

Type N RotoClone

*Hydro-Static Precipitator
Model B Arrangement "B"*

*Design 2 or 3, Size 1½ thru 6
Design 4 or 5, Size 8 thru 28*

RotoClone Size No. _____ Serial No. _____

1. Design (2) (3) (4) (5)
2. With water level control (Model SV) (Model SV with Low Water Safety Control) (Model A)
3. Wiring diagram No. _____
4. Operating Line (1) (2) (3) (4) (5)

American AirFilter™

RotoClone Type N

Arrangement B

The Type N RotoClone is a complete dust control unit. Designed to perform its various functions automatically, the RotoClone requires very little maintenance. Like any other mechanical equipment, however, it should have regular attention and be operated according to instructions to insure long life and trouble-free service.

Design 2 and 4 have the exhaustor on the clean air side of the Type N RotoClone. In the Design 3 and 5, the exhaustor is on the dirty air side and discharges into the Type N RotoClone.

See cover page for Design Number, operating line, type of water level control and wiring diagram that apply to this Type N RotoClone.

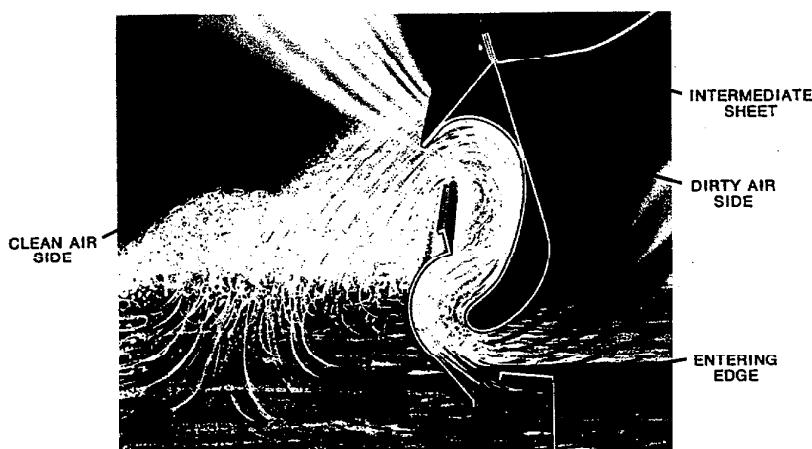


Fig. 1. Cross section of Type N RotoClone Impeller.

OPERATING PRINCIPLE

The Type N RotoClone cleans the air by the combined action of centrifugal force and a thorough intermixing of water and dust-laden air. The dust is separated from the air by means of a water curtain, created by the flow of air through a partially submerged stationary impeller (see Figure 1). Air flowing through the impeller at a high velocity conveys water with it in a very turbulent sheet. Additional water is introduced at the narrowest portion of the impeller opening through a specially designed slot in the bottom. Since there is a certain pressure drop through the impeller, the water flows upward through the slot in an attempt to reach the water level on the clean air side. This water flow upward through the slot creates increased interaction between the dust and water, thus, increased collection efficiency. Since the water flows upward in an attempt to reach the level on the clean air side of the impeller, the impeller opening can be decreased (resulting in higher pressure drop and collection efficiency) by raising the water level in the unit. This is accomplished by means of an exclusive and patented variable water level control box. The centrifugal force exerted by rapid changes in direction of air

flow causes the dust particles to penetrate the water film and become permanently trapped (Figure 1).

Any entrained moisture in the cleaned air is removed by specially designed, wide-space chevron eliminators made in removable sections for Sizes 1½ through 6 and curved entrainment baffles for Sizes 8 and larger.

The water in the reservoir is continually reused, and since the water curtain is produced by the air flow, no pumps or nozzles are required. The water level is maintained by the overflow weir in the control box as long as a small amount of fresh water is supplied through the make-up water connection or by electrical controls that automatically add water, as required, to compensate for evaporation and water lost as the collected dust is removed from the unit.

The sludge hopper is designed for generous storage of collected material and ample access and headroom provisions for manual removal of the collected dust. Screen and louvre protection against washing of suspended solids sludge from RotoClone during draining can also be provided to protect against drain plugging.

Installation Instructions

Read following instructions completely and carefully.

A. FOUNDATIONS

Foundations must be true, level and rigid enough to prevent vibration and to support the weight of the RotoClone with its maximum dust and water load given below.

| Size | Maximum Operating Wt. Lbs. (Note 1) | Normal Operating Wt. Lbs. (Note 2) | Water Capacity Gallons | Erecting Weight | |
|-------|-------------------------------------|------------------------------------|------------------------|-----------------|----------------|
| | | | | RotoClone Only | Exhauster Only |
| 1 1/2 | 2,600 | 2,200 | 90 | 1,300 | 300 |
| 2 1/2 | 2,800 | 2,400 | 90 | 1,300 | 400 |
| 4 | 4,200 | 3,700 | 140 | 1,800 | 500 |
| 6 | 5,900 | 4,800 | 220 | 2,400 | 600 |
| 8 | 8,200 | 6,700 | 295 | 3,400 | 800 |
| 12 | 11,200 | 9,000 | 440 | 4,000 | 1,300 |
| 16 | 14,000 | 11,500 | 510 | 5,000 | 2,200 |
| 20 | 17,900 | 14,200 | 730 | 5,900 | 2,200 |
| 24 | 21,900 | 17,500 | 880 | 6,800 | 3,300 |
| 28 | 24,900 | 19,800 | 1,025 | 7,900 | 4,000 |

NOTE 1: Weight based on maximum sludge capacity with a sludge weight of 100 pounds per cubic foot.

NOTE 2: Weight based on weight of water 62.4 pounds per cubic foot.

B. RotoClone ERECTION

1. Set RotoClone on foundation and adjust base until unit is level. Place spirit level on the leveling strips welded on two or more sides of the hopper. Use care in leveling in both directions as functioning of RotoClone depends on accuracy of this operation.

NOTE: This level can be checked by filling the unit with water until the level reaches the entering edge (Figure 1) of the impeller. This entering edge should be level with the water along its entire length with maximum variation of 1/8" plus or minus. (See Item A, Operating Instructions.)

2. Where headroom permits, elevation of RotoClone above floor will facilitate cleanout, especially where cleanout door Figure 2 is provided. Height of supports will vary with tote box used for collected material. One typical method of support is shown in Figure 2.

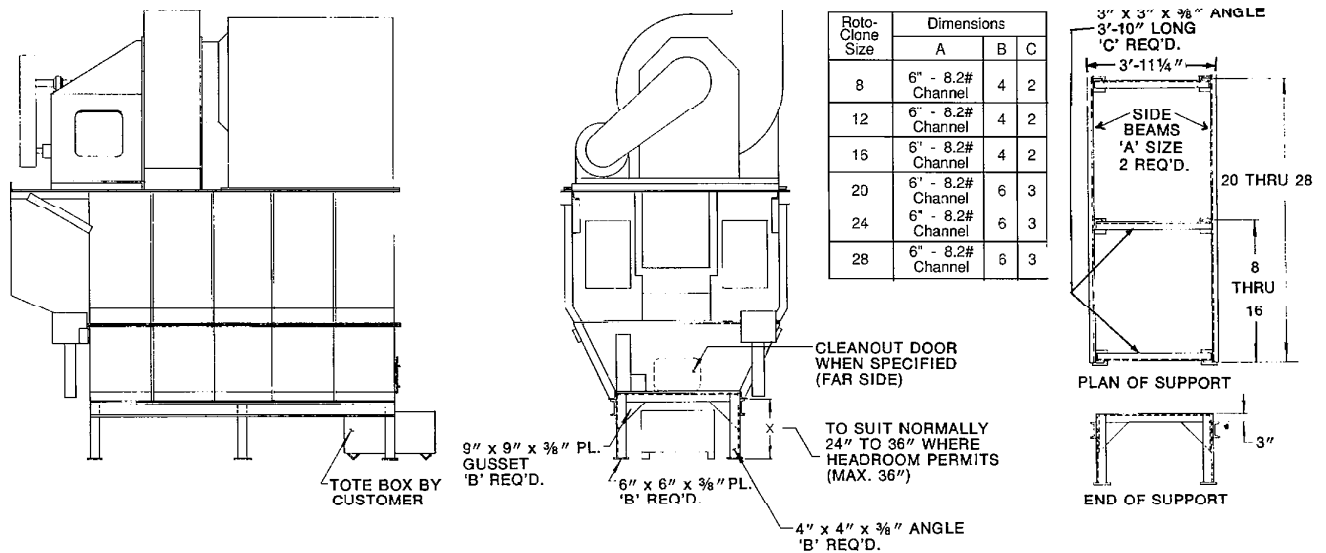


Fig. 2 Typical support to elevate Type 'N' Model 'B' RotoClone, Arrangement B.

Installation Instructions (Continued)

- For Design 2 and 3, check eliminator sections through the access door of the RotoClone. Correct location of these eliminator sections is painted on the sides of the RotoClone. For Design 4 and 5, the entrainment baffles are fixed in place as an integral part of the unit and it is not necessary to make any adjustments.
- RotoClones, size 1½ thru 6, are shipped fully assembled. Size 8 thru 28 are shipped with the transition, motor, and exhauster disassembled from the RotoClone. When shipment is in major subassemblies the gasket for the flange between the RotoClone and transition outlet and exhauster are packed in a box with the necessary bolts.

The nominal 5/8" gap between the transition piece outlet and exhauster inlet will be sealed with the three inch sealing tape which is also included in the box of bolts.

C. LUBRICATION

All bearings are ball bearings packed with grease before leaving the factory. Do not add more grease during installation. See Bearing Manufacturer for greasing instructions and schedules.

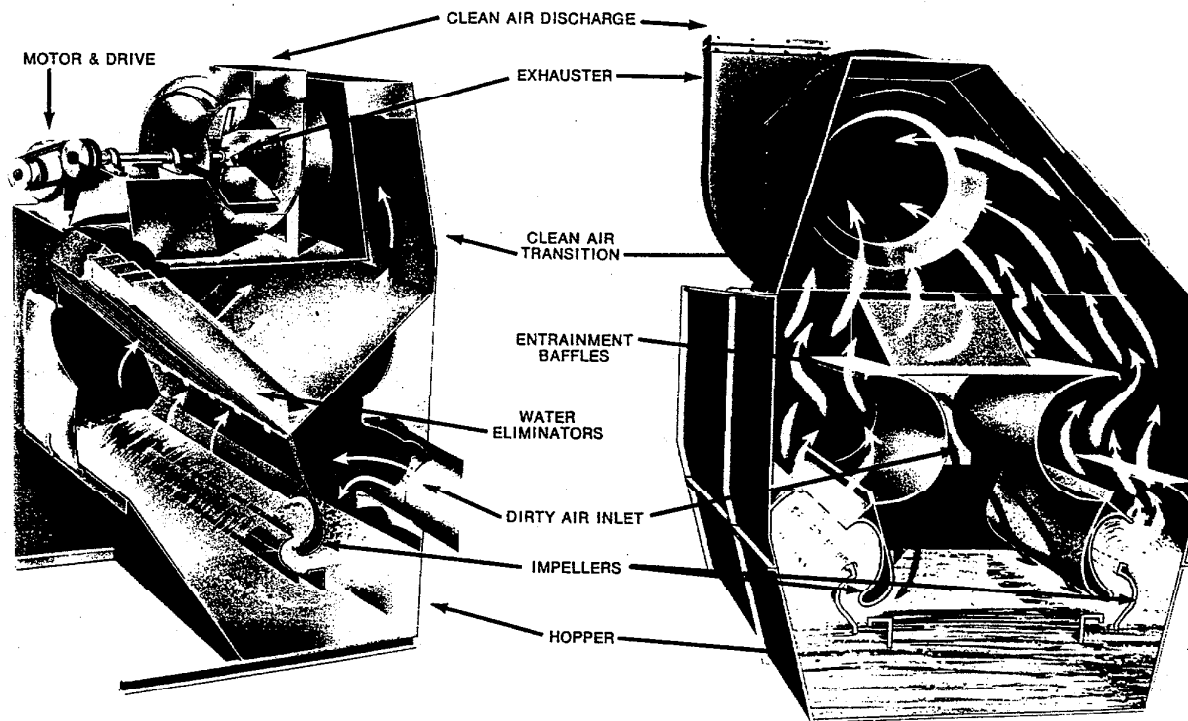


Fig. 3. Cutaway section of typical Type N RotoClone Design 2 Arrangement B size 1½ thru 6.

D. DUCT CONNECTIONS

In order to prevent surging within the RotoClone, three to four duct diameters length of straight run prior to the inlet will provide uniform distribution at the inlet. If an elbow is required due to space limitations, turning vanes must be used in the elbow to evenly distribute the air and prevent surging.

Inlet and exhaust duct must be supported from floor, wall or ceiling; **not** from RotoClone or exhauster. Depending on the application and local conditions, the discharge from the exhauster may be either returned to the workroom or discharged to the atmosphere. It may be desirable to have both outside and inside discharges fitted with a selective damper. This will save heat in the winter with recirculation and aid ventilation by discharging outside during the summer months. Where discharge duct is required, it should extend above adjacent roof lines and should discharge vertically upward. As long as there is a drain in the fan housing, a drain cap or weather hood should not be used. Cross-section of the discharge duct should not be less than the exhauster outlet area.

Fig. 4. Cutaway section of typical Type N RotoClone Design 4 Arrangement B size 8 and larger.

E. WATER SUPPLY CONNECTION

Connect a 1" line for Sizes 1½ thru 6 or a 2" line for Sizes 8 and larger at point shown on Figure 6 or 7.

F. DRAIN CONNECTION

Connect the 1½" drain line to sewer or drain at the tee connection shown in Figure 5. Connecting line to sewer should be no smaller than the drain line of the RotoClone.

G. ELECTRICAL CONNECTIONS

Electrical components of the RotoClone are the exhauster motor, motor starters, solenoid valve, and flow switch. Each connection is to be made in accordance with the appropriate wiring schematic enclosed with the RotoClone instruction packet.

1. Exhauster motor - The motor nameplate will show the connection hookup of the motor leads.

CAUTION: After connecting motor leads, insure that the exhauster rotates in the proper direction as indicated by the arrow on exhauster housing.

2. Motor starter - The exhauster motor starter may or may not be supplied by American Air Filter.

3. Solenoid valve - This valve is normally supplied in the water supply line. A solenoid valve is furnished with Sizes 1½ through 28 on the Model "SV", Model "SV" with low water safety control, and Model "A" controls.

4. Flow switch - It is an electrical interlocking protective flow switch wired in series with exhauster starter holding coil circuit. This prevents operation of RotoClone until the solenoid water valve is opened. In the event of a water supply failure, the flow switch contacts open and the RotoClone stops. This flow switch is used only on the Model "SV" water level control.

CAUTION: For some applications, such as incinerators and dryers, damage to the process or equipment would occur if the RotoClone is stopped during its operating cycle. In such cases, the flow switch should be wired to an alarm bell or signal light to indicate a water supply failure.

H. WATER LEVEL CONTROL OPTIONS

Supply water makeup for the RotoClone is required because of water losses from evaporation and that required at the overflow weir. This makeup water will maintain the proper water level in the unit by entering the RotoClone through the RotoClone/CONTROL BOX connection.

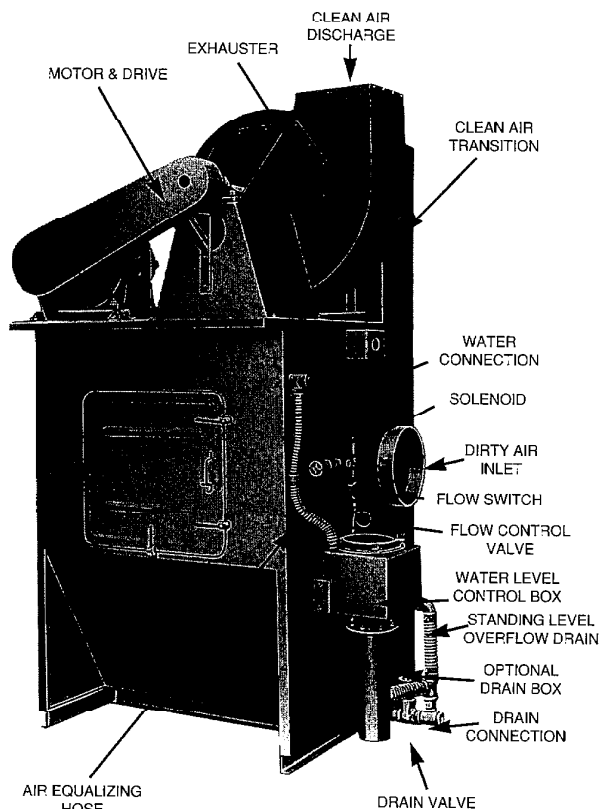


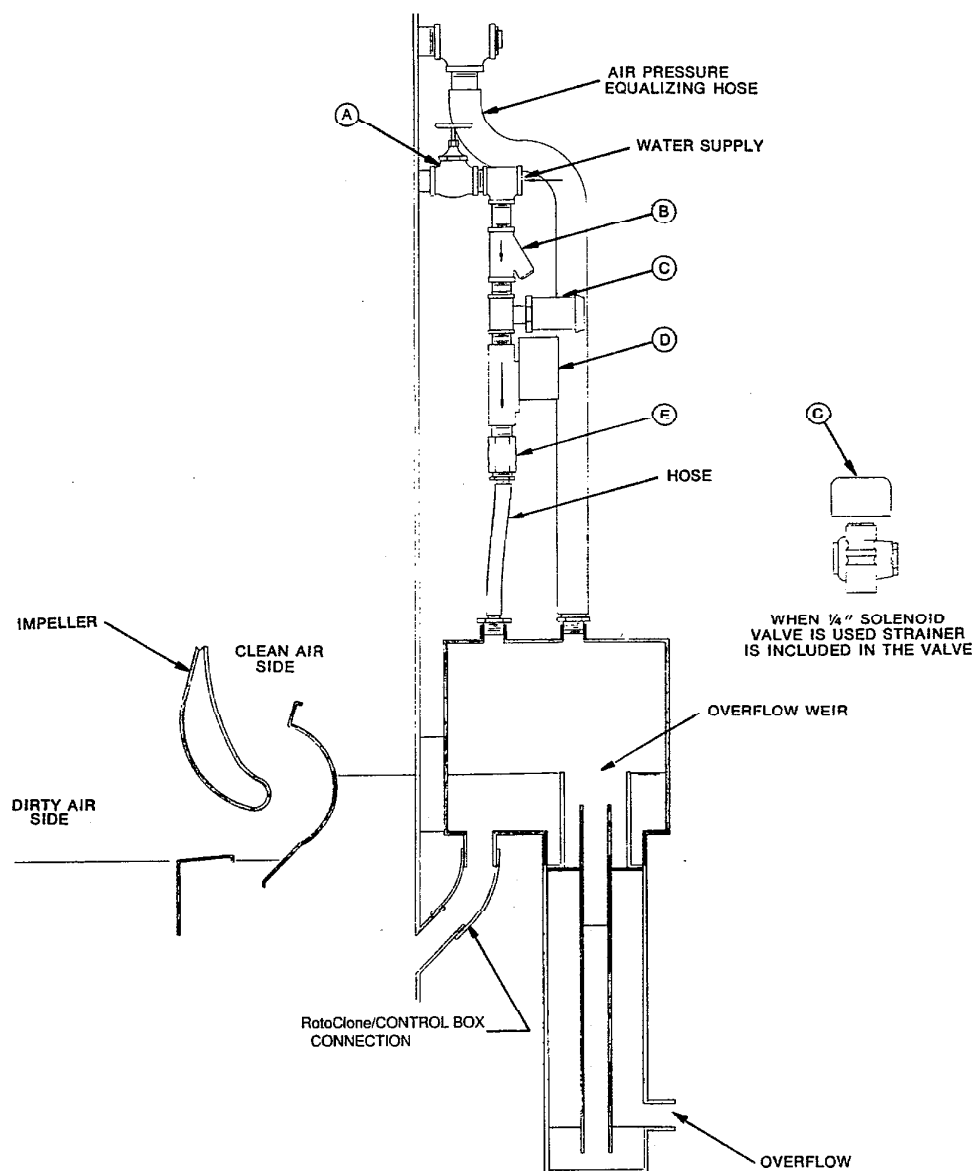
Fig. 5. Typical Type N RotoClone Design 2, Arrangement B, Size 1½ thru 6.

There are three types of water level controls available on the Type N RotoClone Arrangement B, the Model "SV", Model "SV" with low water safety control, and Model "A". Item 2, Front cover, denotes which control is applicable.

1. Model "SV" Control (Figure 6) - This is the standard water level control for the Type N RotoClone Arrangement B. It prevents operation of the RotoClone when there is insufficient water flow. It also allows a continuous water flow over the running level weir, down the drainpipe, and into the overflow. The water supply system contains a fill valve, solenoid valve, strainer, flow switch and flow control valve. As long as the solenoid valve remains open, the flow control valve will maintain a constant water flow into the control box, independent of small pressure fluctuations.

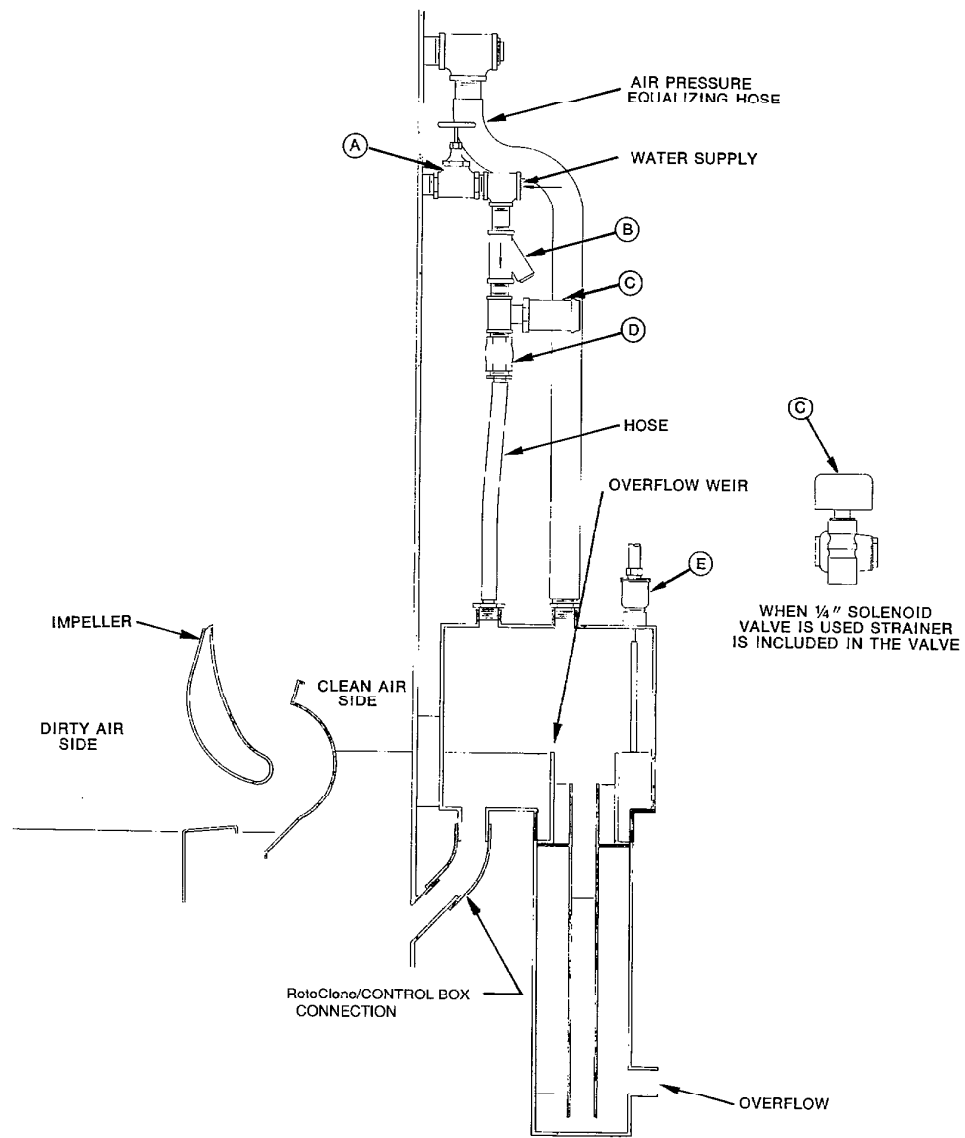
The air pressure equalizing hose is connected directly to a port in the top of the control box. This connection permits the air pressure on the clean air side of the RotoClone to equal the air pressure in the control box. Consequently, the water level on the clean air side of the RotoClone and in the control box will be the same.

Water Level Control-Box Arrangements



| | | | |
|---|----------------|---|--------------------|
| A | FILL VALVE | D | FLOW SWITCH |
| B | STRAINER | E | FLOW CONTROL VALVE |
| C | SOLENOID VALVE | | |

Fig. 6. Control Schematic, Model "SV" Water Level (Type N RotoClone, Model B).



*NOT USED ON MODEL A CONTROL

| | | | |
|---|----------------|---|---------------------|
| A | FILL VALVE | D | FLOW CONTROL VALVE* |
| B | STRAINER | E | ELECTRODE |
| C | SOLENOID VALVE | | |

Fig. 7. Control Schematic, Model "SV" With LWSC or Model "A" Water Level (Type N RotoClone, Model B).

2. Model "SV" with low water safety control - This control should be used for magnesium and other explosive dusts. In addition to the standard "SV" controls, the model contains an electrode, electrode holder, and a timing relay. It does not use the flow switch (Figure 7).

The low water safety control prevents operation of the RotoClone if the water level in the unit is too low.

The electrode and holder are installed in one of the ports on the top of the control box. This low water safety device is designed to maintain continuous contact with the water in the control box. If the water level in the control box drops below the electrode, a 3 minute timer relay activates. The water level must reach the electrode within three (3) minutes or the RotoClone fan will shut down automatically and the RotoClone operation stops.

As long as the unit operates, the solenoid remains open. When the fan stops, the solenoid valve closes and the water flow to the control box stops.

The air pressure equalizing hose is attached to a separate port on top of the control box. This keeps the air pressure on the clean air side in the RotoClone the same as in the control box. Hence, the water level in the RotoClone and the control box will be the same.

Whenever makeup water is needed in the RotoClone, the water continuously drains into the unit through the hose connection in the bottom of the water level control box.

This model gives a continuous flow of water over the control box weir.

3. Model "A" Control - This control is used when there can be no water overflow from the RotoClone. Makeup water will be added to the system only when the requirement exists. This control also prevents the RotoClone from operating when there is insufficient water level.

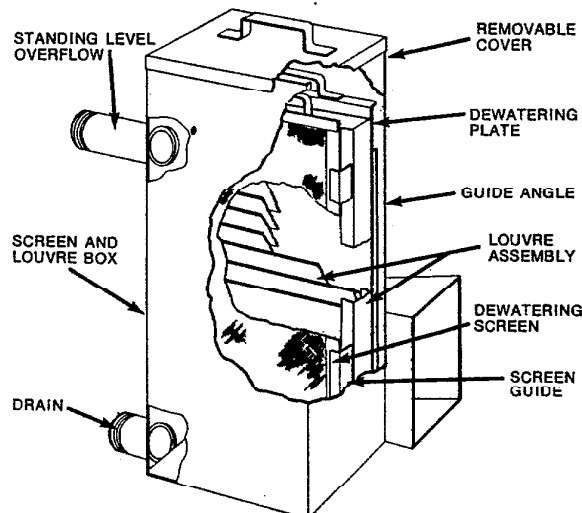


Fig. 8. Elements of Optional Drainbox.

The water supply system contains a fill valve, strainer, solenoid valve, electrode, electrode holder, and a timing relay.

The electrode and holder are installed in one of the ports on the top of the box. This low water safety device is designed to be in continuous contact with the water in the control box. When the water level drops below the electrode, the solenoid valve opens to supply the required makeup water to the system. When the control box water level is again in contact with the electrode, the solenoid valve closes and stops the makeup water flow. This prohibits a continuous water overflow at the weir.

If the water level has not reached the electrode within three (3) minutes, the timer will turn off the RotoClone exhaustor and stop the RotoClone operation.

I. FLOW CONTROL VALVE

The Model "SV" and Model "SV" with low water safety switch contain this valve in the makeup water controls (Figure 6 or 7). It will deliver a continuous water flow to the water level control box at a minimum water pressure of 10 psig. Should the flow rate not maintain the water level, report to your AAF representative who can provide a replacement.

Operating Instructions

A. TO FILL RotoClone

1. Be certain RotoClone drain valve (Figure 5) is closed.
2. Open Fill Valve (Figure 6 or 7) and add water until it reaches the standing level overflow drain (Figure 5).

For Design 3 and 5, no standing overflow can be provided so fill until water reaches a point 2"

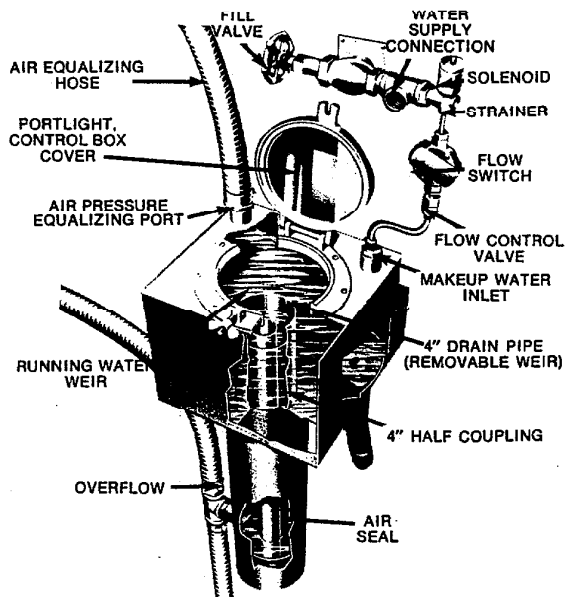


Fig. 9. Cutaway view of Standard Water Level Control Box.

below running level weir in control box. This level is marked on the outside of the control box pipe.

When filling for the first time:

- a. First bring water level to entering edge of the impeller (Figure 1) and check that RotoClone was properly leveled during erection. (See Item B-1, Installation Instructions.)
- b. Pour one gallon of water down control box drain pipe to make an air seal at the bottom of the pipe (Figure 9).
3. Close and tighten control box cover. It must be air tight or incorrect water level in RotoClone will result.

B. TO START RotoClone

1. Check control box cover and be certain cover is tight.
2. Check water supply.
3. Press start button for the RotoClone exhauster. Solenoid valve in water supply line should be interlocked to open simultaneously with fan start-up.

C. TO STOP RotoClone

1. For units without solenoid valve in the make-up water line, close lever-operated valve in the water line.
2. Press stop button for RotoClone exhauster. Solenoid valve in water supply line should be interlocked to close simultaneously with fan stoppage.

Maintenance Instructions

A. REMOVAL OF COLLECTED MATERIAL

In general, the Arrangement B RotoClone is best suited for light or moderate dust loadings such that the interval between each sludge removal is of a reasonable length. The required cleaning interval can be determined for any given RotoClone installation by using the rule shown below.

CLEANOUT INTERVAL ESTABLISHED MUST BE FREQUENT ENOUGH TO PREVENT COLLECTED MATERIAL FROM EXCEEDING A DEPTH OF 9".

The sludge depth may be checked by probing through the access door periodically during the first week of operation. At the end of the week, inspect the unit to determine the depth of sludge accumulation. Based upon this inspection, a fixed schedule should be established for regular sludge removal.

Note: Size 1½ thru 6 may be cleaned without draining.

1. To Drain RotoClone

- a. Ideally, the RotoClone should be shut down for a period of 8 to 12 hours prior to draining to allow solids to settle.
- b. Open the drain valve slowly such that flow increases gradually (see Figure 5). This will prevent a sudden rush of solids into the drain.

Initially, a small amount of the sludge layer will erode away in the vicinity of the drain. The clearer water will then flow out and tend to leave the remainder of the sludge layer intact.

If the drain is plugged, backflush the drain or manually back the sludge away from the drain in order to establish flow. Drain pluggage is an indication that the frequency of cleaning should be increased.

- c. If the dust to be collected tends to float, remain in suspension, agglomerate into lumps or otherwise resists forming a compressed sludge layer, an optional drain box may be provided (see Figure 8). The drain box is furnished with a louvre assembly, dewatering plate and screen. The louvre assembly prevents carryover of lumps that could plug the screen. The dewatering plate and screen work together to prevent fine material from entering drain lines. Should the screen plug, close the drain, remove the drain box cover, slide the screen out of the box for cleaning and replace the screen and the cover before reopening the drain.

2. To Clean RotoClone

- a. For small RotoClones, Sizes 1½ thru 6, collected material can be raked up sloping side thru main access door on clean air side. Remove water eliminator to provide necessary working area.
- b. For RotoClones, Size 8 and larger, collected material can best be removed by pushing to access door on front of RotoClone and shoveling thru this door to tote box type of sludge container. CONTAINER MUST BE WATER TIGHT TO PREVENT LEAKAGE OF WATER FROM THE SLUDGE.
- c. Sufficient headroom is provided in the RotoClone to permit workman entering unit to remove collected material. Removal from outside the RotoClone is feasible where unit is elevated and provided with cleanout door as discussed in Item B-2, Page 3. Where cleanout door is used, BE CERTAIN THAT GASKET IS CLEAN BEFORE DOOR IS CLOSED.
- d. Mud or sludge pumps are available from several manufacturers, such as Gorman-Rupp (Mansfield, Ohio), Peabody-Barnes (Mansfield, Ohio), Marlow Pumps (Midland Park, New Jersey) and Industrial Products (Chicago, Illinois), and can be used to pump the settled material into a suitable container.

3. To Maintain RotoClone

During the draining and cleaning of the RotoClone, a routine inspection and maintenance of control box, RotoClone housing, and eliminators should be made. (See Item B, Routine Maintenance, Page 10.)

4. To Fill RotoClone

RotoClone should be filled after removal of collected material. Follow instructions Item A, Operating Instructions.

Maintenance Instructions (Continued)

B. ROUTINE MAINTENANCE

To insure proper operation of the RotoClone, these procedures should be followed as a minimum. More frequent cleaning may be required for certain applications.

1. Water Level Control Box:

- a. Observe water in control box frequently. Be certain that water level is at the running level weir (Figure 9). Observe frequently through glass portlight in control box top. **DO NOT** open portlight when unit is running because air leakage will alter water level.
- b. Open portlight each week while RotoClone is stopped and remove any accumulations in the box, check air equalizing port for pluggage, check running level weir, electrode (if supplied), and drain pipe for build-up and wear (Figures 6 or 7). Clean cover glass and secure portlight, carefully tightening holddown nut.
- c. Remove strainer in water makeup line after first 24 hours of service and clean. Clean monthly thereafter. Strainer is located inside valve on 1/4" solenoid valve.

2. Eliminator Plates (Design 2 and 3):

- a. Inspect each week and remove any accumulations. Cleaning methods will vary with material collected. Hosing in place is effective for many materials. Removal of plates and scraping or washing may be necessary. After cleaning install correctly. See diagram painted on side of RotoClone.

3. RotoClone Housing:

After one month's operation, drain RotoClone and check for build-up on any surface. Check all impeller surfaces and hopper walls carefully and wash down with water hose, if required. Frequency of this operation can be extended until proper cycle for a given application has been determined.

4. Optional Drain Box:

Each time water is drained from the RotoClone, clean drain box elements after collected material has been removed from RotoClone housing.

Remove louvre, dewatering plate and screen (See Figure 8), wash or clean thoroughly, and replace.

5. Exhauster:

- a. Check exhauster for excessive vibration each month while checking V-Belt drive. Be certain exhauster is rotating in proper direction.
- b. Check exhauster wheel and housing every three months and remove any accumulation.
- c. Remove old grease from bearings every six months, replacing with medium (No. 2) grade straight mineral grease. Excessive grease will cause bearings to overheat. If too much grease

has been added, remove grease fitting and run exhauster, until excessive grease is driven from the bearing. Replace grease fitting.

6. V-Belt Drive:

- a. Check belt tension each week for the first month of operation; monthly thereafter. Loose belts reduce air flow through the RotoClone and cause excessive belt wear.

7. Replacement Parts:

- a. Parts of the Arrangement B RotoClone will not require frequent replacements and spare part stock is seldom necessary.
- b. Replacement of impeller sections will be required at prolonged intervals. Routine inspection will give ample warning of need to order these parts.

WHEN ORDERING ANY PARTS GIVE PART, NAME AND NUMBER, PART LIST NUMBER, RotoClone SIZE, TYPE AND SERIAL NUMBER.

C. CORRECTION OF POOR RotoClone OPERATION

Most difficulties that may be encountered in RotoClone operation will be discovered and corrected by one or more of the following:

1. Reduction in air flow at exhaust hoods:

- a. Reduced exhauster speed due to belt slippage.
- b. Accumulations in ducts or hoods due to sticky nature of dust or settling in ducts caused by low conveying velocities.
- c. Addition of more exhaust points to the system.
- d. During winter when doors and windows are closed, insufficient makeup air to the exhaust system will create high negative pressure in room.
- e. High water level in RotoClone can be observed through closed portlight in control box. Water level above running level weir can be caused by:
 - (1) Plugged drain line from control box.
 - (2) Open or leaky fill valve that allows water to flow into RotoClone raising the level over running level weir 1/4" or more.
 - (3) Malfunctioning solenoid valve on Model "A" control box.
- f. Plugged eliminator plates or accumulations in impellers or dirty air chamber.
- g. Plugged air equalizing hose.
- h. Air leak in control box due to portlight cover not closed tight or failure to pour water in drain pipe to provide air seal (See Item A3, Operating Instructions).

2. Reduced dust collection efficiency can be caused by:

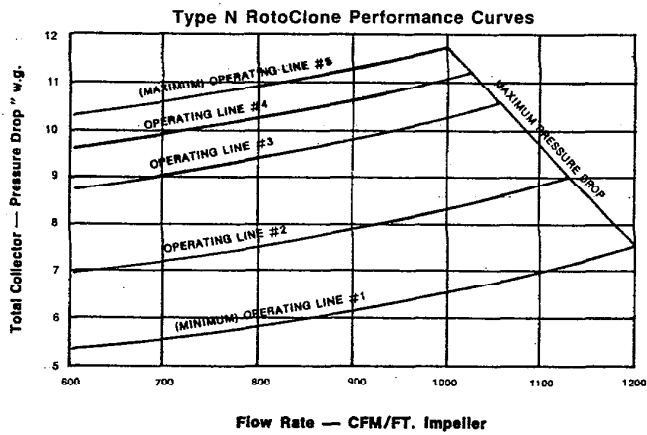
- a. Extreme reduction in air flow indicated in Item C-1, Maintenance Instructions.
- b. Corrosion or abrasion to impeller sections.
- c. Low water level in RotoClone. Can be observed through closed portlight. Water level below running level weir can be caused by:
 - (1) Open or leaky drain valve.
 - (2) Insufficient water supply due to plugged strainer in makeup water line. Prolonged periods of low water pressure can reduce water supply rate below water evaporation rate in RotoClone. Evaporation will be greatest on hot, dry days.
 - (3) Incorrect flow control valve. Contact AAF representative for replacement.
 - (4) Solenoid valve sticking in closed position.
 - (5) Accumulation on electrode in Model "SV" with low water safety control or Model "A".
 - (6) The unit out of level. (See Item B-1, Installation Instructions.)
- d. Surging of the RotoClone is a rocking of the water from end to end in the unit. This can be caused by running the unit well below its rated capacity. Contact the local AAF sales representative for assistance.
 - (1) Surging can also be caused by a duct elbow at the RotoClone inlet. Three to four duct diameters length of straight run will give an even flow at the inlet. If an elbow is required due to space limitations, turning vanes in the elbow will evenly distribute the air and eliminate surging.

3. Water entrainment in Exhauster Discharge:

- a. Rain or snow draining into exhauster housing during erection or shut down.
- b. Incorrect position of water eliminator plates in Design 2 or 3. (See Item B-2, Maintenance Instructions.)
- c. Excessive air flow through RotoClone. Overrating can be checked by measuring the pressure drop across the RotoClone. This can be done by subtracting the static pressure directly upstream of the inlet of the RotoClone from the static pressure directly downstream of the exhaust plenum. (Between the RotoClone and the exhauster on draw-thru systems.) If the pressure drop of the RotoClone exceeds the maximum allowable for the particular operating line the RotoClone was sized for (see Item 4, Front Cover for operating line selected for this unit), this usually indicates excessive air flow. The maximum allowable pressure drop for each operating line can be determined from the operating line chart in Figure 10. The maximum allowable pressure drop for a particular operating line occurs at its intersection with the "maximum pressure drop" line.

To stop entrainment caused by excessive air flow, increase static pressure or reduce exhauster speed.

- d. A plugged air equalizing hose will cause the water level control box to maintain a too high water level in the unit. Clean the hose and readjust the water level (Operating Instructions A-2).
- e. A unit out of level may cause water entrainment. (See Item B-1, Installation Instructions.)



Typical chart of Type N RotoClone pressure loss for exhaust volume variations and given operating lines. The Type N RotoClone MUST OPERATE IN ONE OF THE OPERATING LINES. RotoClone size multiplied by cfm/ft impeller gives rating in cfm.

| Operating Line | Maximum Pressure Drop In. W.G. |
|----------------|--------------------------------|
| 1 | 7.5 |
| 2 | 9.0 |
| 3 | 10.6 |
| 4 | 11.2 |
| 5 | 11.7 |

If further help is required there is an AmericanAirFilter Representative available to check the operation of your RotoClone and answer any questions concerning erection, operation, or maintenance.

SnyderGeneral
Corporation

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