

Water Table

***Instruction Manual
800270 - Rev. 1***

Hypertherm
*The world leader in
plasma cutting technology*

Water Table
Instruction Manual
IM-27

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The process of controlling smoke and fumes by way of a Water Table is patented under U.S. Patent No. 3,787,247. The patent rights are the property of Hypertherm, Inc. The information contained in this manual and all related drawings provided by Hypertherm are intended solely for the use by the licensee of this process. It may not be duplicated or distributed to others. Each user must obtain a separate license for each Water Table installation.

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INTRODUCTION

INTRODUCTION

The Water Table is an extremely efficient fume control system for use in both oxy-fuel and plasma cutting operations. The Water Table consists of a work support surface (slats) and a water reservoir.

Two options are available with the Water Table, the Raise/Lower option and the Grating option. Using the Raise/Lower option, the water level in the reservoir can be adjusted to different depths for different cutting processes. The Grating option prevents small parts from dropping into the bottom of the Water Table during cutting.

The kinetic energy of the hot gases and molten metal ejected from the kerf during cutting are responsible for fume removal. The mixing of the gases and particulates with the water creates a localized scrubbing action, causing the particulates to mass together and settle to the bottom of the tank. When the Water Table is used with a Hypertherm Water Muffler in plasma cutting, or a Hypertherm Water Spray System in oxy-fuel cutting, fume control efficiency is 99.5%.

WATER TABLE OPTIONS

Raise/Lower Option

The Raise/Lower option allows the operator to rapidly raise or lower the water level in the Water Table using pressurized shop air. This feature is important when the Water Table is used for both plasma and oxy-fuel cutting, since these two cutting processes require different levels of water. Regardless of the cutting process being used, the Raise/Lower feature makes material handling easier.

The rapid adjustment of water level is achieved by means of a pressurized holding tank fabricated below the open cutting tank. By opening a valve, the operator allows the air pressure in the holding tank to decrease. This decrease in air pressure forces the water in the upper open tank to flow into the holding tank. When this valve is closed and the air valve is opened, the holding tank is again pressurized and the rushing air forces the water into the open tank. The water level can be adjusted to any depth in four to six minutes or less without the use of auxiliary pumps. The time required for water level adjustment is usually insignificant since the operator is usually doing other tasks such as overhead crane handling during the adjustment period. (See Figure 2.)

Grating Option

A grating option is available to prevent small parts from dropping into the bottom of the Water Table during cutting, making cleaning the tank easier. The grating option includes expanded metal grating located six inches below the work surface of the Water Table.

INTRODUCTION

Auxiliary Equipment

For additional fume and noise control, you can choose to add the Water Muffler (for plasma cutting) or the Water Spray System (for oxy-fuel cutting) to your Water Table and cutting equipment setup.

Water Muffler

There are three Water Muffler designs, one for use with the PAC-500 torch, one for use with the MAX200, and one for use with the HT400 oxygen plasma torch.

The Water Muffler is an effective device for controlling sound emissions in plasma arc cutting installations. It will usually bring noise levels to within OSHA requirements, although actual noise levels depend heavily on the characteristics of each individual installation. Such factors as power level, room volume, the presence of reflecting surfaces and many other characteristics significantly influence the sound level.

Noise reduction is achieved by means of a thick, stable water film surrounding the plasma arc. Water Mufflers require the use of a Water Table to provide both complete enclosure of the noise source and an adequate supply of water. Eighteen gallons per minute of water is circulated through the Water Muffler nozzle.

The water is pumped from the Water Table to the nozzle, then it is returned to the Water Table. Many users dissolve dyes in the water for the added benefit of ultraviolet radiation shielding. Hypertherm will recommend a source of satisfactory dyes for this purpose.

The Water Muffler system includes the nozzle, a pump with fifty feet of 3/4-inch outlet hose, and a four-foot inlet hose with a strainer. Special voltages and additional outlet hose lengths are available.

Water Spray System

The Hypertherm Water Spray System is a pollution-control device for use with all mechanized oxy-fuel cutting installations. The System should be used with the Water Table for maximum fume control. When used with a Water Table, no external water source is required; water is recirculated from the Water Table. Spray heads are available for torches with either English or metric dimensions.

Compared to uncontrolled cutting operations, fume levels from oxy-fuel cutting are reduced by 99.5% when the Water Spray System and Water Table are used together. A typical uncontrolled oxy-fuel installation produces 0.5 pounds/hour of fumes per torch. Using the Water Spray System and Water Table, the same installation will produce 0.0025 pounds/hour of fume products, which in a typical plant environment, will be within the OSHA limit of 10 ppm (parts per million) of iron oxide fumes.

INTRODUCTION

When cutting thin plate, the Water Spray System also has the advantage of reducing warping of the material due to the cooling effect of the spray. The System can be used on all thicknesses of metal. Cut quality is improved on all thicknesses when the Water Spray System is used.

Water Spray Systems are available in four, six, eight, and ten-torch configurations. Included in each system is:

- A multi-head manifold with solenoid valve
- The appropriate number of spray heads
- A twenty-foot (6.1 meter) electrical cord to connect the solenoid valve to the cutting machine control.

Each spray head is provided with:

- A needle valve assembly
- A twenty-foot #4 hose and a spare fitting (permitting the installer to trim the hose to a length appropriate to the installation.)

An optional Water Supply System (pump assembly) is available. The Water Supply System includes:

- A 50-foot (15.24 meter) outlet hose
- A four-foot (1.2 meter) inlet hose.

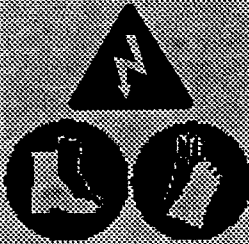
WATER TABLE SAFETY

To protect yourself and your equipment, follow these safety guidelines:

- Refer to the manufacturer's instructions before installing or operating any cutting equipment.
- Ground the Water Table to a high-quality earth ground with a #2/0 AWG copper cable (10 mm diameter). Do not rely on a building frame or water pipe to provide an adequate ground. The grounding method should meet the specifications of all applicable electrical codes.
- General plasma cutting safety instructions are listed on Page 5. Before operating Hypertherm plasma cutting equipment, read the *Safety* and *Operation* sections in the instruction manual supplied with the equipment.
- Do not stand on the Water Table during cutting or material-handling operations, or while operating any controls.
- When using oxy-fuel to cut thin material, be sure that the water level is at least one inch (25 mm) below the lower surface of the workpiece to prevent accumulation of combustible gases. This distance should be increased up to four inches (100 mm) for thicker metal. Maintaining a proper water depth ensures that gases are burned off during the cutting operation, preventing accumulation. Refer to the *Operation* section for further recommendations.
- Continuously watch the cutting operation, and immediately shut off the gas to any torch if its flame goes out. Do not turn on the gas again until you are ready to light it immediately.
- Do not allow fuel or other combustible gases to accumulate.
- When using plasma arc equipment to cut aluminum, free hydrogen gas may be produced regardless of the type of cutting gas used. Special precautions are required to prevent accumulation of hydrogen. Refer to *Aeration Manifold for Cutting Aluminum With Plasma* for the proper method for handling aluminum.
- The shop air supply used for raising the water level with the Raise/Lower option must be regulated to 5 psig (0.345 bar). Excessive pressure can damage the lower tank and, in extreme cases, can cause personal injury.
- Under no circumstances should attempts be made to leak test the tank by pressurizing it with the water ports sealed.

PLASMA CUTTING SAFETY

WARNING



ELECTRIC SHOCK CAN KILL.

- Do not touch live electrical parts.
- Keep all panels and covers in place when the machine is connected to a power source.
- Insulate yourself from work and ground: wear insulating gloves, shoes and clothing.
- Keep gloves, shoes, clothing, work area, torch, and this machinery dry.



EXPLOSION WILL RESULT IF PRESSURIZED CONTAINERS ARE CUT.



ARC RAYS CAN INJURE EYES AND BURN SKIN.

- Wear correct eye and body protection.



NOISE CAN DAMAGE HEARING.

- Wear correct ear protection.



FUMES AND GASES CAN INJURE YOUR HEALTH.

- Keep your head out of the fumes.
- Provide ventilation, exhaust at the arc, or both to keep the fumes and gases from your breathing zone and the general area.
- If ventilation is inadequate, use an approved respirator.



HEAT, SPLATTER AND SPARKS CAUSE FIRE AND BURNS.

- Do not cut near combustible material.
- Do not cut containers that have held combustibles.
- Do not have on your person any combustibles such as a butane lighter or matches.
- Pilot arc can cause burns. Keep the torch nozzle away from yourself and others when the switch is depressed.
- Wear correct eye and body protection.

Engineering Design Package

The Engineering Design Package includes:

- Tank drawings
- Slat support rack drawing
- Mechanical layout
- Instruction manual

The bill of materials (material required to construct the Water Table) is shown on the tank drawing.

Plumbing Connections

The 2-inch NPT couplings specified at the rear of the tank are for inlet water, overflow, and connections to the optional Water Muffler or Water Spray System. Extra couplings should be installed during construction of the Water Table to allow for the installation of additional pumps later on. Any unused fittings can be plugged until needed.

Water Table Size

To size your Water Table:

- Base the size of your Water Table on the size of the largest plate or combination of plates that you plan to cut.
- Plan to provide an open area of 12 to 24 inches (300-600 mm) around the edge of the plate so that lifting hooks for material handling can be used.
- Take into account the size of the work area provided by the cutting machine and the clearance requirements of the cutting machine and adjacent equipment.

INSTALLATION

Construct the Water Table in a manner that will provide a level cutting surface. A tolerance of $\pm 1/4$ inch (± 6 mm) is generally sufficient. Any areas that are not level will show up plainly when the water level is raised to the work support surface. You can use shims, grouted in place, to achieve a level installation.

Plumbing Connections

Plumbing connections required for the Water Table are an Inlet Water Line, an Industrial Drain, and an Overflow Line (secondary drain). (See Figure 2.) If the Table is equipped with the Raise/Lower option, a Shop Air Line must also be provided.

Inlet Water Line

- The Inlet Water Line should be at least one-inch diameter (25 mm) pipe to allow the tank to fill in a reasonable amount of time.
 - On small Water Tables, a hose may be sufficient.
 - On large Water Tables, one of the two-inch NPT couplings at the rear of the Table can be used for the Inlet Water Line connection.
- Local codes and/or prudent plumbing standards may require installation of an anti-siphon device to prevent backflow of water into the supply line.

Drain Line

- The Drain Line should be two-inch pipe or larger.
- Connect the Drain Line to the two-inch flange provided at the rear of the Water Table.

Overflow Line

- The Overflow Line should be connected to one of the two-inch NPT couplings at the rear of the Table.
- Inside the tank, a two-inch elbow and an appropriate length of two-inch pipe should be installed to collect water if the tank continues to fill above the desired level. It should be long enough to allow for maximum water depth. This depth will be slightly above the top of the slats for regular plasma cutting - more if

INSTALLATION

submerged cutting is intended. If the pipe is long enough to extend to one inch below the lip of the tank, it is generally sufficient. The pipe and elbow should be installed only hand-tight so that the operator can tilt it when necessary to reduce the water level.

- The Water Table operates as its own settling tank. The water is usually quite clear within a few hours after the cutting operation, the particulate matter having settled to the bottom of the tank. The effluent of the Water Table is normally of high enough quality to be discharged into industrial sewers. Some localities, may, however, require the use of a secondary holding tank to meet regulations.

Shop Air Line

If the Water Table includes the Raise/Lower option, a Shop Air Line must be provided.

- The shop air supply used for raising the water level must be regulated to 5 psig (0.345 bar).



WARNING



Excessive pressure may damage the lower tank, and, in extreme cases, can cause personal injury.

- The pressure regulator must be located above the maximum water level to protect it from contamination and corrosion from the tank water.
- The air line between the regulator and the Water Table should be one-inch pipe if the distance is less than 30 feet; 1-1/2-inch pipe should be used for longer runs.

Auxiliary Equipment

Water Mufflers & Water Spray Pumps

- Water Muffler and Water Spray Pumps should be installed at the rear of the Water Table.
- One Water Spray Pump can supply up to eight oxy-fuel torches. However, a separate pump is required for each Water Muffler on plasma installations. In all cases, each pump must have its own separate connection at the rear of the Water Table. Attempts to operate pumps that are manifolded to a single inlet pipe will result in one pump sucking the others dry.
- For pumps located within four feet (1.3 m) of the Water Table, one-inch hard pipe

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may be used for the pump inlet line. For greater distances, use 1-1/2-inch pipe. The pump inlet line should not exceed 15 feet (5 m) in any case.

- For pump outlet lines, use one-inch hard pipe from the pump to the start of the hose trolley or power track.
- Provide a separate electrical disconnect box for each pump.
- Refer to the instruction manuals provided with each pump for further details regarding both electrical and plumbing connections, as well as startup and operating procedures.

Aeration Manifold For Cutting Aluminum With Plasma

When using plasma arc equipment to cut aluminum, free hydrogen gas may be generated by the cutting process. This can occur regardless of which arc gas is used. It is common even when only nitrogen is used for cutting. If the hydrogen is able to collect beneath the workpiece, a small explosion can occur. While these explosions are usually harmless, there have been a few reported instances where equipment has been damaged.

The hydrogen is generated because of the aluminum atom's high affinity for oxygen. The high temperature of the plasma process causes disassociation of oxygen and hydrogen in the water in the Water Table. The hot aluminum is then able to combine with oxygen leaving free hydrogen.

Lowering the water level below the lower surface of the workpiece reduces the probability of explosion. **It does not eliminate this problem.** To avoid hydrogen explosions, install an Aeration Manifold on the floor of the Water Table.

A satisfactory Aeration Manifold can be made with PVC tubing:

- Use two-inch (50 mm) diameter tubing for the manifold, with one-inch (25 mm) distribution lines connected to it. Install the distribution lines in a pattern that provides full coverage of the cutting area. Install end caps at the free end of these lines.
- Drill holes 1/8-inch (3 mm) in diameter every six inches (150 mm) in the distribution lines.
- Connect the manifold to a shop air line using a pressure regulator set to create a steady stream of bubbles.

The aeration manifold moves hydrogen away from the cutting area and dilutes it with air. The hydrogen will either burn off harmlessly as it is produced or dissipate into the atmosphere. Explosions will not occur because significant accumulations of the gas will not be produced.

OPERATION

Oxy-fuel Cutting

- When cutting with the oxy-fuel process, it is important to provide a gap between the water and the bottom surface of the workpiece. Failure to do so will interfere with the cutting process and can present a safety hazard by allowing fuel gases to accumulate beneath the workpiece. An appropriate gap between the water and the workpiece is one inch (25 mm) for 1/4-inch to 3/4-inch (6-19 mm) metal. For thicker metal, two to four inches (50-100 mm) is recommended.
- The cutting parameters are identical to those normally used for oxy-fuel cutting without a Water Table.
- If a Water Spray System is used, it should be turned on after the cut is started. See the Water Spray System instruction manual (800380) for details on operation.
- If your table is equipped with the Raise/Lower option, adjusting the depth of the water is a simple matter of closing valves when the water has reached the desired level. (See the *Raise/Lower* operation section.)
- If your table does not have the Raise/Lower option, you can adjust the water level by tilting the overflow standpipe, or by filling the table to the correct level.

Plasma Arc Cutting

- For metal up to about 1-1/2 inches (40 mm) thick, the plasma cutting parameters are identical to those normally used for plasma cutting without a Water Table. Refer to the instruction manual supplied with your plasma cutting system for details.
- Keep the water in contact with the workpiece for maximum fume control and noise reduction. A water level just above the top surface of the slats assures good contact with the workpiece. In some applications, however, this method may result in reduced cut capacity and quality.
- It is also possible, with the Hypertherm HT400, PAC-500, MAX100 and MAX200 torches, to cut with the workpieces totally submerged, resulting in greater noise reduction. However, cut capacity may be reduced in some applications.
- Refer to the specific instruction manuals for proper cutting parameters and water level requirements for metal thicker than 1-1/2 inches (40 mm).
- For an even greater degree of fume and noise control, the Hypertherm Water Muffler can be used with the Water Table except for thicker metal (over 1-1/2"

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(38 mm) thick). Again, refer to the instruction manuals for specific information.

- When using plasma arc equipment to cut aluminum, free hydrogen gas may be generated by the cutting process. This can occur regardless of which arc gas is employed. It is common even when only nitrogen is used for cutting. If the hydrogen is able to collect beneath the workpiece, a small explosion can occur. While these explosions are usually harmless, there have been a few reported instances where equipment has been damaged.

The hydrogen is generated because of the aluminum atom's high affinity for oxygen. The high temperature of the plasma process causes disassociation of oxygen and hydrogen in the water in the Water Table. The hot aluminum is then able to combine with oxygen leaving free hydrogen.

When cutting aluminum, the water level should be kept four inches (100 mm) below the bottom surface of the workpiece to prevent accumulation of hydrogen gas bubbles. However, lowering the water level below the workpiece only reduces the probability of explosion. **It does not eliminate this problem.** To avoid hydrogen explosions, install an Aeration Manifold on the floor of the Water Table. See *Aeration Manifold For Cutting Aluminum With Plasma* for details.

- If your table is equipped with the Raise/Lower option, adjusting the depth of the water is a simple matter of closing valves when the water has reached the desired depth. (See the *Raise/Lower* operation section.)
- If your table does not have the Raise/Lower option, the water level can be adjusted by tilting the overflow standpipe, or by filling the table to the appropriate level.

Raise/Lower Operation

Filling the Tank Initially

- Close the bottom air valve.
- Open the top air valve.
- Open the water inlet valve and allow the tank to fill until the water level reaches the bottom of the work support slats
- Shut off the water inlet line.

Adjusting the Water Level

To raise the water level:

- Adjust the pilot-operated air regulator for an output pressure of 5 psig (0.345 bar).
- Open the bottom air valve and allow the water level to rise to the desired depth.
- Shut off the bottom air valve when the water level reaches the desired depth.

If vigorous bubbling occurs, the water in the holding tank has been depleted:

- Shut off the bottom air valve.
- Open the water inlet valve until the water reaches the desired depth.

This situation will not normally recur once the proper amount of water has been let into the tank.

To lower the water level:

- Open the top air valve. (The bottom valve should be closed at this time.) Releasing air in the holding tank permits water in the upper tank to flow back into the holding tank.
- Close the valves when the water level has been lowered to the desired depth.

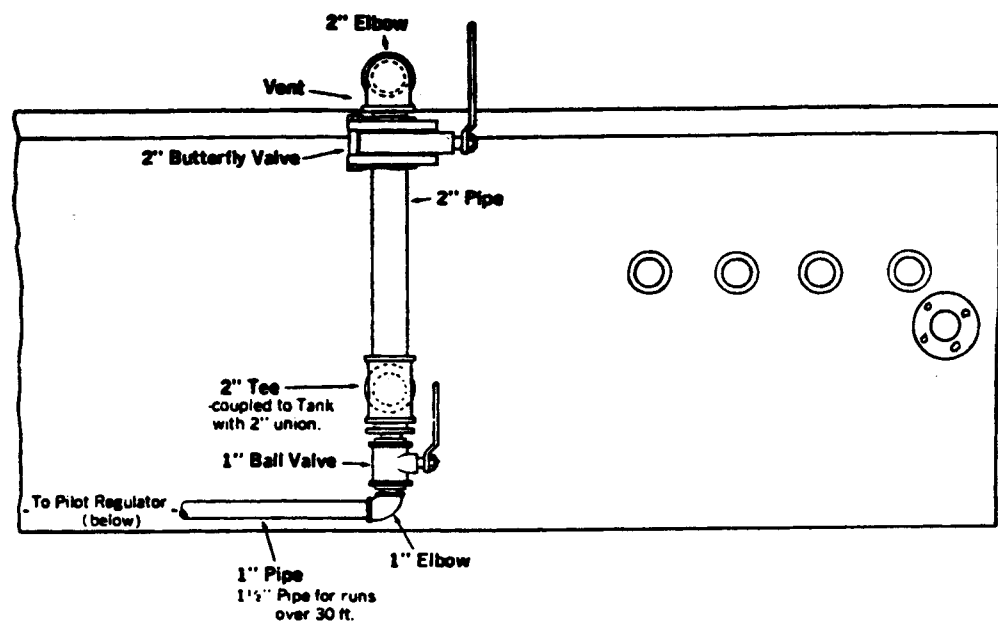
Cleaning the Tank

The frequency of tank cleaning depends on how much cutting you do. The Hypertherm Water Table is designed to maximize the amount of scrap holding space beneath the work support slats so that daily cleaning is not needed. When the space becomes filled with scrap, you can remove the slat racks and clean the tank. The slat racks lay on support beams within the tank. A space of 2-3 inches (50-75 mm) is provided between each rack for easy rack removal. Individual slats may be removed and replaced when necessary. Entire racks may be removed as a unit when cleaning the tank.

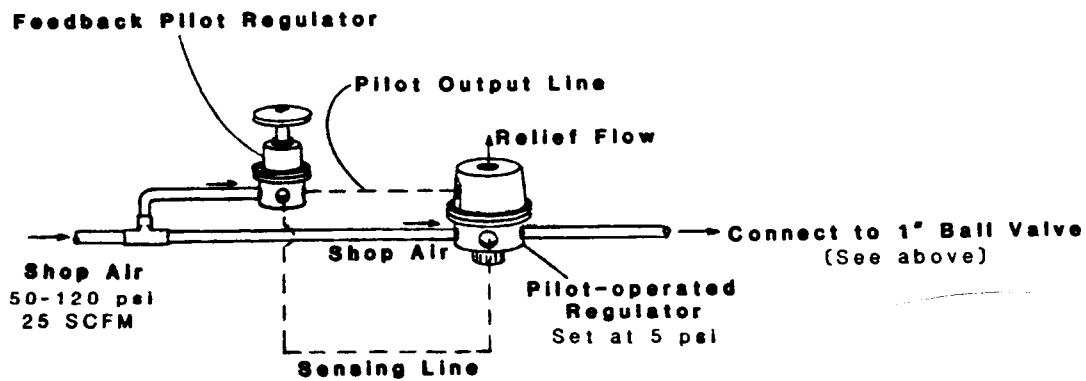
Replacing the Slat

The Hypertherm Water Table is designed so the slats are easy to remove and replace. New slats can be made easily using only a shear. Slat should be made from 1/4-inch (6 mm) metal.

With use, some slats will become quite worn or large quantities of slag may attach to them. These conditions may produce grounding problems or cause the workpiece to rest in a non-level position or to be unstable. Such conditions reduce the efficiency of the cutting operation and should be avoided. While slat life is generally quite good, keep a supply of spare slats so that the cutting support surface is kept in good condition.



REAR VIEW



Note: Mount regulators above maximum water level.

Figure 1 Raise/Lower Option

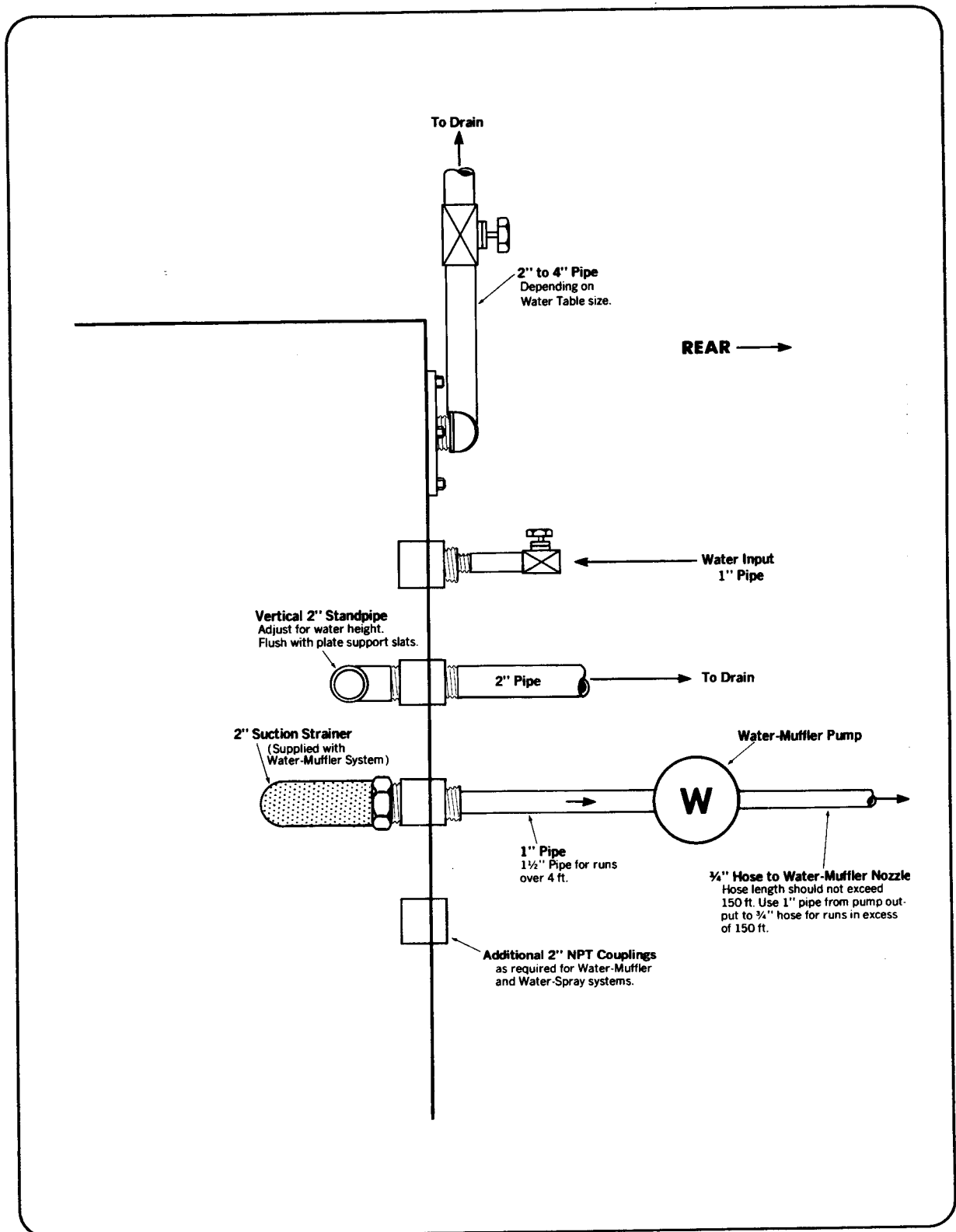


Figure 2 Plumbing Detail - Top View

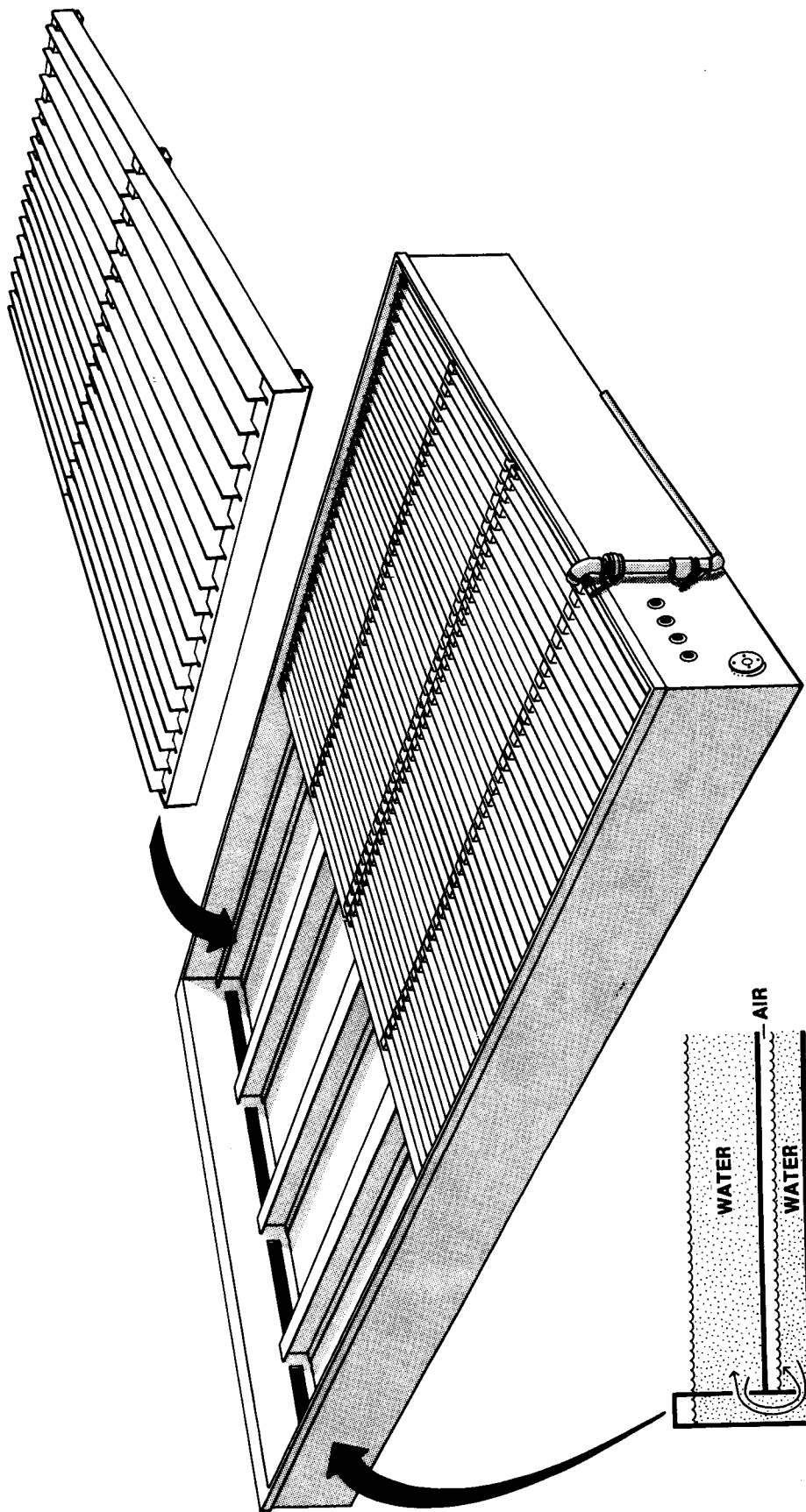


Figure 3 Water Table with Raise/Lower Feature