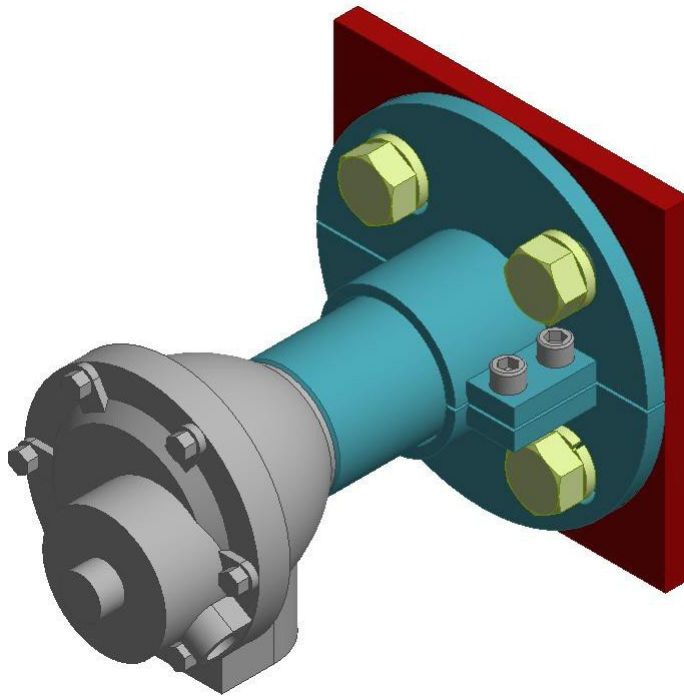




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Clean Sweep AC



Installation & Maintenance Manual

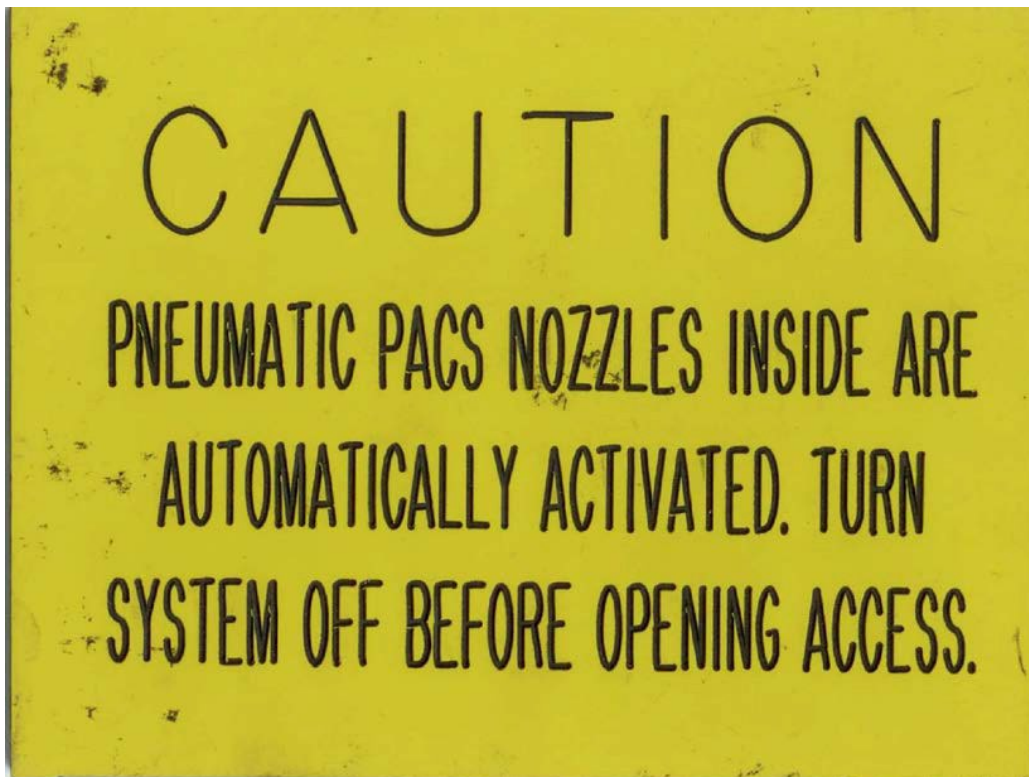
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1.0 SYSTEM PRECAUTION:

Clean Sweep operate at 80 - 100 PSI pressure. Place appropriate safety signage on all access doors where CLEAN SWEEP are installed. DO NOT inspect CLEAN SWEEP nozzles when operating. Always shut off and tag out CLEAN SWEEP prior to entering or inspecting chutes or bins where CLEAN SWEEP are installed.

CAUTION: Never visually inspect chutes when CLEAN SWEEP are firing. Always turn off and tag out CLEAN SWEEP System prior to chute inspection or entry



2.0 THEORY OF OPERATION

The Pneumatic Accumulation Control System (CLEAN SWEEP) works on the principle that compressed air can be utilized to remove buildups of wet, sticky material from the walls of bulk solids handling system chutes, bins and hoppers. Compressed air (80 to 100 psig) has been proven to exert enough energy to remove large accumulations of buildup on chute walls. CLEAN SWEEP does this without interfering with normal material handling process and operations. Loss of material flow due to pluggage is virtually eliminated in areas where CLEAN SWEEP nozzles are correctly positioned.

A standard CLEAN SWEEP System consists of properly positioned CLEAN SWEEP nozzles, air operated solenoids, compressed air reservoir tank, high pressure hose/fittings and controls (Figure #1). A blast of compressed air is delivered sequentially to each nozzle through a quick-opening/quick-closing air operated diaphragm valve. Each nozzle directs compressed air in a 360° pattern along the surface of the chutework for a radial distance of approximately two to three feet. The air blast dislodges and breaks up a layer of material buildup, which is then carried away by gravity or other material flowing through the chute or bin.

All CLEAN SWEEP valve bodies are mounted flush to a chute/bin surface with (only) the hardened steel valve nozzle head extending into the material stream. When activated, the valve nozzle head extends into the material stream (approximately 1/8"). A blast of high pressure air is directed along the chute or bin wall and up to a 3' radius is cleaned. The valve nozzle head then retracts back to its original position through spring loading. The system will continue to cycle through all nozzles until the buildup is removed (adjustable depending on material conditions).

A complete CLEAN SWEEP System includes the following:

- **Nozzle Assembly** - Includes limited travel hardened steel nozzles with high pressure hose, hose fittings, solenoid valves, pilot actuators, flanged clamp brackets, mounting (weld) plates with mounting bolts,.
- **Tank Air Supply Assembly** - Includes 30 – 60 gallon ASME certified accumulator tank with pressure gauge, auto tank drain, pressure switch and moisture trap.
- **Control System Assembly** - Includes NEMA 4X control panel with timer card(s), panel switches and indicator lights for automatic and manual operation.

3.0 INSTALLATION

If your CLEAN SWEEP System will NOT be installed by Benetech personnel, or you have chosen to expand the CLEAN SWEEP System yourself, installing/expanding your CLEAN SWEEP System can be completed per the following instructions:

A. CLEAN SWEEP Installation

1. Determining where to locate CLEAN SWEEP nozzles:
CLEAN SWEEP nozzles should be located at the area where material first starts to build up. From this initial point, additional CLEAN SWEEP should be installed in an upward direction throughout the pluggage areas. Typical areas are; dog legs, in Clean Sweep zones, bin to hopper transition, hopper corners, slide areas, hopper ledges, corner transitions, in Clean Sweep points, chute discharge etc. Nozzles are typically located approximately 3' apart. It is recommended that personnel responsible for clearing and cleaning pluggage be consulted to determine area of initial buildup.
2. After nozzle locations have been selected (technical assistance provided by your Benetech sales or service representative is recommended), a 3" diameter hole is cut through the chute or hopper wall and lining. If the chute or hopper wall contains two (2) or more linings and there is a gap between liners, it is recommended that the gaps be filled in. CLEAN SWEEP nozzles have been installed successfully in a variety of chute and hopper wall materials including; ceramics, stainless steel and chromium carbide.
3. The square "mounting plate" (Item 1 Figure 3) is welded to the outside of the chute or hopper wall. The 3" diameter hole in the "mounting plate" and the hole in the chute or hopper wall **MUST** line up.
4. Bolt the flanged "clamp bracket" (Item 2 Figure 3) to the mounting plate, use only two (2) bolts (finger tight) at this time.
5. Tighten the set screw located in the "clamp bracket" this will spread the clamp apart to accept the valve body (Item 8 Figure 3).
6. Insert the "valve body" assembly (Item 3 Figure 3) into the "clamp bracket" until the outer edge of the valve body is flush with the internal wall surface. Loosen the set screw. Tighten both 3/8" hex head bolts (approximately 50 ft./lb.) to hold the valve body assembly in place. **NOTE: Limited travel hardened steel nozzles are pre-set, do not adjust valve stem nut.**
7. Tighten the set screw.

8. Install the two (2) remaining bolts into the “mounting plate” and tighten all bolts.
9. Install a 1½” all-thread nipple and air operated diaphragm valve (See Figure 2) to the back of valve body.

NOTE: Use Teflon thread sealant on all pipe fittings.

10. Install ¼” MNPT x ¼” tube 90° elbow into air operated diaphragm valve.
11. Locate the 6-gang pilot valve solenoid box(s) in an area so that the length of ¼” poly tubing from the valve box to the solenoids does not exceed five feet. All tubing from the pilot box to solenoids should be (approximately) the same length (±1-2’). If this cannot be accomplished, additional pilot valve solenoid boxes should be installed.
12. Connect ¼” poly tubing from ¼” tube fitting in air operated diaphragm valve to the 6-gang pilot valve solenoid box.
13. Locate the air accumulator tank in a suitable area (not more than 100’ from tank to CLEAN SWEEP) that minimizes piping material and manpower. Install supply air to the tank. Install 1½” pipe from the tank to the CLEAN SWEEP area(s). NOTE: if a suitable sized accumulator tank is **not** being used, (e.g.: small air compressor) insure that a pressure switch is placed in the CLEAN SWEEP air supply line set at 60 PSI. Pressure below this set point will deactivate CLEAN SWEEP system.
14. Connect 1½” high pressure fitting and hose from air operated diaphragm valve to CLEAN SWEEP air header. It is recommended that shut off valves be installed between the air header and CLEAN SWEEP nozzles. (Reference installation pictures)
15. Mount control panel, connect 120 volt, 60 Hertz, 15 amp, single phase (Figure 1 & Figure 7). Install conduit and wire from the control panel to the pilot valve solenoid box(s)
16. Place Caution and Warning signs on all access doors where CLEAN SWEEP are installed.

4.0 OPERATIONS

A. OVERVIEW

The system is designed to maintain material flow through hoppers, bins, or chutes using a sequential timing device to alternately fire each CLEAN SWEEP nozzle.

The system can be interlocked with a “run permissive” to ensure that the system will only operate during times when material is present.

A selector switch allows the user to select two (2) modes of operational service; “TIMED” and “CONTINUOUS”. During normal conditions the system can be operated in the “TIMED” mode. In this mode nozzles fire as usual but take “breaks” between timing cycles. This mode saves air and provides the longest nozzle service life. If material is abnormally wet or sticky, place the selector switch in the “CONTINUOUS” mode. In this position, nozzles fire at the same frequency as “TIMED” but without “breaks” between cycles.

A “Clean Out” pushbutton switch activates all nozzles for one or more (programmable) cleaning cycles regardless of whether the run permissive is made or not.

B. ADJUSTMENTS

The digital timer boards located inside the control panel activate the CLEAN SWEEP nozzles in a preset sequence and interval to insure even clearing of material. The firing order is usually from the discharge (lowest unit) of the chute or hopper to the top.

There are six (6) adjustments that should be made prior to putting the CLEAN SWEEP System into operation. They are defined as follows (See Section 8, Goyen Sequential Timer for additional information):

ON Time:	The duration of electric pulse sent to operate nozzle.
OFF Time:	The length of interval between the operation of individual nozzles.
Number of Valves:	The number of outputs actually being used on the timer board.
Number of OFF's:	The number of complete firing cycles when the clean-out is used.
Rest Time:	The time the nozzles will be inactive when the system is in "TIMED" mode.
Run Time:	The time the nozzles will be active when the system is in "TIMED" mode.

The first four (4) adjustments are made on the timer board. Press the select button on the timer board. Then press the adjust button to change the value. The last adjustments are made on the timer relay.

Step 1: Press select button on timer board. An LED will light next to “ON Time”. This time is generally set to 35 to 45 milliseconds. The nozzles should give a rapid “pop” when adjusted properly (importance of ¼” tubing lengths not exceeding 5’ and all approximately the same length.

Step 2: Press select until LED lights next to “OFF Time”. The time is set in seconds, typically 20 to 30 seconds. The time setting will vary depending on number of nozzles in service, air demand, etc. The time should be set as long as reasonable.

Step 3: Press select until LED lights next to #valves. Press adjust button for number of nozzles used on this timer board.

Step 4: Press select until LED lights “#OFF’s”. This is usually set at 1 or 2.

There are four settings on the Crouzel OLR1 timer located inside the control panel.

Step 5: (1) Set the top setting on 0-60 minutes.
(2) Set the second dial “On Time” so that all the nozzles fire at least one time whenever the system is in the “Timed” mode.
Note: The rest time should be set as long as practical. This reduces excess air usage and prevents premature nozzle failure.

Step 6:

(3) Adjust the third (lower) thumbwheel on the timer relay to 0-60 seconds for length of active time when in “TIMED” mode.

(4) Adjust the fourth timer to three to four minutes. This is the amount of time the system will be at rest between cycles

5.0 MAINTENANCE

A. TROUBLESHOOTING GUIDE

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>REMEDY</u>
System does not operate in any mode	No power to controls Low air pressure Timer Board Faulty	Circuit Breaker Increase air pressure Replace timer board
System only operates in clean-out mode	Auto run permissive not made	Verify that equipment is running Check permissive contact
Nozzles will not fire in TIMED mode only	Cycle is in 'Pause' time Timer Relay fault	Wait for 'Pause' time to end Replace timer relay
Nozzle(s) will not stop blowing	Solenoid pilot stuck open Solenoid diaphragm broke or material lodged in it Tubing from pilot to solenoid leaking Output bad on timer board	Repair or replace pilot valve Repair or replace solenoid diaphragm Repair ¼" poly tubing Move to spare output or replace timer board
Nozzle(s) do not clear material build-up	Valve body not adjusted to proper depth Valve head worn or missing Solenoid valve or pilot valve not working No 120 Volt signal from timer board ¼ pilot tube to long	Refer to installation guide Repair or replace Repair or replace Move to spare output timer board or replace board Relocate pilot box to shorten tube

NOTE: For maintenance purposes, isolation valves should be installed on the individual CLEAN SWEEP nozzles. This will allow for one or more nozzles to be removed for repair without taking the entire system out of service.

CAUTION: *Never visually inspect chutes when CLEAN SWEEP are firing. Always turn off and tag out CLEAN SWEEP System prior to chute inspection or entry.*

B. CLEAN SWEEP NOZZLE REPLACEMENT

NOTE: Before performing maintenance and/or adjustment, electrical power and compressed air supply must be turned off and supply header must be drained of pressure. Follow appropriate lock and tag procedures

Remove CLEAN SWEEP valve body in reverse order of installation. Install new CLEAN SWEEP valve body per installation instructions.

Adjust the body to achieve the proper adjustment of the valve to the chute or wall surface by measuring the distance from the internal wall surface to the outer portion of the clamp flange that holds the main body. Insert the main body into the clamp flange the measured amount. If this is done correctly, the valve head should extend 0.125 inches past the internal chute or hopper wall. See Figure 4.



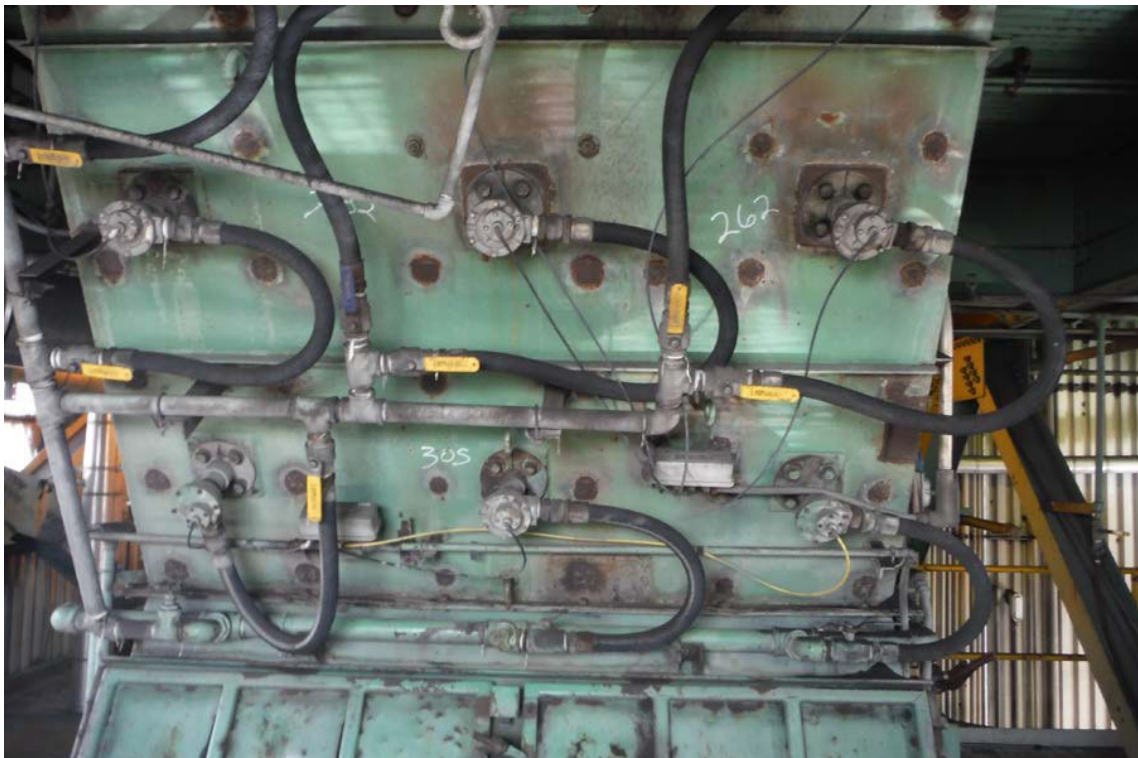
Note air supply piping installation with block valves



CLEAN SWEEP Installed in Chute to Remove/prevent
Pluggage

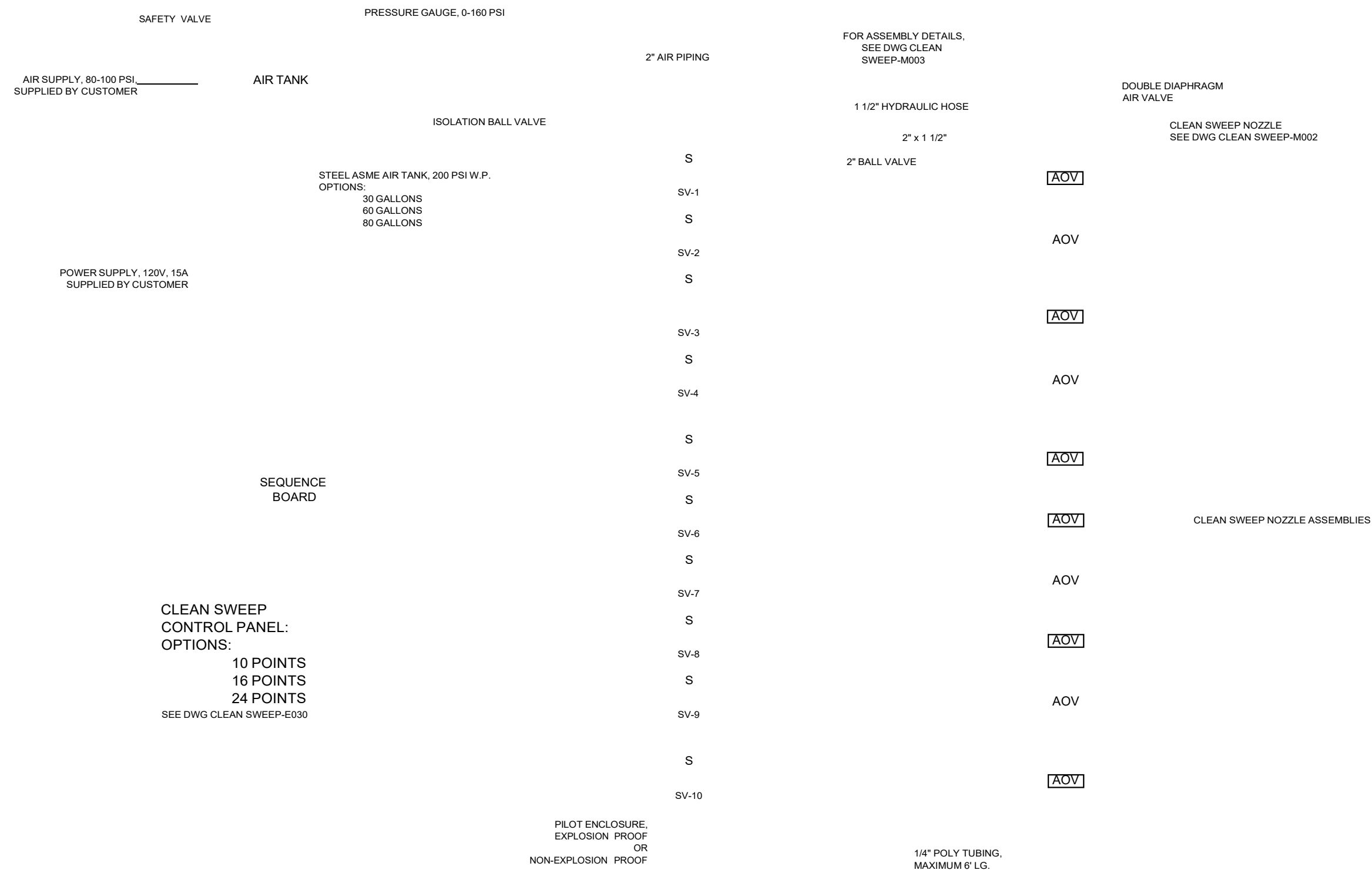


Pilot Valve Box Location and 1/4" Tube



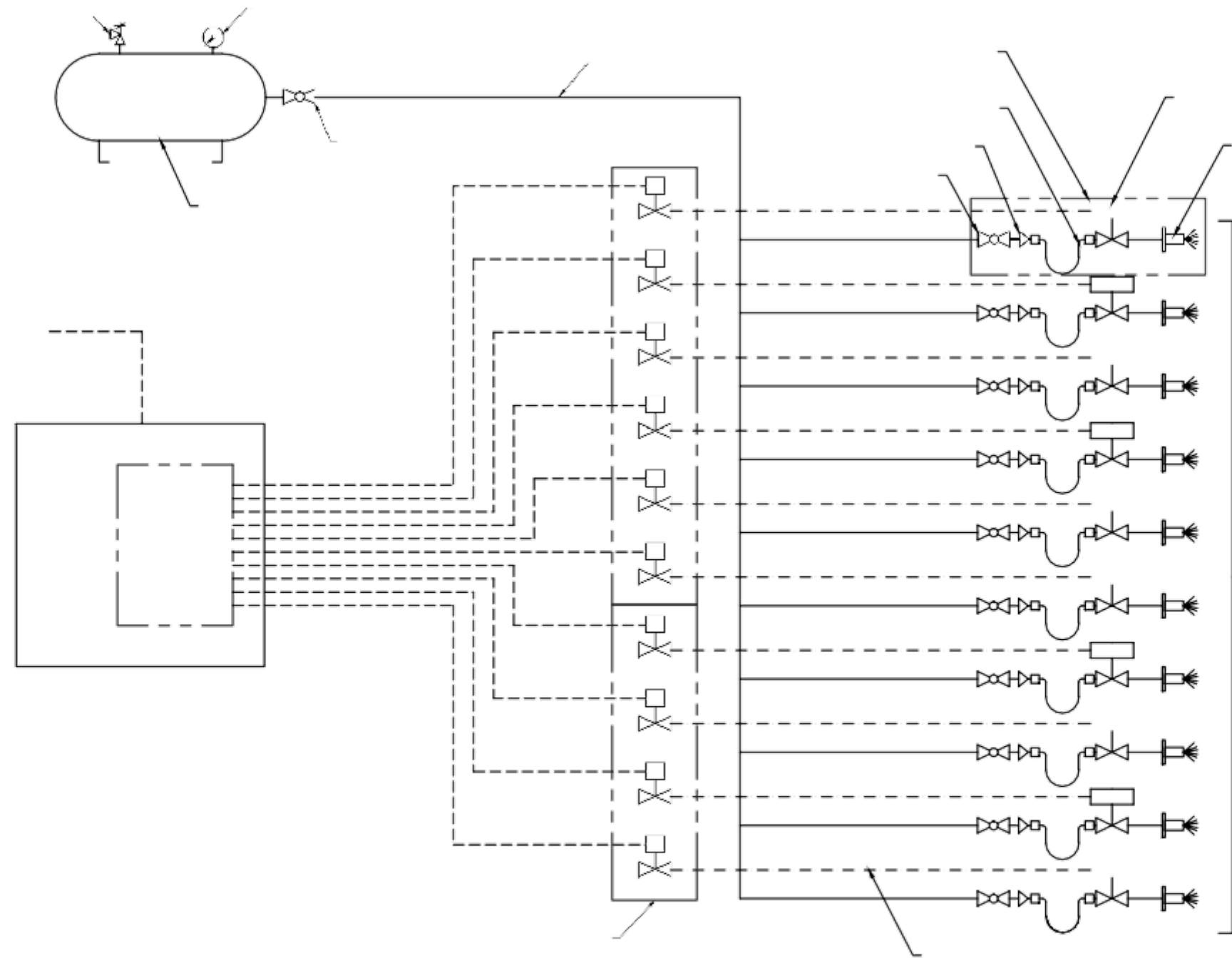


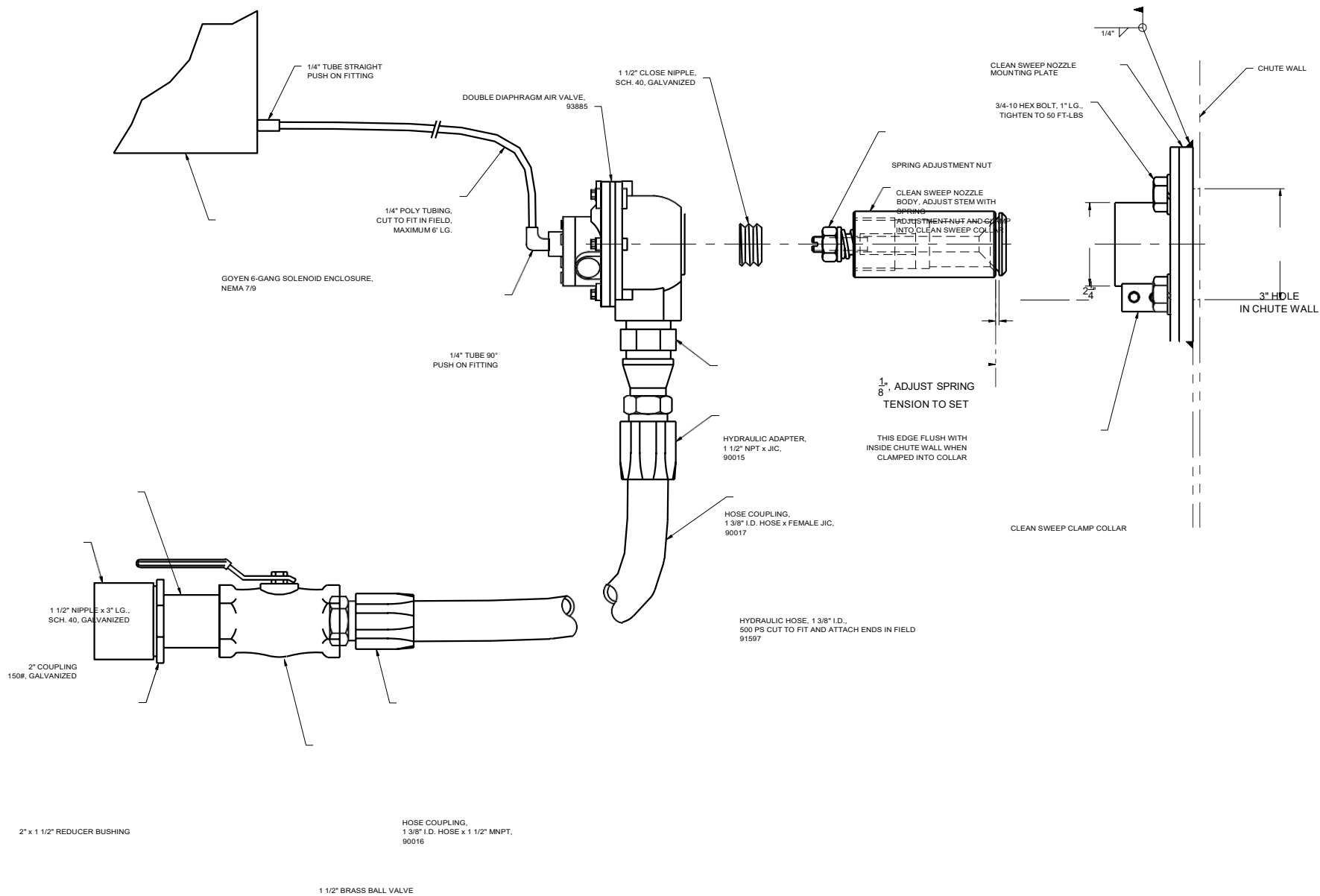
CLEAN SWEEP Installed in Hopper Discharge: Note location of pilot box



BASIC CLEAN SWEEP SYSTEM
DIAGRAM FOR REFERENCE
ONLY!

FIGURE A1





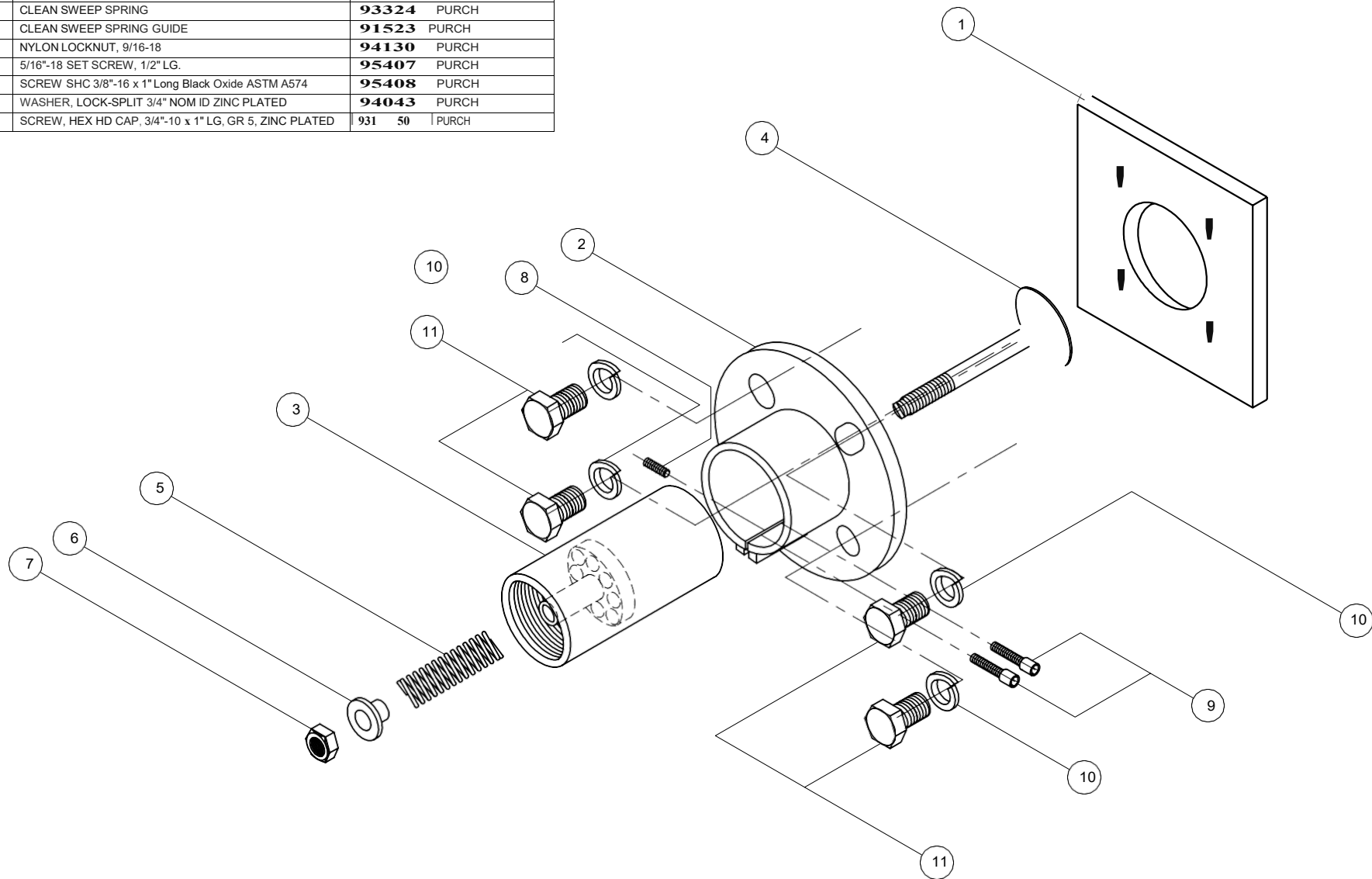
CLEAN SWEEP NOZZLE ASSEMBLY

DETAILS

FOR CLEAN SWEEP NOZZLE EXPLODED VIEW AND BILL OF MATERIAL, SEE DWG
CLEAN SWEEP-M002

FIGURE A2

BILL OF MATERIAL				
GM R 8;0		DESCRIPTION	MANUFACTURER	MODEL NUMBER
			OR EQUIVALENT	
1	1	CLEAN SWEEP MOUNTING PLATE	92590	PURCH
2	1	CLEAN SWEEP CLAMP COLLAR	90629	PURCH
3	1	CLEAN SWEEP MAIN NOZZLE BODY w/VALVE GUIDE	90269	PURCH
4	1	CLEAN SWEEP VALVE STEM	93346	PURCH
5	1	CLEAN SWEEP SPRING	93324	PURCH
6	1	CLEAN SWEEP SPRING GUIDE	91523	PURCH
7	1	NYLON LOCKNUT, 9/16-18	94130	PURCH
8	1	5/16"-18 SET SCREW, 1/2" LG.	95407	PURCH
9	2	SCREW SHC 3/8"-16 x 1" Long Black Oxide ASTM A574	95408	PURCH
10	4	WASHER, LOCK-SPLIT 3/4" NOM ID ZINC PLATED	94043	PURCH
11	4	SCREW, HEX HD CAP, 3/4"-10 x 1" LG, GR 5, ZINC PLATED	931 50	PURCH



CLEAN SWEEP NOZZLE EXPLODED
VIEW

BILL OF MATERIAL				
ITEM NO.	NO. REQ'D	DESCRIPTION	MANUFACTURER	MODEL NUMBER OR EQUIVALENT
1	1	ENCLOSURE, SINGLE DOOR, NEMA 4, 24" x 24" x 8" DP.	91187	PURCH
2	1	BACK PANEL	90851	PURCH
3	1	PANEL LABEL 3" x 3", BLACK LETTERS ON WHITE	BENETECH	N/A
4	4	PANEL LABEL 1" x 3", BLACK LETTERS ON WHITE	BENETECH	N/A
5	1	PILOT LIGHT, RED INCANDESCENT	91888	PURCH
6	1	PILOT LIGHT, AMBER INCANDESCENT	91889	PURCH
7	1	3 POSITION SELECTOR SWITCH	93472	PURCH
8	1	PUSHBUTTON, MOMENTARY	93463	PURCH
9	2	SHALLOW BLOCKS	90247	PURCH
10	1	CIRCUIT BREAKER, 1 POLE, 15A	90525	PURCH
11	9	TERMINAL BLOCKS	93610	PURCH
12	1	DIGITAL TIMER BOARD	95678	PURCH
13	1	8 PIN SOCKET FOR TIMER	93654	PURCH
14	1	REPEAT CYCLE TIMER	93653	PURCH

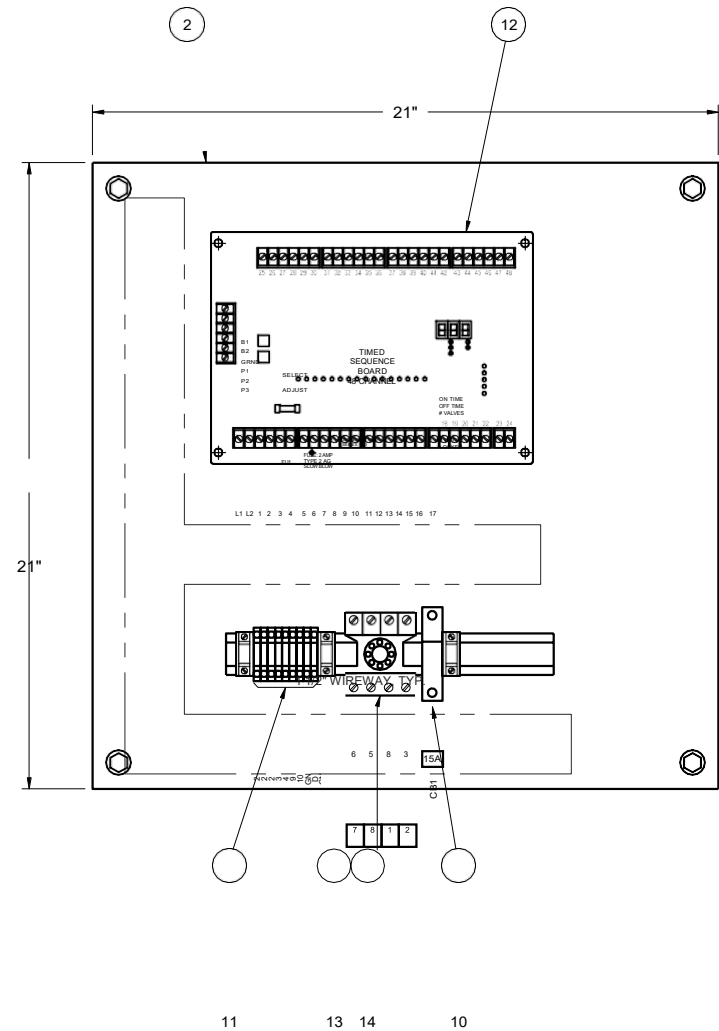
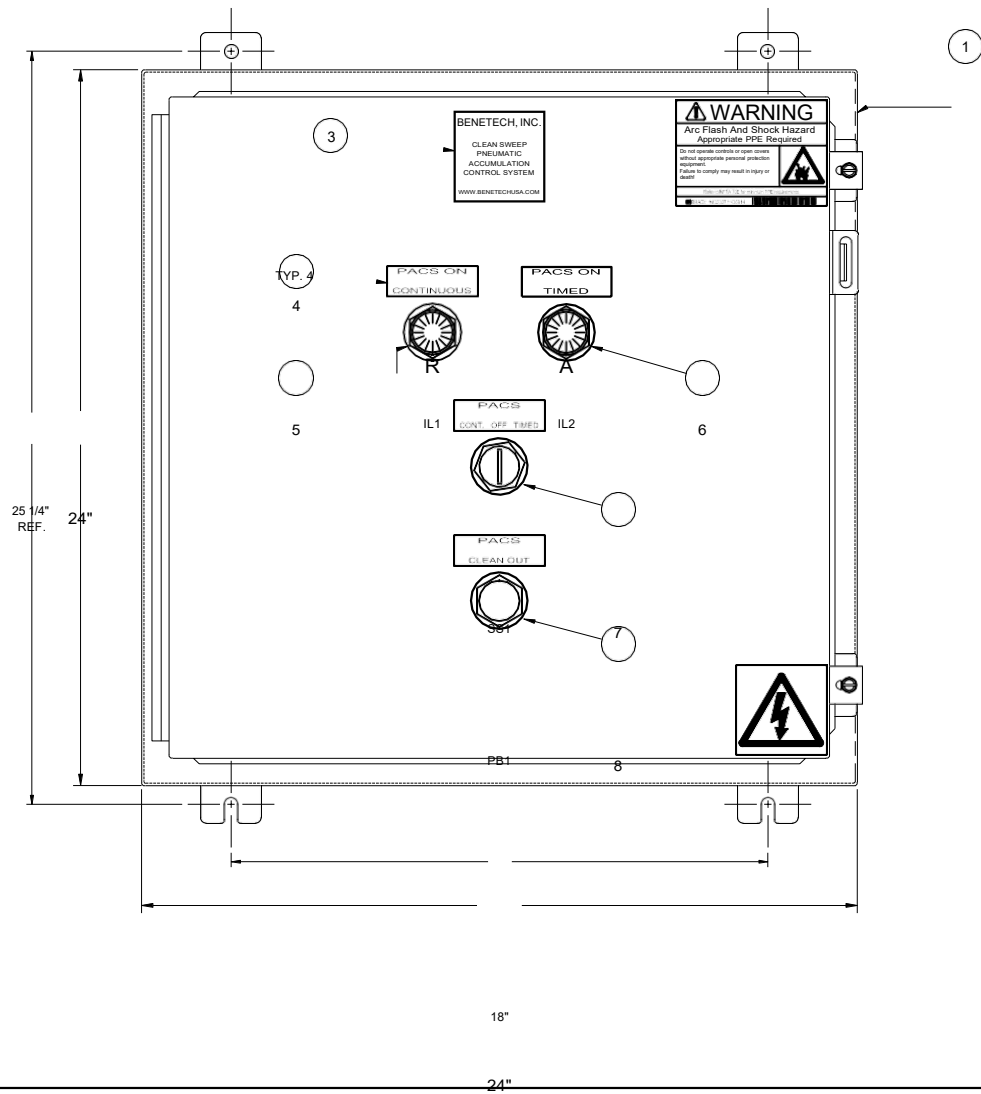


FIGURE A4