MP4500FS **Ironworker**

USA MADE | DURABLE | AFFORDABLE

OPERATIONS MANUAL

METALpro

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metalprocorp.com

TABLE OF CONTENTS

Introduction....1

Warranty....1

Return and Refund Policy....1

Safety....2

Machine Description....3

Dimensions and Capacity....4

Specifications and Features....4

Unboxing and Installation Process....5

Operating Instructions....5

Bill of Material....6

Leg Stand Assembly....7

Power Head Assembly....8

Hydraulic Components....9

Slug Chute Installation....10

Maintenance....11

Shear Assembly....12 - 13

Punch Station Set Up....14

INTRODUCTION

This manual provides the information required for assembling, setting up, operating, and maintaining the **MP4500FS Ironworker**. Included as a part of this manual are a replacement parts lists and assembly illustrations to guide you.

Included in manual are the specifications and capabilities of the Ironworker. If you have questions regarding the capabilities of the **MP4500FS Ironworker** for a new application or need assistance in determining tooling requirements, please contact us at:

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The first several pages of this manual view safety and cautionary information. This safety section summarizes the design safety elements, reviews WARNINGS, and lists the WARNING labels on the machine and accessories. It is your responsibility to understand all WARNINGS.

Observe all WARNINGS and CAUTIONS during installation, operation, servicing, and maintenance of the **MP4500FS Ironworker**.

WARRANTY INFORMATION

Metalpro Corporation (seller) will, within three (3) years from date of purchase replace F.O.B. the factory, any goods which are defective in materials and/or workmanship provided the buyer, at the seller's option, return the defective goods prepaid to the seller. Warranty is void if warranty application is not submitted within 30 days of purchase date. Punches, dies, and/or blades are warranted to be free of defects in materials and workmanship within thirty (30) days of purchase date.

This warranty does not apply to machines and/or components that have been altered, changed, modified in any way, subjected to abuse, abnormal use, inadequate maintenance, and lubrication, or subjected to use beyond recommended capacities and specifications. In no event shall the seller be liable for labor costs expended on such goods or consequential damages. Seller shall not be liable to purchaser or any other person for loss or damage directly or indirectly arising from the use of the goods, from any representations or warranty of fitness, or to waive any of the foregoing terms of sale, and none shall be binding on the seller.

This warranty is non-transferable.

RETURN AND REFUND POLICY

METALpro offers a 3-year limited manufacturing warranty on all METALpro machines from manufacturing defects.

- The Buyer has 30 days from date of delivery to contact the Seller regarding a return
- All METALpro returns are subject to a 20% restock fee
- The Buyer is responsible for shipping item back to METALpro at 4715 136th Ave Hamilton, MI 49419 and providing pictures showing condition of product before it ships
- The product needs to be in new/unused condition and be in original METALpro packaging for resale
- If not, Buyer is liable for cost to repair and repackage item additional to the 20% restock fee
- All returns are subject to METALpro's inspection at time of delivery

Any questions or concerns please contact METALpro's Customer Service at (262)-679-0504.

SAFETY

To prevent serious bodily injury:

- **Do not** operate, install tool, service, or adjust machine without proper instructions, reading, and understanding the operations manual
- **Do not** service the machine with electrical power connected
- **Do not** operate any station without the respective strippers or hold downs in place
- **Do not** operate machine with protective guards removed
- **Do not** place any part of your body under blade, punch, or moving parts
- **Do not** punch half holes, punch, or shear unknown materials
- **Do not** side load the brake
- **Do not** operate punch station without checking the punch to die alignment and tightness
- Check the punch to die alignment frequently while performing work

SAFETY SUMMARY

- The **MP4500FS Ironworker** complies with ANSI standards for safety design and labeling
- The **MP4500FS Ironworker** components are heavy. To avoid possible injury, the power head assembly (which includes the hydraulic cylinder, the arm, the main weldment, punching station, and shear station) compiles more than half the weight of the machine and should be handled with a hoist.
- Wear approved eye protection when using the **MP4500FS Ironworker**. Observe the WARNINGS displayed on the Ironworker and keep hands and clothing clear of all moving parts
- When using the optional 8" brake or the 12" brake, (the ends of the workpiece move upward while bending), make sure that there is clearance for the movement of the workpiece. Keep your hands and other body parts away from workpiece as it moves.
- Before doing any installation, adjustment, maintenance, or repair on the Ironworker, make sure it is unplugged from electrical source.

WARNING LABELS

Power Arm Warning

The power arm label displays the standard WARNING symbol, the standard symbol for safety glasses and the following text:

> SAFETY GLASSES REQUIRED WHEN OPERATING OR OBSERVING THIS MACHINE

Punch Station Warning Label

The punch station label displays the standard WARNING symbol and following text:

> 45 Ton Capacity
> DO NOT CHANGE OR ADJUST PUNCH/DIE WITHOUT REFERRING TO THE OPERATOR'S MANUAL AND SAFETY INSTRUCTIONS

Shear Station Warning Label

The entry point and the exit guard above the flat shearing station displays the standard WARNING symbol, the symbol for hand injury, and the following text:

> TO PREVENT SERIOUS BODILY INJURY AND/OR DAMAGE TO THE MACHINE:
> DO NOT BRAKE ROUNDS
> LOAD MATERIAL CENTRALLY
> REMOVE TOOL WHEN NOT IN USE

The second front and rear labels display the standard WARNING symbol and the following text:

> KEEP HANDS CLEAR

MP4500FS **Ironworker**

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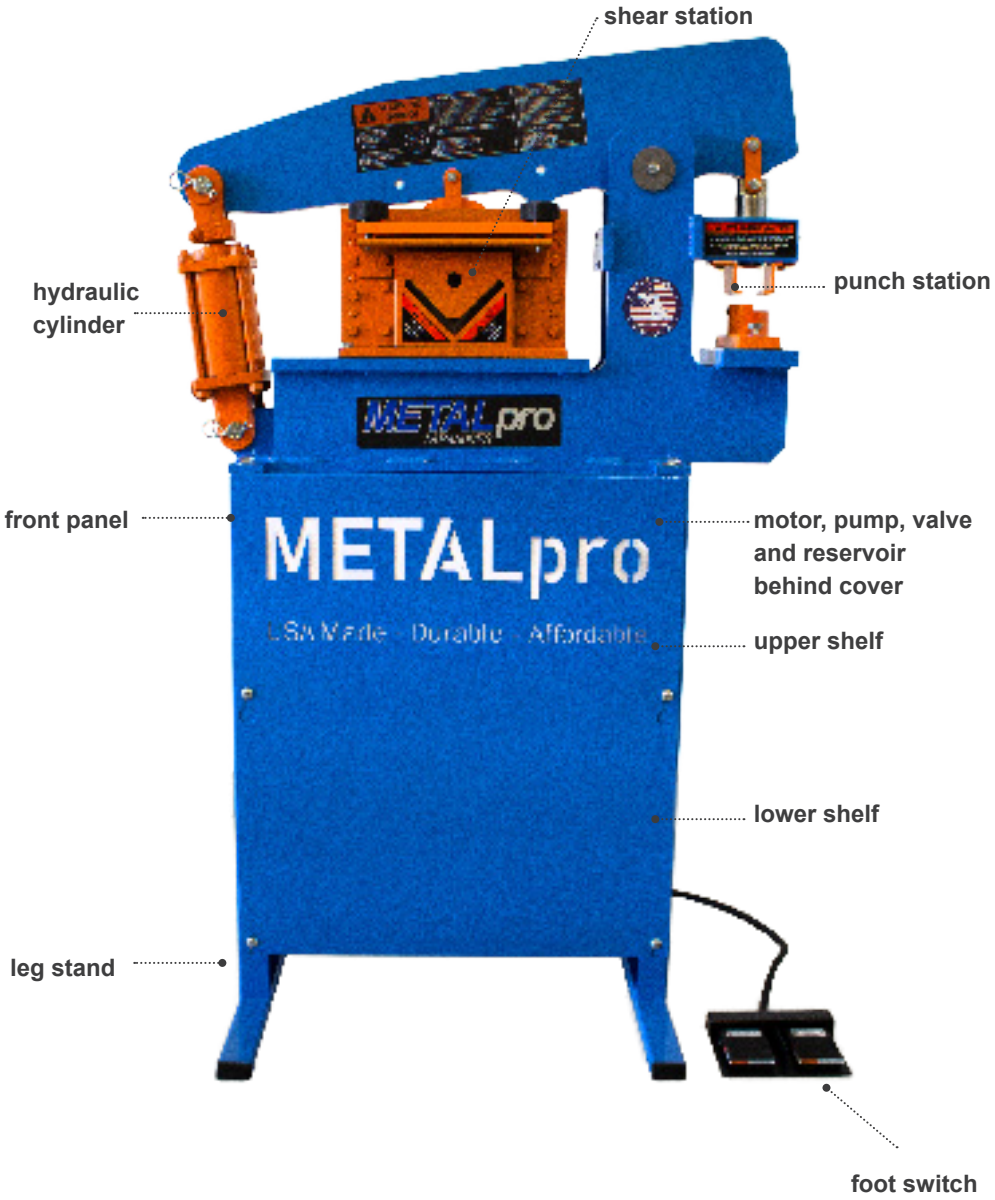
DESCRIPTION

The **MP4500FS Ironworker** is a multipurpose two station metal working machine that provides capability for several different operations in a single machine. The straightforward design allows for quick setup and ease of use.

The **MP4500FS Ironworker** is foot switch controlled. When the left foot switch is pressed the ironworker will travel in one direction and will stop only if the pedal is released or the maximum stroke is reached. When the right foot switch is pressed, the ironworker will travel in the opposite direction.



DIMENSIONS AND WEIGHT

- Width: 37 inches
- Height: 55 – ¼ inches
- Depth: 24 inches
- Approximate shipping weight is 550 lbs. and includes packaging

OPERATIONAL CAPACITY

- 8 Stroke operations per minute maximum (¼" material)
- Ironworker capacity is based on 65,000 psi tensile steel
- Maximum force is 45 ton
- Shearing:
  Flat stock ⅜ X 6 inches
  Flat stock ¼ X 8 inches
- Angle Iron: ¼ X 4 X 4 inches
- Round Rod: ¾ inch diameter
- Square Rod: ⅝ inch diameter
- Notching: 1¾ X 2 inches in ¼ inch plate (Maximum one pass capacity)
- Bending: 25 US Metric tons maximum force
- Forming: 45 tons at the punch station and 25 tons at shear station

SPECIFICATIONS

- Electric power requirement: 110V, 20 amp service
- Hydraulic power: Self-contained, 2900 psi

DESIGN FEATURES

Pinch Points
The operating mechanism is free of unguarded pinch points.

Rotating Mechanisms
A guard encloses the rotating motor shaft, coupling, and pump shaft.

Guarding
The opening to the flat shearing station has a fixed guard immediately above the opening extending 3½" beyond the shear point. The opening to the round shearing station and the opening to the angle iron shearing station have a fixed rod guard extending 2" in front of shear point. The exit side of the shear station has a hinged guard that covers the back of the shear except when the workpiece is exiting the shear.

UNBOXING, INSPECTION, ASSEMBLY, AND INSTALLATION

For assembly and installation, refer to the exploded views as well as the bill of materials.

- Use a forklift or pallet jack to move the boxed **MP4500FS Ironworker** as close as practical to the workstation where the ironworker will be assembled and installed
- Unbox the ironworker
- Ensure that the instruction manual and the packing list are preserved and that components are all accounted for prior to discarding the shipping materials
- Carefully inspect ironworker and make sure that all items listed on the packing list are present
- If damage is discovered, report the nature of the damage to the carrier. Replace any damaged components before using the ironworker.
- The installation site should be level
- Tools required:
  - adjustable wrench
  - ½" socket
  - ½" wrench
  - ¾" socket
  - ¾" wrench
  - 9/16" socket
  - 9/16" wrench

OPERATING INSTRUCTIONS

WARNING: WEAR APPROVED EYE PROTECTION WHEN OPERATING THE MP4500FS IRONWORKER. OBSERVE THE WARNINGS DISPLAYED ON THE IRONWORKER, KEEP HANDS AND CLOTHING CLEAR OF ALL MOVING PARTS.

Activation of the left or right foot switch determines the direction of travel. Depressing one switch causes the ironworker to drive the tool downward and depressing the other switch causes the tool to move upward. Releasing either foot switch stops but does not reverse the travel direction.

BILL OF MATERIAL

Item	MP Number	Description	Qty
1	2040	main weldment	1
2	5002	ram	1
3	5003	pivot shaft	1
4	5004	ram bushing	1
5	5005/5005A	front link/rear link	4
6	5006	retaining nut	1
7	5007	die holder	1
8	5008	7/16 - 20 x 2¼" hex head screw	2
9	5009	7/16 - 20 lock nut	2
10	5010	stripper	2
11	5011	½ -13 x 1¾" hex head screw	6
12	5012	½" Flat Washer	8
13	5013	5/16 -18 x 1" set screw	1
14	5014	⅛" NPT grease fitting	2
15	5015	7/16 x 2" clevis pin	1
16	5016	7/16" bridge pin	1
17	5017	5/16" flat washer	10
18	5018	5/16 -18 x ¾" hex head screw	2
20	5020	⅜" flat washer	2
22	5022	⅜ -16 x 1" hex head screw	4
23	5023	⅜" lock washer	4
25	5025	⅜ -16 x ⅝" hex head screw	2
27	2030	arm	1
28	5028	⅜ -16 x ⅜" set screw	1
29	5029	hydraulic cylinder (3½" bore x 4" stroke)	1
31	5031	5/16 -18 x ¾" carriage bolt	12
32	5032	5/16 -18 lock nut	12
35	5035	wrench	1
39	5039	2 x 1½" plastic end cap	4
51	6048	⅜" x 30" hydraulic hose assembly	2
56	5056	slug chute	1
57	5057	lower shelf	1
58	5058	upper shelf	1
59	5059	leg	2
62	5062	front panel	1
65	5065	½ -13 lock nut	4
85	2031	cam	1
102	2051	½ -13 x 1⅛" hex head screw	2
103	5092	½" - ⅜" reducer bushing	2
104	6047	⅜" - ¼" steel reducer nipple	2
105	9027	⅜" steel elbow	2
106	2032	7/16" x 2" clevis pin (modified)	1
107	2053	¼ - 20 x ½" flat head screw	1
108	6026	dual footswitch	1
109	6062/6060	pump/motor assembly 110V 50HZ	1
110	6027/6049	solenoid valve 110V	1
111	2074	pivot shaft washer	2
112	2075	⅛" FPT - ⅛" MPT adaptor	1

LEG STAND – Refer to Figure 1

Item	Description	Qty
11	½ -13 x1¾" hex head screw	4
12	½" flat washer	4
17	5/16" flat washer	8
20	⅜" flat washer	2
22	⅜ -16 x ⅝" hex head screw	2
31	5/16 -18 x ¾" carriage bolt	8
32	5/16 -18 lock nut	8
35	punch wrench	1
65	½ -13" lock nut	4
103	½" - ⅜" reducer bushing	1
	Above items are packed in a bag	

Item	Description	Qty
56	slug chute	1
57	lower shelf assembly includes items 31, 32, 108, 109, and 11	1
58	upper shelf	1
59	leg	2
62	front panel	1

Assembly Instructions

Step 1: Place the two legs (59) on edge and position the lower shelf with pump/motor assembly (57) and the upper shelf (58) between them.

Step 2: Install 5/16 -18 x ¾" carriage bolts (31), 5/16" flat washers (17), and 5/16 -18 lock nuts (32) hand tight.

Step 3: Set the base upright. Put the dual foot switch (108) on the lower shelf (57).

Step 4: Viewed from the operating side of the Ironworker, the motor will be at the right side of the base.

Step 5: Make sure the legs and the shelves are properly positioned and square. Tighten the lock nuts on the backside of the Ironworker. Leave the lock nuts on the front side hand tight until the front panel (62) is installed.

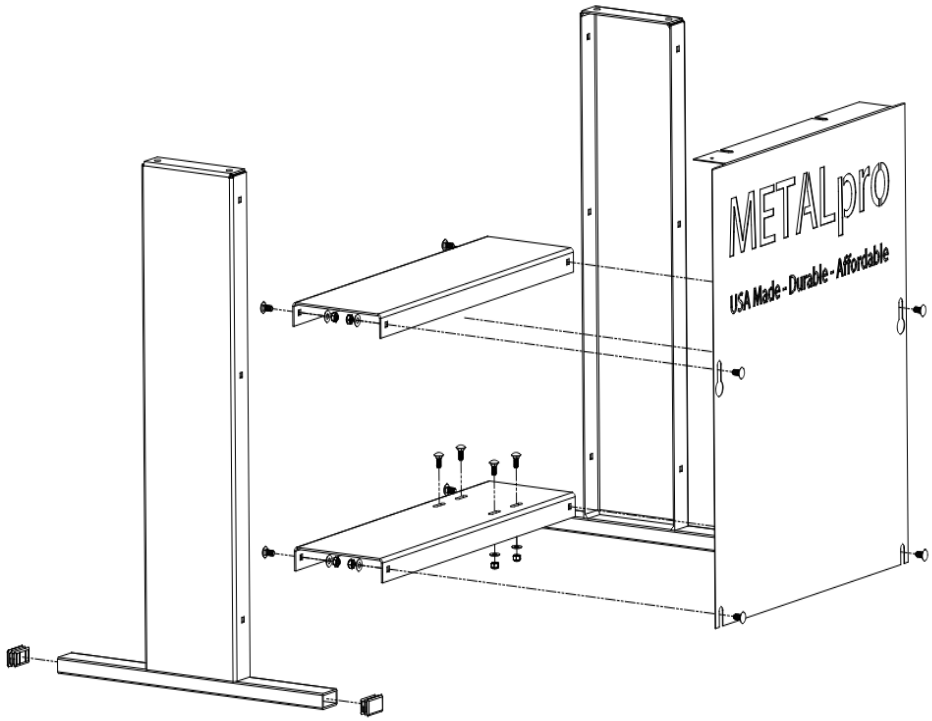


FIGURE 1:
LEG STAND
ASSEMBLY

POWER HEAD – Refer to Figure 2

WARNING: THE POWER HEAD ASSEMBLY IS HEAVY. USE A LIFTING DEVICE SUCH AS ELECTRIC HOIST OR HYDRAULIC LIFT. MAKE SURE THE LIFTING STRAP IS POSITIONED TO BALANCE THE POWER HEAD.

Assembly Instructions

Step 1: Lift and position the power head assembly over the leg stand assembly. Lower until it is properly positioned and resting on the base. As viewed from the operating side of the Ironworker, the hydraulic cylinder will be at the left end of the base.

Step 2: Before removing the lifting strap, install four ½ -13 x 1¾" hex head screws (11), ½" flat washers (12) and ½ -13 lock nuts (65) hand tight.

Step 3: Tighten the screws and nuts.

Step 4: Position the front panel (62, page 7) so the lip of the panel is flush against the bottom of the main weldment channel iron by first slipping the long edge of the panel inside of carriage bolts (31) of upper shelf (58, page 7). Make sure the holes in the main weldment and the slots in the lip of the front panel are aligned. Install two ⅜ -16 x ⅝" hex head screws (25) and two ⅜" flat washers (20) hand tight. You will be adding the slug chute (56) using these same screws.

Step 5: Tighten the lower and the upper shelf mounting screws (Items 17, 31 and 32) providing the small lip of the front panel (62, page 7) is flush against the bottom of the power head.

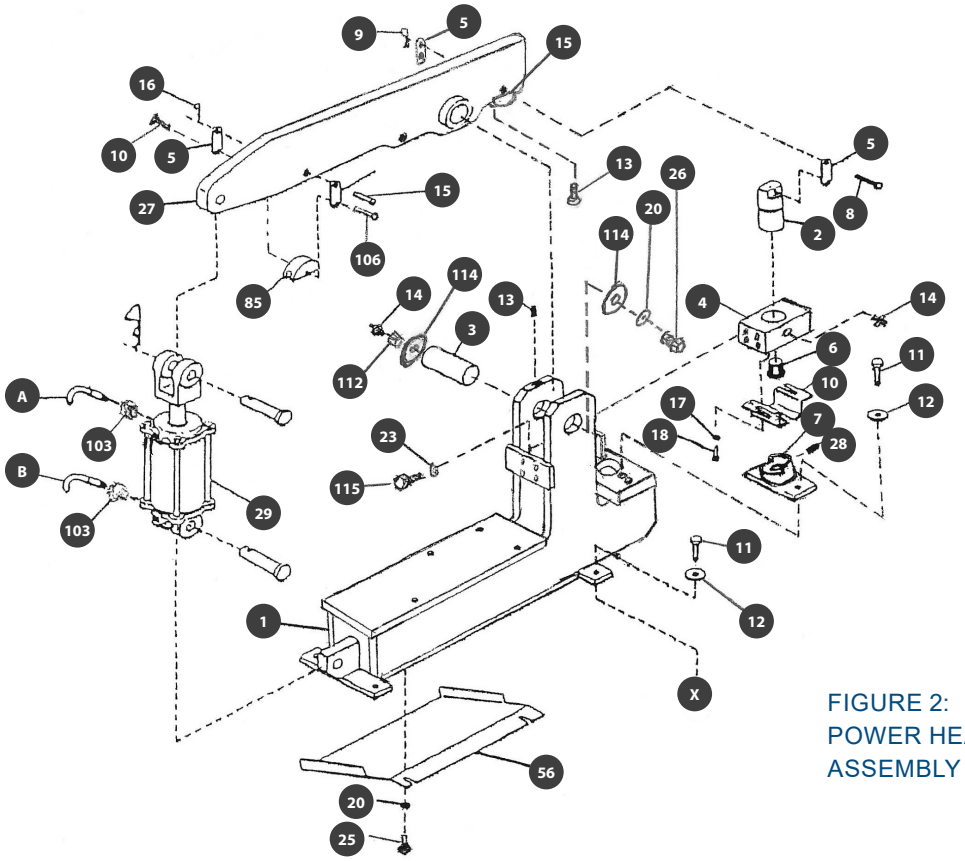


FIGURE 2:
POWER HEAD
ASSEMBLY

HYDRAULIC COMPONENTS – Refer to Figure 3

CAUTION: DO NOT ALLOW PIPE TAPE TO OBSTRUCT THE FITTING OPENINGS. IF YOU USE PIPE SEALANT, USE ONLY ENOUGH TO ACHIEVE A GOOD SEAL. DO NOT ALLOW ANY OF THE PIPE SEALING COMPOUND TO GET IN THE HYDRAULIC SYSTEM.

Assembly Instructions

Step 1: Connect the hydraulic hoses as shown.
WARNING: USE THE REAR PORTS OF THE CYLINDER ONLY. THE LOWER PORT ON THE LEFT SIDE OF THE CYLINDER MUST REMAIN PLUGGED.

Step 2: Tighten the fittings on the hydraulic hoses.

Step 3: Remove the breather/fill plug from the hydraulic reservoir.

Step 4: Fill the reservoir to within 1" of the top with Recommended ISO 32 Hydraulic Oil or AW/AL ISO 68 20W/20, ISO 32 10W, Mobil DTE 24-SSU, or equal hydraulic oil. Replace the breather/fill plug.

Step 5: Prime the hydraulic system as follows:

- Plug the Ironworker motor into a 110V, 20 amp circuit.
- Start the pump by switching on the motor.
- Using the foot switch, cycle the hydraulic cylinder up and down slowly. Complete ten cycles to make sure all the air has been purged from the hydraulic system.
  CAUTION: OPERATING IRONWORKER WITH INADEQUATE AMOUNT OF OIL WILL DAMAGE PUMP AND CYLINDER

FIGURE 3: HYDRAULIC COMPONENTS

SLUG CHUTE – Refer to Figure 4

Assembly Instructions

Position the slug chute (56) as shown in Figure 5, making sure that the slots engage the ⅜ -16 x ⅝" hex head screws previously installed with the front cover and tighten the screws.

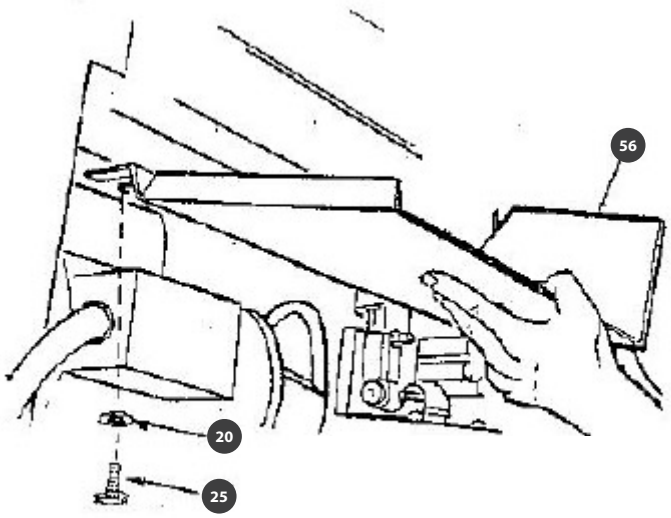


FIGURE 4:
SLUG CHUTE
INSTALLATION

MAINTENANCE

During maintenance of the ironworker, check condition of all hydraulic and moving parts. Repair any damage and replace worn parts. Call METALpro customer service with any questions or concerns.

CLEANING

WARNING: ALWAYS WEAR EYE PROTECTION WHEN CLEANING THE IRONWORKER.

1. Keep the ironworker clean. Periodically remove chips, dirt, and debris from machine paying particular attention to the interior working cavity around the shear and punch station. Use an appropriate brush to remove heavy accumulations. During periods of heavy use, clean the ironworker more frequently.
2. Wipe away any oil that is found. It may be hydraulic oil, which indicates a hydraulic system leak. Inspect the ironworker hydraulic system and repair any leaks.

HYDRAULIC SYSTEM

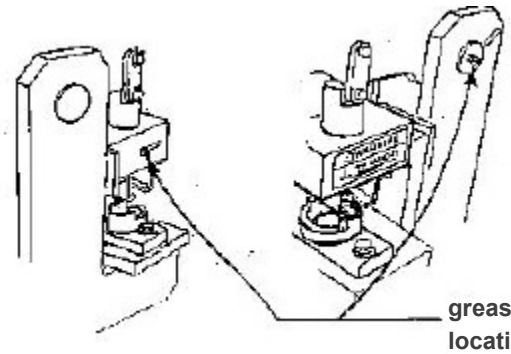
ISO 32 Hydraulic Oil or equivalent is recommended
(AW/AL Hydraulic Oil ISO 68 SAE 20W/20, ISO 32 SAE 10 WW, Mobil DTE 24-SSU, or equivalent oil)

1. Check the entire hydraulic system for signs of leakage and check the condition of all hydraulic hoses monthly. Replace any damaged hoses and eliminate any leaks found.
2. Remove the breather/fill plug from the hydraulic reservoir to check the oil level and condition. Add hydraulic oil if necessary to within 1" of the top of the reservoir.
3. Check the oil condition. Although the oil is colored, it must be clean. If the oil is contaminated, drain the pump, the hydraulic cylinder, and the reservoir. Fill and reprime the hydraulic system as described previously.

LUBRICATION

Each day of use, or every three (3) hours of operation, grease the ironworker through the fittings as shown in image below.
Use commercially available lubricating grease.

FIGURE 5



REPLACING LINKS AND CLEVIS PINS (Refer to Power Head Assembly, page 8)

CAUTION: OPERATING THE MP4500FS WITH BENT LINKS OR CLEVIS PINS WILL CAUSE DAMAGE TO THE SHEAR AND PUNCH STATION

It is necessary to replace the punch or shear links (5) and clevis pins (15) if they become bent. To disassemble:

1. Shut off power to the motor and unplug the Ironworker.
2. Remove bridge pin (16) and clevis pins (15). The links are now free.
3. Replace parts as necessary. Position the links, install the clevis pins, and secure the links/clevis pins with the bridge pin with bridge pins.

SHEAR ASSEMBLY – Refer to Figure 6

Bill of Material

Item	Part #	Description	Qty
23	5023	⅜" lock washer	6
38	5038	¼ -20 lock nut	2
71	2006	8" shear base plate	1
72	2004	8" shear back plate	1
73	2002	8"/12" rear angle blade set	1
75	2003	8" shear front plate	1
76	2005	8"/12" shear column	2
78	2001	8" front blade	1
80	2015	8" shear shelf	1
81	2007	8" shear stop	1
82	2021	8" shear flapper	1
83	2022	8" shear flap bracket	1
84	2000	8" shear movable blade	1
85	2031	8"/12" shear cam	1
86	2017	⅜ -16 x 3¼" hex head screw	8
87	5033	5/16" lock washer	24
88	2027	⅜ -16 hex nut	8
89	2019	5/16 -18 x 1⅛" hex head screw	4
91	7021	½ -13 x 1¼" flat head screw	2
92	2018	5/16 -18 x 1" hex head screw	14
93	2024	½ x 3" dowel pin	6
94	7028	¼ - 20 x ½" socket head screw	2
95	2020	8"/12" shear front guard	1
99	7029	¼ -20 x ¾" hex head screw	2
111	2023	5/16 -18 x 1⅜" hex head screw	6
112	2025	⅜ -16 x 2" stud knob	2
113	2016	8" shear hold down plate	1
114	2026	⅜ ID x .063 wire x 1" spring	2
	5016	3/32 x 1⅝" hair pin cotter	1
	5005	link	2
	5015	7/16 x 2" clevis pin	1
	5071	triangle label - keep hands clear	3
	5073	shear warning label	2

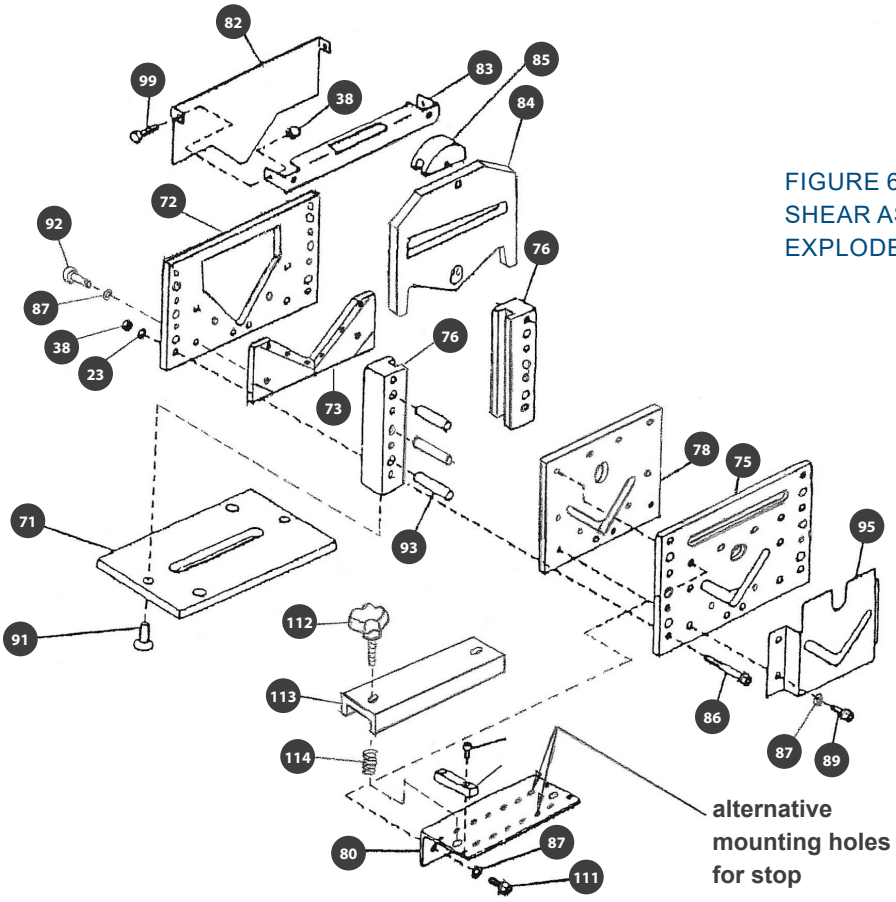


FIGURE 6:
SHEAR ASSEMBLY
EXPLODED VIEW

SHEAR ASSEMBLY – Refer to Figure 7

Set Up

1. Using two ½ -13 x 1¾" hex head screws (11) and two ½" flat washers, attach the shear assembly to the main weldment (1).
2. Attach the upper clevis pin (15), links (5) to the arm (27). Install bridge pin (16).
3. Tighten the screws, securing the shear to the main weldment making sure the shear is centered under the arm.

Positioning the workpiece to be sheared to size requires measurement. The simplest method of single piece shearing is to measure the piece as shown. Measure from the appropriate shear blade to the end of the piece to be cut.

For volume shearing, use a worktable attached to the exit side of the ironworker, with a positioning stop fixed at the length required. The stop will aid in maintaining square cuts.

When shearing flat stock, always center the material to be sheared. Several pairs of holes are provided to allow the stop to be repositioned for centered shearing. Note: When reversing the moveable blade (84) to access the other cutting edge, position the stop starting from the right.

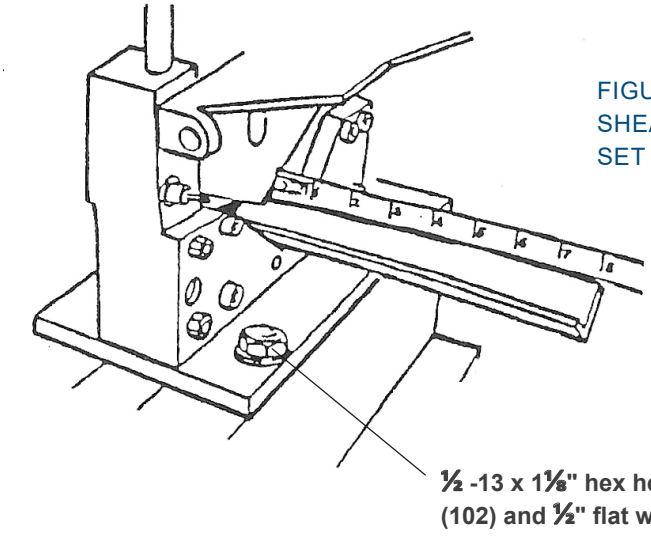


FIGURE 7:
SHEAR ASSEMBLY
SET UP

PUNCH SET UP (punches and dies sold separately) – Refer to Figure 8

1. Install the die holder (7), two ½ -13 x 1¾" hex head screws (11), and two ½" flat washers (12).
2. Secure the punch with the retaining nut (6). Tighten the nut with the punch wrench (35).
3. Install the die into the holder. Tighten the ⅜ -16 x ⅜" set screw (28). Note: Square, oblong, special shapes, and some round dies have a flat on them. Always tighten the set screw against the flat if there is one.
4. Using the foot switch, carefully lower the punch into the die. Position the die holder so that the punch is centered visually in the die. There will be approximately .030" clearance around the punch. Tighten the hex head screws, securing the die holder to the main weldment without changing the alignment of the punch and die. Recheck that the punch is centered in the die.
5. Install the strippers (10) with the 5/16 -18 x ¾" hex head screws (18) and 5/16" flat washers (17).
6. Recheck the installation by cycling the punch slowly, making sure that the punch, die, and stripper do not interfere at any point in the stroke.
7. You may use a center punch to establish the hole location in the material to be punched. Lower the punch slowly and align the tip of the punch with center punch mark.

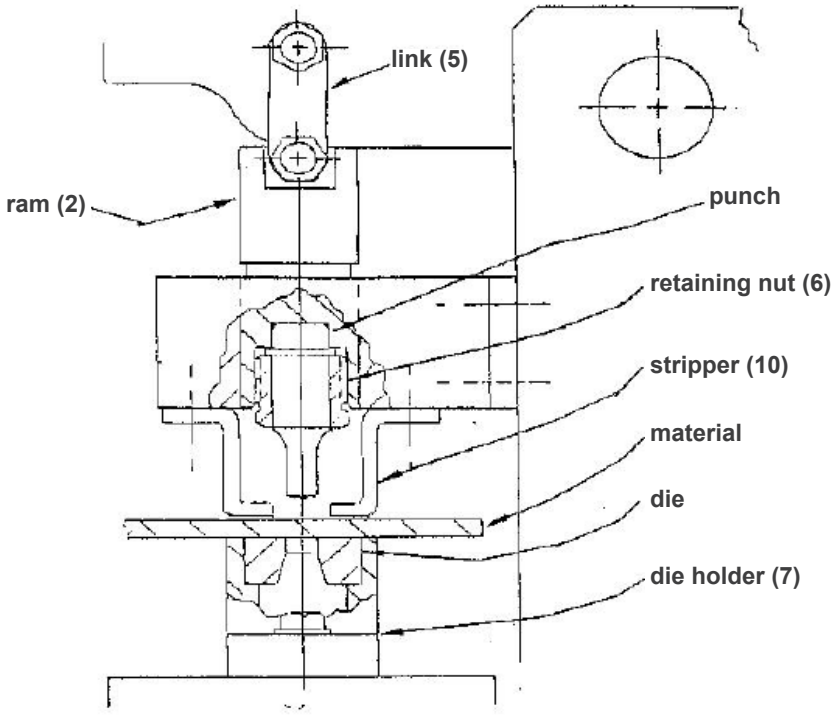


FIGURE 8: PUNCH STATION

Accessories **Ironworker**

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MP4000, MP4000FS, MP4500FS, MP5000FS, MP4500XP, MP5000XP

Part #	Round P&D
MP7996	1/8"
MP7998	3/16"
MP8000	1/4"
MP8001	9/32"
MP8002	5/16"
MP8003	11/32"
MP8004	3/8"
MP8005	13/32"
MP8006	7/16"
MP8007	15/32"
MP8008	1/2"
MP8009	17/32"
MP8010	9/16"
MP8011	19/32"
MP8012	5/8"
MP8013	21/32"
MP8014	11/16"
MP8015	23/32"
MP8016	3/4"
MP8017	25/32"
MP8018	13/16"
MP8019	27/32"
MP8020	7/8"
MP8021	29/32"
MP8022	15/16"
MP8023	31/32"
MP8024	1"
MP8025	1 1/32"
MP8026	1 1/16"
MP8028	1 1/8"
MP8032	1 1/4"

Part #	Square P&D
MP8050	1/4"
MP8051	9/32"
MP8052	5/16"
MP8053	11/32"
MP8054	3/8"
MP8055	13/32"
MP8056	7/16"
MP8057	15/32"
MP8058	1/2"
MP8059	17/32"
MP8060	9/16"
MP8061	19/32"
MP8062	5/8"
MP8063	21/32"
MP8064	11/16"
MP8065	23/32"
MP8066	3/4"
MP8067	25/32"
MP8068	13/16"
MP8069	27/32"
MP8070	7/8"
MP8071	29/32"
MP8072	15/16"
MP8073	31/32"
MP8074	1"
MP8075	1 1/32"

Part #	Oblong P&D
MP8100	1/4"x 1/2"
MP8101	9/32"x 9/16"
MP8102	5/16"x 5/8"
MP8103	11/32"x 11/16"
MP8104	3/8"x 3/4"
MP8105	13/32"x 13/16"
MP8106	7/16"x 7/8"
MP8107	15/32"x 15/16"
MP8108	1/2"x 1"
MP8109	17/32"x 1 1/16"
MP8110	9/16"x 1 1/8"
MP8111	19/32"x 13/16"
MP8112	5/8"x 1 1/4"
MP8113	21/32"x 15/16"
MP8114	11/16"x 1 3/8"
MP8115	23/32"x 1 7/16"
MP8116	3/4"x 1 7/16"

Part #	Accessory
MP4110	8" Brake
MP4510	12" Brake
MP4120	2"x1 3/4" Heavy Duty Notcher
MP4130	1"x 3/4" Standard Notcher
MP4150	Pipe Notcher Housing
MP4151	1/2" Pipe Notch Die
MP4152	3/4" Pipe Notch Die
MP4153	1" Pipe Notch Die
MP4154	1 1/4" Pipe Notch Die
MP4155	1 1/2" Pipe Notch Die
MP4156	2" Pipe Notch Die
MP45LS	Limit Switch Kit
MP45PSP	Punch Station Plate (not compatible with MP4000 or MP4000FS)
MP40SSE	6" Shear Shelf Extension
MP45SSE	8" Shear Shelf Extension
MP50SSE	12" Shear Shelf Extension
MP8BG	8" Brake Front or Back Guide
MP12BG	12" Brake Front or Back Guide
MP2500	Wheel Kit
MPBBS	8/12" Brake Back Stop
MP45SC	Slug Catcher
MPSBS	Shear Back Stop (Fits 6", 8" and 12" Shear)
1BG	1 Gallon BlueGuard Tooling Lubricant
116BG	1 Gallon + 16oz BlueGuard Bundle
5BG	5 Gallon BlueGuard Tooling Lubricant
516BG	5 Gallon + 16oz BlueGuard Bundle

Part #	Round P&D Sets
MP4140	1/4, 3/8, 1/2, 5/8, 3/4"
MP4142	9/32, 11/32, 13/32, 15/32, 17/32, 19/32, 21/32, 23/32"
MP4144	25/32, 27/32, 29/32, 31/32, 13/16, 15/16, 7/8, 1"
MP4146	9/32, 11/32, 13/32, 15/32 17/32, 21/32, 25/32, 29/32"

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Round **Tonnage Chart**

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Round Punch Tonnage Chart For Mild Steel

Round Tonnage Formula: Hole Size x Material Thickness x 102 = Tonnage Required

Hole Diameter		1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"	7/8"	15/16"	1"	1-1/16"	1-1/8"
Metal Gauge	Thickness Inches	0.125	0.1875	0.250	0.3125	0.375	0.4375	0.500	0.5625	0.625	0.6875	0.75	0.8125	0.875	0.9375	1.00	1.0625	1.125
		PRESSURE IN TONS																
28	0.015	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.7
26	0.018	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.1
24	0.024	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.8
22	0.030	0.4	0.6	0.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.4
20	0.036	0.5	0.7	0.9	1.1	0.0	1.6	1.8	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.7	3.9	4.1
18	0.048	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.8	3.1	3.4	3.7	4.0	4.3	4.6	4.9	5.2	5.5
16	0.060	0.8	1.1	1.5	1.9	2.3	2.7	3.1	3.4	3.8	4.2	4.6	5.0	5.4	5.7	6.1	6.5	6.9
14	0.075	1.0	1.4	1.9	8.8	2.9	3.3	3.8	4.3	4.8	5.3	5.7	6.2	6.7	7.2	7.7	8.1	8.6
12	0.105	1.3	2.0	2.7	3.3	4.0	4.7	5.4	6.0	6.7	7.4	8.0	8.7	9.4	10.0	10.7	11.4	12.0
11	0.120	1.5	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	8.4	9.2	9.9	10.7	11.5	12.2	13.0	13.8
10	0.135	1.7	2.6	3.4	4.3	5.2	6.0	6.9	7.7	8.6	9.5	10.3	11.2	12.0	12.9	13.8	14.6	15.5
5/32"	0.157	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0
3/16"	0.188	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4	15.6	16.8	18.0	19.2	20.4	21.6
1/4"	0.250	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.3	15.9	17.5	19.1	20.7	22.3	23.9	25.5	27.1	28.7
3/8"	0.375	4.8	7.2	9.6	12.0	14.3	16.7	19.1	21.5	23.9	26.3	28.7	31.1	33.5	35.9	38.3	40.6	43.0
1/2"	0.500	6.4	9.6	12.8	15.9	19.1	22.3	25.5	28.7	31.9	35.1	38.3	41.4	44.6	47.8	51.0	54.2	57.4

Square Tonnage Chart

Square Punch Tonnage Chart For Mild Steel

Square Tonnage Formula: A x 1.27 x Material Thickness x 102 = Tonnage Required (A = width of square)

Square Hole		1/8" 0.125	3/16" 0.188	1/4" 0.250	5/16" 0.313	3/8" 0.375	7/16" 0.438	1/2" 0.500	9/16" 0.563	5/8" 0.625	11/16" 0.688	3/4" 0.750	13/16" 0.813	7/8" 0.875	15/16" 0.938	1" 1.000	1-1/16" 1.063	1-1/8" 1.125
Metal Gauge	Thickness Inches	PRESSURE IN TONS																
28	0.015	0.2	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.9	2.1	2.2
26	0.018	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.2	2.3	2.5	2.6
24	0.024	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5
22	0.030	0.5	0.7	1.0	1.2	1.5	1.7	1.9	2.2	2.4	2.7	2.9	3.2	3.4	3.6	3.9	4.1	4.4
20	0.036	0.6	0.9	1.2	1.5	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5.0	5.2
18	0.048	0.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.4	5.8	6.2	6.6	7.0
16	0.060	1.0	1.5	1.9	2.4	2.9	3.4	3.9	4.4	4.9	5.3	5.8	6.3	6.8	7.3	7.8	8.3	8.7
14	0.075	1.2	1.8	2.4	3.0	3.6	4.3	4.9	5.5	6.1	6.7	7.3	7.9	8.5	9.1	9.7	10.3	10.9
12	0.105	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2	11.1	11.9	12.8	13.6	14.5	15.3
11	0.120	1.9	2.9	3.9	4.9	5.8	6.8	7.8	8.7	9.7	10.7	11.7	12.6	13.6	14.6	15.5	16.5	17.5
10	0.135	2.2	3.3	4.4	5.5	6.6	7.7	8.7	9.8	10.9	12.0	13.1	14.2	15.3	16.4	17.5	18.6	19.7
5/32"	0.157	2.5	3.8	5.1	6.4	7.6	8.9	10.2	11.4	12.7	14.0	15.3	16.5	17.8	19.1	20.3	21.6	22.9
3/16"	0.188	3.0	4.6	6.1	7.6	9.1	10.7	12.2	13.7	15.2	16.7	18.3	19.8	21.3	22.8	24.4	25.9	27.4
1/4"	0.250	4.0	6.1	8.1	10.1	12.1	14.2	16.2	18.2	20.2	22.3	24.3	26.3	28.3	30.4	32.4	34.4	36.4
3/8"	0.375	6.1	9.1	12.1	15.2	18.2	21.3	24.3	27.3	30.4	33.4	36.4	39.5	42.5	45.5	48.6	51.6	54.6
1/2"	0.500	8.1	12.1	16.2	20.2	24.3	28.3	32.4	36.4	40.5	44.5	48.6	52.6	56.7	60.7	64.8	68.8	72.9

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Oblong **Tonnage Chart**

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Oblong Tonnage Chart For Mild Steel

Oblong Tonnage Formula: [(.63 x Z) + Width] x Material Thickness x 102 = Tonnage Required (Z = Length - Width)

Hole Diameter		1/4" x 1/2"	9/32" x 9/16"	5/16" x 5/8"	11/32" x 11/16"	3/8" x 3/4"	13/32" x 13/16"	7/16" x 7/8"	15/32" x 15/16"	1/2" x 1"	17/32" x 1-1/16"	9/16" x 1-1/8"	19/32" x 1-3/16"	5/8" x 1-1/4"	21/32" x 1-5/16"	11/16" x 1-3/8"	23/32" x 1-7/16"
		.125 x .500	.281 x .562	.313 x .625	.344 x .688	.375 x .750	.406 x .813	.438 x .875	.469 x .938	.500 x 1.000	.531 x 1.063	.563 x 1.125	.594 x 1.188	.625 x 1.250	.656 x 1.313	.688 x 1.375	0.719 x 1.438
Metal Gauge	Thickness Inches	PRESSURE IN TONS															
16	0.060	3.0	3.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	7.0	7.0	7.0	8.0
12	0.105	5.0	5.0	6.0	7.0	7.0	8.0	8.0	9.0	9.0	10.0	10.0	11.0	11.0	12.0	13.0	13.0
1/8"	0.120	6.0	6.0	7.0	8.0	8.0	9.0	10.0	10.0	11.0	12.0	12.0	13.0	13.0	14.0	15.0	15.0
3/16"	0.188	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0
1/4"	0.250	11.0	12.0	13.0	15.0	16.0	17.0	19.0	20.0	21.0	23.0	24.0	25.0	26.0	28.0	29.0	30.0
3/8"	0.375	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	39.0	41.0	43.0	45.0
1/2"	0.500	21.0	24.0	26.0	29.0	32.0	34.0	37.0	39.0	42.0	45.0	47.0	50.0	52.0	55.0	58.0	60.0