MONOKOTE

Equipment and High Production Procedures

GRACE

INDEX

High production Monokote application techniques have come a long way since their introduction approximately seven years ago. High production pump conversion kits; larger, smoother conveying systems; and a lighter, more flexible nozzle system have combined to dramatically increase application rates and decrease in-place costs.

This fifth revision of the *Monokote Equipment and High Production Procedures Manual* incorporates some new ideas for keeping production up and costs down: larger surge hose, larger ball valve, nozzle shut offs, and a smaller, more versatile nozzle assembly to mention a few.

Before starting your next job, review this manual comparing its recommendations to your present job set-up and upgrade wherever possible. Again, no single component makes all the difference, but every component makes a little difference. It all adds up to a more profitable Monokote job.

Our joint efforts will help keep sprayed plaster fireproofing a viable and profitable product for the plastering industry.

MONOKOTE JOB EQUIPMENT AND HIGH PRODUCTION PROCEDURES

I. SITE AND PROJECT PLANNING

Pre-setup Planning

1. Review the specifications and drawings and be sure the general contractor and inspectors have the same interpretation as you do.

2. Arrange with the general contractors representative to meet and walk the site to establish the location of your permanent pumping station.

a. Select a primary and an alternative setup location. Where possible, pump up the outside or through the core of the building from a single site. During the winter, the core will provide some heat and help prevent line freeze-up.

b. Be sure of adequate space for unloading and handling of material for the duration of the job. Space and access routes often change as the project progresses.

c. Find a water source with adequate volume and pressure. Also check on washout procedure and local water regulations. For example, a settling tank may be required. Be certain the general contractor has arranged the necessary facilities.

3. Determine if any protection for interior surfaces is required.

4. Check to see if tarps are necessary for overspray protection outside the building.

5. With the general contractor, carefully plan the means for maintaining proper temperature and ventilation for your phase of the work in all weather conditions.

6. Be certain steel and concrete are reasonably clean for proper Monokote application. Remove loose rust or mill scale with a burlap rag or heavy brush. Oil on steel or concrete should be removed with trisodium phosphate or other cleaners. On concrete, check closely for form oils and curing compounds.

7. Arrange your application schedule with the job superintendent.

a. Insist that you be on the floor as soon as the concrete is poured but before plumbing and sheet metal work have begun.

Working around obstacles such as stacked wall board, pipes and hanging ducts can cut your application rate in half and drastically increase labor costs and material waste.

b. When fireproofing steel roof deck, the roof system (insulation and membrane) must be complete and watertight. All roof traffic must be prohibited during and after Monokote application until the fireproofing has dried and full bond strength is attained.

Items 7a & 7b should be included in your bid and production commitment. Tell the superintendent that clear work areas mean you will be out of his way a lot faster.

II. MIXER, DELIVERY & APPLICATION EQUIPMENT

Select a pump with a production capacity well above the desired daily average. Large 30 HP pumps have performed at heights in excess of 50 floors.

The delivery system greatly affects pumping rate. Study the conveying equipment and system information in section IIE and in Figure 3 at the back of this manual.

Establish a routine preventive maintenance program on all equipment.

Note:

1. Pressure release valves should be kept clean and in good working order.

2. Any equipment abnormality — such as a new noise, uneven surge, etc. — should be checked immediately. Waiting until something malfunctions could result in a system plugged with set material.

3. Install time clocks to measure machine running time. These provide an accurate gauge on which to base routine maintenance.

The single most important development in the application of Monokote has been the introduction of high production conversion kits. These kits are available from Thomsen Equipment and from Essick Manufacturing Co. The principal benefit is the reduction of dead space at the end of the piston stroke. These kits (A) dramatically increase pumping rates, (B) make pumps less sensitive to overmixing, and (C) enable stiffer mixes to be pumped at higher rates. The latter enables thicker scratch coats, resulting in fewer passes.

Labor savings through increased pump efficiency will pay for the kits in a short time. Specific pumps and their corresponding conversion kits are discussed below:

A. Pumps

1. Essick TM-30

A very high volume pump which should be fitted with a high production conversion kit, 8-inch diameter high-production pulley, and urethane balls.

The Essick TM-30 conversion kit (see Figure 2) consists of piston extenders and heavy pattern front covers which protrude into the cavity between the ball check valves. The new front covers have been adjusted to use the standard inlet ball stop pin while reducing inlet ball travel. After installing the conversion kit, remove the pump manifold and rotate the pump by hand through one complete cycle to be sure that there are no installation errors. There must be clearance between the end of the piston extender and the tip of the inlet ball stop pin at the end of the piston stroke. **Caution: Due to increased efficiency, it will be necessary to slow the pump to avoid overloading the nozzle. Do not over stiffen the mix, as excessive pressures and low yield will result.**

The 8-inch pulley replaces the standard 10-inch pulley installed on the transmission output shaft. With the engine turning at a maximum (2,600 rpm), the 8-inch pulley turns the pump at approximately 130 rpm — a 40% increase over the standard 10-inch pulley.

Steel balls and seats have been successfully substituted for the standard urethane balls and corresponding seats. This improvement has eliminated the costly replacement of urethane balls.

Electric motors and diesel engines have also been successfully substituted for the standard 30 HP gas engines.

Production rates in excess of 1 bag minute (420 bags/7 hours) are possible.

2. Thomsen A-3.75

The A-3.75 is another high volume pump which should be fitted with steel balls and a high production kit. Seat type must be that specified for use with steel balls (see Thomsen Bulletin #23).

The steel ball and seat assembly require much less maintenance and pump Monokote more efficiently than the corresponding plastic ball seat combination. The Thomsen A-3.75 conversion kit (see Figure 2) consists of a plug for the manifold, the "Thomsen Marvel" and a sleeve for the upper ball travel that spreads the shock of the balls' impact over the entire length of the pin, reducing pin breakage.

The "Marvel" is installed by (1) removing the pump housing, (2) removing and discarding the lower ball stop (socket head cap screw and sleeve), (3) placing the plug in the housing with the flat surface down, (4) threading the bolt provided through the hole in the housing where the ball stop pin was removed, (5) tightening the bolt, and (6) remounting the pump manifold. With these modifications, the pump output often exceeds the advertised 33% increase and can approach 420 bags/7 hours.

B. Mixers

1. Choose a mixer to match the volume of your pump. Mixer speed should be adjustable and the clutch should permit frequent start/stop operation. Larger mixers will provide more versatility of operation.

The blades should scrape the sides clean. The optional twin screw blades provide excellent mixing action by cutting and folding the material.

The mixer should rotate to empty completely when dumped, leaving no material to be reworked in the succeeding batch.

Thomsen Model 110, Essick Models 120 and 150, and Muller Models 10 and 12CF all are excellent for mixing Monokote and meet the above criteria. Rotation speeds between 30-40 RPM are most efficient in reaching proper density and mix consistency. Use rubber wiper blades where available.

2. Dust Control for Plaster Mixers

In order to control nuisance dust in plaster mixing areas, plaster mixers should be fitted with dust covers. Dust Covers (Patent No. 4,211,491) such as the one illustrated in Figure 1 have lowered dust levels in general mixing areas allowing men and equipment to perform in a cleaner, healthier environment. An added advantage is reduced engine maintenance resulting from cleaner air, gas and oil filters.

For more information on job site operations with a dust cover, contact your local Zonolite Sales Office listed on the back cover.

C. Water Measuring Devices

The basic requirements of a metering system are speed of delivery and the ability to repeatedly deliver a pre-set amount of water. A wash-down hose should always be used in conjunction with a water meter. This permits cleaning of the mixer and fine adjustments in batch-to-batch mix consistency.

1. Essick Model AT-60 and Mr. Parts Watermaster

These systems utilize a timed electric sump pump to deliver approximately one gallon of water per second in pre-set quantities up to 60 gallons. Both use a 55 gallon drum as a reservoir storing water for the next batch while mixing and dumping proceed. This type of system is especially advantageous with low water pressures and flow rates. **Timed sump pump systems are the best water delivery methods available.**

2. Neptune Water Meters

For accurate water measuring and high speed operation a high pressure water source should

Fig. 1 Dust Control for Plaster Mixers

be used. A large diameter water supply hose connected directly to the meter will increase water delivery rate. One version of this meter can be pre-set to shut off automatically when a predetermined number of gallons has been delivered. Where low pressure is a problem install a small centrifugal pump in the line to the meter This boosts water pressure and flow rate.

3. Quick Fill Tanks

Quick fill tanks must hold at least 36 gallons of water and should be equipped with inlet shutoffs for accurate water measurements. Inlet water must be shut off while the tank is dumping. Recovery rate of this system is often slow and depends upon inlet water pressure and hose diameter. Precise water measurement is difficult.

4. The "5-Gallon Bucket" Method

This method is not recommended. Usually the mixer man tires early in the day resulting in a reduced production rate and inconsistent mix uniformity.

The area around the mixer often becomes a mud hole due to spilled or overflowed water resulting in damage to surrounding material Again, **this method is specifically NOT recommended.**

D. Conveying Equipment

High production with minimal buildup of material can only be assured in a clean, smooth-walled, full flow system Drag should be minimized by the elimination of all unnecessary restrictions and bends. Hose, pipe and fittings must be of a type that will help prevent ledges for material buildup. For distance or height smooth walled, 3 inch aluminum pipe is a necessity.

All conveying equipment should be checked regularly for excess wear or deterioration Conveying equipment should be installed in the following order (see Figure 3) pump manifold ——→ safety pressure release valve ——→ tapered reducer ——→ 3 inch surge hose ——→ 3 inch ball valve ——→ 3 inch rigid aluminum conduit ——→ 3 inch x 2 inch reducer ——→ floor hose ——→ tapered reducer ——→ whip hose ——→ swivel ——→ material shutoff valve ——→ spray gun ——→ orifice ($1/2$", $9/16$", or $5/8$") When setting up, check for leaks by pumping water

through the system. Teflon tape or pipe dope on all threaded unions helps seal the system, prevent corrosive lock-up and prevent damage to aluminum threads.

1. Safety/Pressure Release Valve

The ball and seat should be checked and cleaned regularly. The release pressure should be adjusted according to pump manufacturers recommendations, and should be consistent with rated working pressures of other equipment in the system.

2. Bell Reducers (2" x 3") (1½" x 2") (1½" x 1¼")

Bell reducers must be of the conical tapered type with external male threads. This allows the use of female sleeves and/or female swivel fittings. Galvanized reducers are widely used without problems. **Black iron plumbing fittings are unacceptable** because severe material buildup often occurs, restricting material flow and causing premature material set.

3. Surge Hose

The surge hose should be 3 inch minimum 1,000 PSI working pressure, wire-braided hose. Connect hose directly to the reducer on the pump with ground boss spud and fitting, held with a bolt-on clamp. Surge hose should be as short as possible (approximately 25 feet).

4. Ball Valve

A 3 inch (approximately 2¾ inches full flow) stainless ball valve should be used to permit unrestricted flow of material from the surge hose into the aluminum pipe.

5. Elbow

Elbows should be long radius, 3 inch inside diameter, rigid aluminum pipe, with no angle less than 90 degrees. The inside diameter of the elbow should be the same as the standpipe.

6. Standpipe

a. **3 inch rigid aluminum pipe is the only pipe recommended for Monokote application.**

b. Tight, leak-free pipe unions may be obtained by using full-taper threaded, galvanized steel pipe couplings; ground unions or victaulic couplings to join the 10 foot lengths of pipe. **Do not use standard, straight-thread conduit couplings often sold with electrical conduit. They will leak.**

c. Vertical and horizontal pipe must be well anchored and supported to prevent movement due to pump surge. Spot weld clamps to beams and columns for secure attachment. Repeated flexing of aluminum pipe will cause metal fatigue and pipe breakage.

d. Horizontal pipe should be [illegible] that wash out water drains freely and [illegible] during back flushing.

7. Floor Hose

a. Rubber-reinforced, 2 [illegible] high pressure, fabric-braided plaster hose with full flow fittings which present as little restriction as possible to material flow should be used.

b. Pressure-rated fittings should be compatible with rated hose pressure and should be checked regularly for wear or damage. A double female swivel, victaulic coupling or other device is recommended to aid in making and breaking hose junctions without twisting the entire hose.

c. Total floor hose should not exceed 250 feet.

8. Whip Hose

The whip hose may be 1½ inches or 1¼ inches in diameter, lightweight, braided hose fitted with full flow fittings. A combination of 25 feet of 1½ inch diameter hose with 17 feet of 1¼ inch diameter hose is strongly recommended. The whip should be well anchored to the edge of the scaffold. **Length of 1¼ inch whip should not exceed 20 feet. The total whip (if 1½ inch and 1¼ inch hose are used) should not exceed 50 ft.**

9. Gun

a. When using a scaffold, the gun length should be as short as possible. Closeness to the work keeps waste to a minimum.

b. The gun may be swivel mounted directly to a 15 foot x 1¼ inch lightweight whip hose. The nozzle can then be hand-held, and moved with a paintbrush-like action. This method permits very accurate placement of the fireproofing and is excellent in cramped spaces where the standard gun is too cumbersome.

c. Pole guns should be used with caution. Three major areas of concern are overspray, thickness control and proper application to the tops of the bottom flanges of beams. A special gun with a "crook" in the shaft which aims the nozzle down on the top of the bottom flange has been used with some success. With this method two passes are made. Use the special bent nozzle to do all top flanges in a given area. Make a second pass with the standard nozzle if necessary to finish the work. Make a third pass using a scaffold and standard short reach spray gun. Increased material usage rate must be closely monitored and balanced against any labor savings.

d. Lightweight nozzle-shutoff ball valves are now available which significantly reduce overspray and waste. **When nozzle shutoffs are used, be extremely careful not to start the machine with the valve closed.** The machine on-off switch should be located at the nozzle and must be in perfect working order.

10. Nozzle and Spray Adjustments

a. The nozzle should have a recessed seat in which the orifice is centered. A [illegible] inch orifice is recommended for most applications. The higher the production rate, the larger the required orifice.

b. **An air control valve and movable air stem are absolutely essential.** The air stem must be thoroughly cleaned and greased daily to prevent freeze-up.

c. The air stem and orifice must be perfectly centered in the nozzle. The air stem is held in place with a thumb screw. It must be easily adjustable during full operation of the system. The stem should be as far back as possible, consistent with a good fanning action. Proper combination of air pressure and stem position will create a low-frequency buzzing sound. A high-frequency pitch indicates improper adjustment.

d. Air pressure at the nozzle breaks up the stream of fireproofing material so that it can be accurately placed. **Do not use air to "blast" the material to the steel.** This practice greatly reduces yield. For maximum yield, air pressure should be as low as possible, consistent with an adequate spray pattern.

e. The rubber cap on the gun head is designed to blow off if there is a nozzle blockage. This is a safety feature and should not be circumvented by tightly wiring the cap to the gun. The rubber cap may be connected to the head of the gun with very loose wire; this prevents loss of the cap if blow-off occurs.

E. Scaffold

A rolling scaffold must be built to provide stability and safety to the nozzle man. It should be easy to clean and move.

Any strong, lightweight scaffolding may be used, provided the following are incorporated:

1. Wheels should be 8-12 inch diameter for smooth, easy movement so that spraying can continue without interruption.

2. Floor should be of the open grate type; expanded aluminum lath is ideal. This permits material to fall through the walking surface and prevents buildup of a slippery layer underfoot. Plywood or wood planks are poor surfaces and inhibit smooth job operation.

3. 3 inch side guards should be placed around the edge of the scaffold floor to prevent the scaffold hose from slipping off the edge.

4. Guard rails should be placed waist high and firmly anchored. These act as a positive stop so the nozzle man doesn't have to watch the edge while spraying.

5. Adding a 3 foot cantilevered section to create a 10 foot x 10 foot scaffold makes it possible to span over debris on the floor. This addition may also be used in spraying some outside spandrel beams.

6. Putlogs, as long as 22 feet, greatly extend the cantilevered scaffold length, permitting easy access to exterior spandrel beams and exterior columns.

F. Tarps

Tarping material must conform to local codes and job conditions. For summer use, tarps constructed of coarse fiberglass screen are available. These permit good ventilation and promote early drying and strength development. In some areas, a denser material may be required, such as plastic or heavy cloth.

G. Communication

Whenever the nozzle is out of sight of the pump some type of communication is essential to coordinate pump and sprayer. Walkie-talkies, telephones or at least an on-off light are valuable tools. In some areas the telephone company will install a phone for a nominal fee. Care should be taken if selecting a walkie-talkie because job equipment and steel construction severely interfere with some makes.

Variable speed controls may be added to both the Essick TM-30 and the Thomsen A-3 75. These permit the spray man to adjust pump speed from the nozzle while spraying.

III. PUMP STATION SETUP

The entire working and storage area should be covered and protected from weather wherever possible.

A. Pump Placement

Place the pump as close as possible to the 3 inch diameter standpipe. This permits a short surge hose to be utilized. It is very important that the ground be high enough to permit wash water to drain away from the pump base.

B. Mixer

Place the mixer above the pump hopper. It should be high enough to permit full rotation to the complete dump position.

C. Working Platform

Build a platform directly behind the mixer so that the mixer man's waist is level with the top edge of the mixer. It should be large enough to hold at least 20 bags of Monokote. Extending the platform around one side of the mixer permits the man to more easily dump the mix and keep the hopper clean.

D. Storage

1. The storage area should be large enough to hold 600-1000 bags of Monokote or a truck approximately 45 feet long.

2. The storage area must be dry and completely protected from rain and or construction water. Material must be stored to prevent any contact with water on the floor.

3. Pallets make excellent storage bases When storing Monokote on unprotected ground a layer of plastic should be placed under pallets. and also over the stacked bags. This prevents ground moisture from damaging the lowest level of bags. The storage area should be immediately adjacent to the working platform

4. Keep an inventory of at least one day's supply of Monokote to cover any unexpected delivery delay

E. Multiple Pump Setups

On large jobs. a roller conveyor helps to feed material out of a van and down a line of mixers Three pumps can use as much as 1 000 bags per day. With good equipment and organization one mixer man can handle two mixer pump setups

IV. MIXING PROCEDURE

A uniform mix of 50 ± 2 pounds per cubic foot (pcf) density is essential to maintain a high production mixing/pumping operation. To obtain the proper density, follow this procedure:

1. Set mixer speed between 30-40 rpm

2. With blades turning, add water (approximately 31.5 to 36 U.S. gals.).

3. Turn mixer off and clean mixer blades

4. Add two bags of Monokote.

5. Restart mixer, add a third bag and mix for approximately 45 seconds. The mix will initially look dry and will gradually "cream out" The mix is usually correct if it is stopped just as the "grainy" look begins to disappear.

6. Stop mixer and check the material for a density of 50 ± 2 pcf (16.0-17.5 net lbs. in a 10 qt. pail). If not within this tolerance, restart mixer and adjust density by varying the mixing time and/or speed of the blades (a longer mixing time or increased mixing speed will lower the density level). Once a mixing procedure is determined subsequent mixes will give similar results and this step need not be repeated.

7. Restart mixer (3-5 seconds) then dump entire batch into the pump hopper The mixer must empty completely when dumped to avoid leaving any old mix to be re-worked in the succeeding batch

Notes

1. Occasionally scrape the inside walls of the pump hopper

2. Wait until enough material has been pumped out of the hopper to allow sufficient room for the addition of an entire new batch from the mixer

3. If the pump hopper will not take an entire batch, stop the mixer until the remaining material will fit Restart the mixer for 2 to 3 seconds and dump the remaining material.

4. Do not let the pump suck air

5. For maximum yield and minimal back pressure, use as much water as possible consistent with proper hangability The water ratio is correct when no more than [illegible] inch of Monokote can be hung in one pass on bare flat steel [illegible] allow approximate [illegible] flanges

V. START UP AND SHUT DOWN

A. Start Up

1. Nozzle should be detached from the [illegible] hose at the swivel or nozzle shut off valve

2. Add about ten gallons of slightly retarded water to the mixer with the blades turning Then dump water into the pump hopper

3. Prepare the first Monokote mix and start the pump. Dump mix into the pump hopper when the last of the retarded water enters the pump intake.

4. Continue pumping until a small amount of Monokote appears at the end of the open hose Connect nozzle and start production

B. Shut Down Procedure

Thorough wash out is necessary to prevent material from setting and accumulating in elbows and at unions

1. After the last mix has cleared the hopper the pump should be slowed and heavily retarded water pumped through the system A sponge

can also be pumped through the system. If a sponge is to be used, the whip hose and hose reducers must first be flushed and disconnected. A large sponge could plug the system when reaching this area.

2. Dirty water can be pumped into a drain pipe or collected in a 55 gallon drum on the floor.

3. If a drain is used, several minutes of clean water should clear the nozzle before the pump is shut off. Then close the ball valve and disconnect the surge hose from the pump. Securely anchor it to a suitable drain. Reopen the valve and back flush the system as quickly as possible. **Caution: The surge hose must be securely anchored to prevent violent whipping action during back flushing.**

4. If no drain pipe is available, dirty water is collected on the spray floor in a 55 gallon drum. When clear water reaches the nozzle it should be collected in a second drum. When the second drum is nearly full, shut off the pump and remove the nozzle. Place the end of the scaffold hose in the first drum of dirty water. Close the ball valve, connect the surge hose to a suitable drain, and reopen the ball valve. The dirty water will be sucked back down through the system emptying the first drum. As the water level approaches the bottom of the drum quickly transfer the hose to the drum of clean water. This water is sucked down purging the entire system of old material and dirty water.

5. Never leave water in the pipes overnight. Small amounts of material settle out in elbows and horizontal areas. This material sets overnight, causing blockage and restrictions the following day.

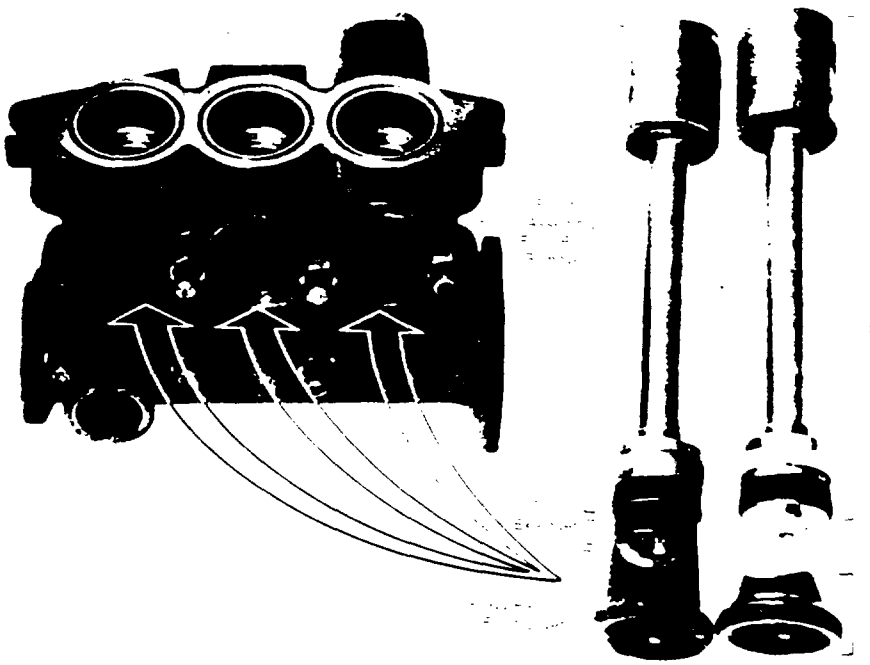
6. Back flushing can be aided by connecting an air source to the whip hose and forcing the water back through the system. The increased speed of back flushing aids in dislodging any remaining material. When back flushing, securely anchor the surge hose. Air is compressible, and will cause a strong whipping action at the hose opening. Work crews should keep clear of the surge hose during back flushing.

VI. JOB RECORDS AND MEETING PRODUCTION QUOTAS

Experience is one of the best teachers and the best way to improve on experience is to record it. A close count by the mixer man and foreman — noting each day's production and floor change — is invaluable in checking and improving production rates and quantity usage. Keep a permanent log: it will tell you each day if you're winning or losing.

Determine the actual pumping rate by timing several consecutive batches at the mixer. Estimate downtime and set realistic average daily production quotas. Pumping rates of 300 bags per day with averages of less than 200 are poor indicators that strong, constructive, on-site management is necessary. With close control, coordination and effective crew management most Monokote jobs should average in excess of 200 bags per day.

FIG. 2 HIGH PRODUCTION CONVERSION KITS



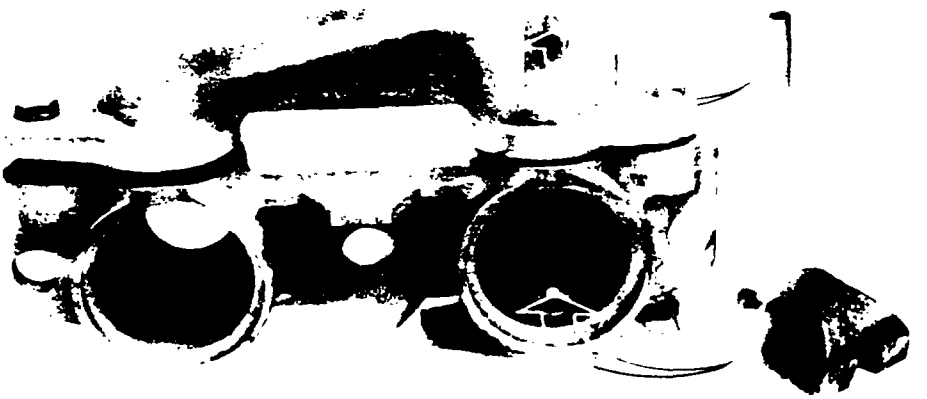
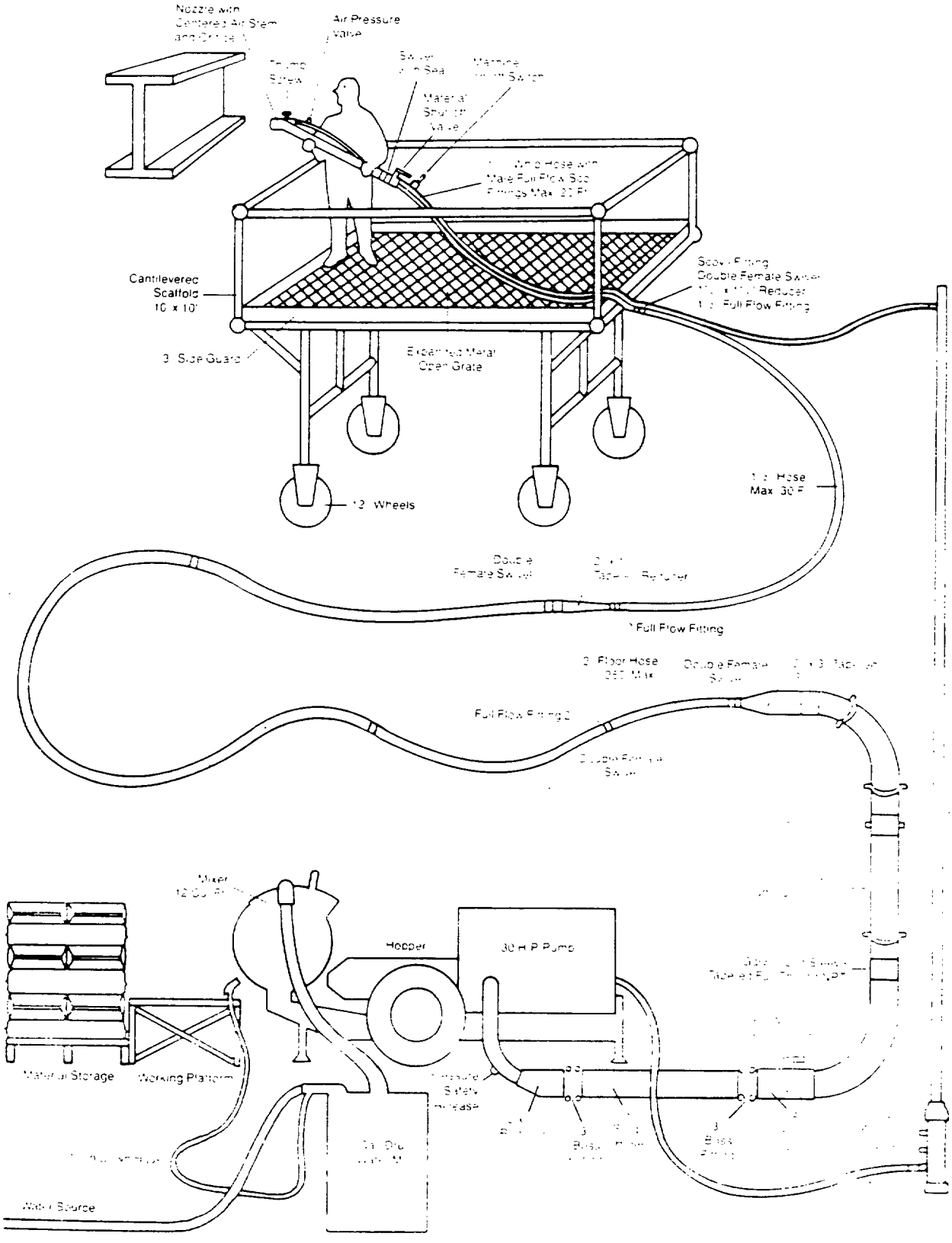


FIG. 3 SCHEMATIC WORK DIAGRAM



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