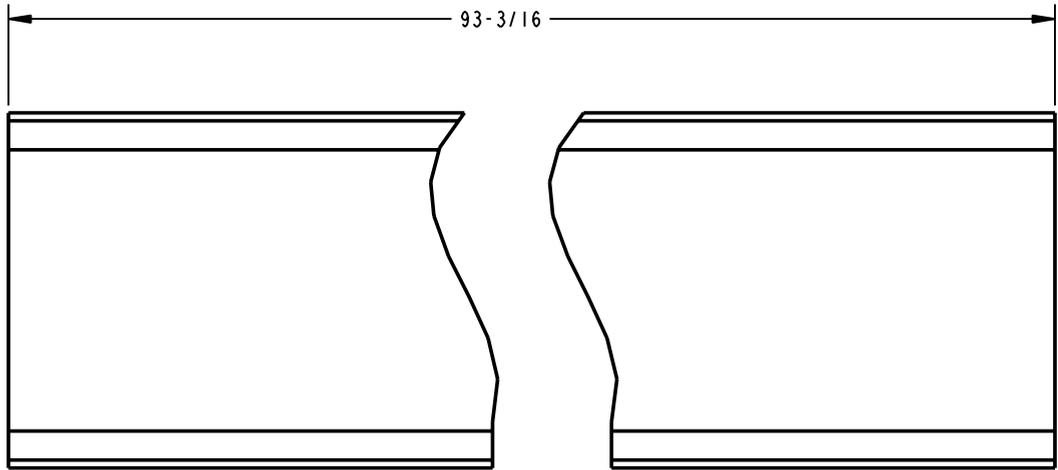
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						SCALE: 1/2
PROJECT NO.: 00-6	TITLE: CROSSMEMBER, LONG					DWG. NO.: 00-1357
						SIZE: B





PART NO: 00-1358
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 FFES SPEC NO: AJ-02012AG
 EST WT: 5.311(.2) LBS

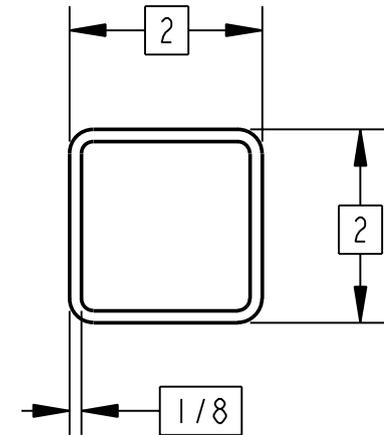
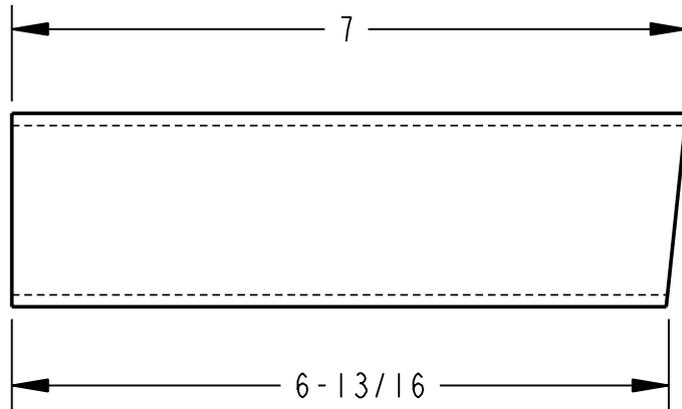
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	TITLE: CROSSMEMBER, SHORT					DWG. NO. 00-1358	SIZE B



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 FFES SPEC NO: AH-03041AG
 EST WT: 30.00 LBS

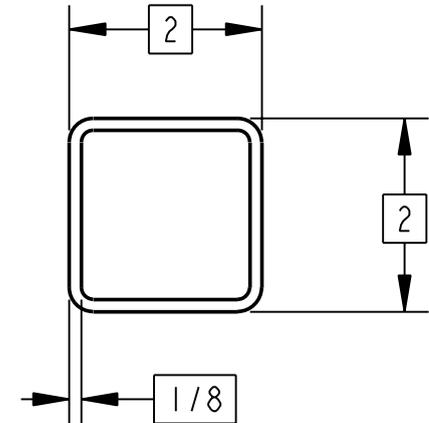
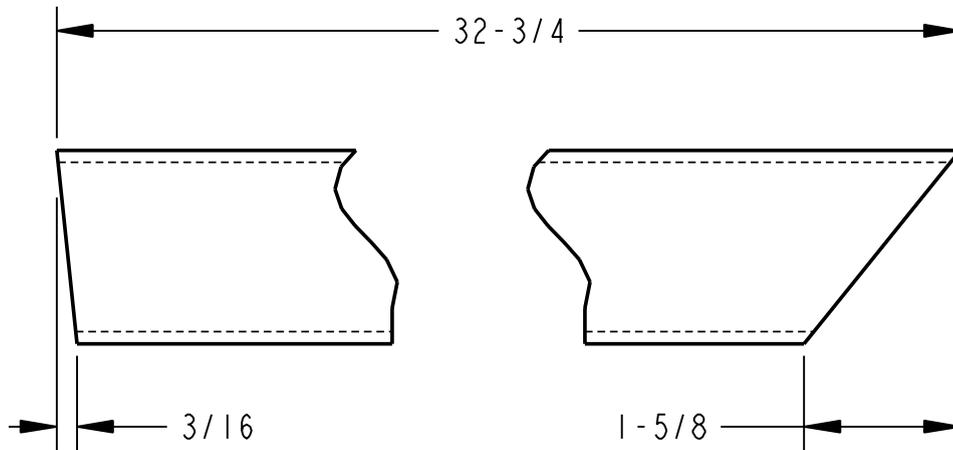
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ANGULAR: ± .1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .005	NO.	BY	DATE	REVISION		DATE: 07-May-2001	
PROJECT NO.: 00-6	TITLE: FRAME RAIL					SCALE: 1/2	
							SIZE: B

FOREST FIRE EXPERIMENT STATION
 P.O. BOX 68 ROSCOMMON, MICHIGAN 48653



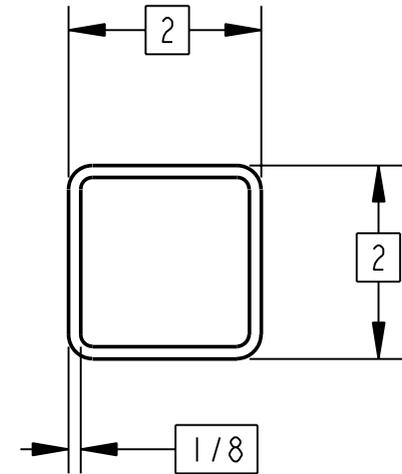
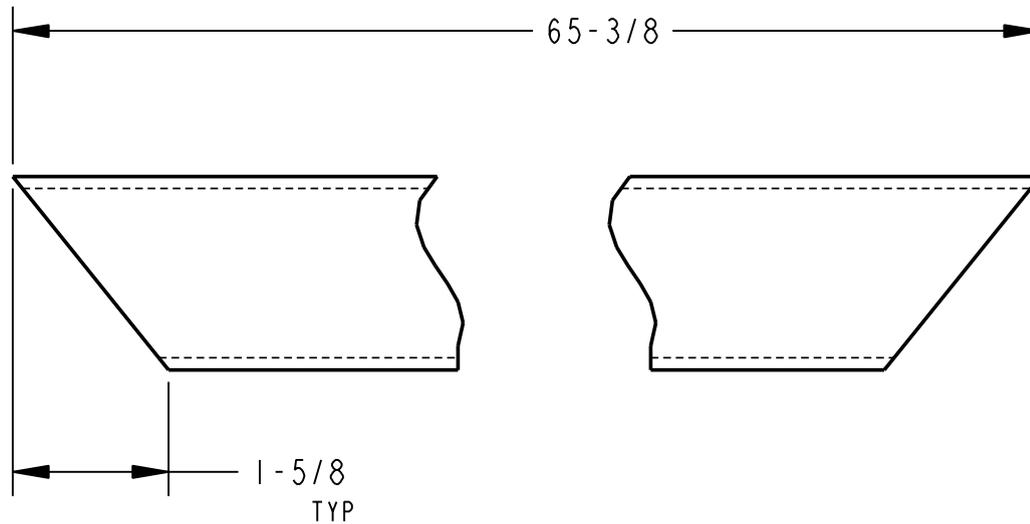
PART NO: 00-1360
 MAT'L: TUBE, SQ 2x2x1/8 WALL
 K03000
 FFES SPEC NO: AE-20004AY
 EST WT: 1.75 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 07-May-2001	
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FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



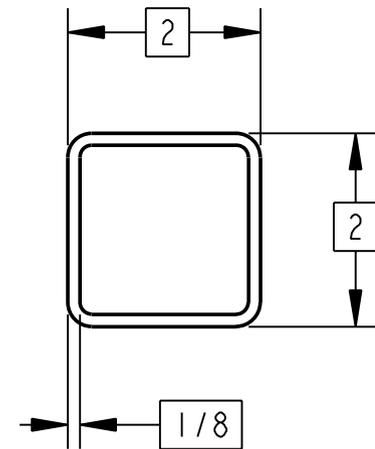
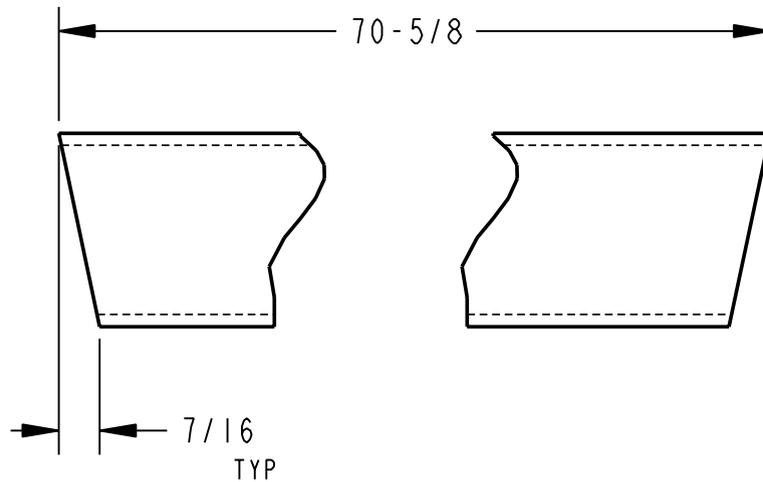
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 K03000
 FFES SPEC NO: AE-20004AY
 EST WT: 8.08 LBS

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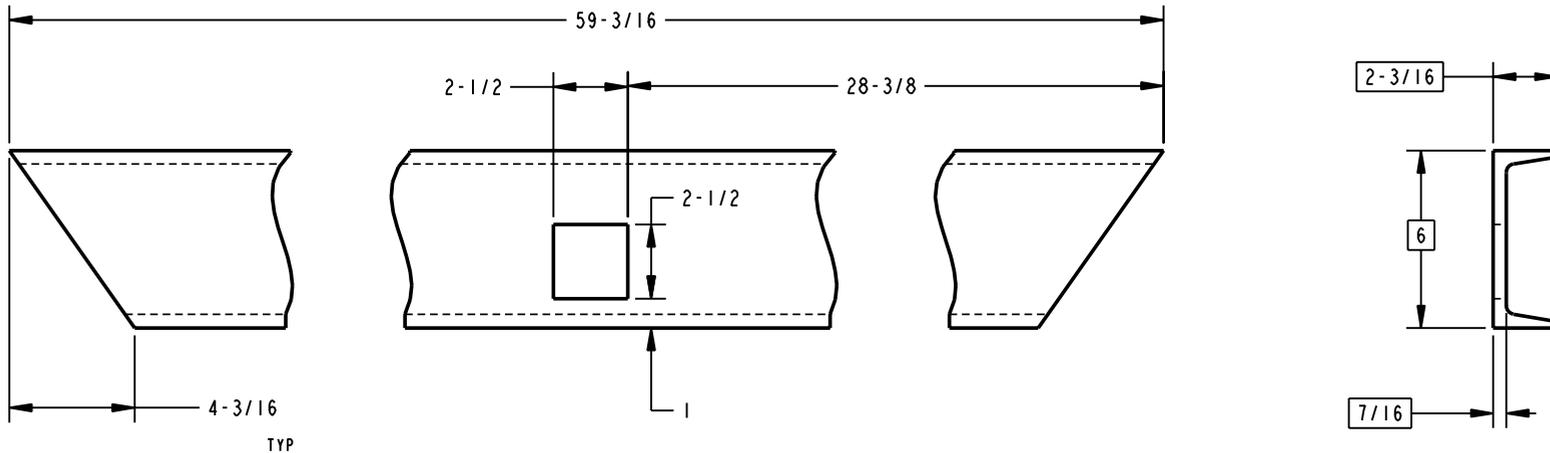
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 K03000
 FFES SPEC NO: AE-20004AY
 EST WT: 16.19 LBS

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FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 07-May-2001	
PROJECT NO.: 00-6	TITLE: HEADACHE, TOP					SCALE: 1/2	
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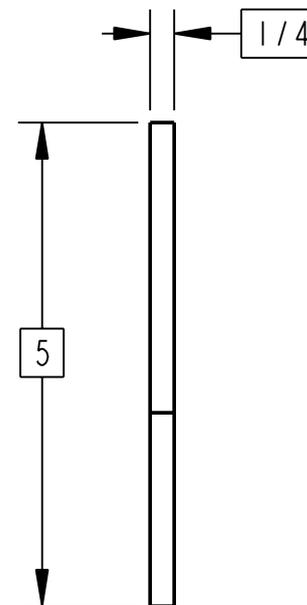
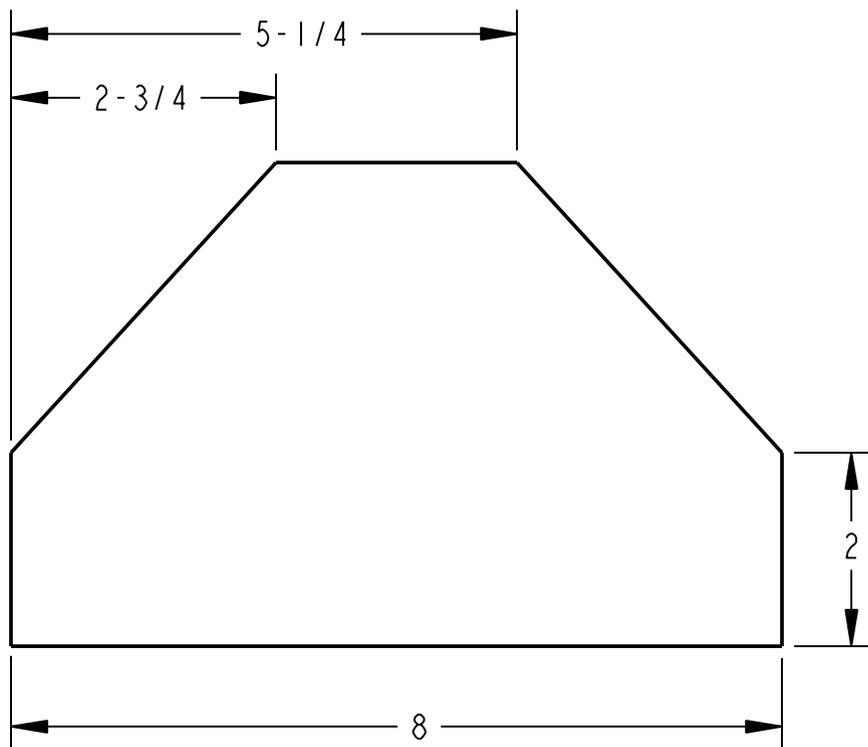
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 K03000
 FFES SPEC NO: AE-20004AY
 EST WT: 17.82 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 07-May-2001	
						SCALE: 1/2	
PROJECT NO.: 00-6	FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653					TITLE: HEADACHE, CROSS	DWG. NO. 00-1363
							SIZE: A



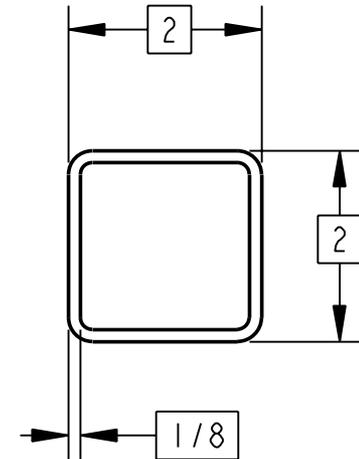
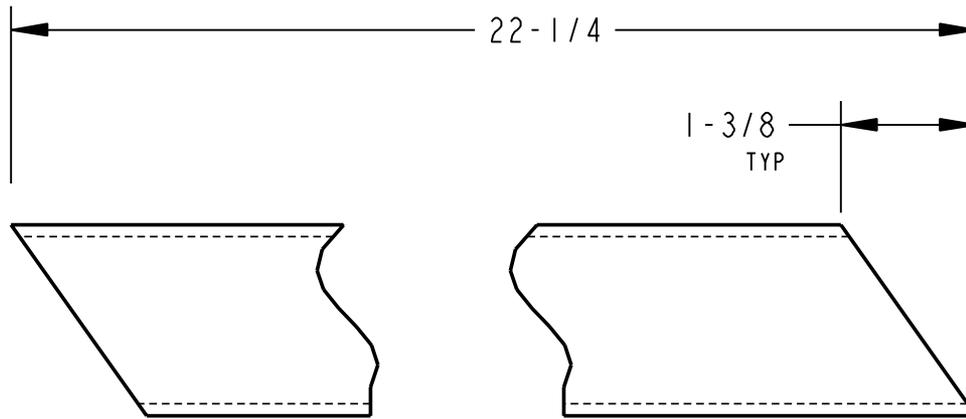
PART NO: 00-1364
 MAT'L: CHANNEL 6 x 13.0 #/FT
 K02609
 FFES SPEC NO: AH-06130AG
 EST WT: 59.48 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: RDB	
ANGULAR: ± .1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .005	NO.	BY	DATE	REVISION			
	FOREST FIRE EXPERIMENT STATION						
	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653						
				DATE: 07-May-2001	DNR FOREST, MINERAL AND FIRE MANAGEMENT		
				SCALE: 1/4			
PROJECT NO.: 00-6	TITLE: BUMPER, LOWER					DWG. NO. 00-1364	SIZE B



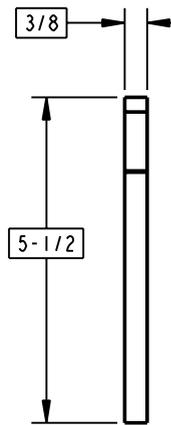
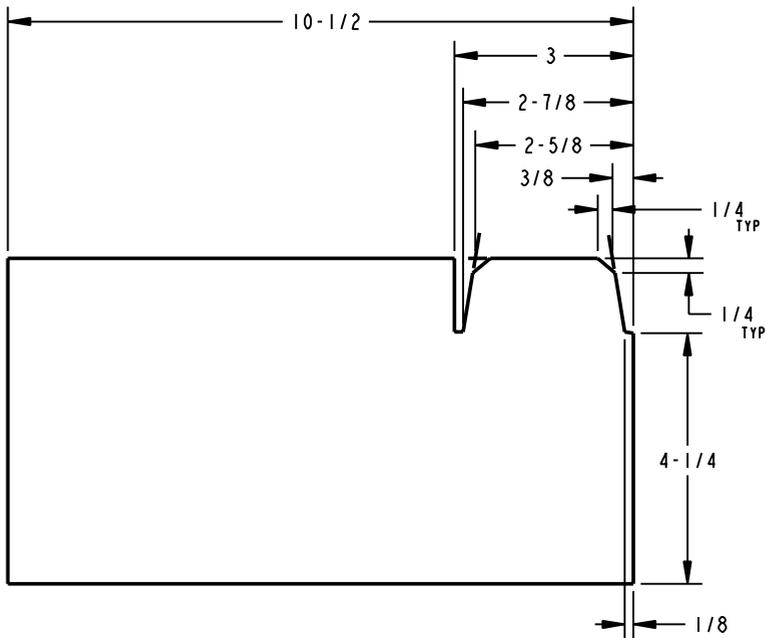
PART NO: 00-1366
 MAT'L: BAR, FLAT 1/4 X 5 HR
 G10200
 FFES SPEC NO: AB-00420AA
 EST WT: 2.25 LBS

STD. TOL.						DRAWN: dgp	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 07-May-2001	
PROJECT NO.: 00-6	TITLE: GUSSET, RECEIVER					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 00-1367
 MAT'L: TUBE, SQ 2x2x1/8 WALL
 K03000
 FFES SPEC NO: AE-20004AY
 EST WT: 5.29 LBS

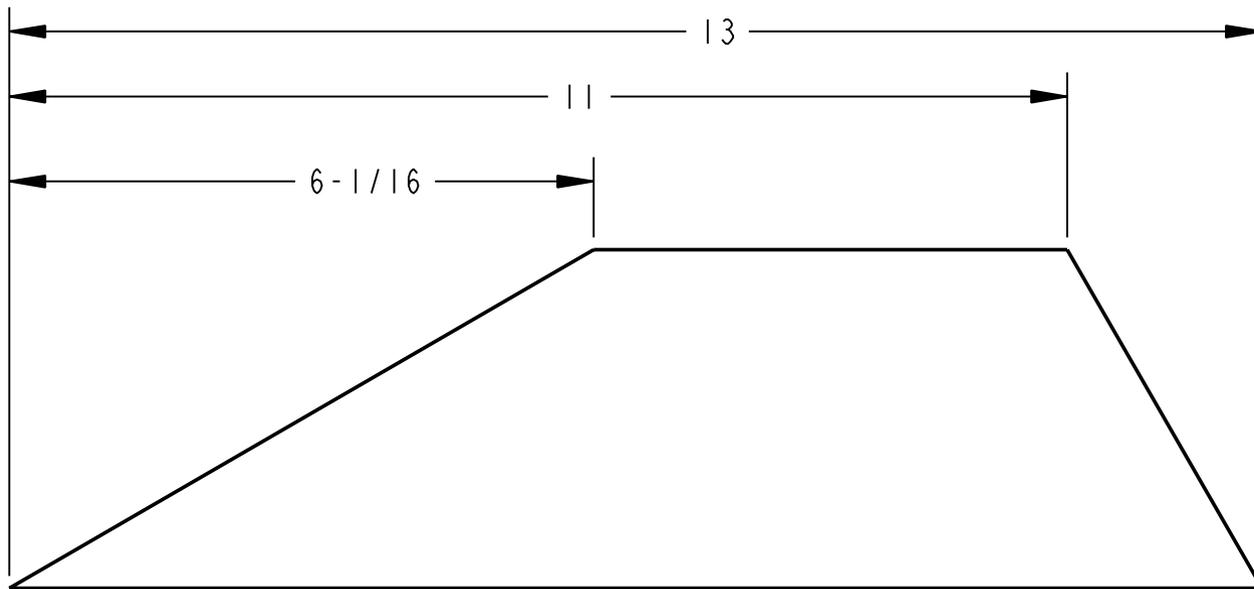
STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: •	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 08-May-2001	
PROJECT NO.: 00-6	TITLE: BUMPER, ANGLE					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



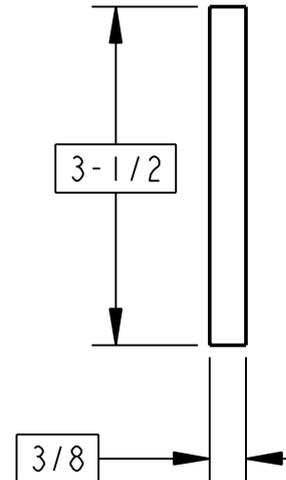
PART NO: 00-1369
 MAT'L: BAR, FLAT 3/8 X 5-1/2 HR
 G10200
 FFES SPEC NO: AB-00622AA
 EST WT: 6.06 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: RDB	
ANGULAR: ± .1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .005	NO.	BY	DATE	REVISION		DATE: 08-May-2001	
						SCALE: 1/2	
PROJECT NO.: 00-6	TITLE: MOUNT BAR, FRONT					DWG. NO.: 00-1369	SIZE: B

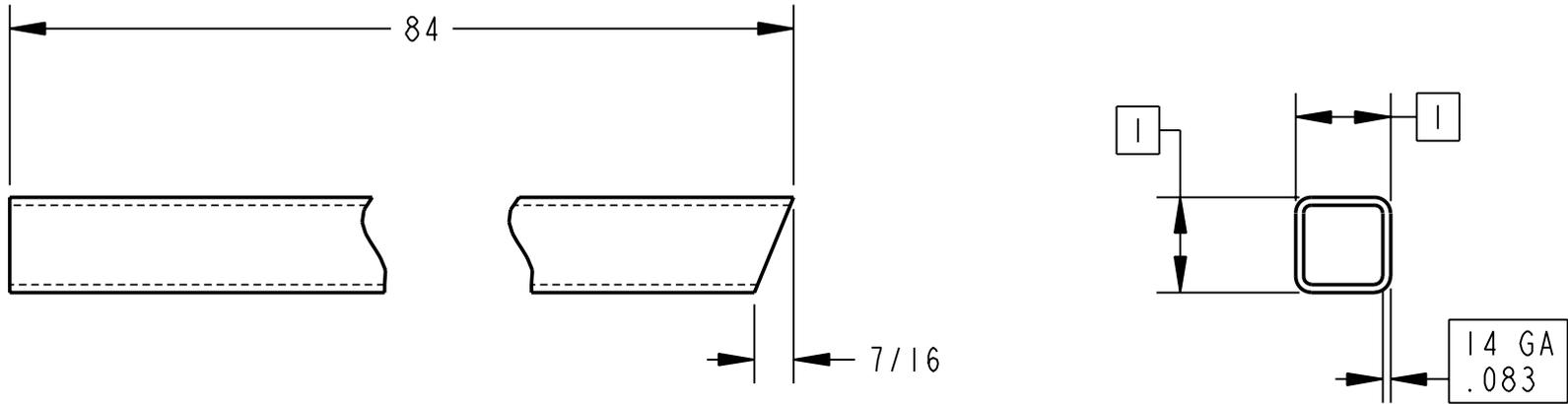
FOREST FIRE EXPERIMENT STATION
 P.O. BOX 68 ROSCOMMON, MICHIGAN 48653



PART NO: 00-1370
 MAT'L: BAR, FLAT 3/8 X 3-1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 3.33 LBS

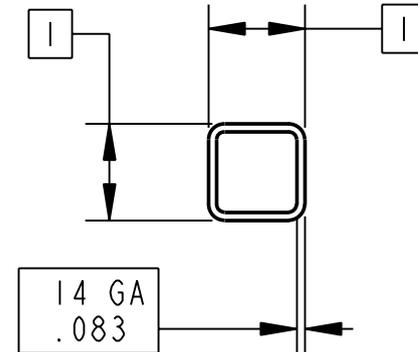
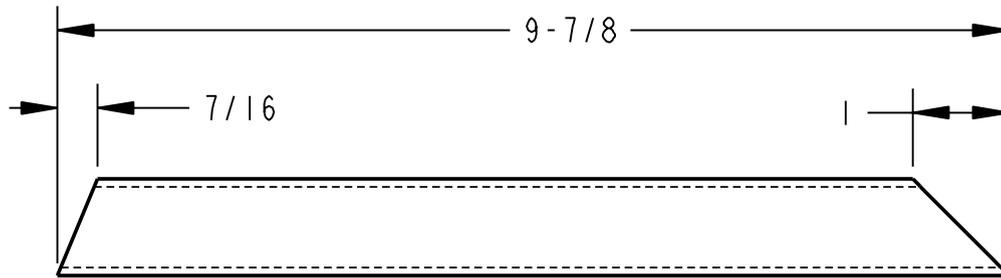


STD. TOL.						DRAWN: DGP	
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 08-May-2001	
PROJECT NO.: 00-6	TITLE: GUSSET, REAR MOUNT					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



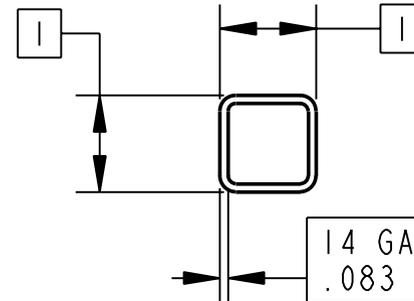
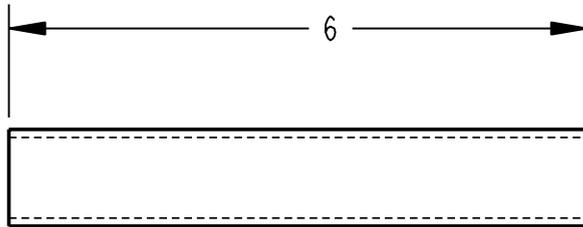
PART NO: 00-1371
 MAT'L: TUBE, SQ 1 X 1 X 14GA WA
 G0100
 FFES SPEC NO: AE-1000IAL
 EST WT: 6.80 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 08-May-2001	
PROJECT NO.: 00-6	TITLE: SIDE RAIL, TOP					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 00-1372
 MAT'L: TUBE, SQ 1 X 1 X 14GA WA
 G0100
 FFES SPEC NO: AE-1000IAL
 EST WT: 0.74 LBS

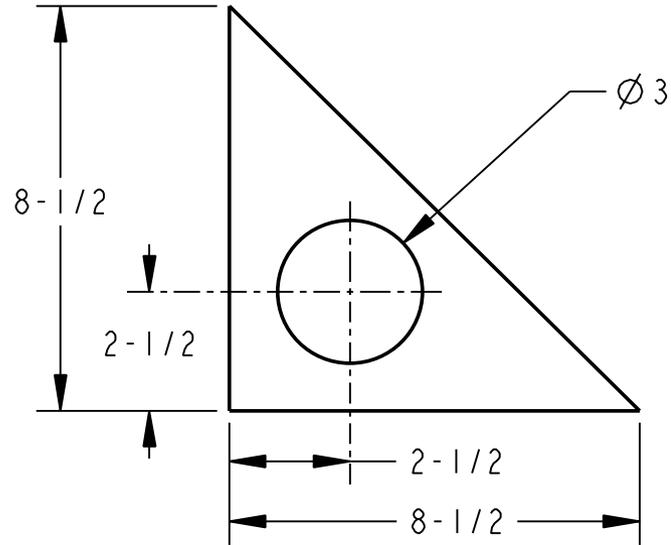
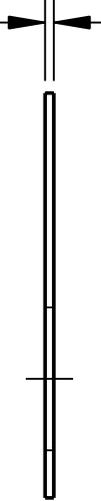
STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: •	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 08-May-2001	
PROJECT NO.: 00-6	TITLE: SIDE RAIL, REAR					SCALE: 1/2	
							SIZE: A



PART NO: 00-1373
 MAT'L: TUBE, SQ 1 X 1 X 14GA WA
 G10100
 FFES SPEC NO: AE-10001AL
 EST WT: 0.49 LBS

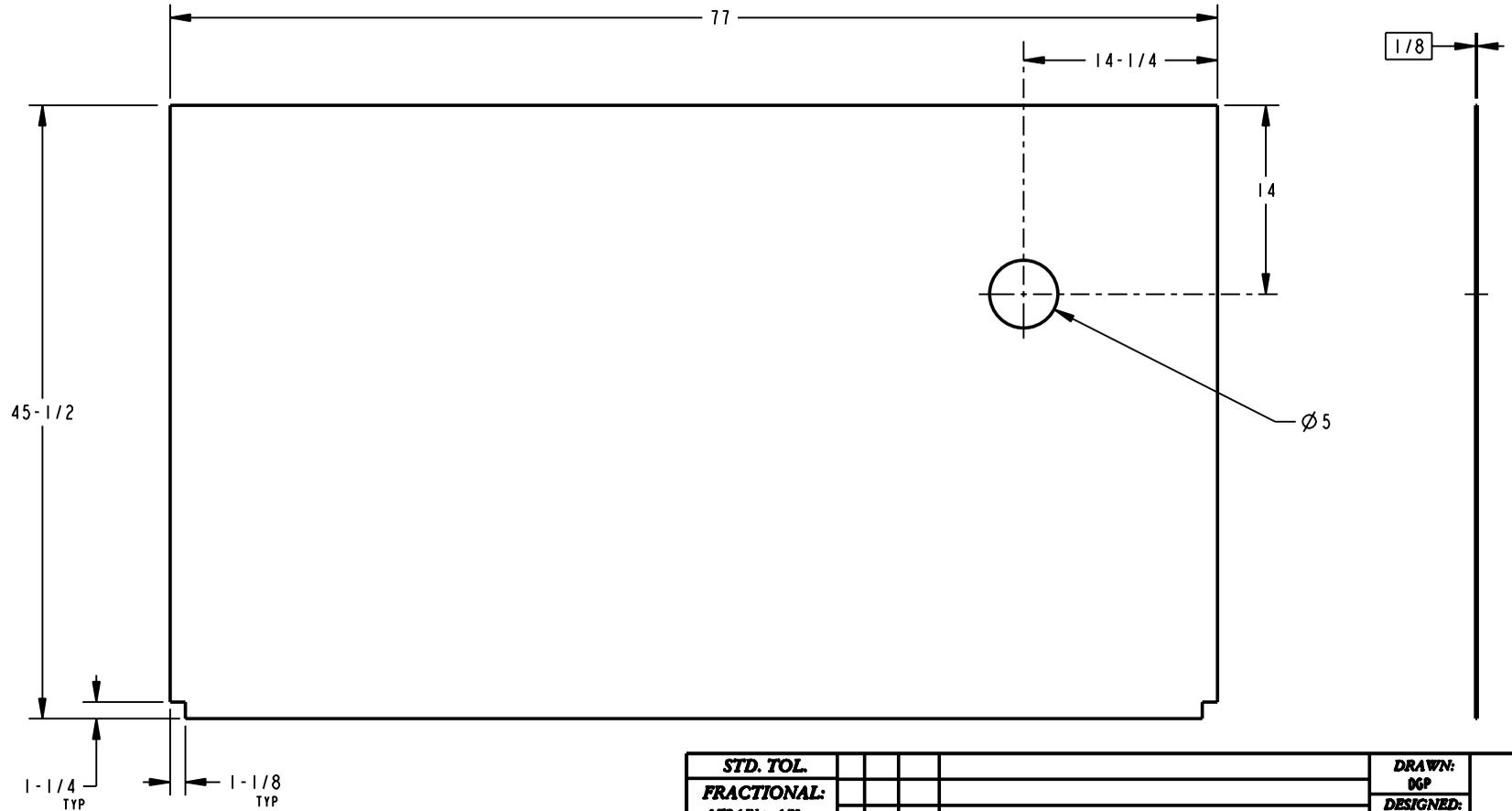
STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	No.	BY	DATE	REVISION		DATE: 08-May-2001	
						SCALE: 1/2	
PROJECT NO.: 00-6	TITLE: SIDE RAIL, VERTICAL					DWG. NO. 00-1373	SIZE: A

7 GA
.1793



PART NO: 00-1374
 MAT'L: SHEET 7GA 3X8 HR PICK&OIL
 ASTM A569_
 FFES SPEC NO: AA-G0738AP
 EST WT: 1.47 LBS

STD. TOL.						DRAWN: DGP		
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB		
ANGULAR: + - 1 DEG.						APPROVED: *		
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 09-May-2001		
PROJECT NO.: 00-6	TITLE: BRACKET, SIDE MARKER					SCALE: 1/4		FWEST, MINERAL AND FIRE MANAGEMENT
<p align="center">FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653</p>							DWG. NO. 00-1374	SIZE: A

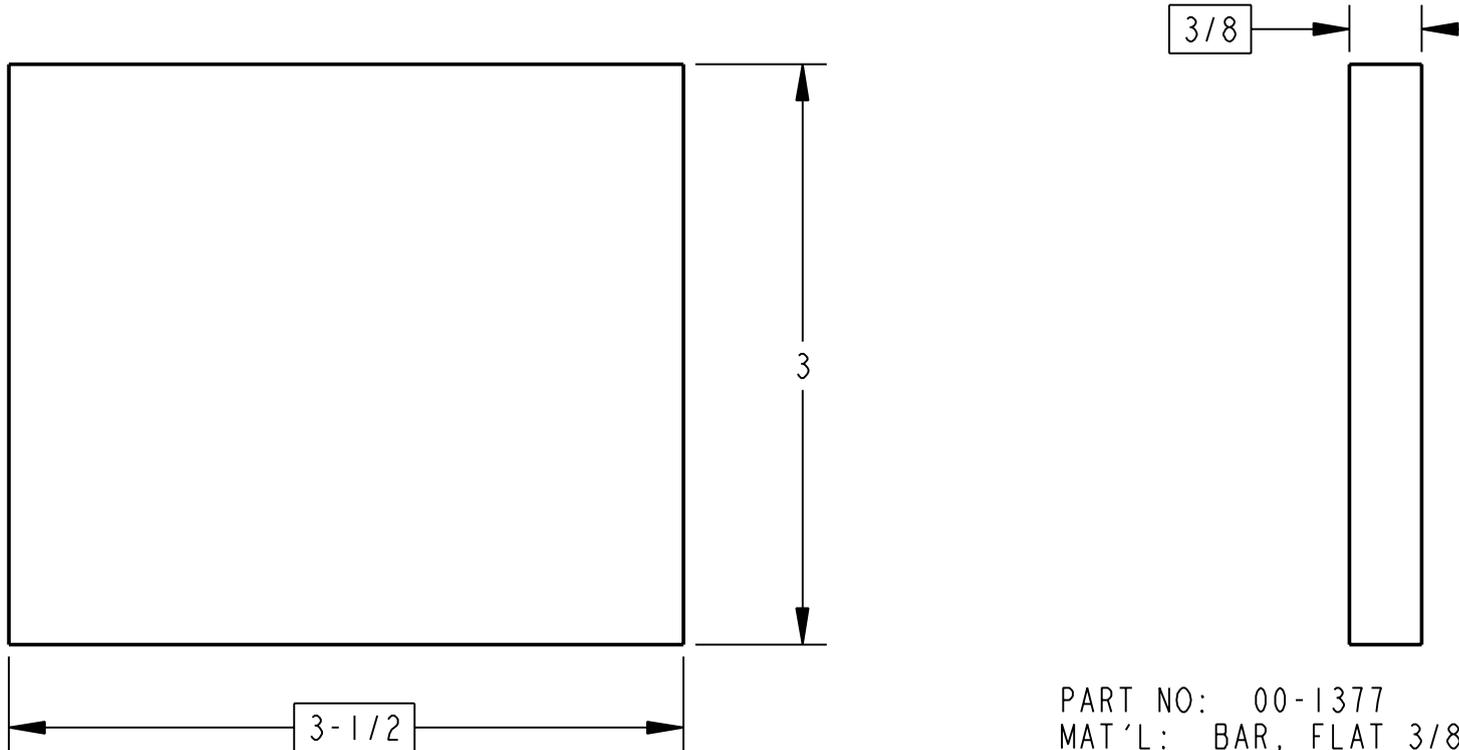


1-1/4 TYP 1-1/8 TYP

PART NO: 00-1376
 MAT'L: SAFETY PLATE, 4 WAY 1/8 4X8 HR
 G10150
 FFES SPEC NO: AA-00248BA
 EST WT: 123.84 LBS

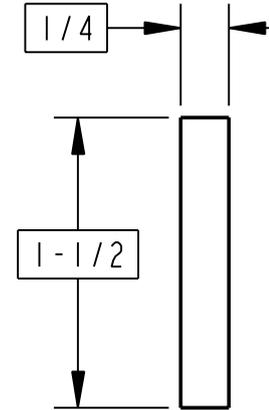
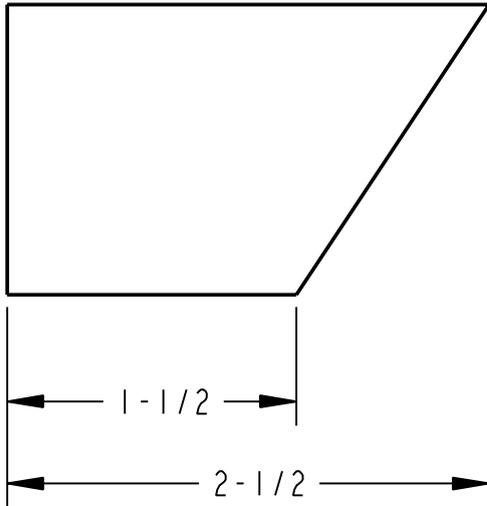
STD. TOL.						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: KDB
ANGULAR: ± .1 DEG.						APPROVED: •
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .003	NO.	BY	DATE	REVISION		DATE: 09-May-2001
						SCALE: 1/8
PROJECT NO.: 00-6	TITLE: DECK, FRONT					DWG. NO.: 00-1376
						SIZE: B





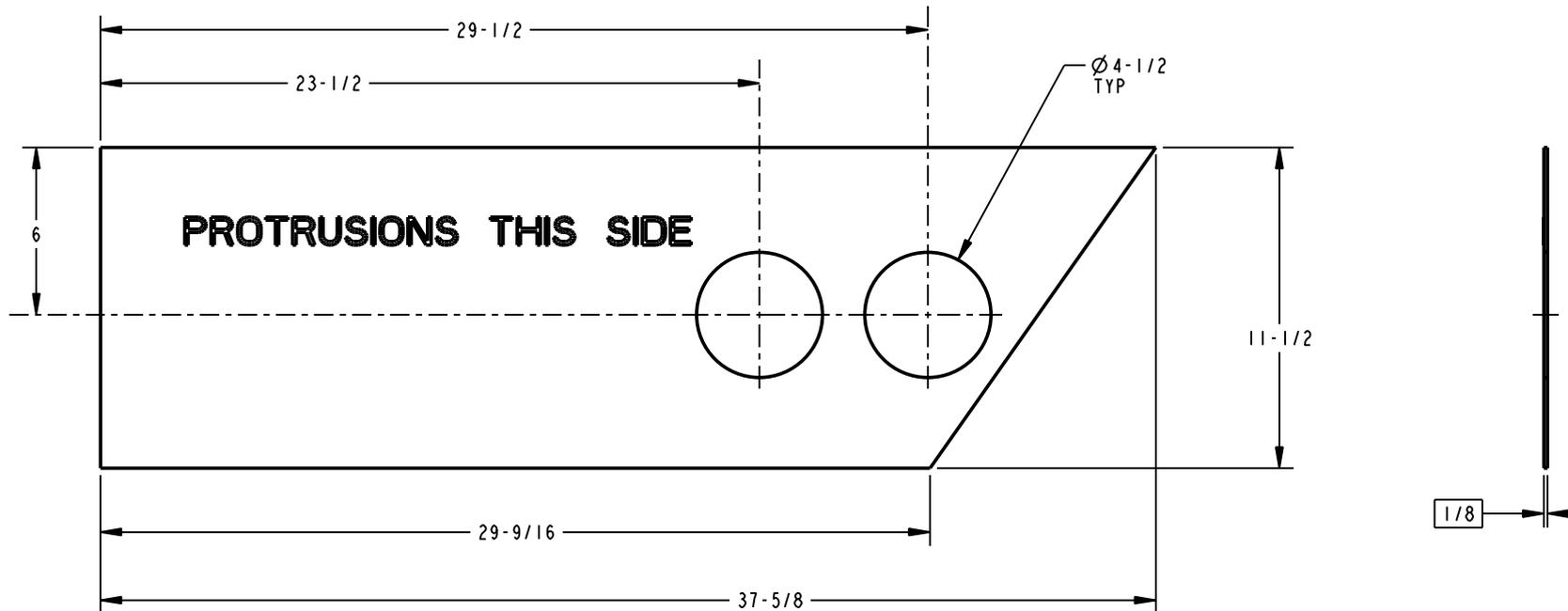
PART NO: 00-1377
 MAT'L: BAR, FLAT 3/8 X 3 1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 1.11 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 09-May-2001	
PROJECT NO.: 00-6	TITLE: MOUNT PAD, FRONT					SCALE: FULL	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



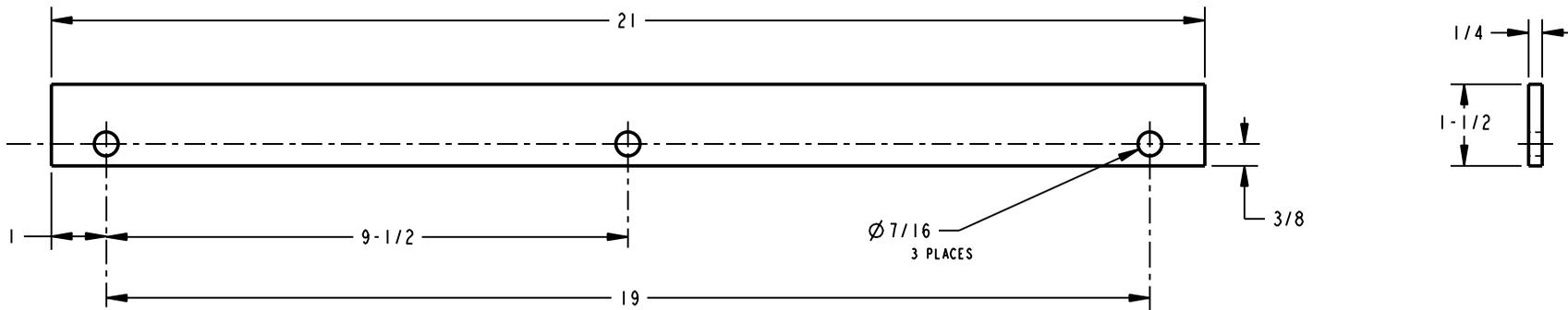
PART NO: 00-1378
 MAT'L: BAR, FLAT 1/4 X 1-1/2 HR
 G10200
 FFES SPEC NO: AB-00406AA
 EST WT: 0.21 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 09-May-2001	
PROJECT NO.: 00-6	TITLE: GUSSET, FRONT MOUNT					SCALE: FULL	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



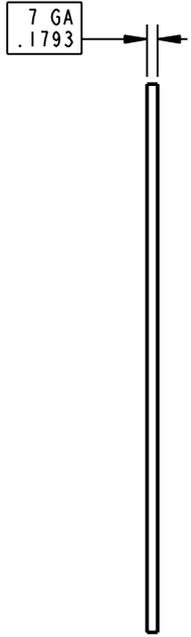
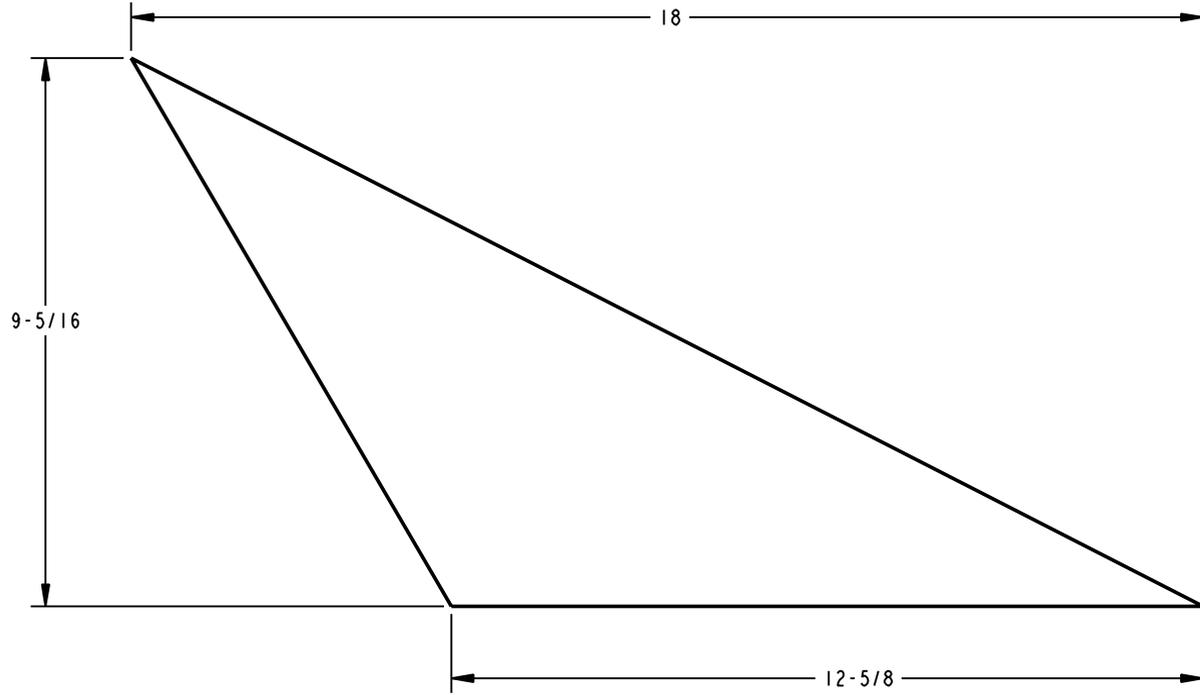
PART NO: 00-1380
 MAT'L: SAFETY PLATE, 4 WAY 1/8 4X8 HR
 G10150
 FFES SPEC NO: AA-00248BA
 EST WT: 15.18 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: KDB	
ANGULAR: ± .1 DEG.	NO.	BY	DATE	REVISION		APPROVED: •	
DECIMAL: 1 PLACE ± .005 2 PLACE ± .003 3 PLACE ± .0005	FOREST FIRE EXPERIMENT STATION					DATE: 09-May-2001	
PROJECT NO.: 00-6	TITLE: COVER, REAR RH					SCALE: 1/4	
						DWG. NO. 00-1380	SIZE: B



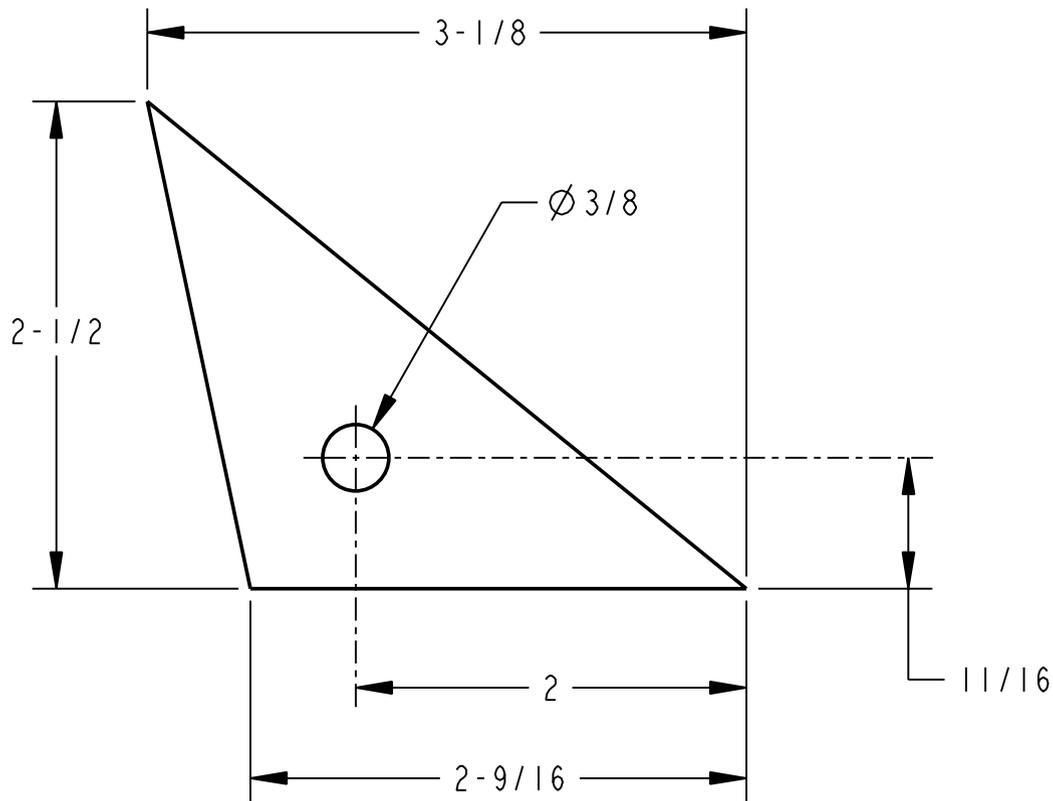
PART NO: 00-1448
 MAT'L: BAR, FLAT 1/4 X 1-1/2 HR
 G10200
 FFES SPEC NO: AB-00406AA
 EST WT: 0.21 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: DGP	
ANGULAR: ± .1 DEG.						APPROVED: •	
DECIMAL: 1 PLACE ± .006 2 PLACE ± .003 3 PLACE ± .0003	NO.	BY	DATE	REVISION		DATE: 09-Nov-2001	
PROJECT NO.:	TITLE: FUEL TANK GUARD, MOUNT					SCALE: 1/2	
						SIZE: B	



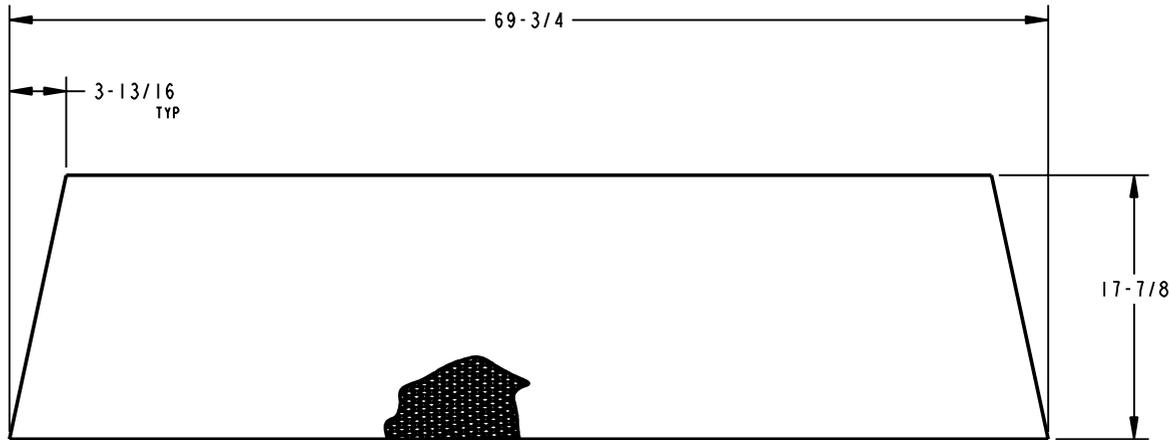
PART NO: 00-1450
 MAT'L: SHEET 7 GA 3X8 HR P & O
 ASTM A570
 FFES SPEC NO: AA-G0738AP
 EST WT: [.2] LBS

STD. TOL.						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: DGP
ANGULAR: +- 1 DEG.						APPROVED: *
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.003	NO.	BY	DATE	REVISION		
PROJECT NO.:	FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653					DATE: 09-Nov-2001
	TITLE: FUEL TANK GUARD, REAR					SCALE: 1/2
						DNR FOREST, MINERAL AND FIRE MANAGEMENT
						DWG. NO. 00-1450
						SIZE B



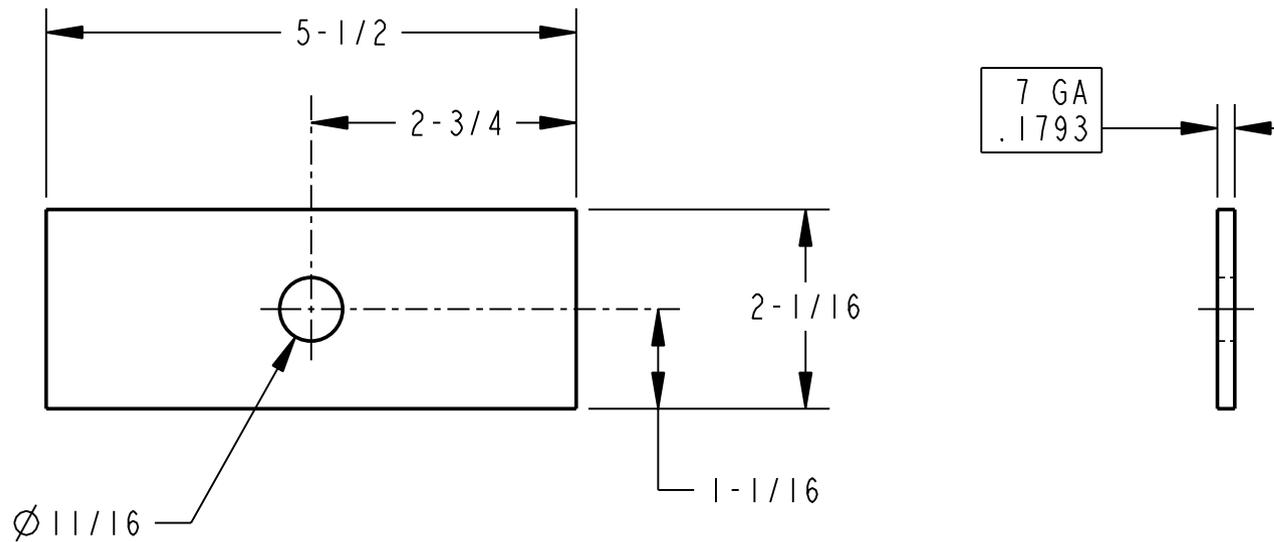
PART NO: 00-1452
 MAT'L: SHEET 7GA HR PICK&OIL
 ASTM-A569
 FFES SPEC NO: AA-G0738AP
 EST WT: 0.16 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: DGP	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 17-Nov-2001	
PROJECT NO.:	TITLE: MOUNT, WORK LIGHT					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653						SIZE: A	
						DWG. NO. 00-1452	



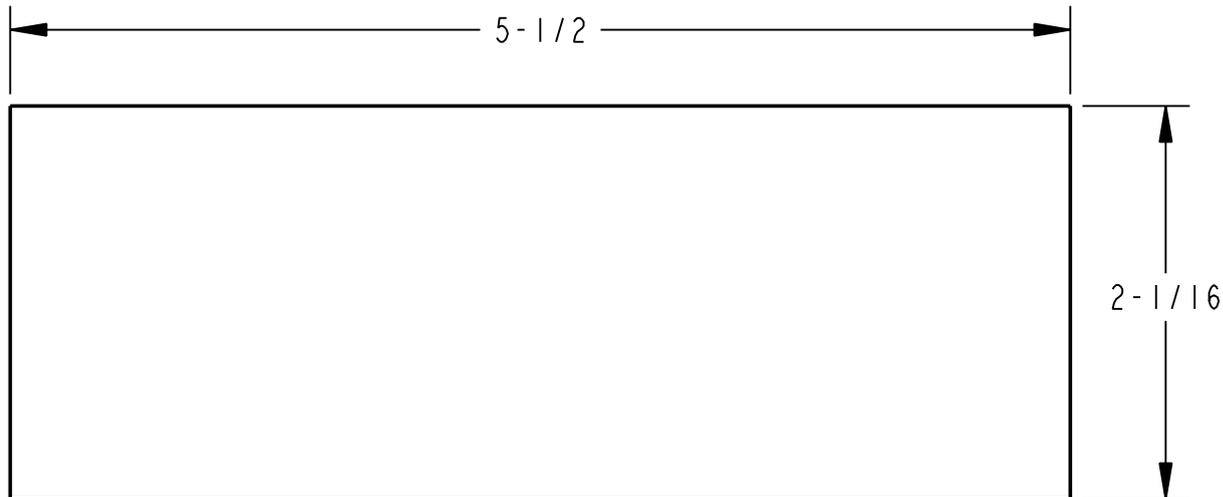
PART NO: 00-1453
 MAT'L: EXPANDED METAL 3/4 NO. 10
 FFES SPEC NO: AP-31049AR
 EST WT: 29.92 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: t db	
ANGULAR: ± .1 DEG.						APPROVED: .	
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .005	NO.	BY	DATE	REVISION		DATE: 05-Feb-2002	
PROJECT NO.:	TITLE: EXPANDED METAL HEADACHE RACK					SCALE: 1/8	
							SIZE: B



PART NO: 00-1454
 MAT'L: SHEET 7GA 4X8 HR PICK&OIL
 ASTM-A569
 FFES SPEC NO: AA-G0748AP
 EST WT: 0.56 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED:	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 28-Nov-2001	
PROJECT NO.:	TITLE: RECEIVER, SIDES					SCALE: 1/2	
							SIZE: A

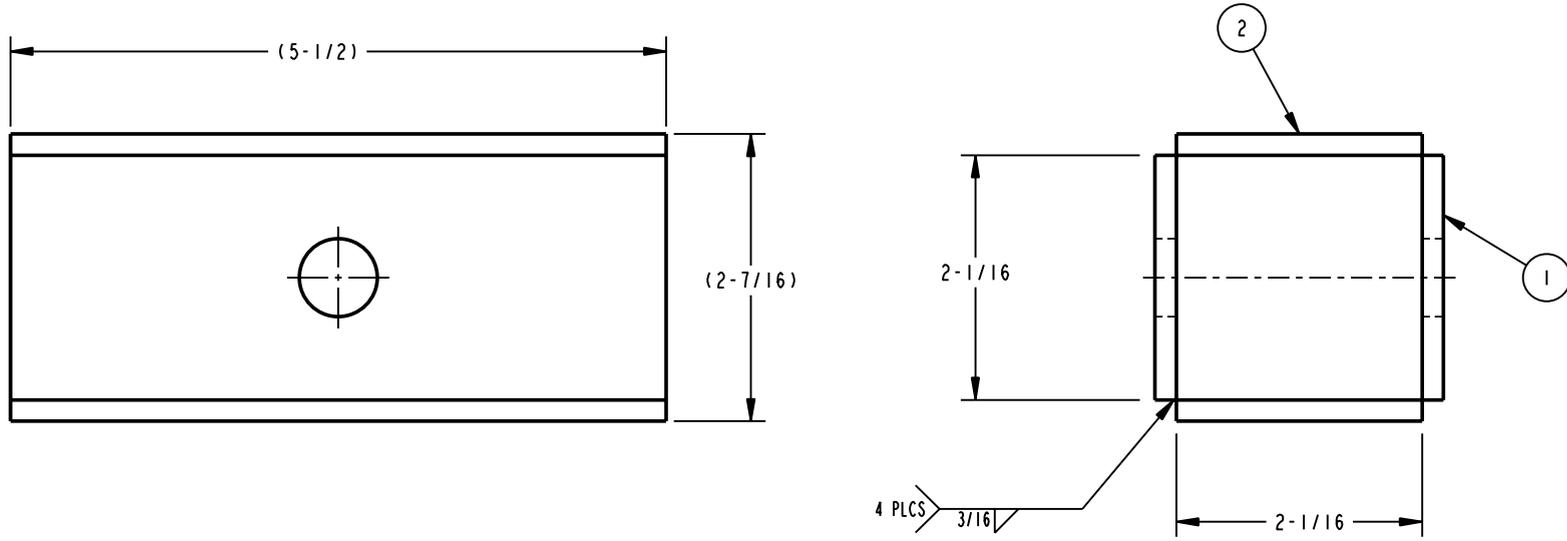


PART NO: 00-1455
 MAT'L: SHEET 7GA 4X8 HR PICK&OIL
 ASTM-A569
 FFES SPEC NO: AA-G0748AP
 EST WT: 0.58 LBS

7 GA
 .1793

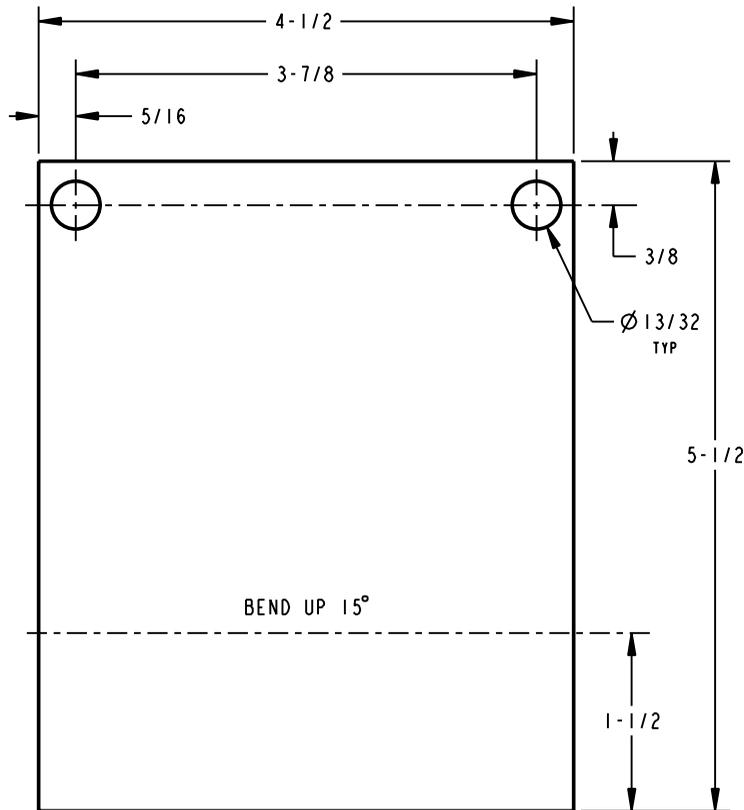
STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED:	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 28-Nov-2001	
PROJECT NO.:	TITLE: RECEIVER, TOP-BOTTOM					SCALE: FULL	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A

ITEM	PART NO.	DWG	DESCRIPTION	QTY
1	00-1454	A	RECEIVER, SIDES	2
2	00-1455	A	RECEIVER, TOP-BOTTOM	2

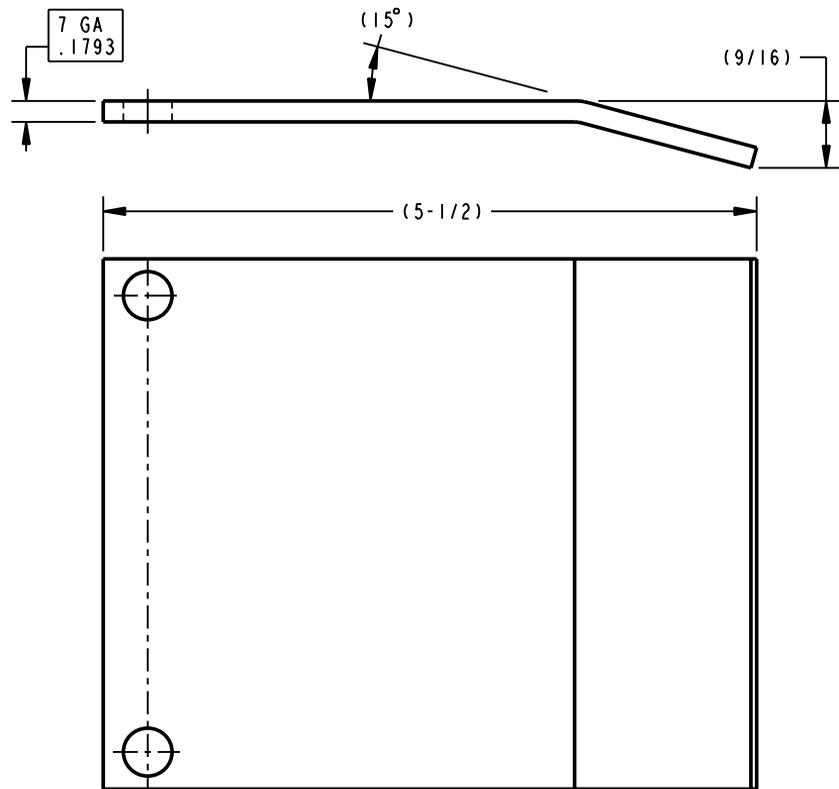


PART NO: 00-1456
 EST WT: 2.27 LBS

STD. TOL.					DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16					DESIGNED: K06	
ANGULAR: ± .1 DEG.					APPROVED: *	
DECIMAL: 1 PLACE ± .005 2 PLACE ± .003 3 PLACE ± .0005					DATE: 28-Nov-2001	
PROJECT NO.:	TITLE: RECEIVER S/W				SCALE: FULL	DWG. NO. 00-1456
						SIZE: B

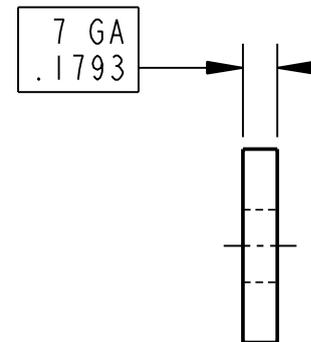
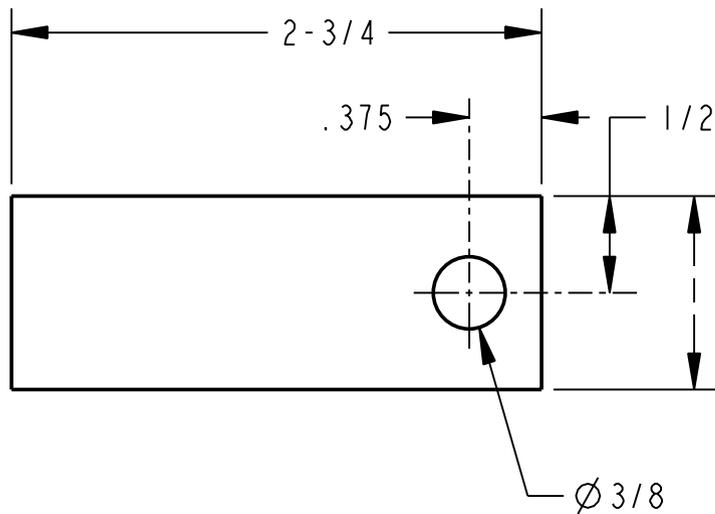


FLAT LAYOUT



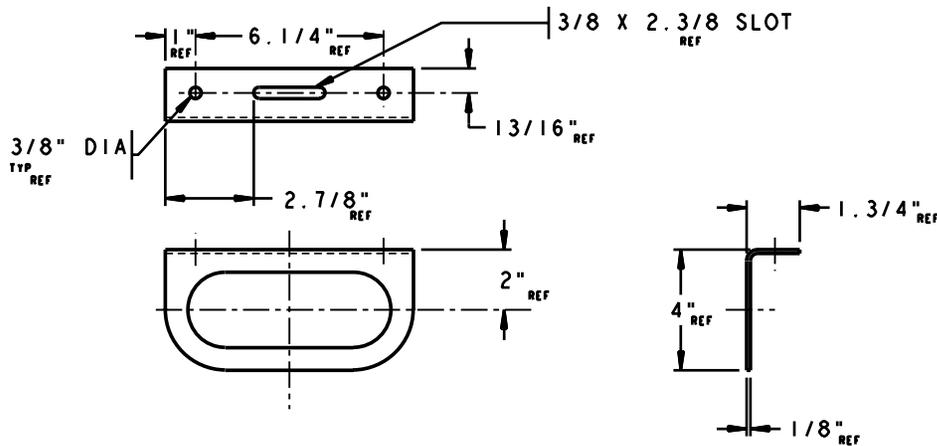
PART NO: 00-1457
 MAT'L: SHEET 7GA 4X8 HR PICK&OIL
 ASTM-A569
 FFES SPEC NO: AA-G0748AP
 EST WT: 1.25 LBS

STD. TOL:						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: DGP
ANGULAR: ± .1 DEG.						APPROVED: *
DECIMAL: 1 PLACE ± .006 2 PLACE ± .003 3 PLACE ± .0003	NO.	BY	DATE	REVISION		DATE: 29-Nov-2001
PROJECT NO.:	FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653					SCALE: FULL
TITLE: BRACKET, FUEL FILL						DNR FOREST, MINERAL AND FIRE MANAGEMENT
						DWG. NO.: 00-1457
						SIZE: B



PART NO: 00-1467
 MAT'L: SHEET 7GA 4X8 HR PICK&OIL
 ASTM A569
 FFES SPEC NO: AA-G0748AP
 EST WT: 0.13 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: DGP	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	No.	BY	DATE	REVISION		DATE: 01-Feb-2002	
PROJECT NO.:	TITLE: MOUNT TAB					SCALE: FULL	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



BRACKET, LIGHT MOUNTING

TYPE: FOR SEALED OVAL LAMPS W/A
 RECESSED RUBBER GROMMET MOUNT
 USAGE: SIGNAL-STAT LAMPS P/N'S 4070,
 4070A & 4072
 MATERIAL: STEEL
 COLOR: BLACK
 EST. WT: 1.00 LBS

APPROVED MANUFACTURERS

PART NO

APPROVED MANUFACTURERS

PART NO

SIGNAL-STAT LIGHTING
 SOUTHFIELD, MICHIGAN 48034

9292

STD. TOLERANCES		NO.	BY	DATE	REVISION
FRACTIONAL:					
0 TO 6 IN. ± 1/32					
6 IN AND UP ± 1/16					
DECIMAL:	ANGULAR:				
1 PLACE ± 0.1	± 1 DEG				
2 PLACE ± 0.01					
3 PLACE ± 0.005					

DRAWN:
R. GREENLAW
 CHECKED:
KDB
 APPROVED:

**MICHIGAN
 DNR**
 FOREST MANAGEMENT
 DIVISION

FOREST FIRE EXPERIMENT STATION
 P.O. BOX 68 ROSCOMMON, MICHIGAN 48653

PROJECT NO.: **90-4**

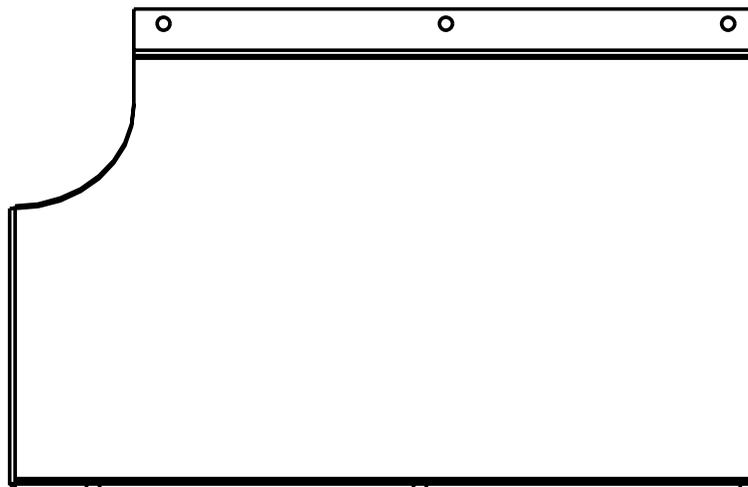
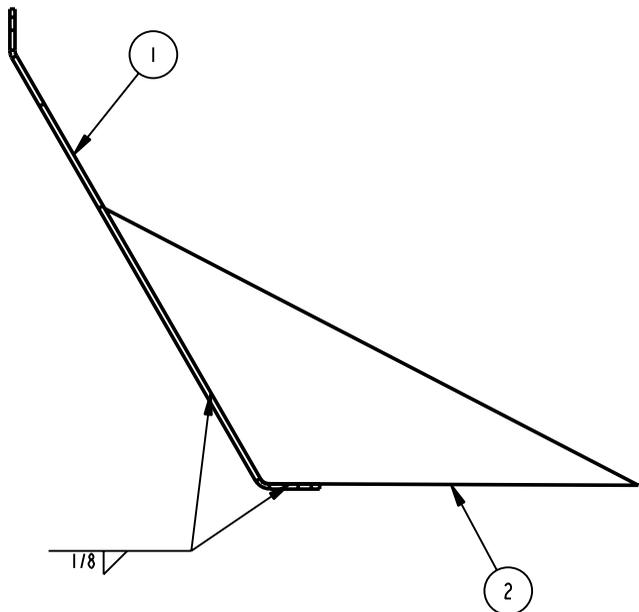
PART NUMBER: **28-8007**

TITLE: **BRACKET, LIGHT MOUNTING**

SCALE: **1 = 4**
 DATE: **01 NOV 95**

DWG. NO. **28-8007B**

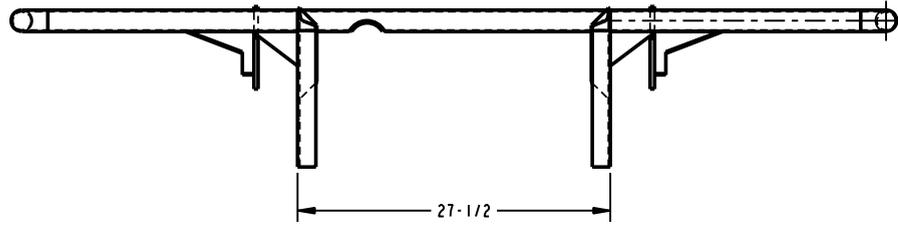
ITEM	PART NO.	DWG	DESCRIPTION	QTY
1	00-1449	C	FUEL TANK GUARD, SIDE	1
2	00-1450	B	FUEL TANK GUARD, REAR	1



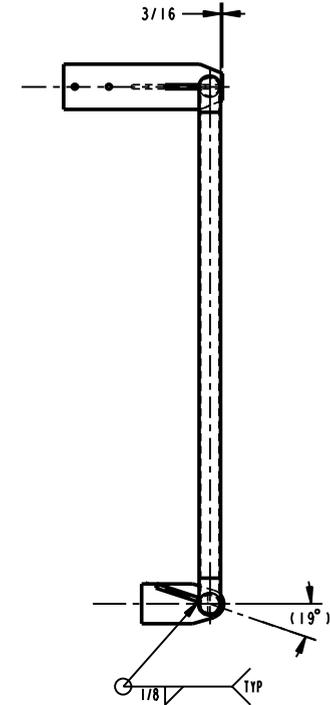
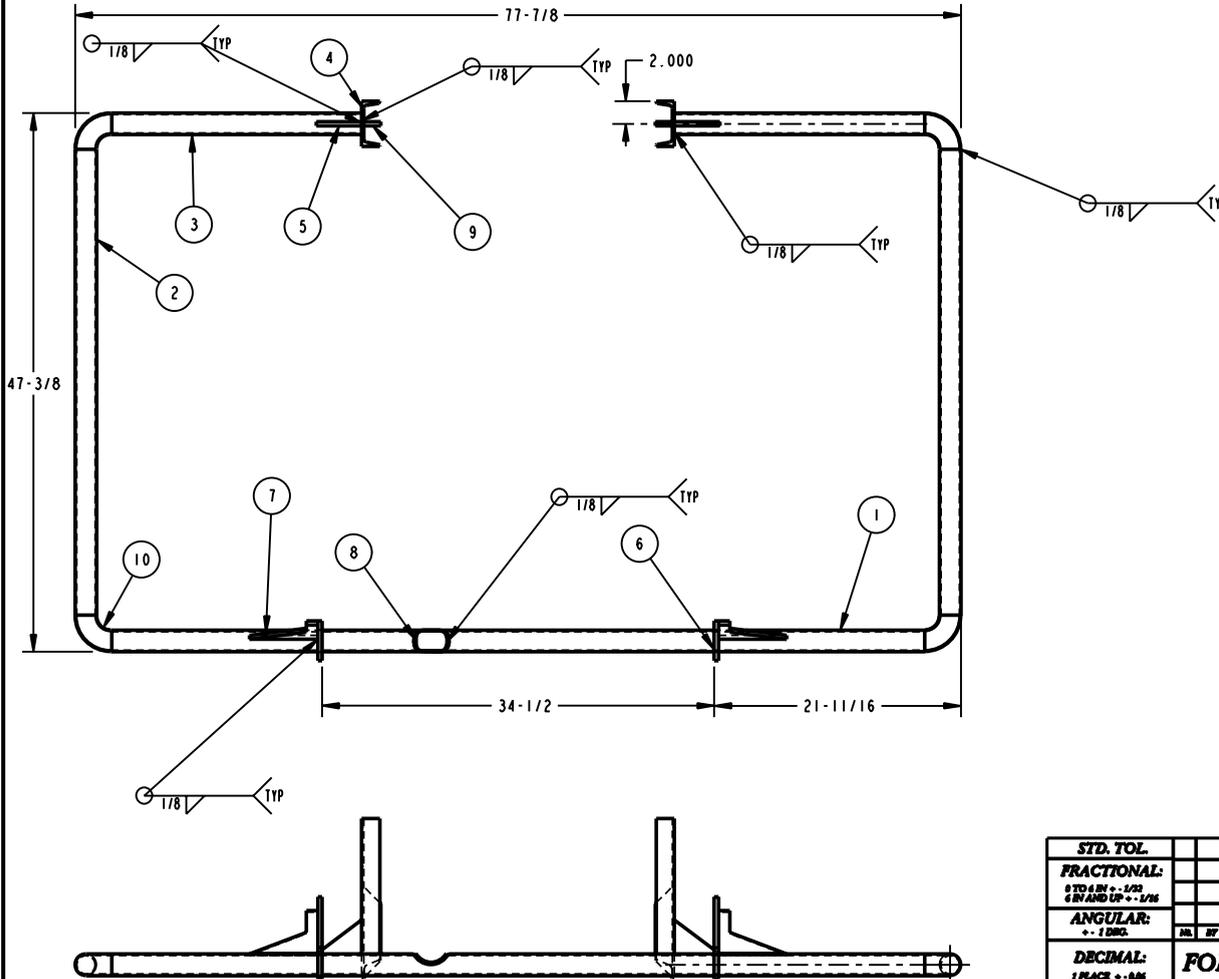
PART NO: 29-0088
EST WT: 27.38 LBS

STD. TOL.					DRAWN: DGP
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16					DESIGNED: DGP
ANGULAR: ± .1 DEG.	NO.	BY	DATE	REVISION	APPROVED: *
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .003	FOREST FIRE EXPERIMENT STATION				DATE: 12-Feb-2002
PROJECT NO.: 01-6	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653				SCALE: 1/4
	TITLE: TANK GUARD W/C				DWG. NO. 29-0088
					SIZE: B





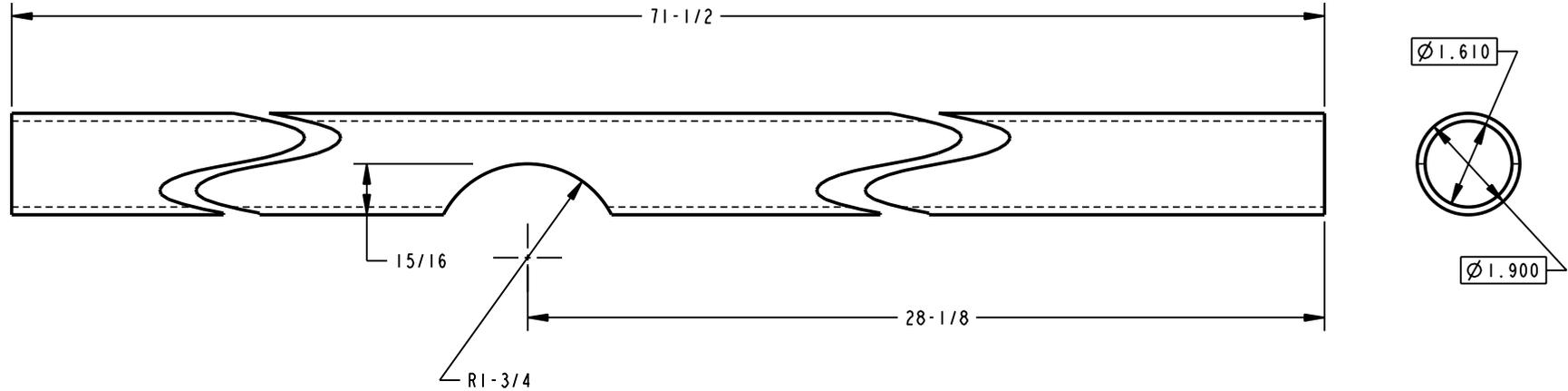
ITEM	PART NO.	DWG	DESCRIPTION	QTY
1	00-1435	B	PIPE, FRONT	1
2	00-1436	A	PIPE, SIDE	2
3	00-1437	A	PIPE, REAR	2
4	00-1438	B	MOUNT, REAR	2
5	00-1439	A	GUSSET, REAR	2
6	00-1440	B	MOUNT, FRONT	2
7	00-1441	A	GUSSET, FRONT	2
8	00-1442	B	CAP, FRONT PIPE NOTCH	1
9	00-1443	A	STIFFENER, REAR MOUNT	2
10	P24-CALV		ELBOW, BUTT WELD 90, 1-1/2 LONG RAD	4



PART NO: 29-0086
EST WT: 68.89 LBS

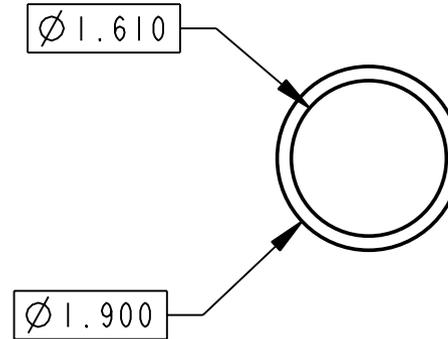
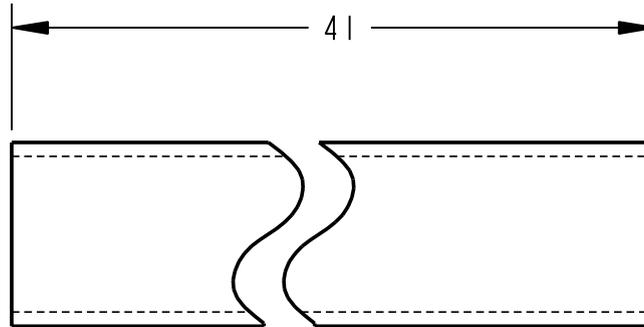
STD. TOL.						DRAWN: BSP
FRACTIONAL:						DESIGNED: BSE
1/16 IN ± .002						APPROVED:
3/16 IN AND UP ± .005						
ANGULAR:						DATE: 07-Nov-2001
± .1 DEG.						SCALE: 1:8
DECIMAL:	FOREST FIRE EXPERIMENT STATION					
1 PLACE ± .005	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653					
2 PLACE ± .002						
3 PLACE ± .001						
PROJECT NO.:	TITLE: STEP, ROCKER PANEL GUARD W/C					DWG. NO. 29-0086





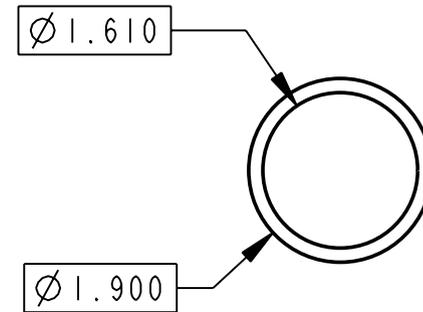
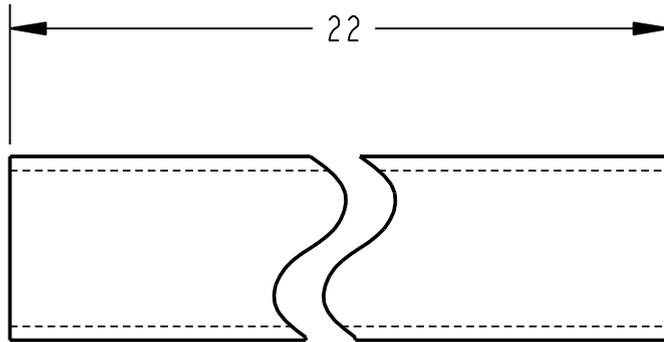
PART NO: 00-1435
 MAT'L: PIPE 1 1/2 NOM SCH 40 STRUCTURAL
 K03000
 FFES SPEC NO: AF-04024AY
 EST WT: 15.90 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16						DESIGNED: EGB	
ANGULAR: ± .1 DEG.	NO.	BY	DATE	REVISION		APPROVED: *	
DECIMAL: 1 PLACE ± .06 2 PLACE ± .03 3 PLACE ± .003	FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653					DATE: 07-Nov-2001	
PROJECT NO.: 00-6						TITLE: PIPE, FRONT	



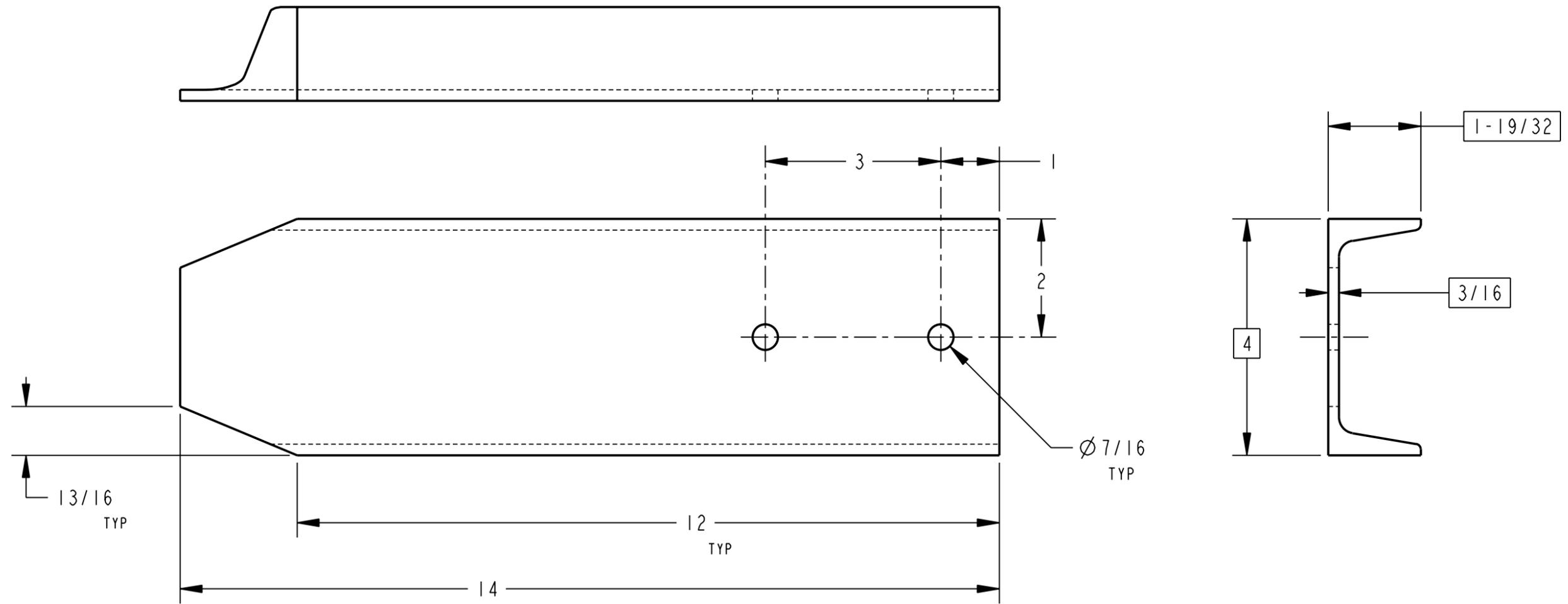
PART NO: 00-1436
 MAT'L: PIPE 1 1/2 NOM SCH 40 STRUCTURAL
 K03000
 FFES SPEC NO: AF-04024AY
 EST WT: 9.28 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 07-Nov-2001	
PROJECT NO.: 00-6	TITLE: PIPE, SIDE					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 00-1437
 MAT'L: PIPE 1 1/2 NOM SCH 40 STRUCTURAL
 K03000
 FFES SPEC NO: AF-04024AY
 EST WT: 4.98 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	No.	BY	DATE	REVISION		DATE: 07-Nov-2001	
PROJECT NO.:	TITLE: PIPE, REAR					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



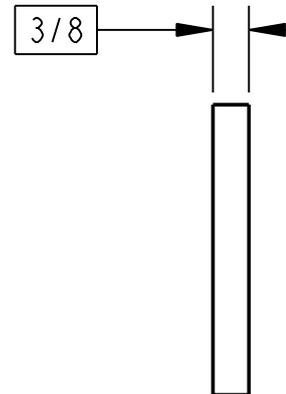
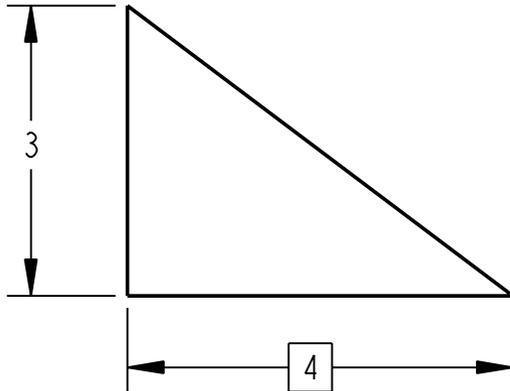
NOTE: BREAK SHARP EDGES

PART NO: 00-1438
 MAT'L: CHANNEL 4 x 5.4 #/FT
 K02603
 FFES SPEC NO: AH-04054AG
 EST WT: 5.78 LBS

STD. TOL.						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB
ANGULAR: + - 1 DEG.						APPROVED: *
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 07-Nov-2001
PROJECT NO.:	TITLE: MOUNT, REAR					SCALE: 1/2
						SIZE: B

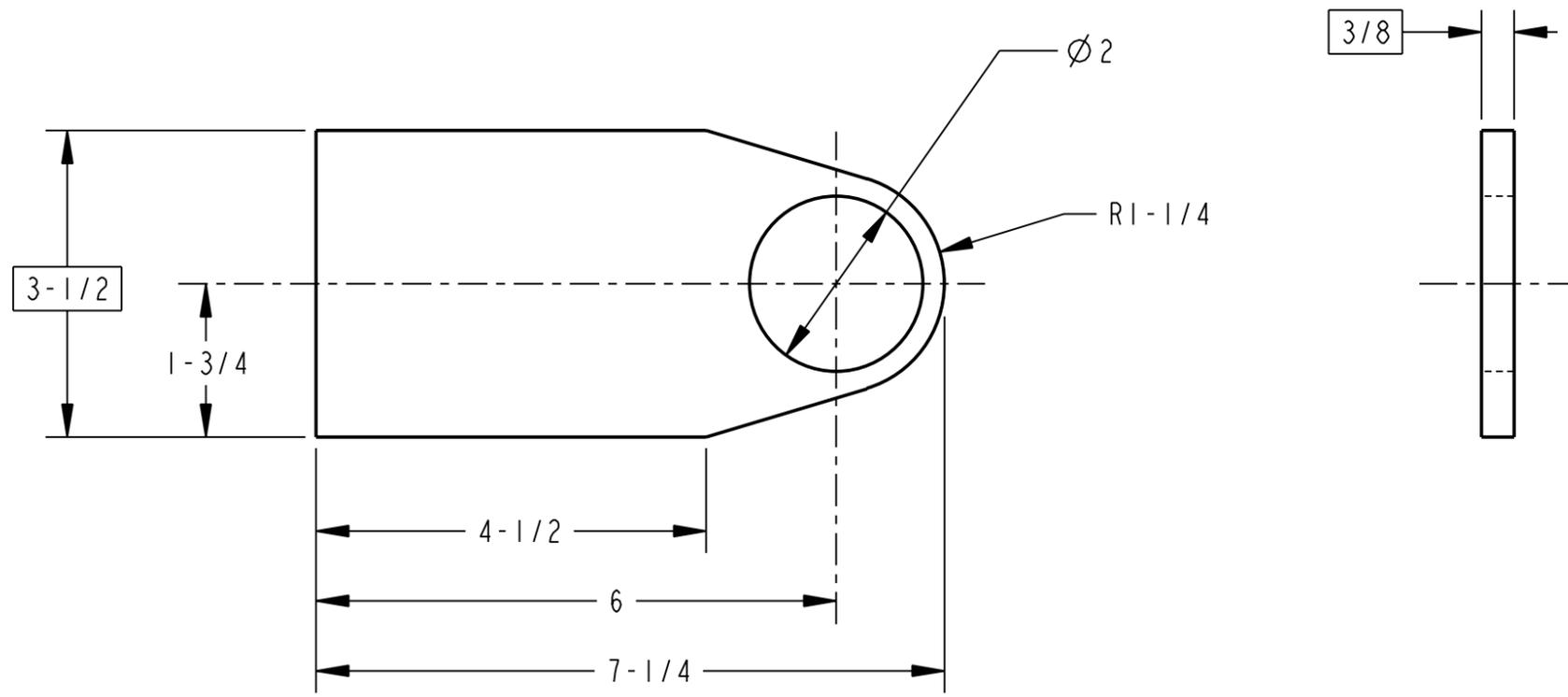


DWG. NO. 00-1438



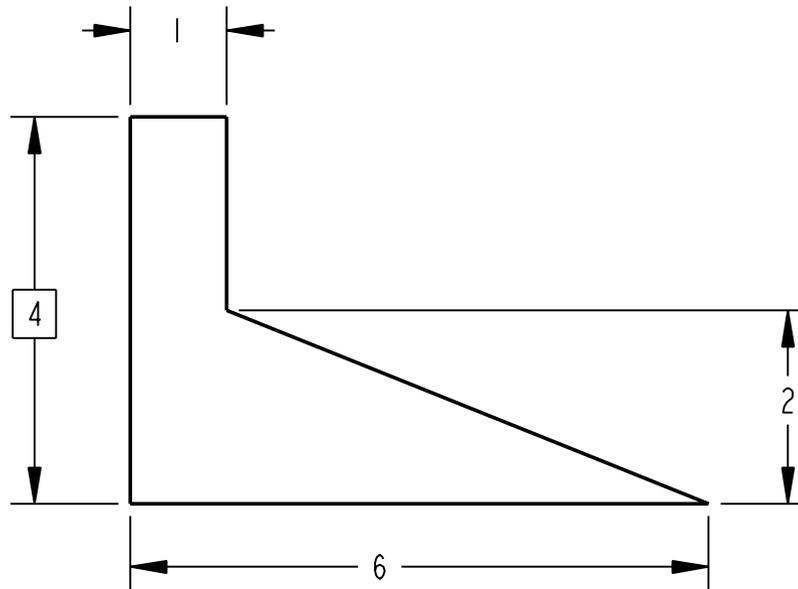
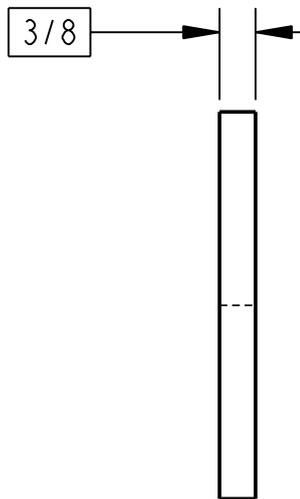
PART NO: 00-1439
 MAT'L: BAR, FLAT 3/8 X 4 HR
 G10200
 FFES SPEC NO: AB-00616AA
 EST WT: 0.64 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 07-Nov-2001	
PROJECT NO.: 00-6	TITLE: GUSSET, REAR					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



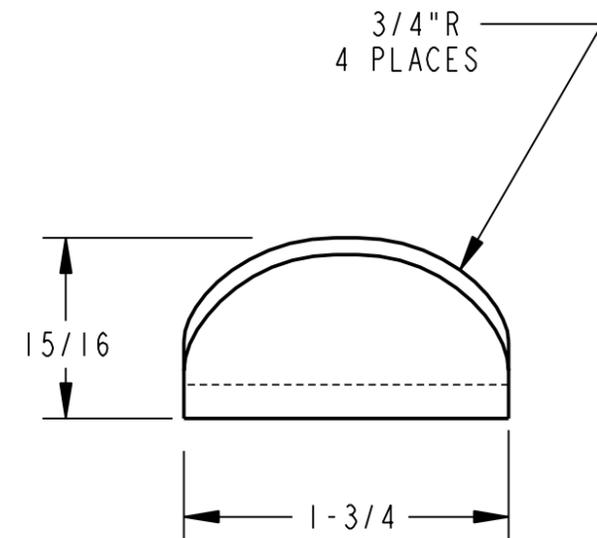
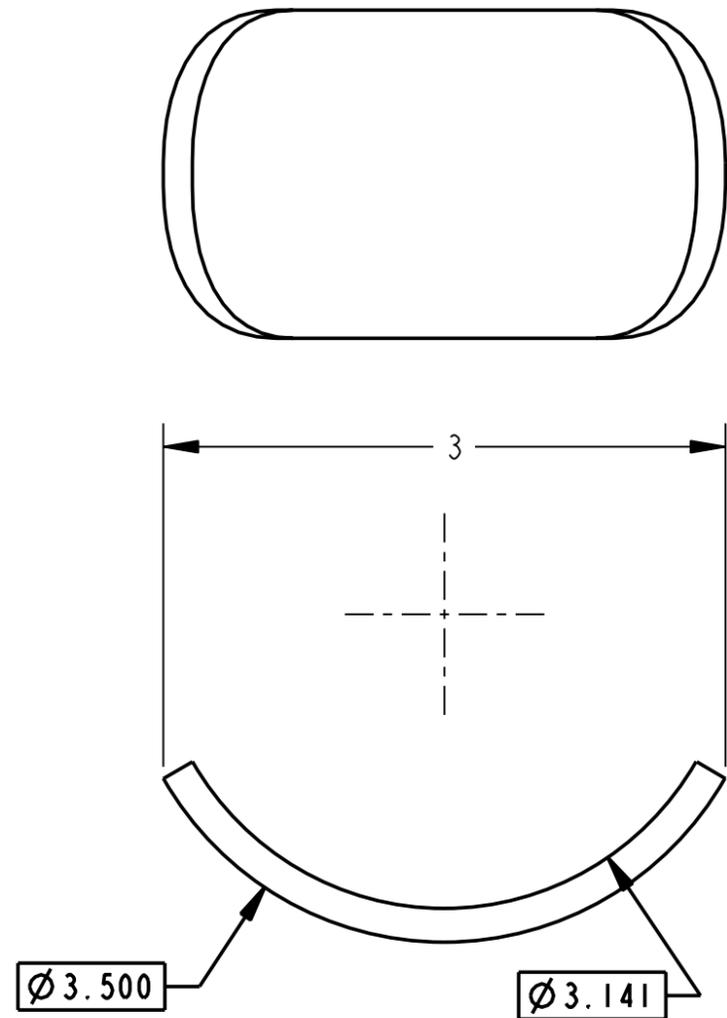
PART NO: 00-1440
 MAT'L: BAR, FLAT 3/8 X 3-1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 2.09 LBS

STD. TOL.						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB
ANGULAR: + - 1 DEG.						APPROVED: *
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 07-Nov-2001
PROJECT NO.:	TITLE: MOUNT, FRONT					SCALE: 1/2
						DNR FOREST, MINERAL AND FIRE MANAGEMENT
						DWG. NO. 00-1440
						SIZE: B



PART NO: 00-1441
 MAT'L: BAR, FLAT 3/8 X 4 HR
 G10200
 FFES SPEC NO: AB-00616AA
 EST WT: 0.96 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 07-Nov-2001	
PROJECT NO.:	TITLE: GUSSET, FRONT					SCALE: 1/2	
							SIZE: A

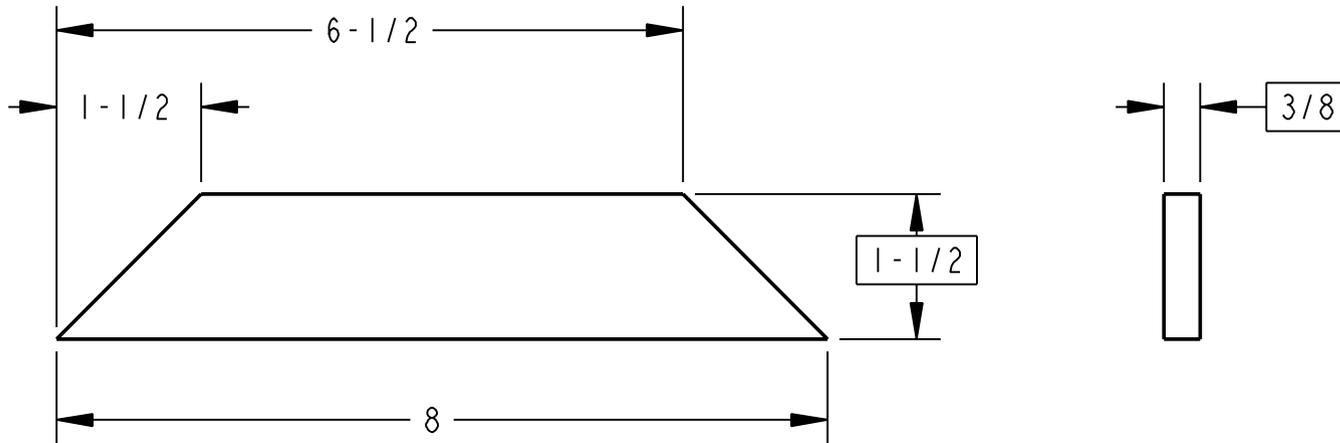


PART NO: 00-1442
 MAT'L: PIPE 3 NOM SCH 40 BLACK
 K03000
 FFES SPEC NO: AF-04048AY
 EST WT: 0.28 LBS

STD. TOL.						DRAWN: DGP
FRACTIONAL: 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: DGP
ANGULAR: + - 1 DEG.						APPROVED: *
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 26-Jan-2002
PROJECT NO.:	TITLE: CAP, FRONT PIPE NOTCH					SCALE: FULL
						SIZE: B

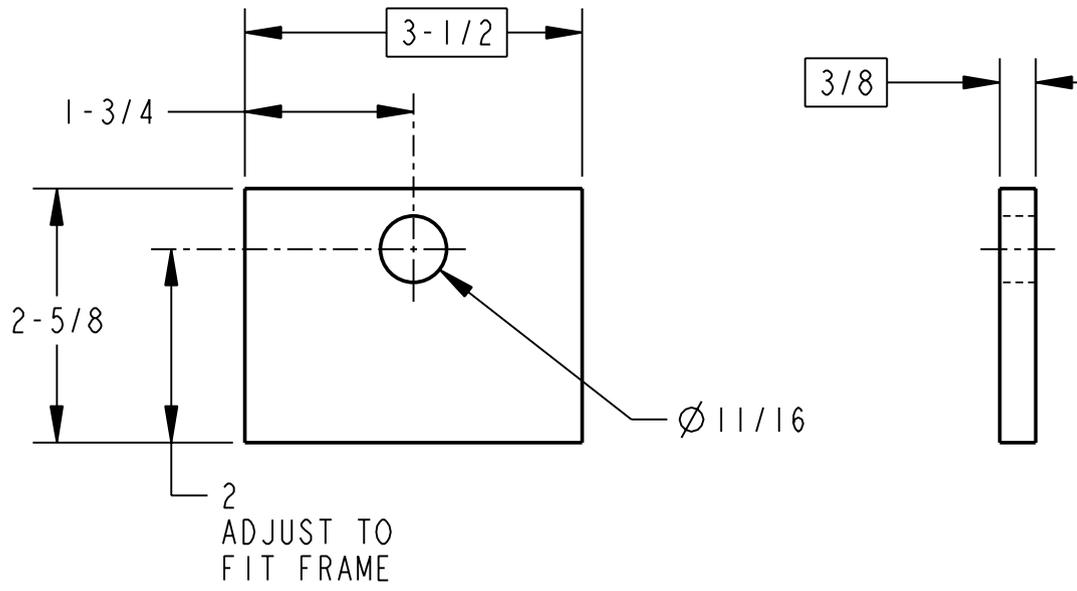


DWG. NO. 00-1442



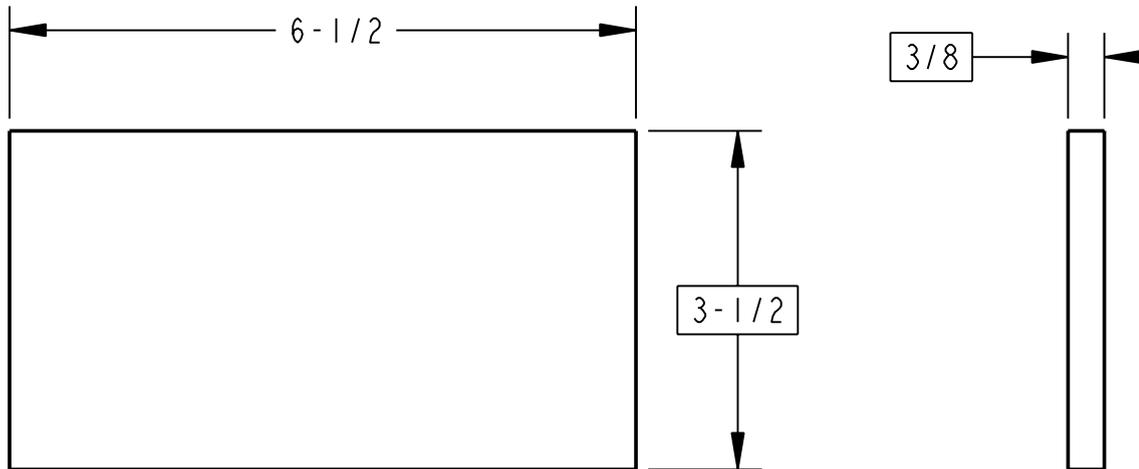
PART NO: 00-1443
 MAT'L: BAR, FLAT 3/8 X 1-1/2 HR
 G10200
 FFES SPEC NO: AB-00606AA
 EST WT: 1.03 LBS

STD. TOL.						DRAWN: DGP	 FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 26-Jan-2002	
PROJECT NO.: 00-6	TITLE: STIFFENER, REAR MOUNT					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



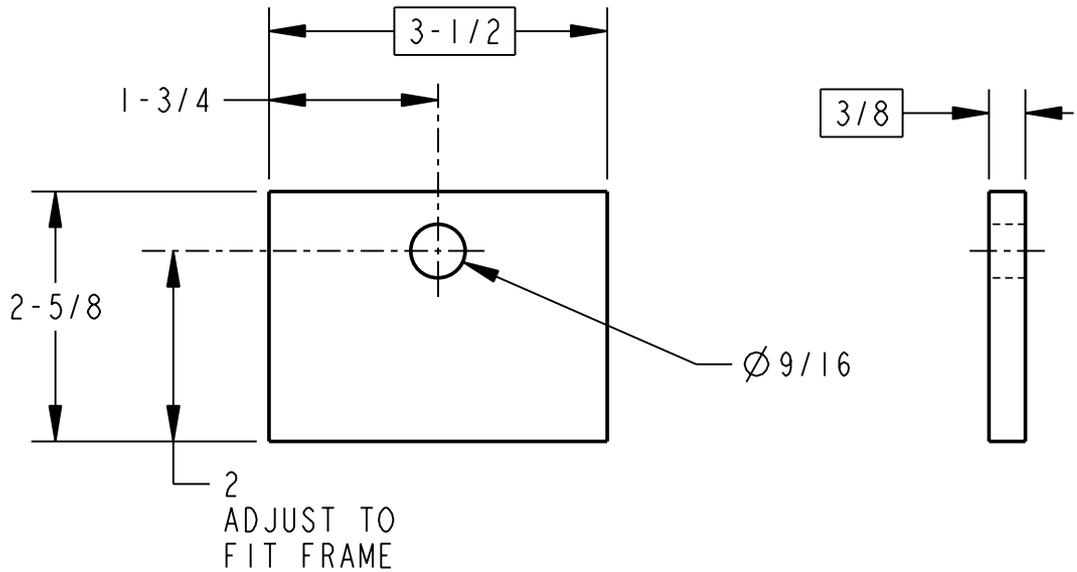
PART NO: 00-1444
 MAT'L: BAR, FLAT 3/8 X 3-1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 0.94 LBS

STD. TOL.						DRAWN: DGP	
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 08-Nov-2001	
PROJECT NO.: 00-6	TITLE: TOP, REAR BRACKET					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 00-1445
 MAT'L: BAR, FLAT 3/8 X 3-1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 2.41 LBS

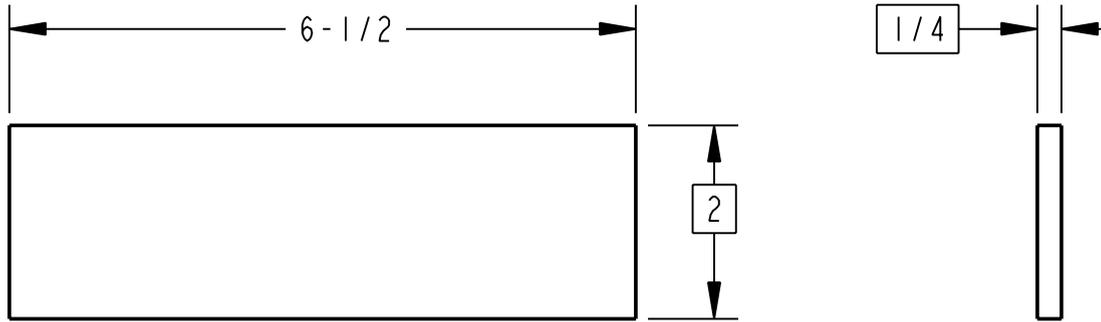
STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 08-Nov-2001	
PROJECT NO.:	TITLE: VERTICAL, REAR BRACKET					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 00-1446
 MAT'L: BAR, FLAT 3/8 X 3-1/2 HR
 G10200
 FFES SPEC NO: AB-00614AA
 EST WT: 0.95 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	NO.	BY	DATE	REVISION		DATE: 08-Nov-2001	
						SCALE: 1/2	
PROJECT NO.: 00-6	TITLE: BOTTOM, REAR BRACKET					DWG. NO. 00-1446	SIZE: A

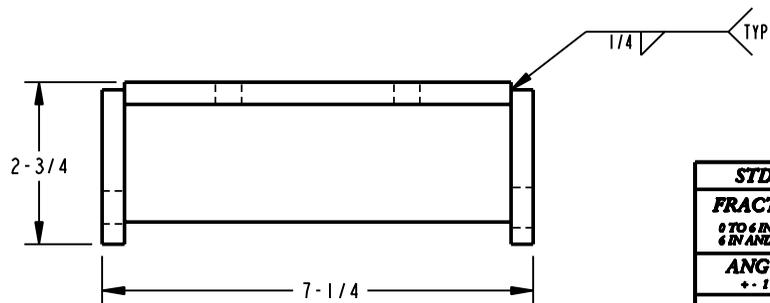
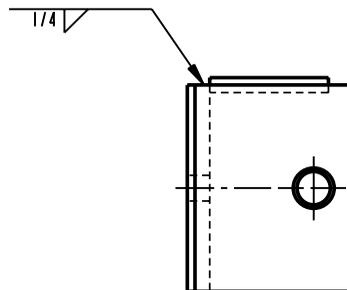
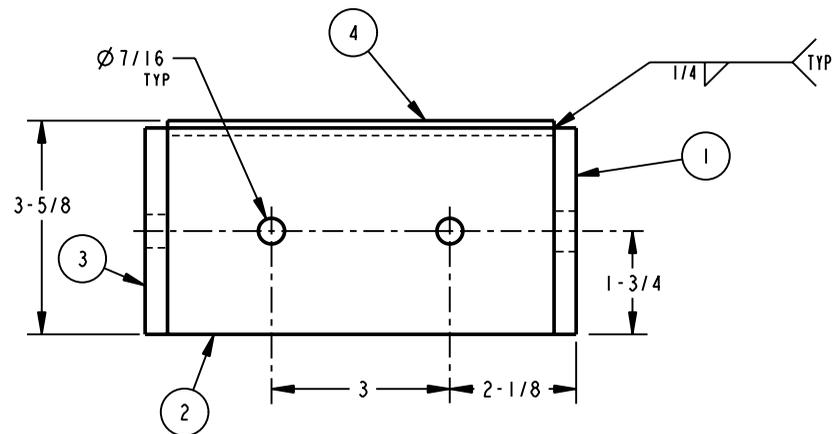
FOREST FIRE EXPERIMENT STATION
P.O. BOX 68 ROSCOMMON, MICHIGAN 48653



PART NO: 00-1447
 MAT'L: BAR, FLAT 1/4 X 2 HR
 G10200
 FFES SPEC NO: AB-00408AA
 EST WT: 0.92 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN + - 1/32 6 IN AND UP + - 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE + - 0.06 2 PLACE + - 0.03 3 PLACE + - 0.005	No.	BY	DATE	REVISION		DATE: 08-Nov-2001	
PROJECT NO.: 00-6	TITLE: STIFFENER, REAR BRACKET					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A

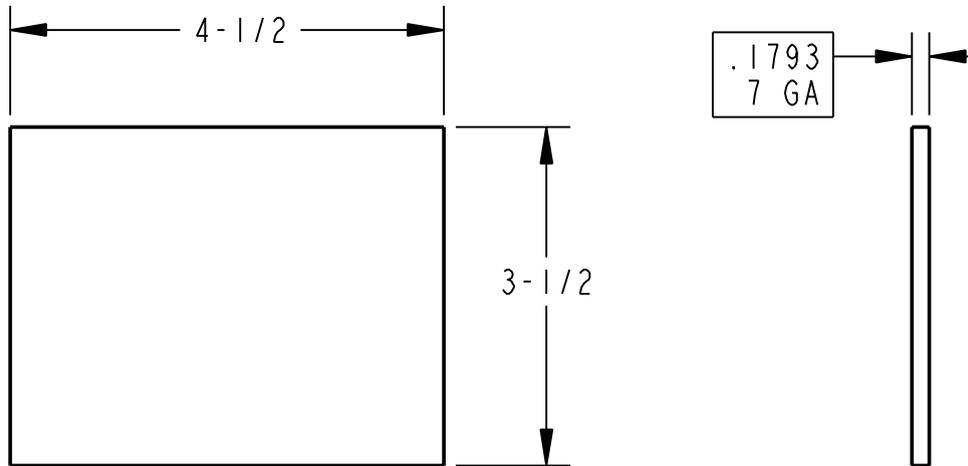
ITEM	PART NO.	DWG	DESCRIPTION	QTY
1	00-1444	A	TOP, REAR BRACKET	1
2	00-1445	A	VERTICAL, REAR BRACKET	1
3	00-1446	A	BOTTOM, REAR BRACKET	1
4	00-1447	A	STIFFENER, REAR BRACKET	1



PART NO: 29-0087
EST WT: 5.18 LBS

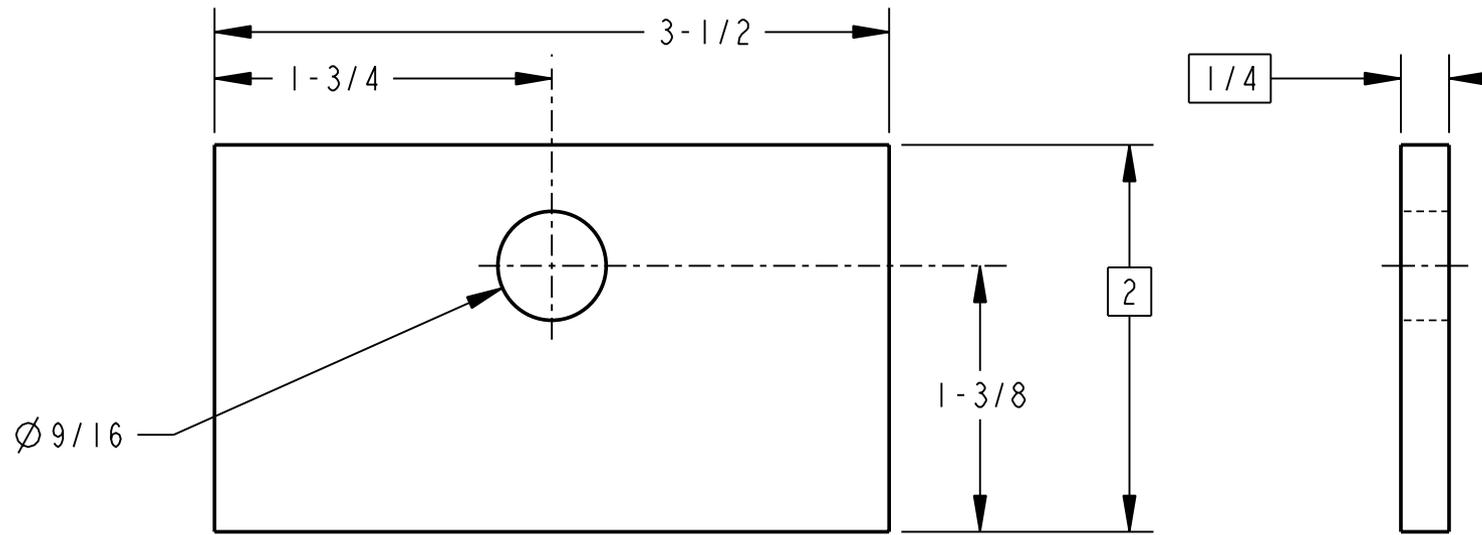
STD. TOL.					DRAWN: DGP
FRACTIONAL: 0 TO 6 IN ± .1/32 6 IN AND UP ± .1/16					DESIGNED: DGP
ANGULAR: ± .1 DEG.	NO.	BY	DATE	REVISION	APPROVED: •
DECIMAL: 1 PLACE ± .006 2 PLACE ± .003 3 PLACE ± .0003	FOREST FIRE EXPERIMENT STATION				DATE: 12-Feb-2002
PROJECT NO.:	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653				SCALE: 1/2
TITLE: BRACKET, REAR W/C	DWG. NO. 29-0087				SIZE: B





PART NO: 29-0089
 MAT'L: SHEET 7GA 4X8 HR PICK&OIL
 ASTM A569
 FFES SPEC NO: AA-G0748AP
 EST WT: 1.11 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	No.	BY	DATE	REVISION		DATE: 15-Nov-2001	
PROJECT NO.: 00-6	TITLE: SPACER, FRONT					SCALE: 1/2	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A



PART NO: 29-0090
 MAT'L: BAR, FLAT 1/4 X 2 HR
 G10200
 FFES SPEC NO: AB-00408AA
 EST WT: 0.48 LBS

STD. TOL.						DRAWN: DGP	 DNR FOREST, MINERAL AND FIRE MANAGEMENT
FRACTIONAL 0 TO 6 IN +- 1/32 6 IN AND UP +- 1/16						DESIGNED: KDB	
ANGULAR: + - 1 DEG.						APPROVED: *	
DECIMAL: 1 PLACE +- 0.06 2 PLACE +- 0.03 3 PLACE +- 0.005	NO.	BY	DATE	REVISION		DATE: 15-Nov-2001	
PROJECT NO.: 00-6	TITLE: SPACER, REAR					SCALE: FULL	
FOREST FIRE EXPERIMENT STATION P.O. BOX 68 ROSCOMMON, MICHIGAN 48653							SIZE: A

Appendix A - Slip-On Tank References

The following references include additional information on this topic. Suppliers names are listed for the convenience of the reader and should not be taken as an endorsement, nor is

the supplier listing complete. It is certain that there are many small slip-on manufacturers not included in the documents listed below.

References

Water Handling Equipment Guide, National Wildfire Coordinating Group, March 1994. This publication has photographs and lists specifications for wildland fire units across the Nation. Some of these are slip-on type units. Order NFES #1275 from the National Interagency Fire Center, ATTN: Great Basin Cache Supply Office, 3833 South Development Avenue, Boise, Idaho 83705.

Wildland Fire Engine Component Guide, National Wildfire Coordinating Group, March 1994. Lists and discusses common components

found on wildland fire vehicles. This publication has chapters which discuss tanks, pumps, and other components. Order NFES #1871 from the National Interagency Fire Center, ATTN: Supply, 3905 Vista Avenue, Boise, Idaho 83705.

REC Newsnote #3, Guidelines for Designing Forest Fire Engines. 1998. Gives additional advise for designing and planning water tank vehicles. Available in pamphlet form or online at www.RoscommonEquipmentCenter.com.

REC Slip-On Tank Designs

REC has several publications that feature slip-on tanks with complete design details. These provide design ideas for those intending to contract for or make their own tanks.

REC Project #33, Tanker Handbook, Military 1-1/4 Ton, 4x4 Cargo Truck, includes design details for a 200 gallon steel slip-on unit. Available as a booklet.

REC Project #34, Tanker Handbook, Military 3/4 Ton, 4x4 Cargo Truck, includes design details for a 150 gallon steel slip-on unit. Available as a booklet.

REC Project #40, Tanker Handbook, Military 880 Series 1-1/4 Ton, 4x4 Cargo Truck (Dodge W-200), includes design details for a 200 gallon steel slip-on unit. Available as a booklet.

REC Project #61B, Indiana 90 Gallon and 150 Gallon Aluminum Slip-on Unit. Available online at <http://www.roscommonequipmentcenter.com/projects/rec61b.pdf>. Includes design details for two aluminum tanks; one for full size and one for mid-size pickup trucks.

Poly Tank Suppliers

The following is a list of known polymer tank manufacturers. Listing does not constitute an endorsement. REC Project #61 has a list of

some slip-on tank suppliers for those looking for a complete pump and tank assembly.

LeVan Manufacturing, Inc.
2440 SW Ferry Street, Ste. D, P.O. Box 1023, Albany,
OR 97321
Telephone: (541) 924-5653 or 1-888-674-0030
Web Site: www.levanmfg.com

United Plastic Fabricating, Inc.
165 Flagship Drive, North Andover, MA 01845
Telephone: 1-800-638-8265
E-mail: info@unitedplastic.com
Web Site: www.unitedplastic.com

Pro Poly of America, Inc.
1821 Northwest 57ty Street, Ocala, FL 34475
Telephone: (352) 629-1414
Web Site: www.propolyamerica.com

Appendix B - Poly Tank Specifications

Polymer Water Tank

Specifications for Part No. 23-0094

USE: The product will be used as a water tank mounted on a steel flatbed of a truck. The tank will be used for wildfire control. The vehicle will be operated off-road a portion of the time.

CONSTRUCTION: The tank will be constructed using the manufacturer's fire service grade polymer (polypropylene or polypropylene/polyethylene blend) material. Material on outside of tank shall be opaque, black in color, and UV resistant. Exception to this can be made for tank bottom, hose reel mounting pads and sight gauge. The outer sides and top must be 1/2 inch thick. The bottom must be 3/4 inch thick. Internal material for baffles or gussets must be 3/8 inch thick minimum and can be of a suitable nonopaque material. Baffling must allow for adequate water and air flow based on 125 gallon/minute pump performance. Welds must meet industry quality and appearance standards

TANK DIMENSIONS: See drawing (23-0094B) for overall dimensions.

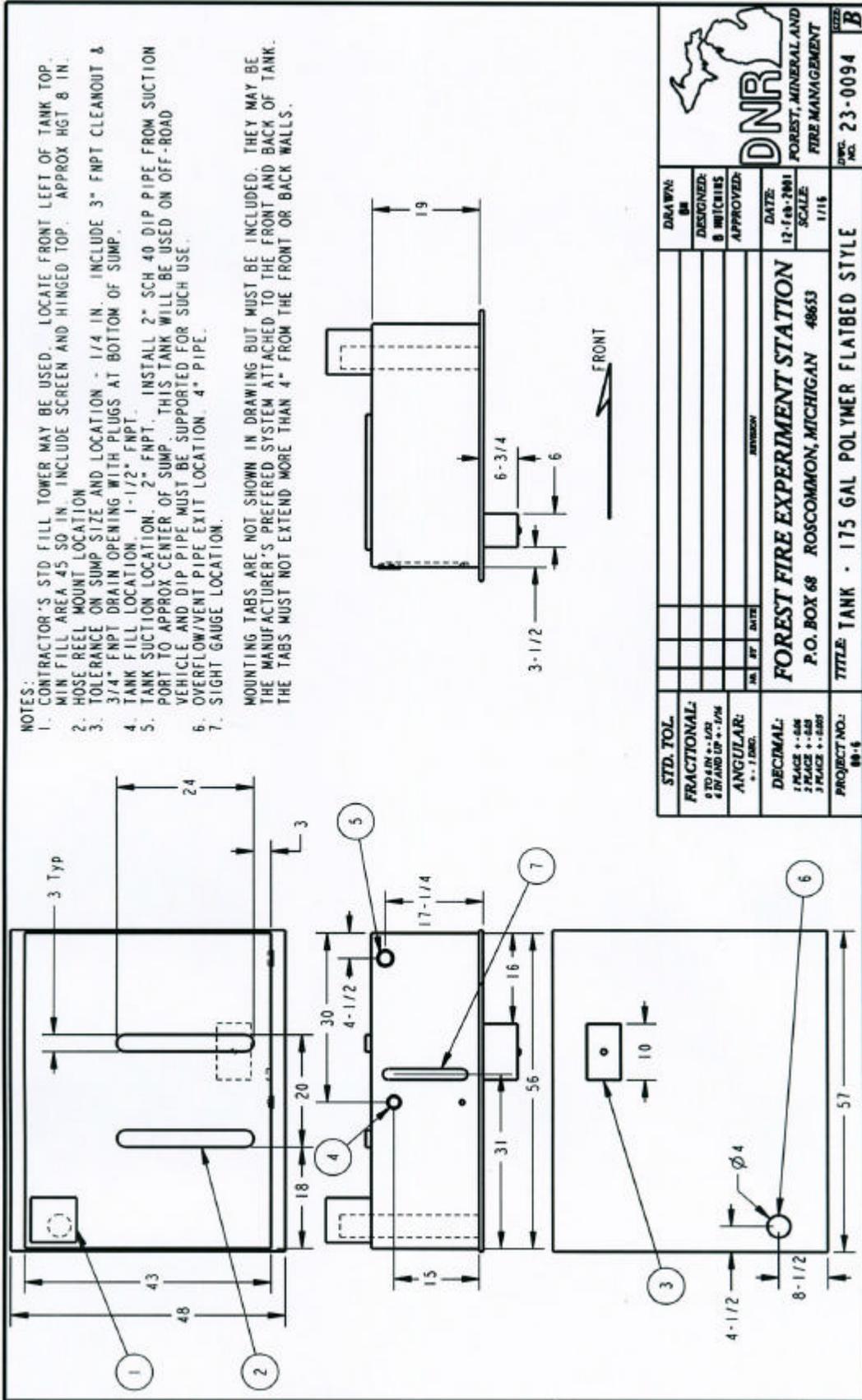
FILL TOWER: A rectangular-shaped fill tower will be provided on the front left top of the tank near the corner. It shall have a hinged lid, and a screen with maximum 1/4 inch diameter holes to filter water entering the fill port. The inside opening shall be a minimum of 45 square inches. The inside minimum dimensions shall be at least 6 inches. A 4 inch diameter vent/overflow pipe shall be incorporated in the fill tower. The drawing shows the overflow pipe outlet location.

SUMP: The tank shall have a sump as shown in the drawing. It shall include a 3 inch FNPT threaded clean-out with plug. It also shall have a 3/4-inch FNPT drain with plug. Both of these will be on the sump bottom. A dip pipe shall run from the suction outlet to the sump. It's end shall be submerged approximately 3 inches deep into the sump opening.

SUCTION AND FILL PORTS: The rear wall of the tank shall have ports placed as shown in the drawing. The suction port shall be threaded 2-inch FNPT. The fill inlet shall be 1-1/2 inch FNPT. The fill inlet can be moved \pm 2 inches (left or right) to accommodate baffle placement.

TANK MOUNTING PADS: The manufacturer shall provide adequate mounting pads for the purchaser to fasten the tank by threaded fasteners to the truck bed. It is preferred to have a four point mount, with a mounting point at each corner of the front and back tank walls.

CONTACT: It is the purchaser's intent to allow the manufacturer to use its normal fire tank construction concepts within the dimension constraints provided. If that cannot be accommodated by these requirements, please contact (your name and telephone number), with any proposed variance.



NOTES:

1. CONTRACTOR'S STD FILL TOWER MAY BE USED. LOCATE FRONT LEFT OF TANK TOP. MIN FILL AREA .45 SQ IN. INCLUDE SCREEN AND HINGED TOP. APPROX HGT 8 IN.
 2. HOSE REEL MOUNT LOCATION
 3. 3/4" FNPT DRAIN OPENING WITH PLUGS AT BOTTOM OF SUMP. INCLUDE 3" FNPT CLEANOUT & TOLERANCE ON SUMP SIZE AND LOCATION - 1/4 IN.
 4. TANK FILL LOCATION. 1-1/2" FNPT.
 5. TANK SUCTION LOCATION. 2" FNPT. INSTALL 2" SCH 40 DIP PIPE FROM SUCTION PORT TO APPROX CENTER OF SUMP. THIS TANK WILL BE USED ON OFF-ROAD VEHICLE AND DIP PIPE MUST BE SUPPORTED FOR SUCH USE.
 6. OVERFLOW/VENT PIPE EXIT LOCATION. 4" PIPE.
 7. SIGHT GAUGE LOCATION.
- MOUNTING TABS ARE NOT SHOWN IN DRAWING BUT MUST BE INCLUDED. THEY MAY BE THE MANUFACTURER'S PREFERRED SYSTEM ATTACHED TO THE FRONT AND BACK OF TANK. THE TABS MUST NOT EXTEND MORE THAN 4" FROM THE FRONT OR BACK WALLS.

STD. TOL.	DRAWN BY	DATE:	SCALE:
FRACTIONAL:	DESIGNED BY	12-18-78	1/16
1 PLACE ±.005	APPROVED:		
2 PLACE ±.010			
3 PLACE ±.015			
ANGULAR:			
±.1 DEG.			
DECIMAL:	FOREST FIRE EXPERIMENT STATION		
1 PLACE ±.005	P.O. BOX 68 ROSCOMMON, MICHIGAN 48653		
2 PLACE ±.010	TITLE: TANK - 175 GAL POLYMER FLATBED STYLE		
3 PLACE ±.015	DWC. NO. 23-0094		
PROJECT NO.:	REV. B		
88-6			



Appendix C - Drilling Holes in Truck Frame Rails

From time to time it is necessary to mount an item to a truck's frame rails. The frame rails are the most substantial mounting points available, but altering or modifying these parts should not be taken lightly. Before drilling into the frame, check with the truck manufacturer for information on what is allowable. If the manufacturer says not to, don't do it. Below are some things you should consider.

- Use existing holes, whenever possible. The manufacturer puts many holes in frames for the variety of optional items they may need to mount. Many of these will be unused. See if you can use some of these existing holes to accomplish the mounting. Often this will be the case.
- Do not drill holes in the frame flanges or upper or lower part of the web without guidance from the truck manufacturer. Figure C-1 shows the important parts of a frame channel. The channel's flanges contribute greatly to the strength of the frame. Weakening them by drilling holes is not advisable, unless you have the technical expertise or information that says otherwise.
- If holes are necessary, plan to drill any holes along or near the neutral axis of the frame. Most truck frames are symmetrical top to bottom, which means that the neutral axis is the center line of the frame (halfway down from the top). Figure C-1 illustrates the location of the neutral axis and shows two holes located directly along it. The darker gray stripe illustrates the approximate zone in which it's normally safe to drill.

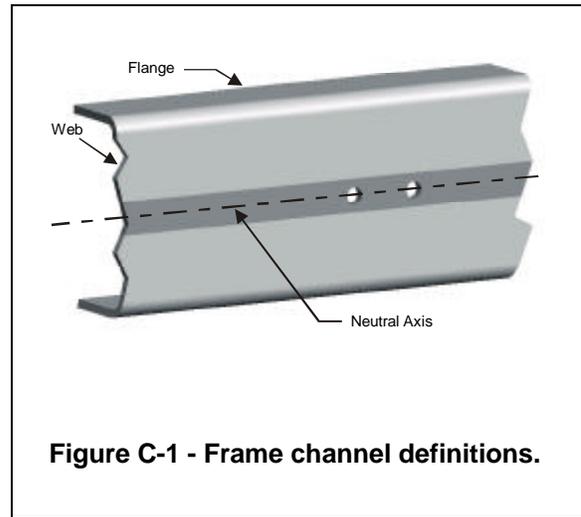


Figure C-1 - Frame channel definitions.

- Do not drill holes too close together. A 2 inch minimum spacing is desirable but it is wise to check with the manufacturer for their advice.
- Watch out for other components when you drill. Brake, fuel, and electrical lines are normally routed inside the frame rails.

Some might have the urge to weld brackets to a truck frame rail. We strongly discourage this practice, unless you have direct consultation with the truck manufacturer. Welding may change the metallurgical composition and therefore the strength of some frame rail materials. Additionally, welded designs almost certainly will require welds somewhere other than the neutral axis. Only those with the proper technical knowledge and experience should attempt to weld brackets or other components to the truck's frame rail.