FIBERGLASS FUME SCRUBBER
INSTALLATION AND MAINTENANCE INSTRUCTIONS

Serial Number _____

Date Manufactured _____

Inspected By _____

HARRINGTON

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General Information

1. All parts of the scrubber equipment have been thoroughly inspected and pre-tested at the factory. Upon receipt of shipment, a complete inspection of the equipment is recommended to determine if any damage was sustained during shipment. If any parts are found to be damaged, a claim should be immediately filed against the freight carrier.
2. It is advisable to have equipment installed by personnel familiar with the installation of air handling equipment. In most cases, our sales representatives can recommend a qualified contractor.
3. Check the nameplates and tags on equipment for special instructions.
4. Scrubber should be mounted on a solid surface which completely supports the bottom of the scrubber. When the scrubber is to be mounted on a platform, the platform should be thoroughly braced. If the scrubber is roof supported, it is recommended that a structural engineer be consulted, to prevent overload of the roof structure. Consult table 1 or 2 for approximate operating weights.
5. Air temperatures at the inlet to the scrubber should never exceed 160°F, unless the scrubber has been designed for application at a higher temperature. Consult factory if unsure of operating conditions.
6. Equipment is constructed of fiberglass reinforced plastic and thermoplastic materials. Care must be taken during handling and installation to prevent damage which may be caused by external stress or shock.

TABLE 1

Approximate operating weight of HPH Series Scrubbers

MODEL NUMBER	OPERATING WEIGHT			
HPH	2	3	4	5
11-	378	438	502	569
12-	573	696	823	942
22-	639	782	924	1066
23-	931	1137	1339	1546
33-	1153	1377	1602	1827
34-	1479	1766	2054	2341
44-	1479	1911	2229	2546
45-	1594	2566	2980	3385
55-	2155	2796	3218	3631
56-	2375	3482	4004	4527
66-	2959	3724	4258	4783
67-	3185	4237	4856	5484
77-	3618	4760	5416	6071
78-	4160	5342	6072	6811
88-	4680	5786	6573	7372
89-	5032	6069	6563	7729
99-	5255	6423	7260	8076
910-	5596	7487	8510	9533
1010-	6464	7943	9028	10099
1011-	6850	9115	9028	11557

TABLE 2

Approximate operating weight of HPV Series Scrubbers

MODEL NUMBER	OPERATING WEIGHT			
HPV	2	3	4	5
11-	212	229	246	263
12-	334	362	390	418
22-	518	562	606	650
23-	667	727	787	847
33-	1138	1219	1300	1381
34-	1328	1424	1526	1628
44-	1711	1839	1967	2095
45-	2129	2283	2437	2591
55-	2611	2796	2981	3166
56-	3064	3280	3496	3712
66-	3656	3908	4160	4412
67-	4199	4487	4775	5063
77-	4677	5066	5336	5664
78-	5535	5905	6335	6645
88-	6254	6670	7086	7502
89-	7044	7506	7968	8430
99-	7525	8028	8551	9064
910-	8278	8842	9406	9970
1010-	9207	9827	10447	11067
1011-	10127	10763	11439	12115

Weights shown are approximate and are subject to change due to special construction or auxiliary equipment.

General Installation Instructions

1. Inspect packing material to determine if damage or shifting occurred during shipment. Inspection can be made by looking at packing face from scrubber inlet.
2. Inspect mist eliminator section. Vertical (HPV) unit mist eliminators are in block form which can be inspected by looking into outlet of scrubber. Horizontal (HPH) units have the mist eliminator contained in the outlet transition. Check the blades to see that they are in the appropriate grooves.
3. Check all piping for cracks or breakage.
4. Utilize nylon straps when lifting scrubbers from truck bed to final position. If lifting lugs are incorporated, use them. If there are no lifting lugs, place nylon straps around scrubber flanges for lifting. The flanges are very strong and will support the weight of the unit.
5. Larger horizontal scrubbers require the contractor or customer to install the inlet and outlet transitions. The outlet transition contains the mist eliminator and must be located on the downstream side of the scrubber. Tubes of caulking compound and a caulking gun are provided. A single ribbon of caulking material should be applied to the inlet and outlet flanges of the scrubber body. The transition is then installed to the scrubber body with the mounting hardware supplied. The above procedure is not required for the smaller horizontal scrubbers, or the vertical scrubber, as the transitions have been installed at the factory.
6. The scrubber should be thoroughly cleaned after installation. Spray the packed bed, eliminator section, scrubber body, and transitions with a hose spray nozzle, to wash all foreign material out of scrubber.

Drainage and Recirculation System Piping

1. Install 1" water supply piping and valves per figure 1. If unit was ordered with float control valve, install piping per figure 1. Check with city code concerning installation or back-flow preventor.

   NOTE: Inlet water must be continuously supplied to unit, to maintain overflow of contaminated sump water. If pH sensing unit is not utilized, overflow water should be maintained at 3% of scrubber recirculation rate. Example: Scrubber recirculation rate is 100 gallons per minute, then overflow rate is 3 gallons per minute.

   The float valve is used *only* for evaporation control. It should not be used in place of make-up control.

2. If pH control system is to be installed, refer to Chemical Feed Section of this brochure.
3. Install drainage piping to overflow and drain outlet per figure 2.
4. Check all valves to insure proper position. All spray header valves should be in the open position, with the handles in line with the flow. The drain valve should be closed, with the handle in a line across the fluid flow.

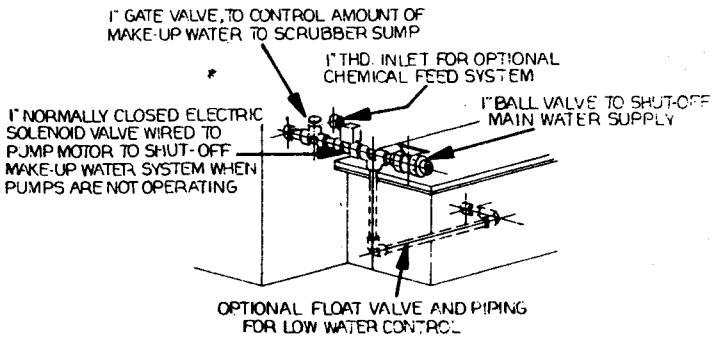


FIGURE 1 — MAKE-UP WATER PIPING

The Scrubber is supplied with these 1" threaded inlets as shown. All piping, valves, fittings, and floats are available as optional equipment.

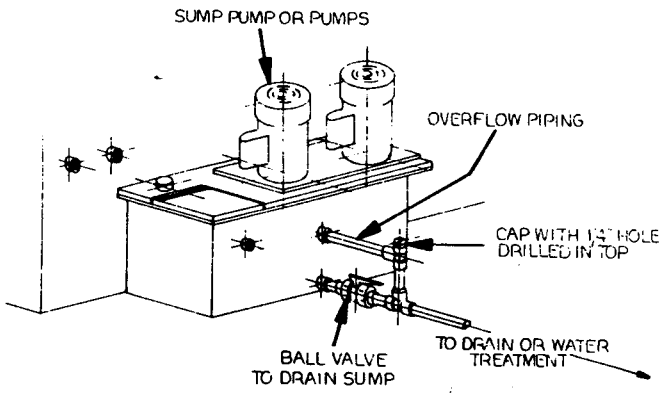


FIGURE 2 — DRAIN AND OVERFLOW PIPING

The Scrubber is supplied with a 2" threaded overflow outlet, and a 2" threaded drain outlet. All piping, valves, and fittings shown are available as optional equipment

Pumps

In most applications, sump pumps are used for recirculation. The pumps are either CPVC or 316 stainless steel. Since they have no seals, they can operate dry without harm. As a result, they are virtually maintenance free.

Pumps are selected from several manufacturers for use on air pollution control equipment. Pump maintenance instructions for the pump supplied with your unit will be attached to the unit.

WARNING: Reverse Rotation can cause severe damage! Check pump rotation before filling sump!

Motor should operate in clockwise direction when viewed from top of pump. (Label on motor also indicates proper rotation direction.)

Pump Motors — Single Phase

These units are supplied with single phase *dual* voltage motors (115/230 volts) and are always wired at the factory for the higher voltage. When changing 230 volt wiring to 115 volt wiring, follow the motor manufacturer's wiring instructions, which are found inside the motor junction box or on the motor nameplate. Be sure to wire the motor for clockwise rotation, as seen from the motor end of the pump (the fan should rotate in a clockwise direction.)

Pump Motors — Three Phase

All three phase dual voltage motors are wired for the *higher* voltage (460 Volts) at the factory. For 230 volt operation, follow the motor manufacturer's wiring instructions, which are found inside the motor junction box or on the motor nameplate.

To check motor rotation:

1. Attach leads to motor and bump start motor.
2. Inspect motor to determine rotation.
3. If motor is rotating in a clockwise rotation when looking at motor fan, rotation is correct.
4. If rotation is not correct, interchange any two leads to obtain the correct rotation.

General Maintenance Instructions

Adequate access has been engineered into the unit to create a minimum of work when cleaning or servicing is required. Reference to the exploded view drawings will help explain the parts of the units.

Some of the features of Harrington units are the same for the HPV Vertical and the HPH Horizontal Series. These are listed first, followed by separate sections, on the HPV and HPH Series.

A) Sump Filter

The filters are located between the sump box and the main unit body. They are white perforated polypropylene, with handles at the top, which slide in a track. Removal of the filter (or filters) from the unit will allow cleaning. The filters should be checked once a week.

B) View Ports

Clear PVC view ports are located in areas to allow observance of the spray nozzles. Inspect the nozzles once a week for proper spray patterns.

C) Pumps

The pump (or pumps) should rarely require maintenance because they have no seals or bearings in the fluid to wear out, and can be run dry indefinitely without harm. There are times when, due to inadvertant installation or maintenance miscalculations, removal and replacement may be required.

The pump (or pumps) are mounted on a PVC or polypropylene plate which is bolted to the sump box. The pumps are plumbed to the spray piping with unions. To remove pump:

1. Turn off electrical power to the pump at the main disconnect switch.
2. Disconnect electrical wiring from pump motor.
3. Turn off ball valve, unscrew union nut on ball valve connecting pump outlet pipe to spray header piping.
4. Remove bolts that attach pump plate to sump box.
5. Remove pump and return to factory for repair or replacement.
6. Reverse above steps to re-install pump (or pumps).
7. Be sure to reconnect wiring for proper pump rotation.

CAUTION: All electrical power to the unit should be disconnected Prior to pump removal.

Remember to turn ball valve back on.

D) Pump Motor Maintenance

Cleaning and Inspection: A CLEAN motor runs COOLER. The motor should be cleaned and inspected at regular intervals. Operating conditions involving continuous running, hot, dirty or dusty surroundings, etc., require frequent attention. Always check bearings when any unusual noise or vibration develops in motor.

Inspect bearings for roughness by removing the pump from the sump box and turning the pump impeller by hand. If the bearings feel "rough" or stick in spots replace them.

Insulation: The insulation resistance should be checked before placing motor in service after any extended storage period, and periodically thereafter expecially when in service under severe conditions encountering high humidity. Check the insulation resistance with megohm meter or similar instrument employing a 500 volt d.c. potential. Resistance should be at least 1.5 megohms; if it is less, the motor should be removed from service, cleaned, dried, re-checked, and the windings given at least two coats of high-grade insulating varnish to assure adequate winding protection.

Maintenance Instructions — HPH Horizontal Series

A) **Sump Access**

The horizontal units have an access door into the sump area. This access is also used to help when replacing packing material. The sump access is located in the inlet transition, and is a sliding panel. It *must not be opened during operation* or the door will not re-seal.

B) **Packing Access**

The top of the unit has two covers which are bolted to the main body. The larger cover has the spray headers mounted to it. Removal of the cover will allow complete access to the packed section. The system must not be in operation while this cover is being removed. Refer to the section on Spray Nozzle Removal to remove spray headers.

C) **Mist Eliminator Access**

The smaller cover bolted to the rear on the main body allows access to the mist eliminator section. The mist eliminator profiles can be removed individually by sliding them out the top of the unit. Removal should not be attempted unless absolutely necessary, because blade replacement can be difficult.

D) **Spray Nozzle Access**

The spray headers are individually removable, to aid in the servicing of the spray nozzles. The unit does not have to be shutdown to service the spray headers or nozzles. To remove spray headers:

1. Turn off ball valve supplying the spray harness.
2. Unscrew union nut on outlet side of valve to free harness piping.
3. Remove pipe straps which attach harness to packing section cover.
4. Remove harness.
5. Unscrew nozzles to remove from harness
6. Reverse above steps to re-install harness

Remember to Turn Ball Valve Back On

Do Not Overtighten Bolts or Screws, or Union Nuts on Ball Valves.

Maintenance Instructions — HPV Vertical Series

A) **Sump Access**

The vertical units have access doors into the packing area, and into the scrubber sump. The sump access is a sliding panel, riding in tracks. It *must not be opened during operation* or the door will not re-seal. This door is for access to the sump for periodic cleaning.

B) **Packing Access**

Another access door is located in the packed section area, and is either a sliding door arrangement, or a bolted flanged door. The door should not be opened or removed during unit operation. The door is for removal of the packing material, if it becomes necessary to clean the packing.

C) **Mist Eliminator Access**

Access to the mist eliminator is available by removing the top outlet transition of the unit. The transition is bolted to the main body and can be easily removed The mist eliminator is in modular form, and can be lifted out by hand. When re-installing the transition, use Silicone Rubber caulking on the flanges for proper sealing.

D) **Spray Nozzle Access**

The spray headers are individually removable, to aid in the servicing of the spray nozzles. The unit does not have to be shut-down to service the spray headers or nozzles.

To remove spray headers:

1. Turn off ball valve supplying the spray harness.
2. Unscrew union nut on outlet side of valve to free harness piping.
3. Remove bolts connecting harness flange to scrubber body.
4. Turn harness 90° and remove.
5. Unscrew nozzles to remove from harness
6. Reverse above steps to re-install spray harness

Remember to Turn Ball Valve Back On.

Do Not Overtighten Bolts, or Union Nuts on Ball Valves

Installation & Maintenance — Chemical Feed Systems (Optional)

A chemical feed system can be utilized to maintain a pre-determined pH value in the scrubber sump. The following list describes all of the parts required for a standard chemical feed system:

A. 300 Gallon Fiberglass Mixing Tank
B. Chemical Feed Pump
C. Mixer (Agitator)
D. pH Controller

A) Mixing Tank

The chemical make-up tank is 42x42x42 I.D. with 6" legs, 2" Ø FIPT Drain, 2" Ø still well, ½" sight glass, split hinge cover made of ⅜" PVC, hinge made of stainless steel, cut away for inserting mixer shaft, stainless steel angle for mounting mixer and stainless steel handle. The entire tank is made with VE 8300 Fiberglass Resin with a Nexus interior Liner. The exterior color of the tank is white. The make-up tank should be located as close as practical to the scrubber.

Sodium hydroxide

B) Chemical Feed Pump

The pump is a Model TE-MDX-MT3 magnetic drive pump, manufactured by March Mfg. Company. Maximum capacity 8.4 gallons per minute, maximum head 17 feet. The pump is powered by a 1/20 HP, 115/230 Volt, single phase, 50/60 cycle, 3500 RPM motor, rated amp draw 1.4 amps at 115 Volt, 1.1 amps at 230 volt. The motor is totally enclosed to protect against splash or drip, and is capacitor equipped. The housing, magnet well and impeller are ryton plastic. The impeller magnet is completely encapsulated in ryton plastic for maximum corrosion control.

The pump is mounted to the chemical mixing tank, and the inlet is pre-plumbed at the factory, including inlet piping and valve. The outlet plumbing, from the pump to the scrubber unit, must be supplied and installed by the customer.

C) Mixer

Mixer (Agitator) is a model C1-TE-PRP/44 with a ⅓ HP 1725 RPM, 115/230/1/60 voltage, automatic overload, ball bearing, capacitor start, fan cooled motor. A ⅝" dia. x 44" long 304 S.S. shaft with propeller is standard. The mixer comes with two clamp mounts for mounting to the vertical surface on the tank cover. The mounts are steel with corrosion resistant paint.

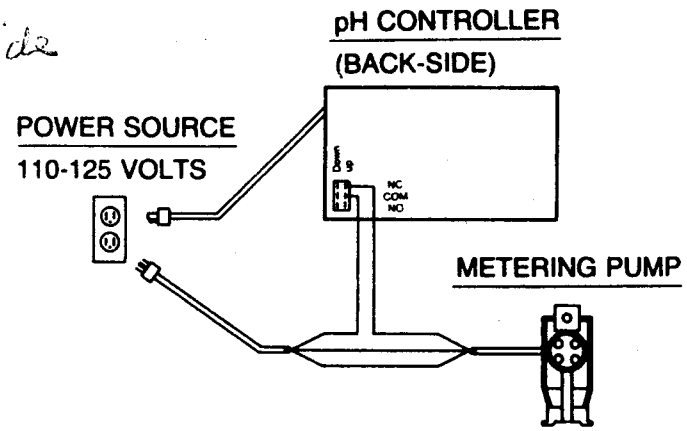
The mixer is to agitate the solution in the make-up tank. It should be operated as often as necessary to prevent the chemical from settling to the bottom of the tank.

D) pH Controller

The controller is a Model ICP75 Analytical pH controller. It has an operating range of 0-14 pH, operates on 115 volt, single phase power, and is supplied with 20 feet of lead. The control unit is mounted in a convenient location by the customer. When wired properly, the pH Controller signals the metering pump when to pump the chemical make-up from the tank to the scrubber sump.

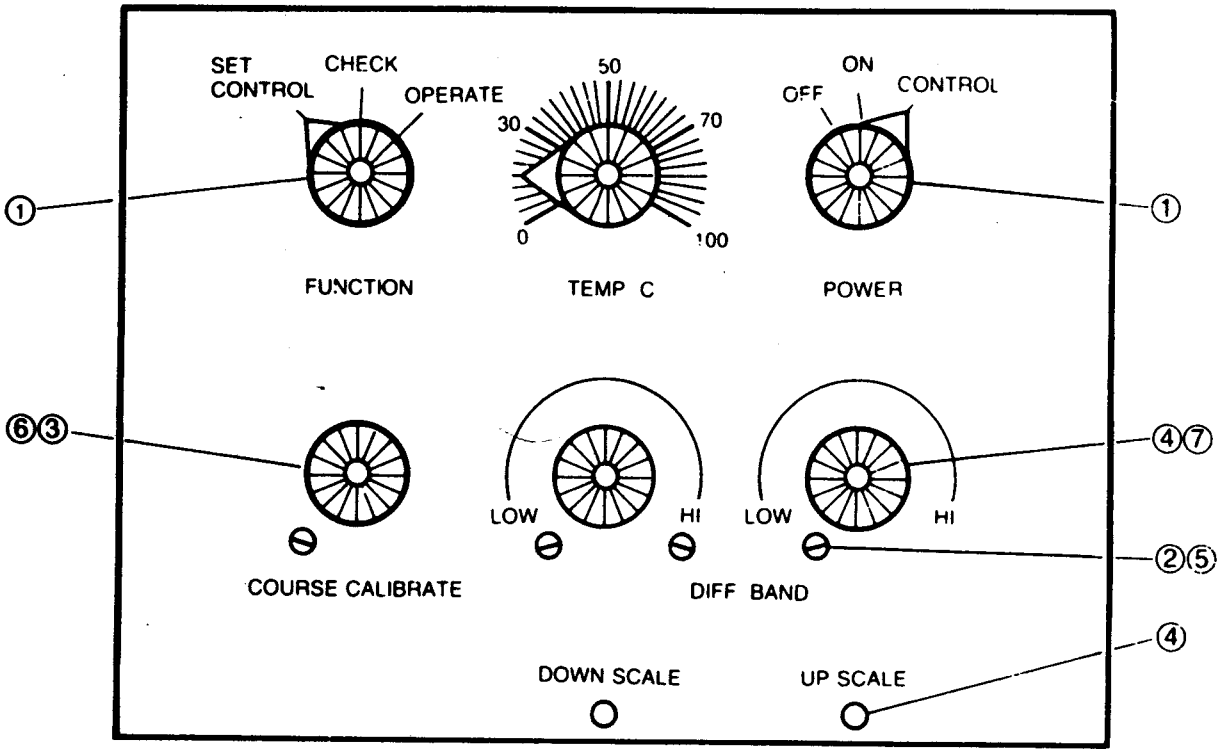
Wiring of Controller to Metering Pump

The wiring procedure for hooking up the pH controller to the metering pump is as follows:



The analytical pH controller will monitor and control the solution pH in the scrubber sump. The ideal pH in the sump is 10 to 12. When the recirculation sump pH comes down to 10 (due to an increase of acidic solutions) the pH controller signals the metering pump to pump caustic from the make-up tank to the scrubber sump. The metering pump will continue to pump until the pH controller signals it to stop when the pH reaches 12.

ANALYTICAL pH INDICATOR — CONTROLLER
Model — IC



Adjusting the Controller

Steps:

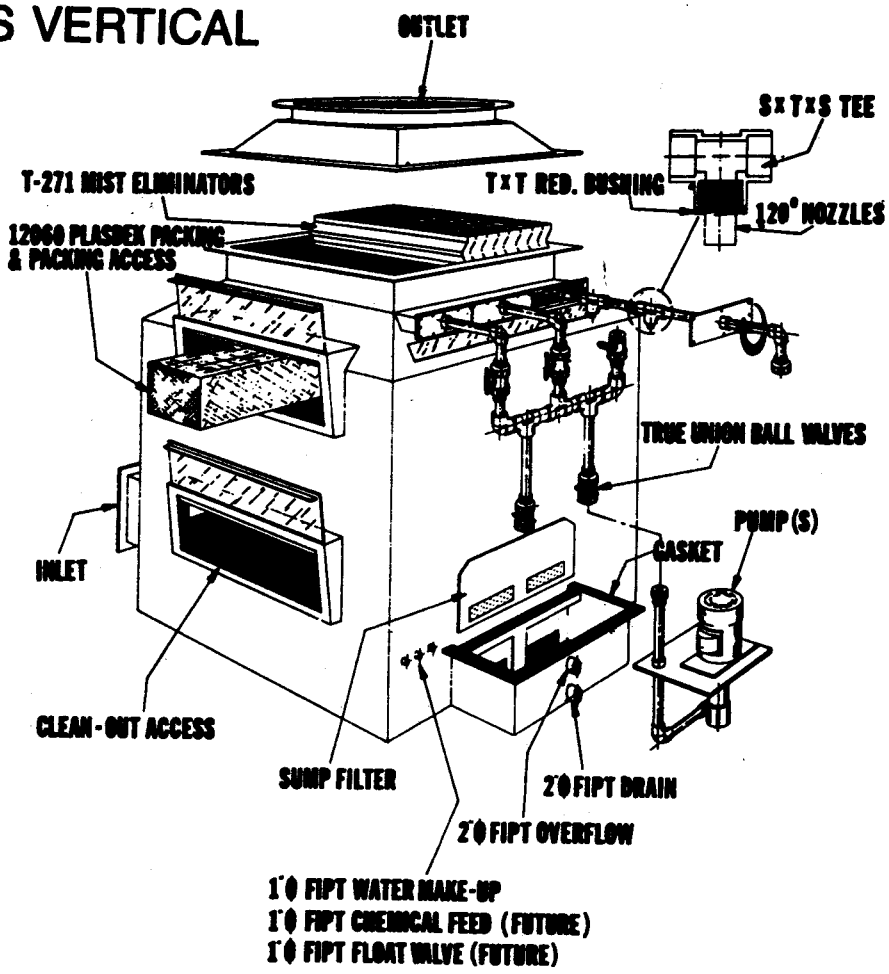
1. Turn "Power Switch" to "Control" and "Function" switch to "Set Control".
2. Set "Diff. Band" control marked "Up Scale" to minimum point (fully clockwise).
3. With recorder running, turn "Calibrate" knob until pointer indicates 12 pH.
4. Turn "Up Scale" control knob counterclockwise until indicator lamp lights.
5. Set "Up Scale Diff. Band" control counterclockwise to maximum point.
6. Turn "Calibrate" knob counterclockwise until pointer reads 10 pH.
7. Turn "Up Scale Diff. Band" control clockwise very slowly until indicator lamp goes out.

OPTIONAL ACCESSORIES

There are many optional accessories available which can be factory installed or purchased from Harrington separately for in-house installation. The following is a short summation of a few of these accessories.

1. PVC, CPVC, or Polypro pipe, fittings, valves or external plumbing.
2. Liquid flow metering or monitoring equipment and gauges.
3. pH indicators and controls.
4. PVC float valves (evaporation control).
5. Inlet gate and solenoid valves.
6. PVC or CPVC ball valves and check valves.
7. Immersion sump heaters.
8. Magnahelic gauges.
9. Air quality testing equipment.
10. PVC line strainer.
11. Remote sump tanks and pumps.
12. Inlet or outlet PVC flex collars.

HPV SERIES VERTICAL
EXPLODED VIEW



HPH SERIES HORIZONTAL
EXPLODED VIEW