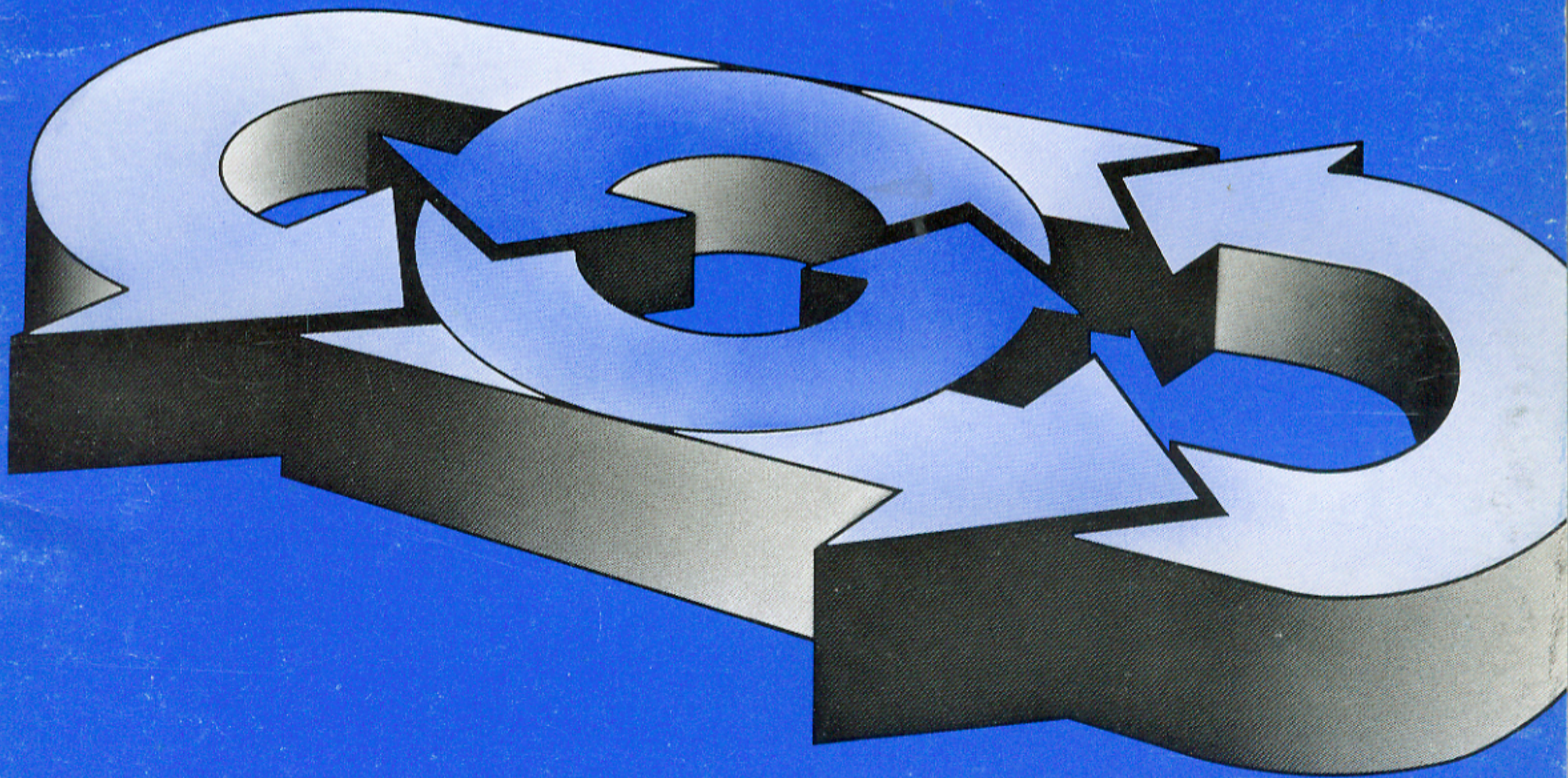


Metaullics[®]

CIRCULATION SYSTEMS
FOR ALUMINUM

Installation,
Operation and
Maintenance
Instructions



Metaullics

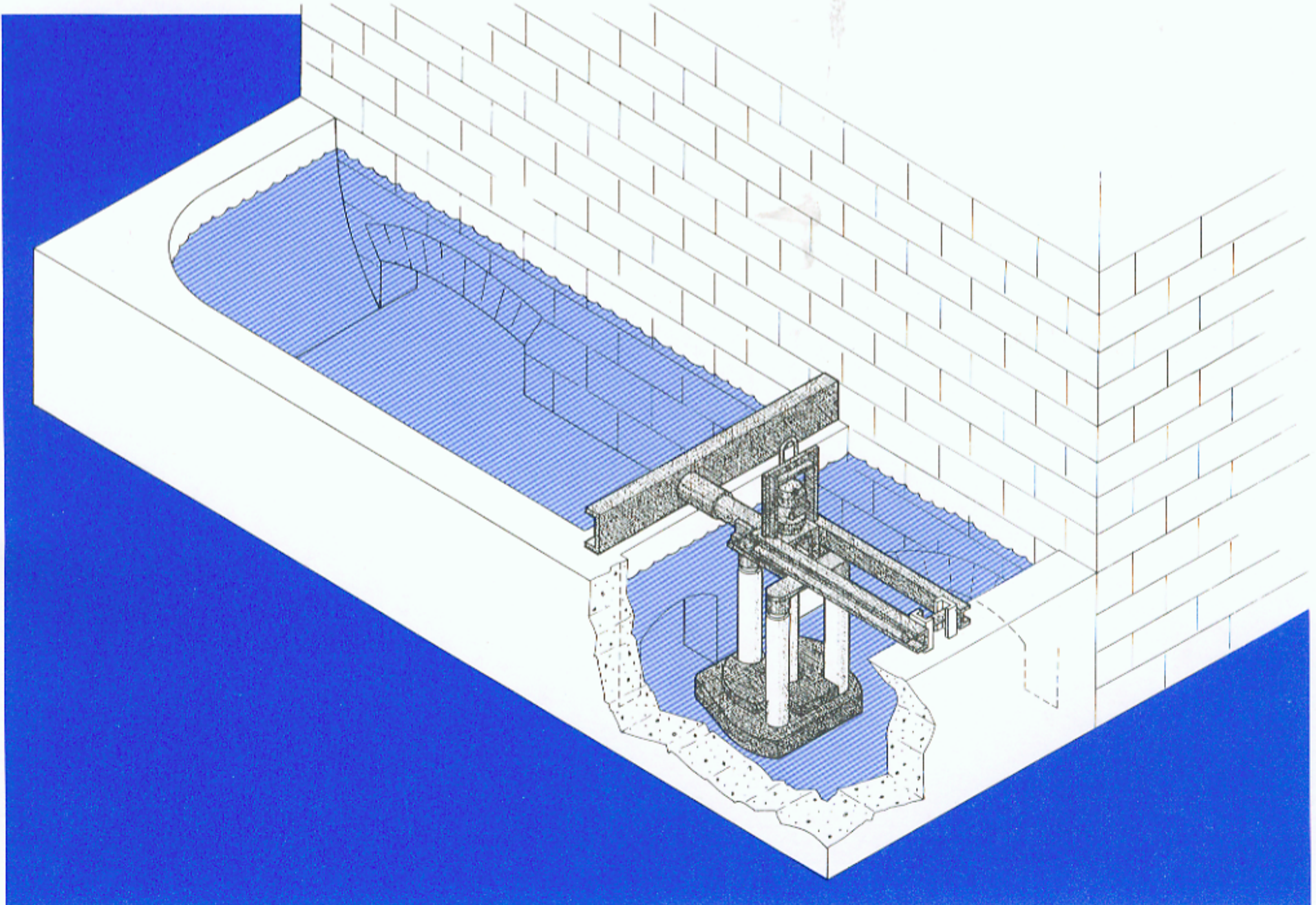
A Sohio Company

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Metallurgy Circulation Systems for Aluminum

Reverberatory furnace with Metallurgy Circulation System.



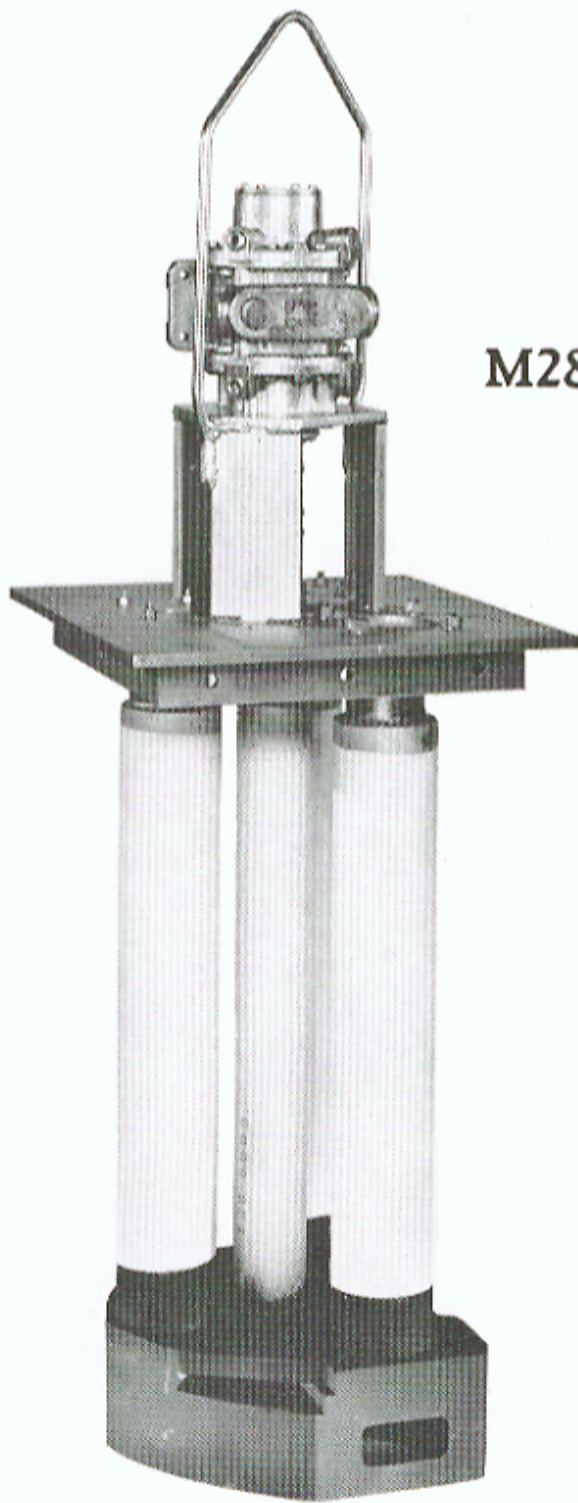
Introduction

The Metallics "M" Series Pumps described in this brochure offer significant improvements in operating efficiencies and service life over previous models. Superior materials assure longer life and require less maintenance. Mechanical design features provide higher flow rates and a more durable product. The "M" Series Pumps are designed to increase productivity and deliver an unsurpassed cost/value relationship.

The Metallics Circulation System consists of a special circulation pump used in conjunction with a reverberatory furnace. The furnace must have an external well of sufficient size to accommodate the pump. This usually is an extension of the charging well with a bridge-wall installed to isolate and protect the pump from physical damage by direct contact with the charged material and fluxing salts.

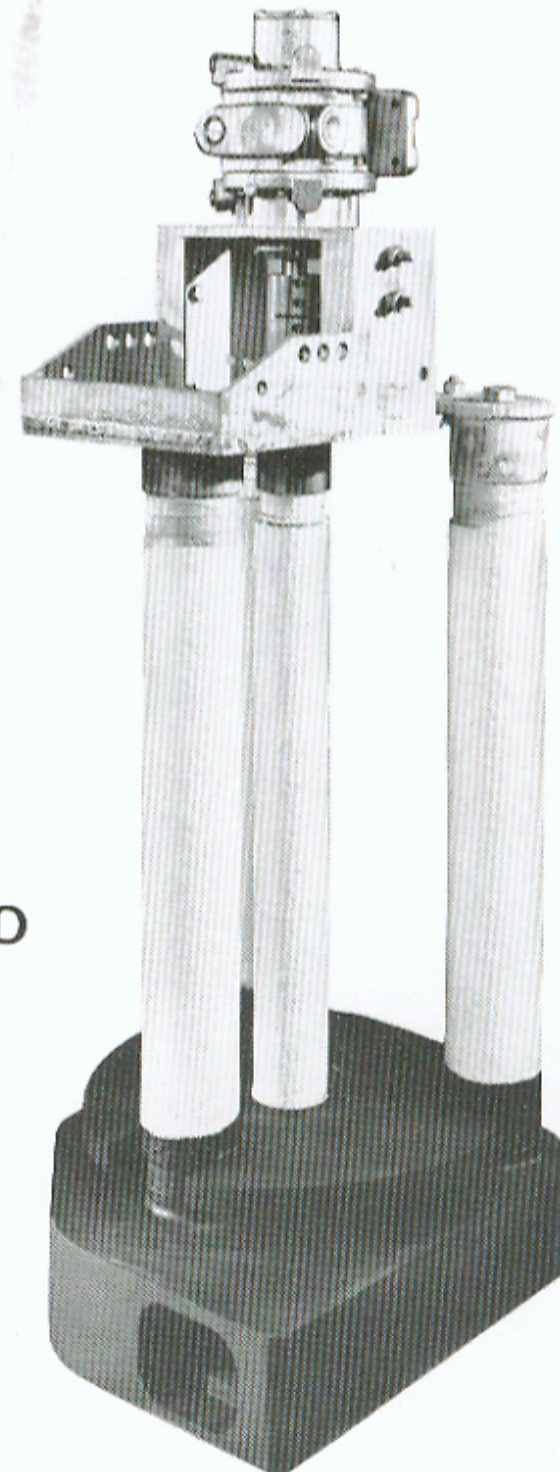
Circulation Pumps for Aluminum

Model	Pumping Rate		Air Requirements		Weight		Minimum Furnace Well Size		Maximum Furnace Capacity	
	lbs/min Max	kg/min Max	PSI	Max. SCFM	(lb)	(kg)	(in)	(mm)	(lb)	(kg)
M28-CSD	3,000	1,375	30-60	150	300	140	24 x 24	610 x 610	60,000	27,250
M30-CSD	6,000	2,750	60-90	150	600	275	30 x 30	765 x 765	120,000	54,400



M28-CSD

M30-CSD



Facilities and equipment to be supplied by the customer

In addition to the furnace facilities with general supporting equipment, the following items must be furnished by the user:

1. **Hoist** for lifting and lowering pump into furnace well – 3/4 ton (750 kg) capacity.
2. **Supporting structure** for holding pump in furnace. Since each furnace is unique in dimensions and design, a standard mounting method cannot be offered. Preferred method is shown in accompanying drawing. In the event that a modification is required, Metallics Systems can assist with your specific requirements.
Structure must allow 2" (50mm) minimum to 4" (100mm) preferred clearance under pump.
3. **Compressed air supply** is required to operate pump motor. Recommended capacities are indicated below.
For higher performance and lower operating costs, electric or hydraulic drive options are available.

Pump Model	Motor Model No.	Air Pressure		Maximum Volume	
		psig	kg/cm ²	scfm	M ³ /min
M28-CSD	1600	30-60	2-4	150	4.2
M30-CSD	1600	60-90	4-7	150	4.2

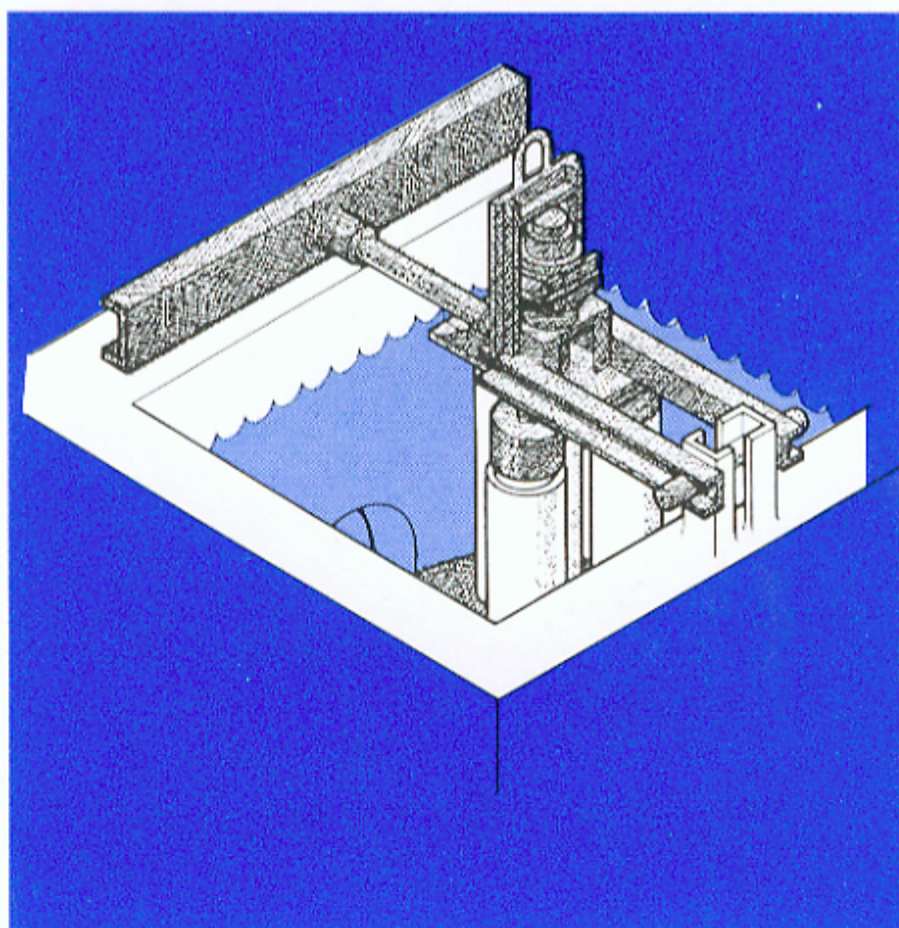
4. **Air control assembly** is shown on page 13.

5. **Fraxset cement** is used when replacing parts. It is available from Metallics Systems.
6. **Pump preheater** is shown on page 14. It is available from Metallics Systems, and is highly recommended for pump maintenance and repair procedures.
7. **Assembly/alignment fixture** is shown on page 14. It is available from Metallics Systems, and is mandatory for pump repairs requiring post replacement.

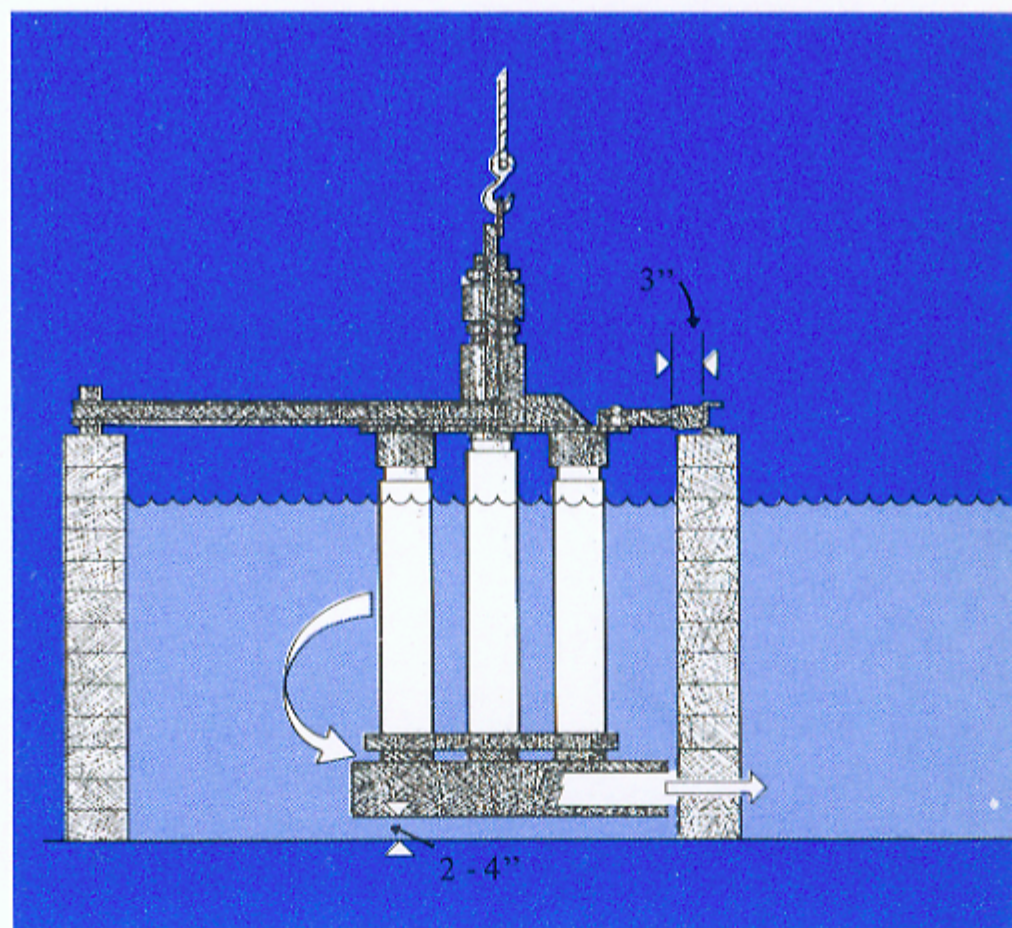
5.



2.



2.



Information to be supplied to Metaullics by customer

1. Ceramic sleeve location is critical and factory installed. It is necessary to submit furnace specifications to Metaullics Systems before pumps can be manufactured. Ceramic sleeves should be positioned to minimize oxidation and erosion of posts and shafts at the molten metal line. Contact Metaullics Systems applications engineering to determine best sleeve location.

Inspection Upon Receipt of System

Immediately upon receipt, open all crates and containers and examine all parts for possible shipping damage. Notify carrier immediately and file appropriate claim for any damage or shortage found. All shipments are FOB Plant, Solon, Ohio. Carrier has responsibility for loss or damage during shipment. If equipment is not to be installed immediately, store in covered area to protect from moisture and high humidity.

1.

Post with ceramic sleeve. Sleeve location determined by maximum-minimum bath levels.



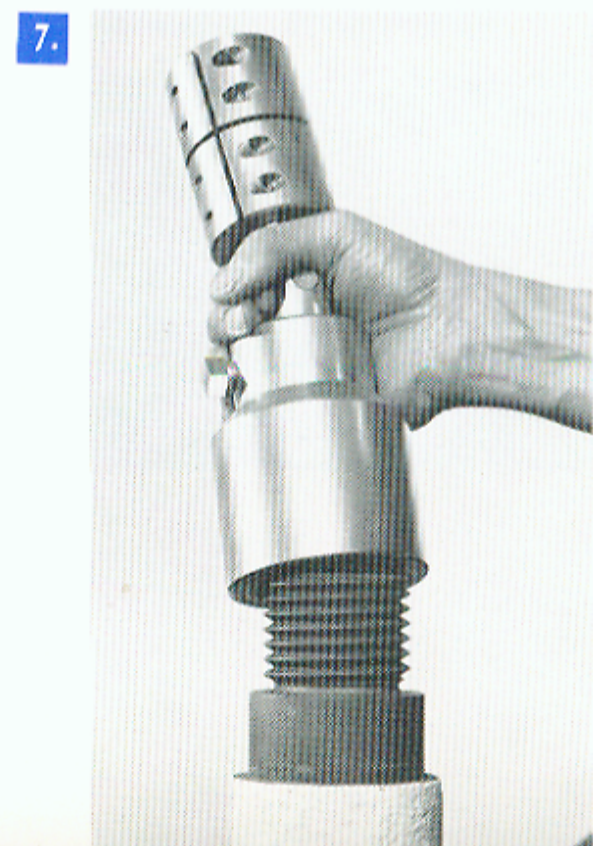
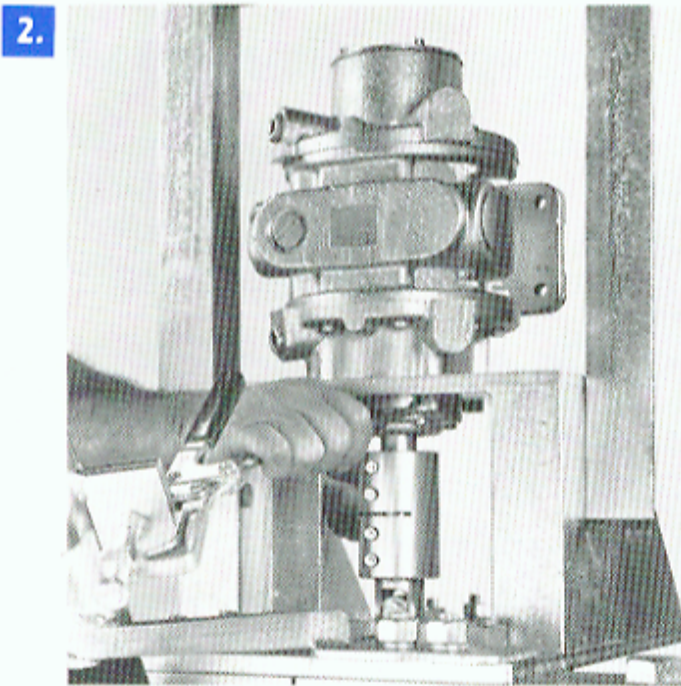
Initial assembly

To prevent damage in transit, pump is shipped partially assembled. To assemble pump and prepare it for installation, proceed as follows:

1. Bolt support (that you have fabricated to position pump in well) to motor mount assembly of the pump. (See 2 page 5.)
The motor mount has holes positioned for bolting pump to support. Do not weld to motor mount as this may cause distortion and misalignment.
2. Bolt air motor to motor mount. The most convenient orientation is to position motor foot facing the same direction as pump outlet. This places motor air inlet closest to furnace edge.
3. Insert universal joint into motor coupling and tighten socket head cap screws securely.

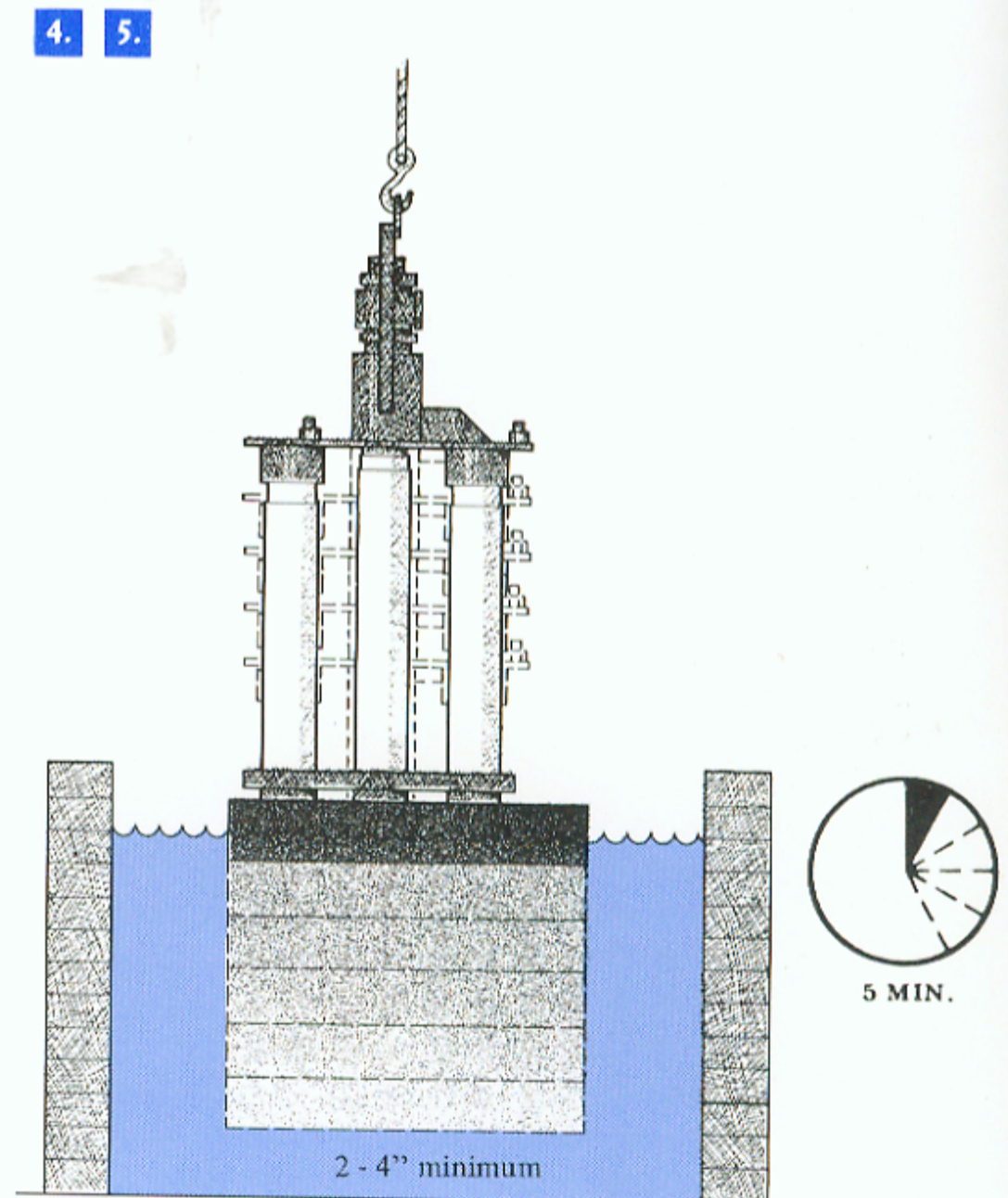
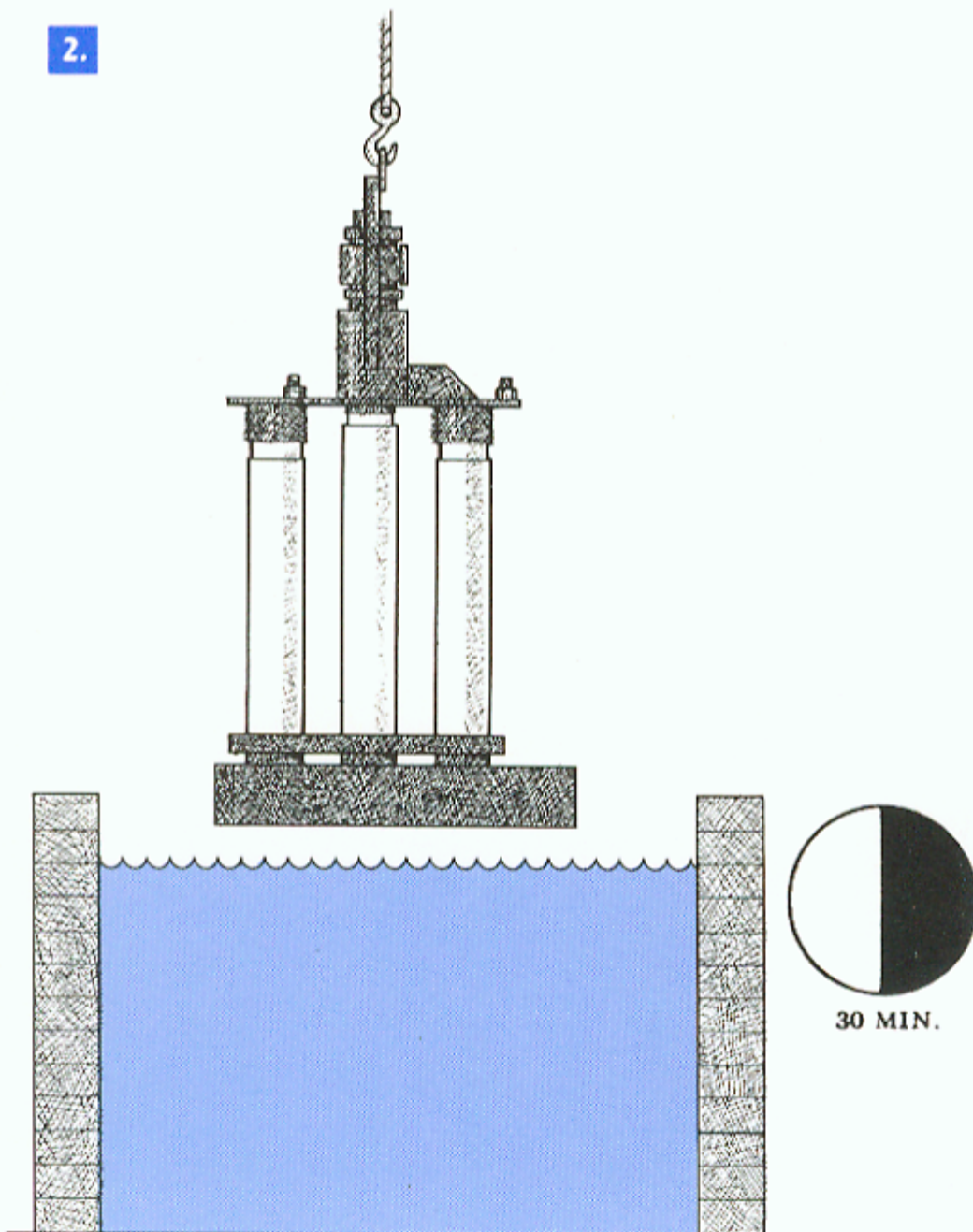
Insert universal joint into shaft coupling. Align set screws with the flats on the universal joint stub. Tighten set screws.
4. Slip coupling assembly 1" onto motor shaft.
5. Screw impeller onto shaft making sure engagement is complete and that impeller snugly fits against shaft shoulder.
6. Installation of pump impeller and shaft is most conveniently done with pump in **horizontal** position.
7. Slip shaft and impeller through base from bottom. Screw top of shaft into shaft coupling. Be sure engagement is complete and coupling seats against top of shaft.

8. To make final adjustment of shaft, impeller and coupling assembly,
 - a. Loosen cap screws at top of motor coupling.
CAUTION: SUPPORT SHAFT ASSEMBLY AS YOU LOOSEN SCREWS SO IT DOES NOT DROP.
 - b. Slide assembly up onto motor shaft until bearing on pump shaft is flush with bearing in shaft bearing mount. Then tighten cap screws securely.
9. Move pump to furnace and position under hoist.
10. Install steel pipe extension section of air inlet assembly to air motor. For convenience, delay connecting air supply line until **after** pump is in final position in pump well.
11. **Ceramic sleeves are delicate. Avoid hitting, dropping, or bumping. They are susceptible to breakage and cracking from careless handling. They are susceptible to damage from thermal shock. Follow instructions on rate of immersion.**



Installation

1. Skim furnace at pump well.
2. Position pump in well with base one (1) inch (25 mm) above hot metal and allow pump to remain in position for minimum 30 minutes. This is necessary to drive all moisture out of pump and prevent thermal shock.
3. Connect air supply line.
4. Lower pump until its base is immersed 2" (50mm). Keep at this level for 15 minutes.
5. Lower in 2" (50mm) increments every 5 minutes to desired depth. If excessive bubbling or simmering occurs, lower pump more slowly.
6. When pump is fully immersed, allow it to set at least five minutes to thaw out any plug which may have occurred.
7. Check impeller freedom by rotating shaft **clockwise** with tongs at shaft coupling. Pump is now ready for startup.
8. **Remember 2" (50mm) minimum, 4" (100mm) preferred clearance from the bottom of the furnace is required.**



Operation

1. Minimum bath level depends upon the pump model.
M28-CSD – 10" (250mm)
M30-CSD – 12" (300mm)
2. Make sure metal bath is thoroughly molten – 1300°F (700°C) minimum.
3. Open main air supply valve with ball valve closed. Adjust to starting pressure for your pump model by reading pressure regulator.

Pump Model	Starting Pressure		Operating Pressure	
	psig	kg/cm ²	psig	kg/cm ²
M28-CSD	15	1.0	30-60	2-4
M30-CSD	15	1.0	60-90	4-7

When pressure regulator reads required pressure, turn ball valve on full. Check to see that the pump is running smoothly.

4. Adjust pressure regulator to operating pressure.
5. Adjust air motor lubricator feed at 1 to 2 drops per minute.
6. **To Shut Pump Down Between Heats**
When pump is left in molten heel for relatively short period of time between heats, it is advisable to keep impeller turning **slowly** by reducing air supply rather than stopping pump completely. This prevents air motor from being overheated by radiation from furnace.

Molten heel should always be deep enough to cover baffle plate of pump. If not, remove pump.

To remove pump

Whenever furnace is scheduled for shutdown, when a remaining heel is not deep enough to cover baffle plate of pump, or when pump must be removed for maintenance or repair, the following procedures apply.

1. Turn off air supply.
2. Skim off pump well.
3. Disconnect air supply at union connector.
4. Lift pump completely out of furnace.
5. While pump is still hot and suspended above pump well, hot clean by removing all solids under the baffle plate with hooked rod. Clean inside of discharge nozzle and scrape excess slag off the posts and shaft. Rotate shaft by hand (with tongs) at shaft coupling to permit subsequent shaft removal if required.
6. If shaft is to be removed, it must be done as soon as pump is removed from pump well.

Pump Removal

1. Move pump away from the furnace.
2. Return pump to preheater stand and store at 250°F to 300°F (120°C to 150°C).

Maintenance and Trouble Shooting

Skim pump well, several times per shift being careful not to touch shaft with skimmer. It is best to reduce motor rpm during this operation.

Whenever pump is removed from furnace, clean under baffle plate and discharge areas. Inspect shaft and posts for worn areas and loose cement. Apply new Fraxset cement where required.

The pump should be hot cleaned daily.

Trouble Shooting

1. **Insufficient circulation?**
 - a. Check pump rpm.
 - b. Pump shaft may be broken at impeller.
 - c. Impeller may be clogged or damaged.
 - d. Pump intake may be obstructed.
 - e. Pump discharge may be obstructed. Check as above.
2. **Low pump rpm?**
 - a. Check air pressure.
 - b. Check air motor lubrication.
 - c. Check for restrictions in air line downstream from the regulator.
 - d. Check inside diameter of air line to make sure it is large enough for proper air volume.
 - e. Check muffler for blockage.
 - f. Check vanes in air motor for excessive wear.
3. **Excessive vibration?**
 - a. Look for broken shaft or impeller bearing rings.
 - b. Check posts for breaks.
 - c. Check coupling assembly and U-joint for wear.
 - d. Foreign matter may be lodged in impeller.
 - e. Check alignment.

For further assistance, call Metallics Systems applications engineering, at 216-248-7100.

Repair & parts replacement

Shaft, impeller and support posts will require periodic replacement because of normal erosion and oxidation. **Shaft and posts should be replaced when diameters have been reduced to less than half their original dimension.** Operation beyond this point will result in breakage and subsequent damage to pump base and other parts.

Shaft and Impeller Replacement

Shaft and impeller are usually replaced at the same time. Installation procedure is described on page 7.

If impeller is still in serviceable condition when shaft is replaced, it is sometimes possible to remove old shaft from impeller by drilling a number of small holes in the end of shaft just inside threads.

Alternately, if radial drill or lathe facilities are available, one large hole that is slightly smaller than thread I.D. will remove most of old shaft. By careful use of small cold chisel, remaining portion in threads can be removed.

CAUTION: Ceramic sleeves are delicate. They are susceptible to breakage and cracking from careless handling. Avoid hitting, dropping, bumping. They are susceptible to damage from thermal shock.

Post Replacement

When posts have been worn or oxidized to half of their original diameter, replace them by using the following procedure:

1. Remove shaft and impeller.
2. Remove motor mount by removing the four bolts at each post socket and center bolt in post socket.
3. Using a hack saw, cut off posts flush with pump base. Also cut posts at post socket.
4. The remaining portions of old posts are removed from the base and sockets by careful use of a drill and cold chisel. The following hole dimensions in the base must be maintained:
M28-CSD – 3-1/16" dia. x 2" deep (7.8 x 5 cm)
M30-CSD – 3-1/2" dia. x 2" deep (8.9 x 5 cm)
5. Remove old post stubs from post sockets with drill and chisel in same manner.
6. Bolt post sockets to motor mount.
7. Position base on assembly fixture, dry fit new posts into base holes and temporarily place motor mount with post sockets on top of posts to check alignment of parts. Proper alignment of parts during assembly requires use of Metallics assembly/alignment fixture. Assembly/alignment fixtures are available from Metallics Systems, 31935 Aurora Road, Solon, Ohio 44139. See page 14.

3.



5.



8. Prepare for cementing of parts by lifting off motor mount with post sockets attached and removing posts from base. Thoroughly stir Fraxset cement (available from Metallics Systems).
9. **Wipe area to be cemented with damp cloth to remove any dust.** Apply 1/16" (2mm) layer of Fraxset cement in base post holes and to bottom of posts. Insert one post at a time working out excess cement by applying pressure to top of post. Remove excess cement and finish with a fillet around each post.
10. Apply 1/16" (2mm) layer of Fraxset cement to machined shoulder of posts. **Do not apply cement to top of post or socket.** Place motor mount with sockets over posts and push down firmly to seat it. Insert and tighten center bolts into posts. Scrape off excess cement and finish with cement fillet where posts meet sockets. (Fraxset cement is available from Metallics Systems.)
11. Push cement into holes in post sockets to completely fill joint with cement.
12. Install alignment fixture shaft.
13. Bolt top collar of alignment fixture to top of motor mount.

Drying of Cement

Once pump is assembled, it should be left on assembly/alignment fixture until after cement is dry.

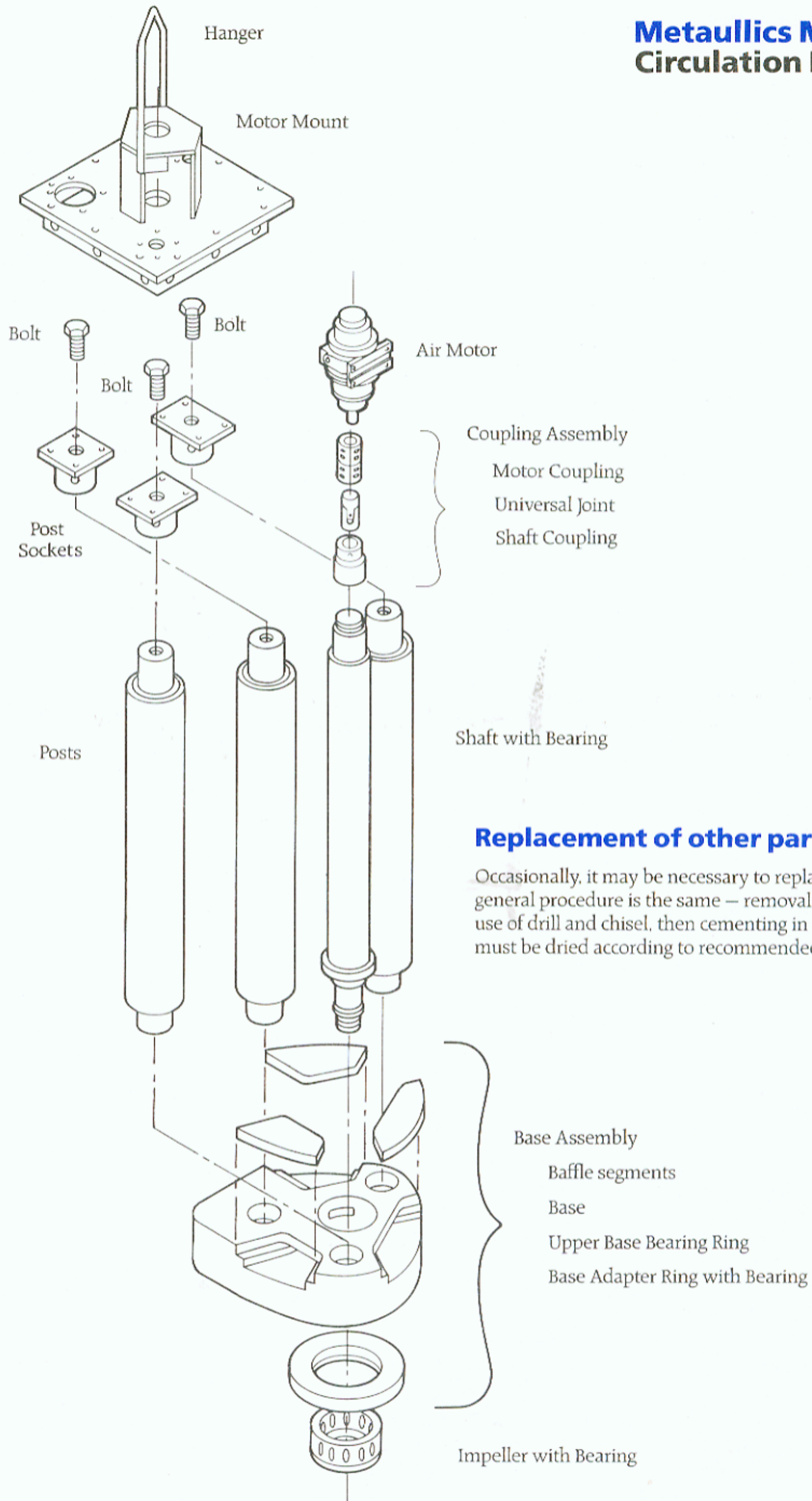
1. Allow cement to air dry at least four hours at minimum 60°F (16°C). Check for any excess cement and clean this area thoroughly.
2. Do not attempt to lift pump by hanger until you have completed drying procedure.
3. Move pump to preheater (on fixture) and dry for an additional 16 hours at 250°F to 300°F (120°C to 150°C). **Do not apply open flames to graphite since this will cause oxidation.** See page 14 for pump preheater available from Metallics Systems. For further information regarding recommended preheater specifications contact the Metallics Systems engineering department at 216-248-7100.

When re-installing pump in furnace, follow normal installation procedure.

3.



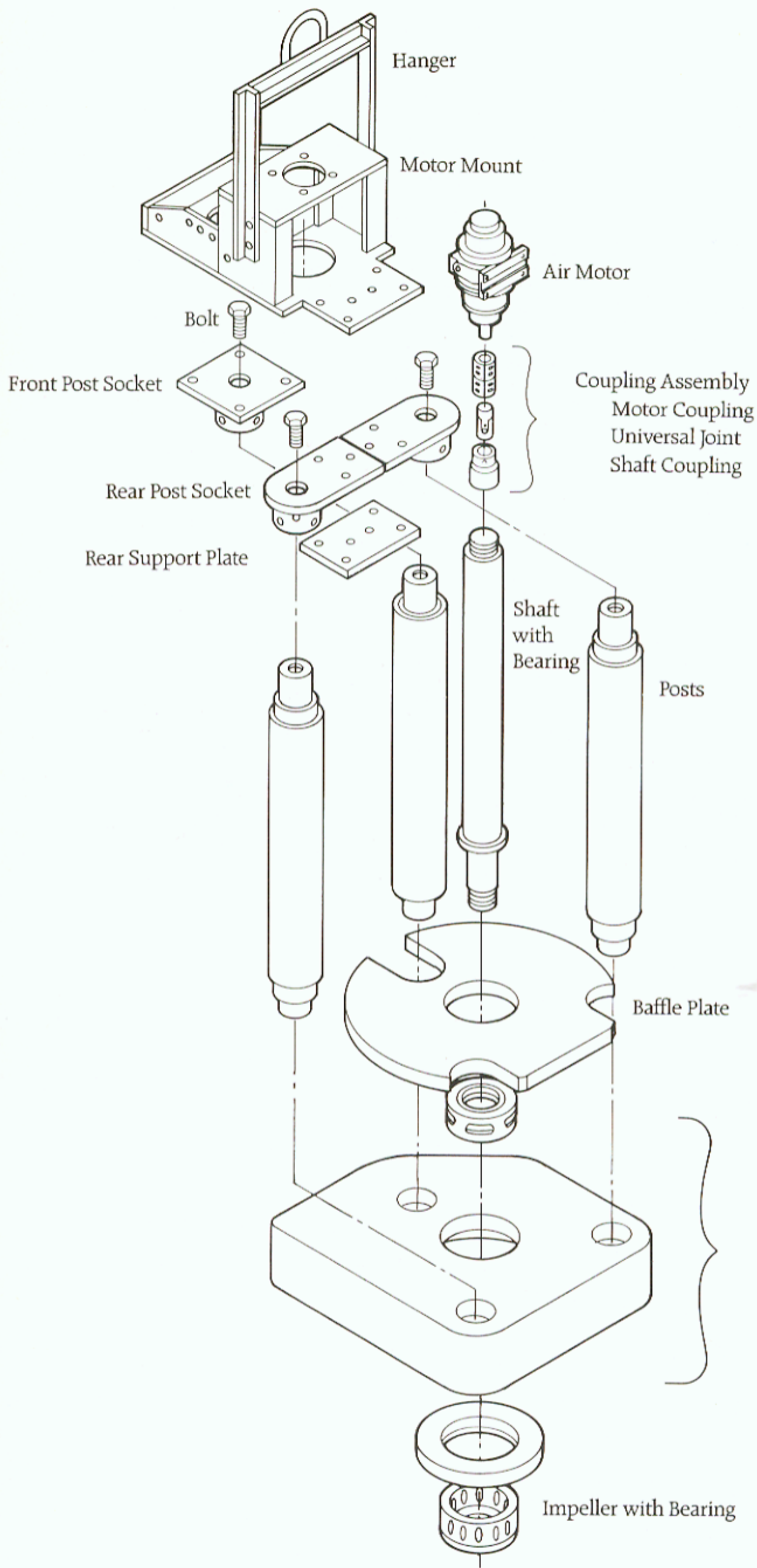
Metaulics M28-CSD Circulation Pump



Replacement of other parts

Occasionally, it may be necessary to replace other parts. The general procedure is the same – removal of old part by careful use of drill and chisel, then cementing in new part. Cement must be dried according to recommended procedure.

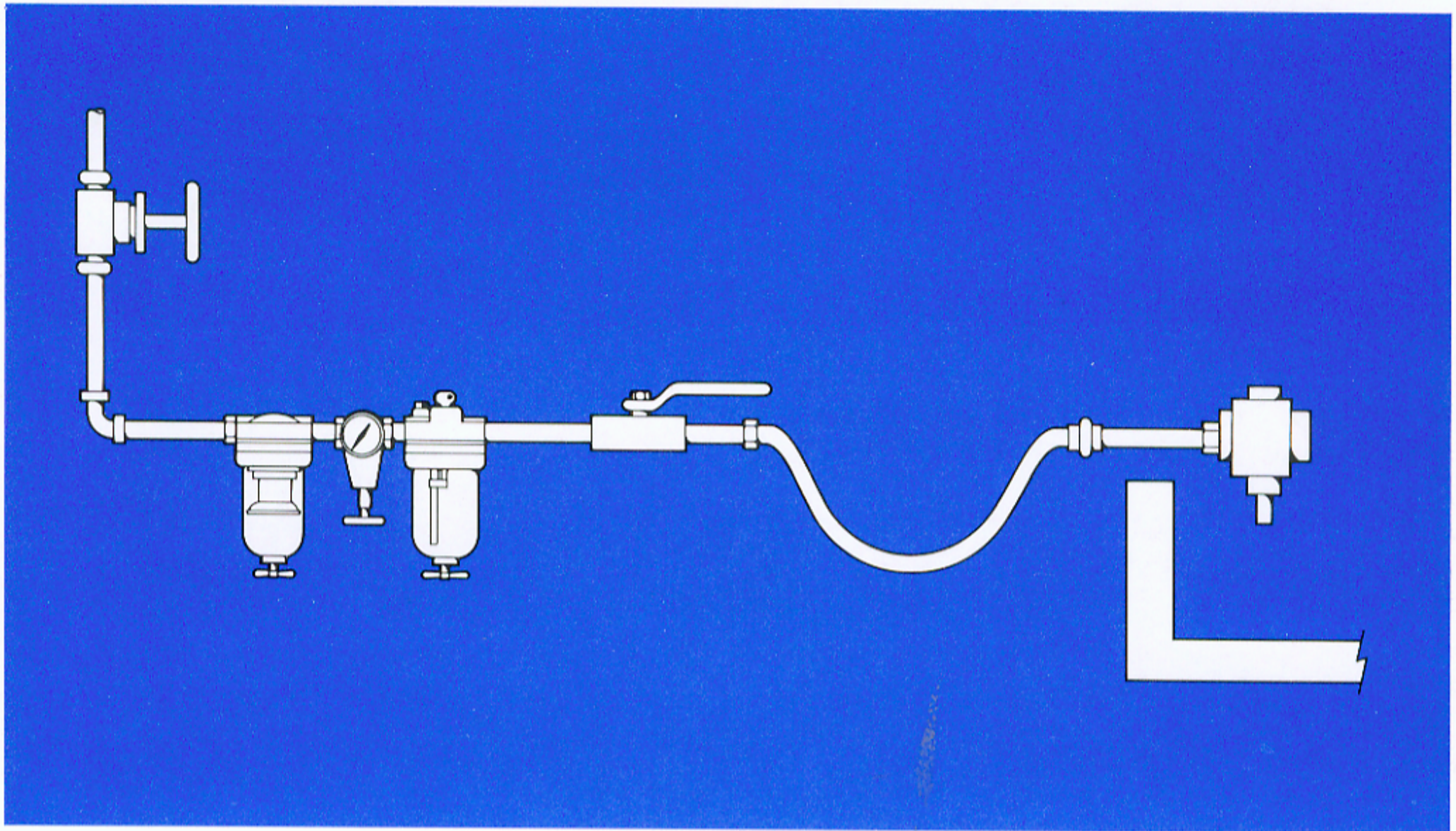
Metaullics M30-CSD Circulation Pump



Replacement of other parts

Occasionally, it may be necessary to replace other parts. The general procedure is the same – removal of old part by careful use of drill and chisel, then cementing in new part. Cement must be dried according to recommended procedure.

Air control assembly

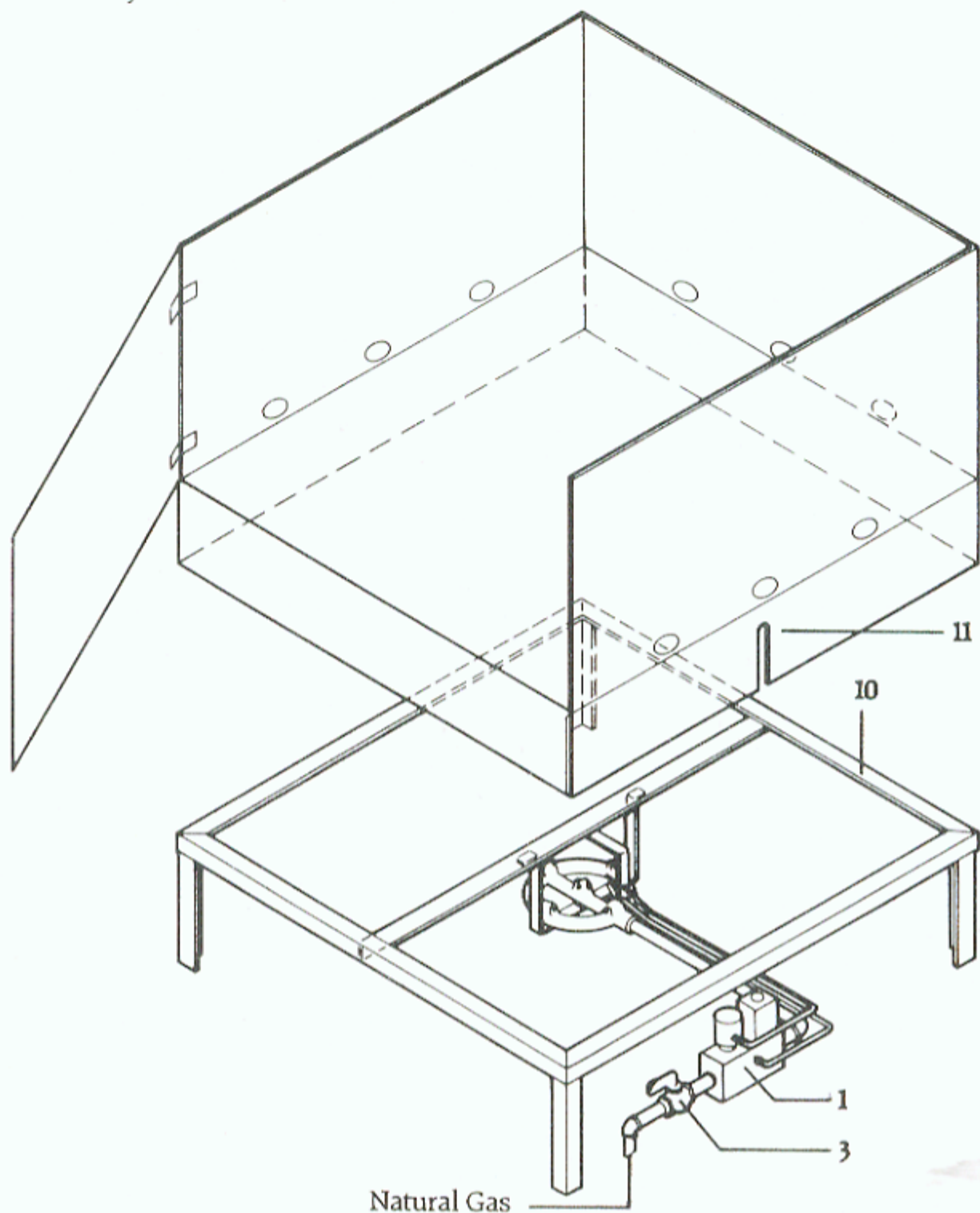


Pump Size	Air Motor	Line Size	Air Filter	Pressure Regulator	Lubricator	Ball Valve	Hose Connector	Union Hose Connector	Air Hose
M28 & 30	1600	1"	Gast AH109F	Gast AH110R	Gast AH111L	Jamesbury 1" A22TT	Aeroquip 412-16-16S	Aeroquip 41-16S and 2022-16-16S	Aeroquip 1503-16

NOTE: References to specific manufacturers and model numbers are intended to be descriptive only and do not constitute an endorsement by Metaulics Systems of such products or exclusion of products of other manufacturers.

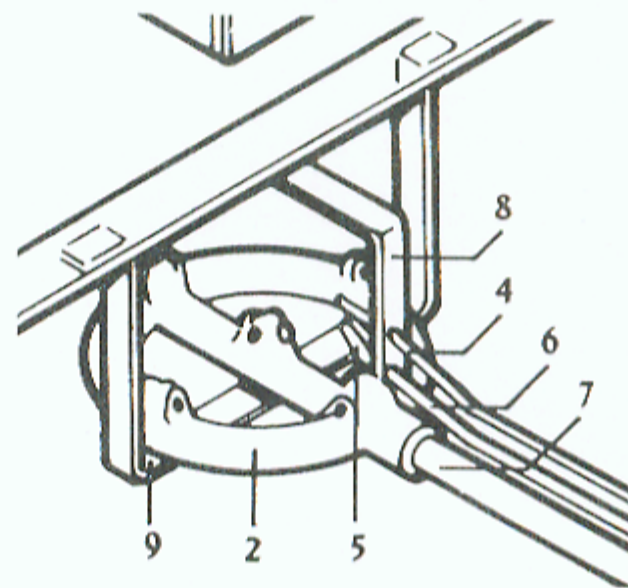
Pump preheater

This Pump Preheater is available from Metallics Systems.



Notes:

1. The system depicted on this drawing is suggestive of a functional design only. Builders using this design are responsible for incorporation of any safety features and compliance with local codes.
2. The main burner is controlled by turning the knob on the manual gas valve.



Suggested Platform Size

M28	24" x 36"	(609 x 913 mm)
M30	36" x 42"	(914 x 1066 mm)

Assembly alignment fixture

This Alignment Fixture is available from Metallics Systems.

Model	Item No.
M28*	500-0113 500-0101
M30	500-0067

*Note: both items required



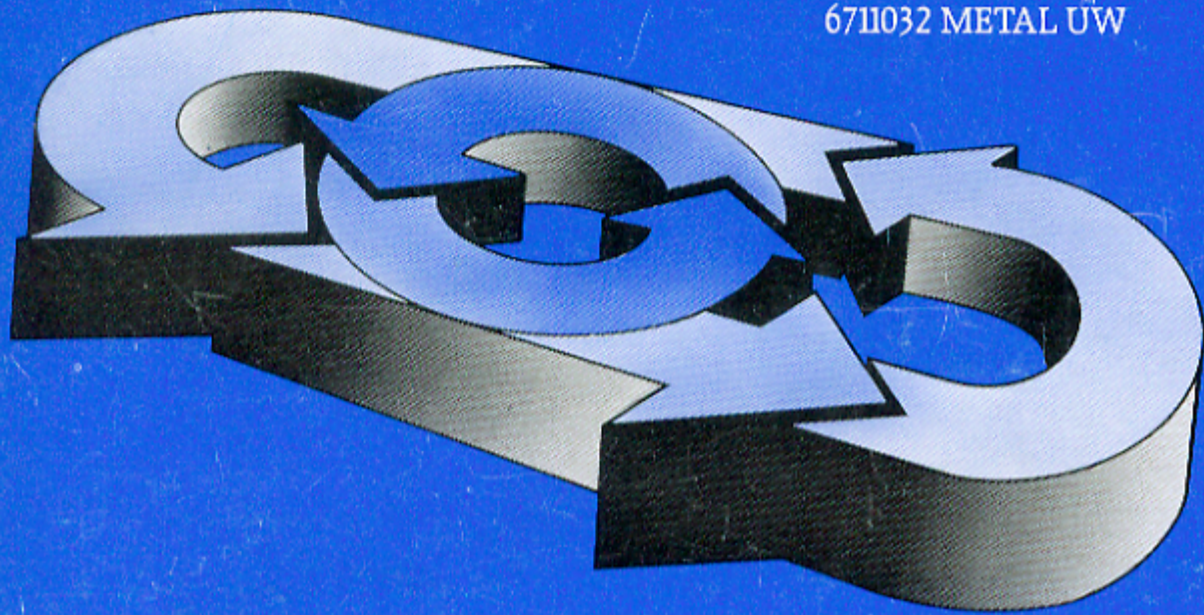
Ref. No.	Function	Description
1	Gas Safety Valve – Manual	W. W. Granger Supply Co. Dayton Cat. No. 2E374
2	Gas Fired Burner	Solarflow Corp. (prev. Barber Mfg.) Model Z-20w 638B Nat. 1(2)1-65
3	Gas Shut-off Valve	1/2" N.P.T. Gas Cock
4	Pilot Light Thermocouple	30 Millivolt Thermocouple – Universal Type
5	Pilot Light Jet	Solarflow Corp. (prev. Barber Mfg.) Model No. 642 Bell Baffle
6	Pilot Light Tubing	1/4" Copper or Alum. Tubing
7	Gas Piping	1/2" N.P.T. Black Pipe
8	Pilot Light Bracket	1" x 1/8" thk. Steel Strap
9	Burner Support Bracket	1-1/2" x 1/8" thk. Steel Strap
10	Platform Frame	2" x 2" x 13/16" Steel Angle
11	Platform Cover	No. 10 or 12 Gauge Sheet Steel

METALLICS

CIRCULATION SYSTEMS FOR ALUMINUM

Improving productivity through higher flow rates
and less frequent maintenance

Metaullics Systems
31935 Aurora Road
Solon, Ohio 44139
Telephone: 216-248-7100
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6711032 METAL UW



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Proper safety precautions should be exercised in all molten metal transfer operations to prevent unexpected metal discharge in event of operator error or mechanical failure. Recommended precautions include shielding or covering well openings around transfer pump; pump should only operate when on/off control is held in "on" position; and control should be located where operator has clear view of pump discharge.

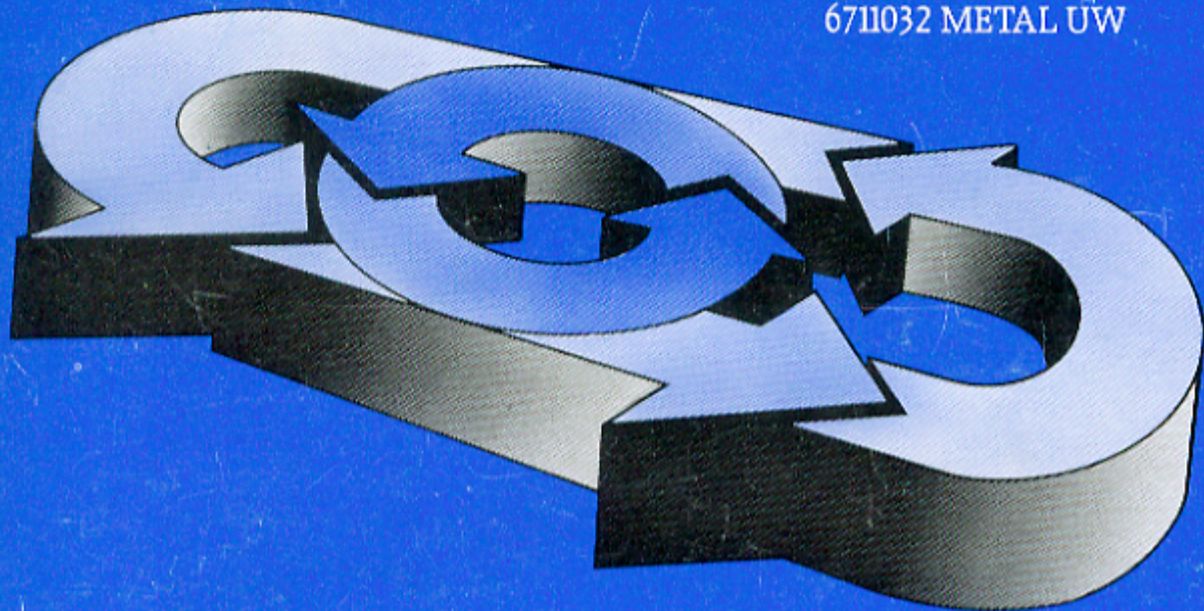
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METALLICS

CIRCULATION SYSTEMS FOR ALUMINUM

Improving productivity through higher flow rates
and less frequent maintenance

Metaullics Systems
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