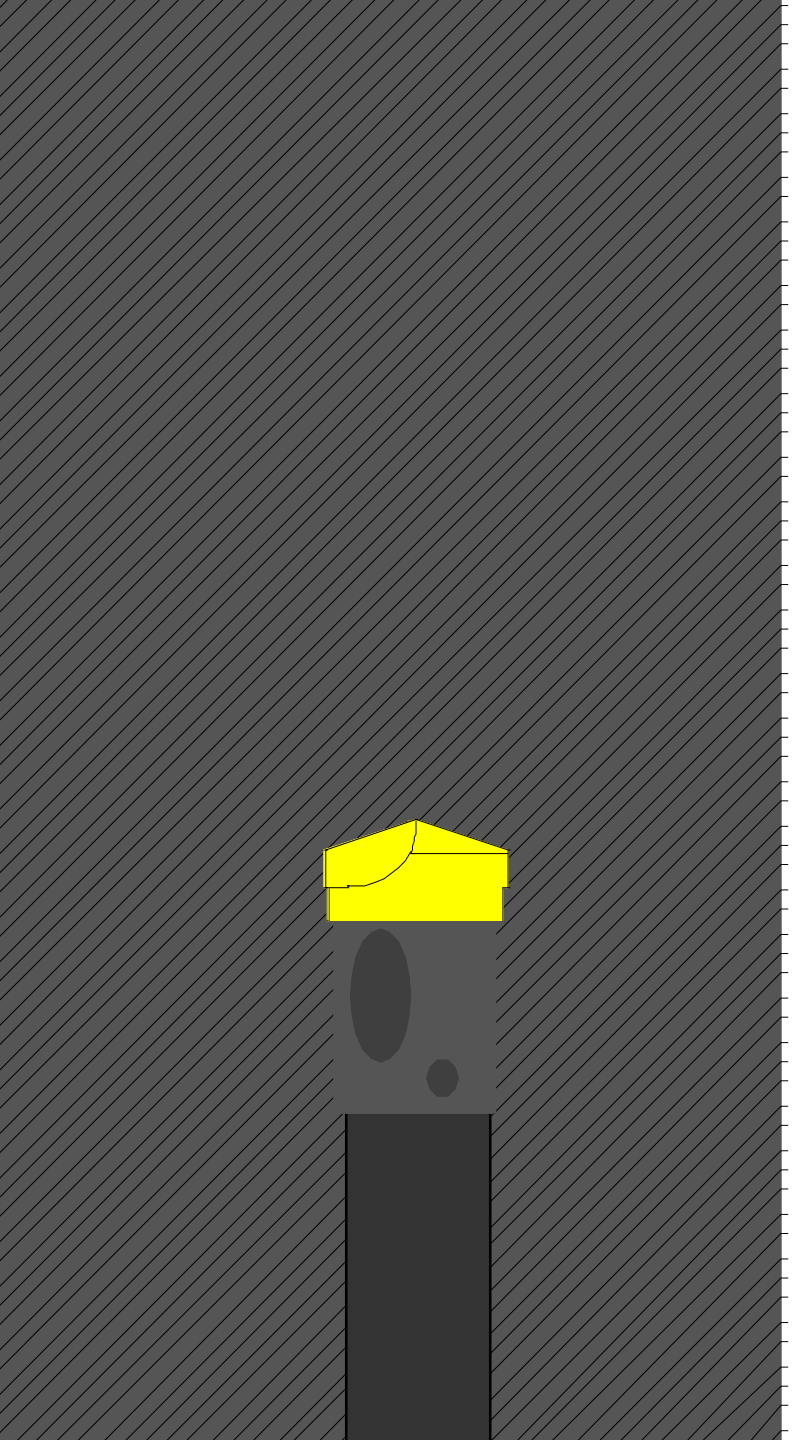
J.H. Fletcher & Co.

Dry Dust Suppression System

Importance of Dust Suppression System

Fletcher® MINING EQUIPMENT



Drilling Rate

- Drilling cannot occur any faster than the rate at which cuttings are removed from the hole.
- Shark bits make big chunks.
- Proper drill feed package valve adjustment
- Don't over thrust and grind cuttings into fine dust.
- Feedback drilling control

Fletcher® MINING EQUIPMENT

Health (MSHA)

The Dust Suppression System must be designed, manufactured and maintained to limit the machine operator's exposure to harmful dust.

Approval Requirements for Dust Suppression System

MSHA Standard 30 CFR 33.9

Title 30 Code of Federal Regulations

Parts 1-199 Mineral Resources
Department of Labor
Mine Safety and Health Administration

30 CFR § 33.9

Certification of dust-collecting systems.

Manufacturers of dust-collecting systems that are designed for integral use on machines with drilling equipment may apply to MSHA to issue a certificate of performance for such systems. To qualify for a certificate of performance, the dust-collecting system shall have met satisfactorily the test requirements of Subpart C under specified operating conditions, such as type of drilling equipment, drilling speed, and power requirements and the construction thereof shall be adequately covered by specifications and drawings officially recorded and filed with MSHA. Individual parts of dust-collecting systems will not be certified for performance. Certificates of performance may be cited to fabricators of combination units as evidence that further inspection and testing of the dust-collecting system will not be required, provided the dust-collecting requirements of the drilling equipment do not exceed the limits of performance for which the system was certified. Since MSHA does not sanction the use of the words "permissible" or "approved" except as applying to completely assembled equipment, dust-collecting systems, which have been certified only as to performance, shall not be advertised or labeled in a manner inferring that such systems themselves are permissible or approved by MSHA. However, a certified system may be advertised as suitable for use on combination units for which certification may be desired if the limits of its performance are cited. Certified dust-collecting systems shall bear labels or tags which shall contain the following: "Performance-tested Dust Collecting, System, MSHA File No. P/T_____," and name of manufacturer, identifying numbers of the dust-collector parts, and description of the limitations for which performance is certified. MSHA will assign a P/T file number in the certification letter.

Approval Requirements – Certification Plate

A Dust Suppression System Approval Plate must be installed on the machine.

Provides:

Approval Number

Minimum Blower Vacuum Relief Valve Setting

Tags on Dust Tank

PN: 359538

PN: 359126

PN: 359539

⚠ NOTICE

J.H. FLETCHER & CO.: DUST COLLECTION SYSTEM

1. SHUT THE MACHINE OFF.
2. OPEN THE DUST BOX DOOR.

NOTE: IF MACHINE IS EQUIPPED WITH DUST BAG, REVIEW PROCEDURES IN OPERATOR'S MANUAL FOR ADDITIONAL INFORMATION.

3. LOOK AT THE DUST FILTER (DO NOT ATEMPT TO CLEAN THE FILTER, AS THIS FILTER WILL CONTAIN A HIGH CONCENTRATION OF RESPIRABLE DUST).
4. IF THE DUST FILTER IS EXTREMELY CLOGGED, HAVE MAINTENANCE REPLACE THE FILTER WITH A NEW ONE. IF YOU ARE CHANGING THE FILTER, WEAR APPROPRIATE PPE PROCTECTION.
5. PULL OUT THE HEAVIER DUST "FINES" WHICH HAVE GATHERED AT BOTTOM OF THE BOX. REMOVE THE FINES BY GRABBING THE TRAY AND PULLING OUT THE DUST "FINES".
6. WHEN YOU ARE REMOVING THE DUST, MAKE SURE YOU STAND ON THE SIDE OR END THAT IS PUSHING FRESH AIR AGAINST YOUR BACK SO THAT THE DUST "FINES" THAT COME OUT ARE BLOWN AWAY FROM YOU.
7. REPLACE THE TRAY IN THE TANK.

NOTE: TRAY NOT SUPPLIED IF DUST BAGS ARE USED.

8. USE A TOWEL/RAG TO REMOVE DUST FROM AROUND THE GASKET ON THE DOOR.
9. CHECK COMPLETE SYSTEM FOR LEAKS OR RESTRICTIONS.
10. SECURE THE DOOR.

SEE SERVICE AND PARTS MANUALS FOR INFORMATION ON THIS SYSTEM.

USE ONLY J. H. FLETCHER & CO. REPLACEMENT PARTS TO MAINTAIN MSHA DUST SYSTEM APPROVAL (30CFR PART 33).

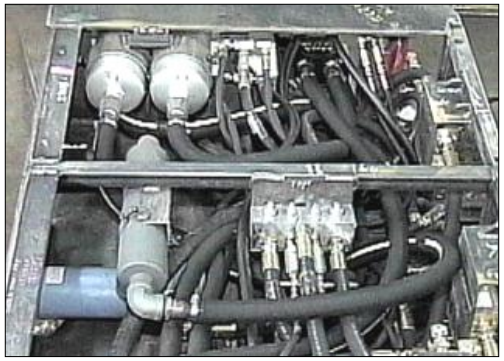
FLETCHER ®

PART NO. 359126

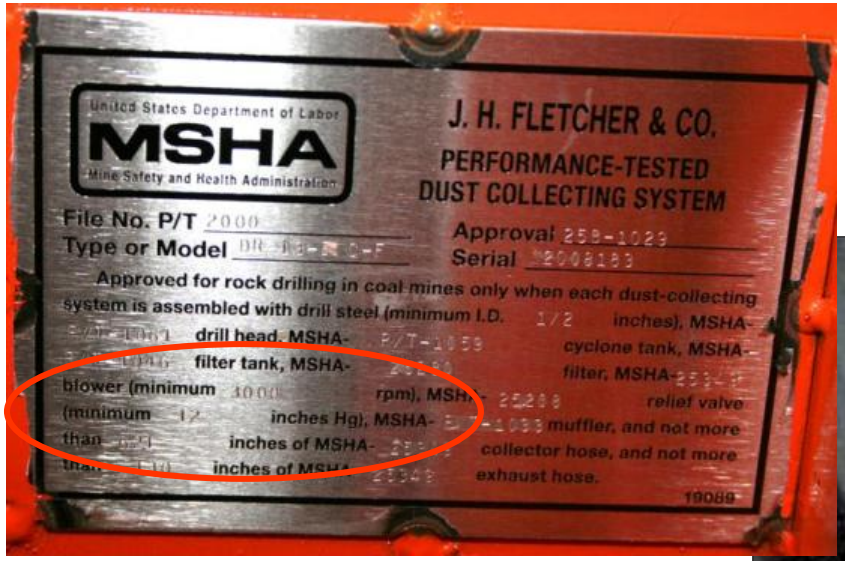
Follow Proper Procedures When Disposing of Dust Collection Bag

Dust Approval Requirements:
Components

All components must meet Dust Suppression System Approval specifications.

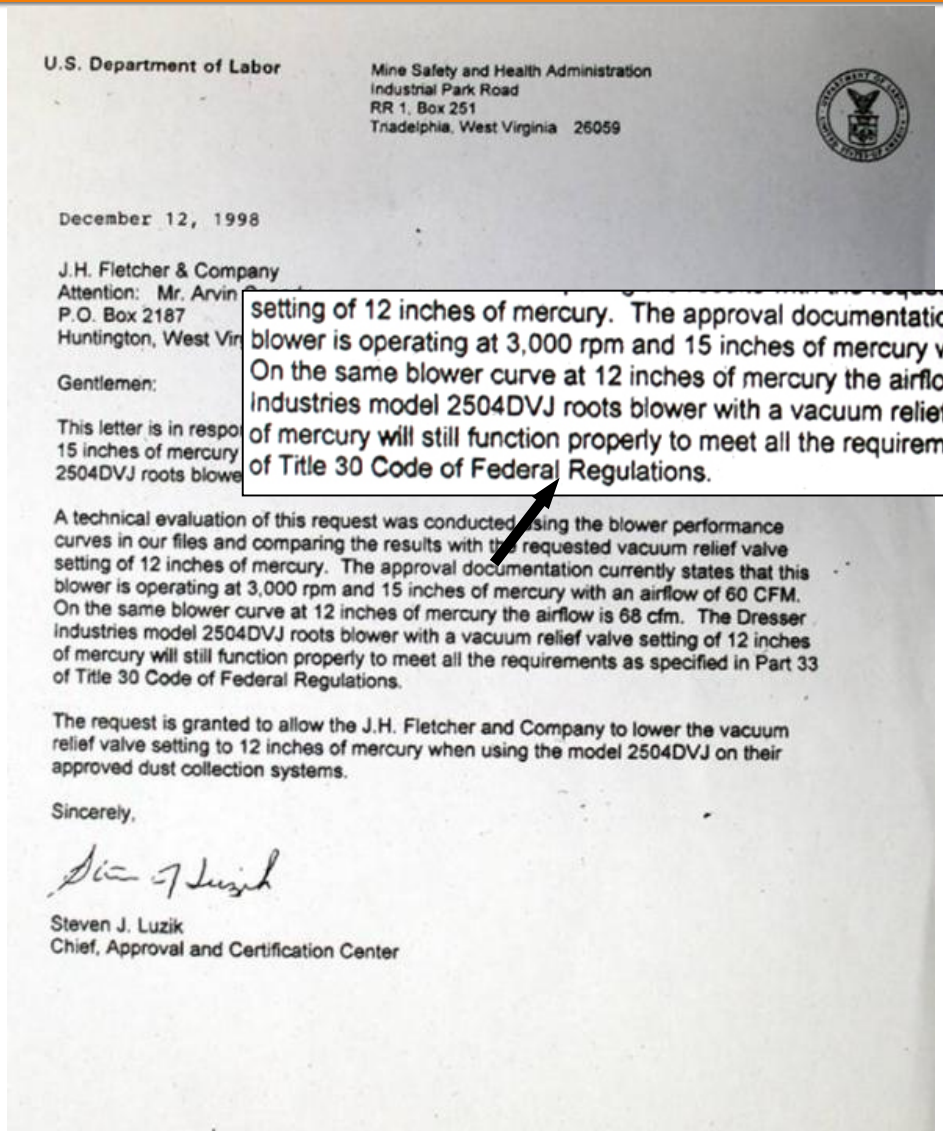


Dust Approval Requirements:
Minimum Blow Vacuum Relief Valve Setting



The Blower Vacuum Relief Valve Setting must meet Approval Requirements.

Dresser Industries Model 2504DVJ Blower



U.S. Department of Labor

Mine Safety and Health Administration
Industrial Park Road
RR 1, Box 251
Triadelphia, West Virginia 26059

December 12, 1998

J.H. Fletcher & Company
Attention: Mr. Arvin
P.O. Box 2187
Huntington, West Vir

Gentlemen:

This letter is in respo
15 inches of mercury
2504DVJ roots blowe

A technical evaluation of this request was conducted using the blower performance curves in our files and comparing the results with the requested vacuum relief valve setting of 12 inches of mercury. The approval documentation currently states that this blower is operating at 3,000 rpm and 15 inches of mercury with an airflow of 60 CFM. On the same blower curve at 12 inches of mercury the airflow is 68 cfm. The Dresser Industries model 2504DVJ roots blower with a vacuum relief valve setting of 12 inches of mercury will still function properly to meet all the requirements as specified in Part 33 of Title 30 Code of Federal Regulations.

The request is granted to allow the J.H. Fletcher and Company to lower the vacuum relief valve setting to 12 inches of mercury when using the model 2504DVJ on their approved dust collection systems.

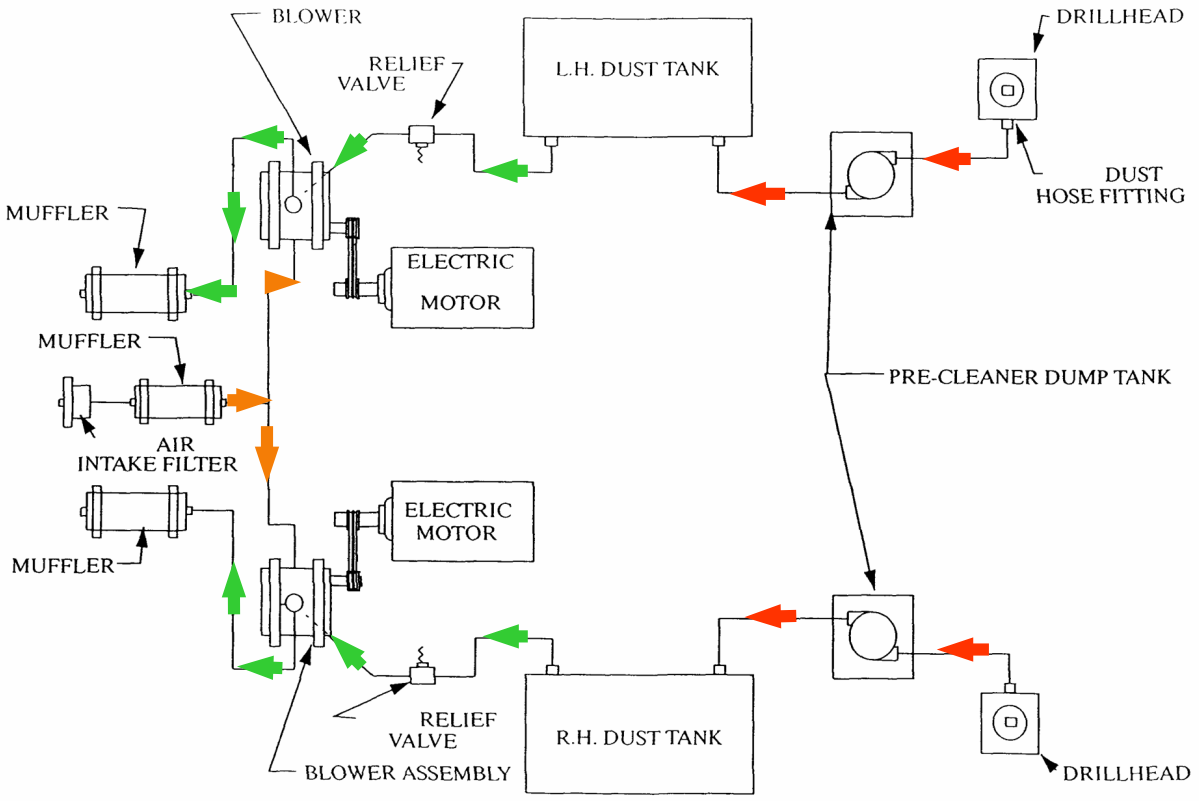
Sincerely,

Steven J. Luzik
Chief, Approval and Certification Center

setting of 12 inches of mercury. The approval documentation currently states that this blower is operating at 3,000 rpm and 15 inches of mercury with an airflow of 60 CFM. On the same blower curve at 12 inches of mercury the airflow is 68 cfm. The Dresser Industries model 2504DVJ roots blower with a vacuum relief valve setting of 12 inches of mercury will still function properly to meet all the requirements as specified in Part 33 of Title 30 Code of Federal Regulations.

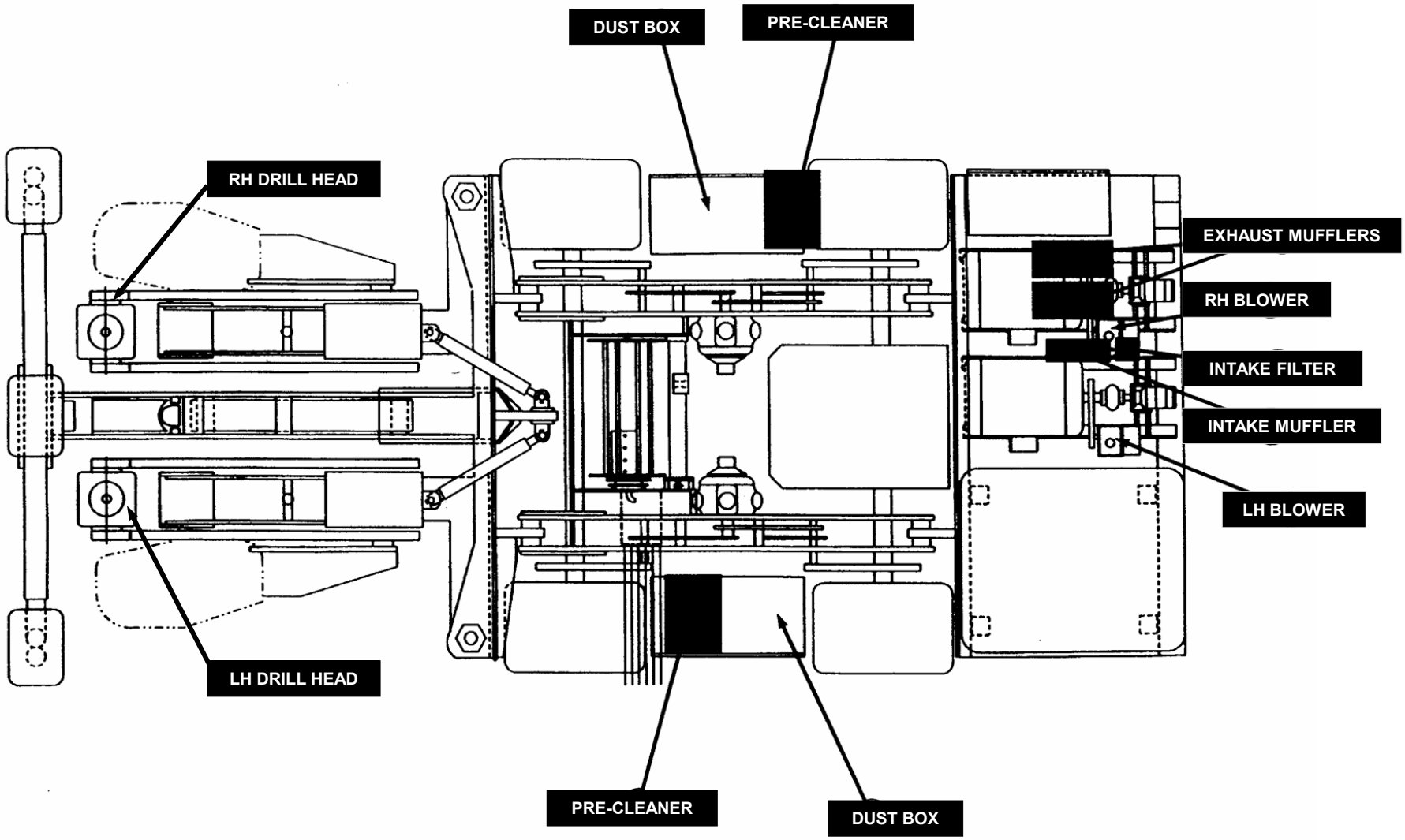
System Components

System Components:
(Typical System) Circuit & Airflow



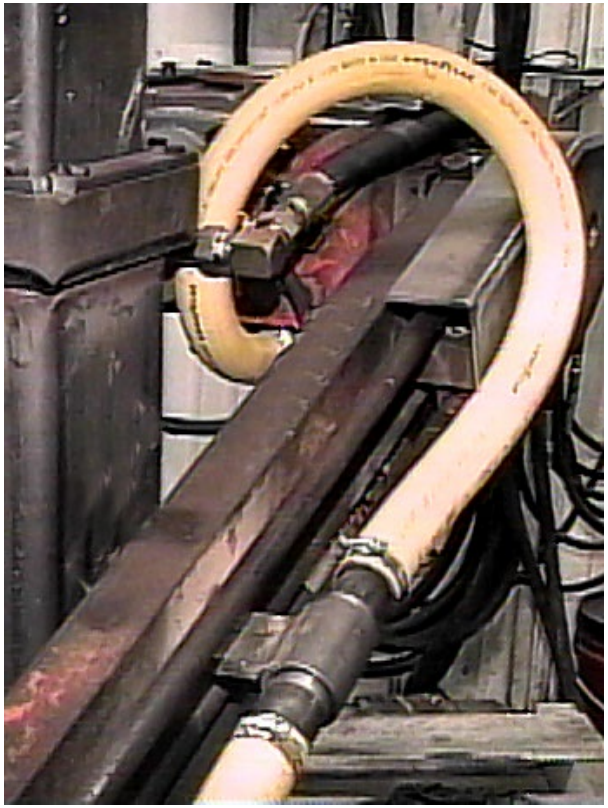
System Components:

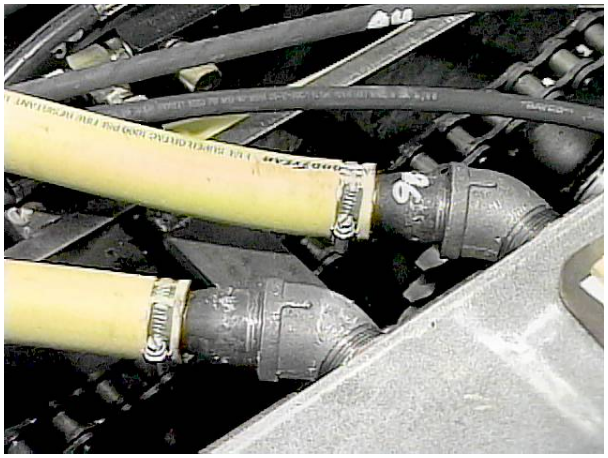
(Typical System) RRII Layout Drawing

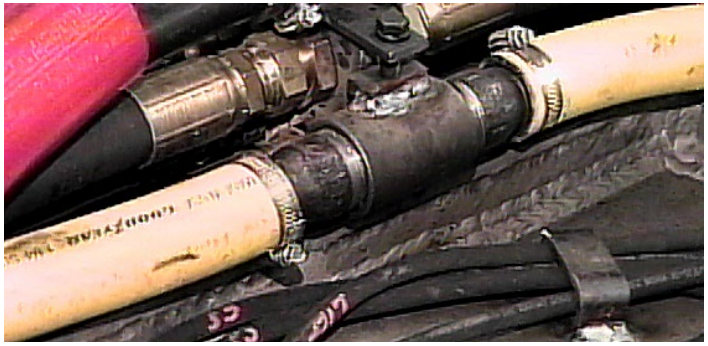


System Components:
Drillhead & Chuck

System Components:
Dust Hose, Fittings, and Clamps







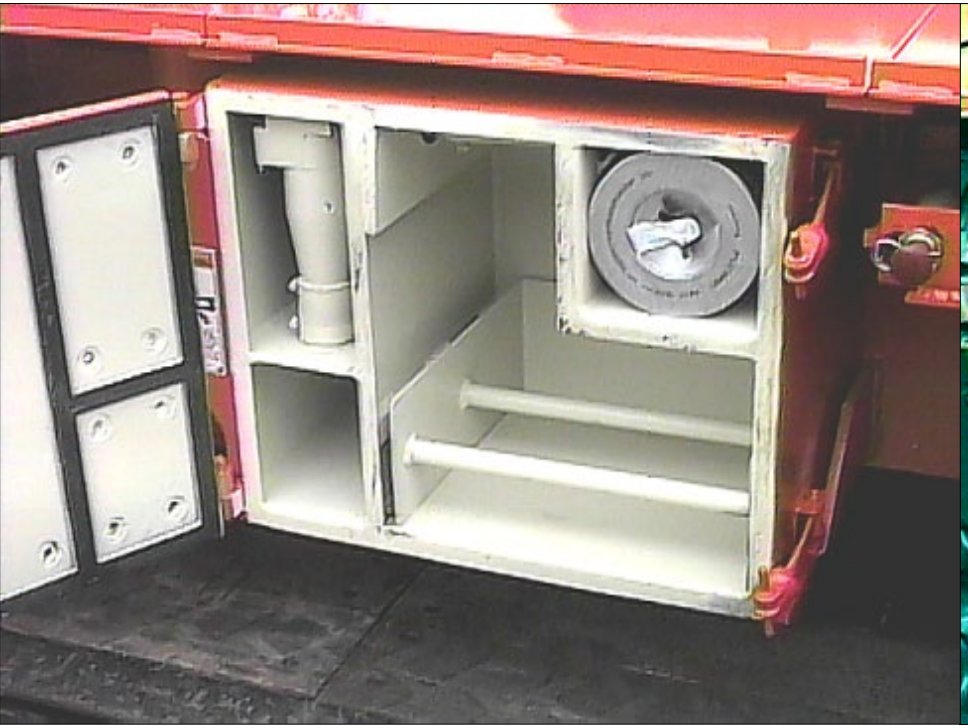
- No kinks in hoses
- Use only approval hose
- Make sure all clamps are tight

System Components:
MSHA Approved Dust Hose

Fletcher® MINING EQUIPMENT

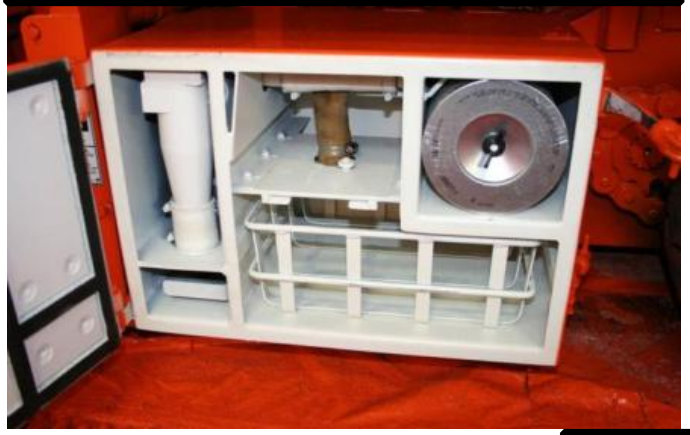
System Components:
Pre Collectors

System Components:
Filter Elements



System Components:
Dust Boxes & Filter Elements

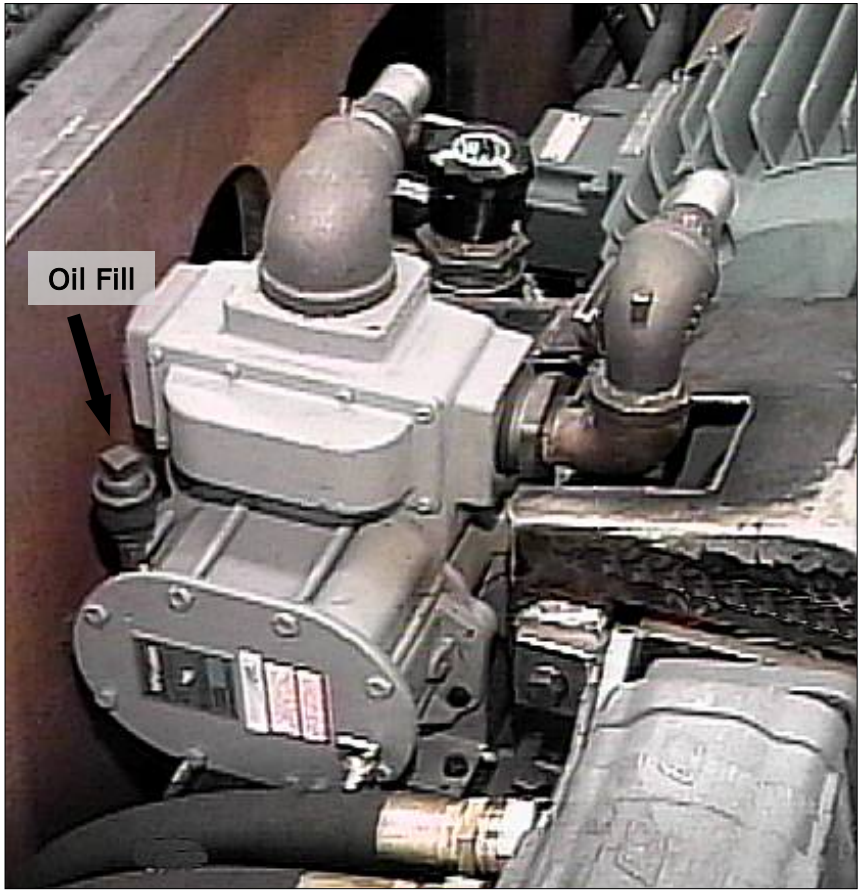
Basket to be used with dust bags.



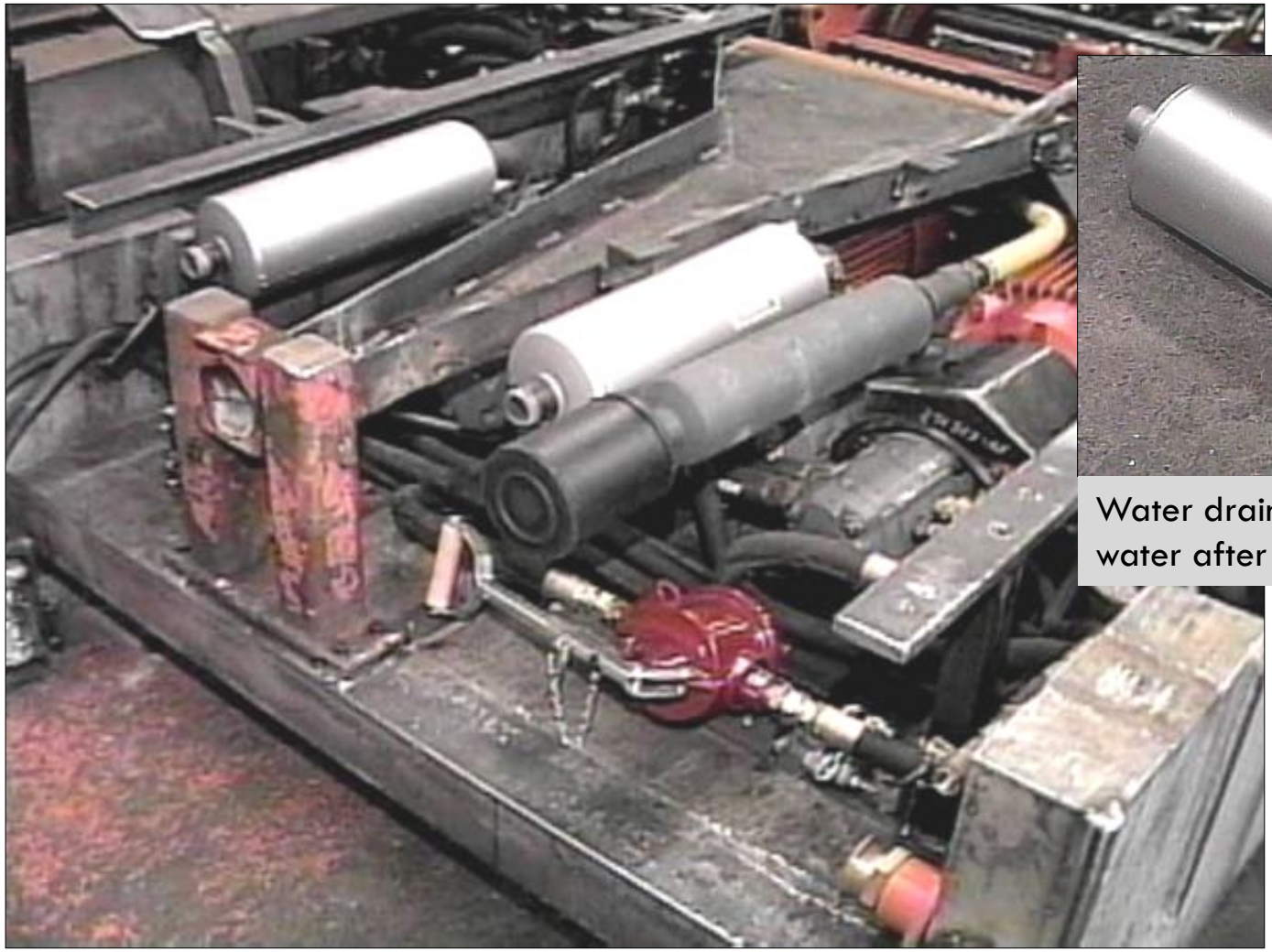
Tray to be used without dust bags.

NOTE: Not all dust boxes can utilize dust bags.

System Components:
Blowers & Relief Valves

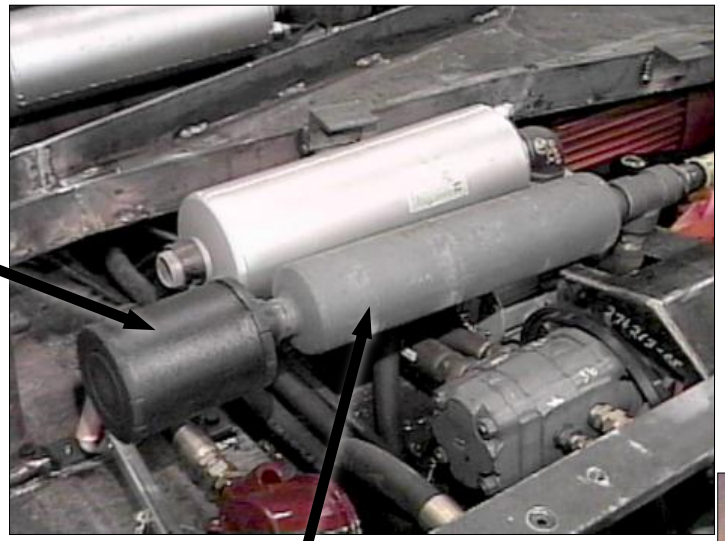


System Components:
Mufflers

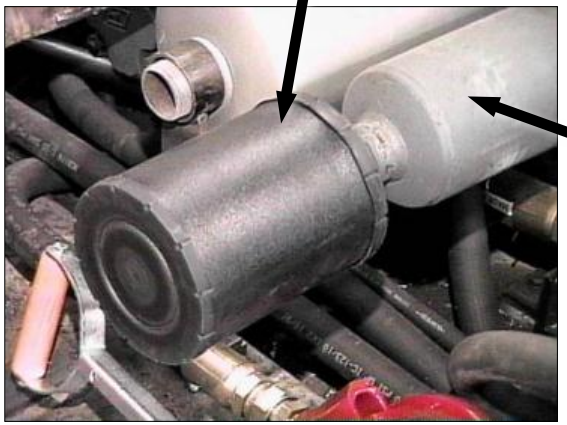


Water drain plug for draining water after flushing muffler

System Components:
Cooling Air Intake Filter & Muffler

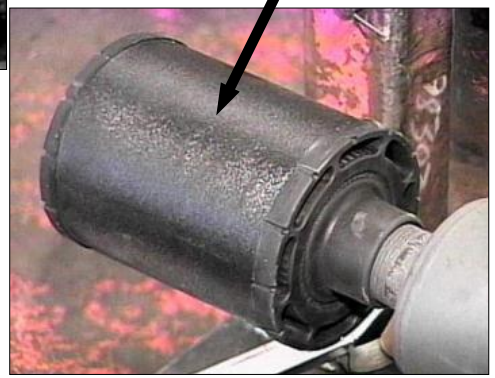


COOLING AIR INTAKE FILTER (optional)



COOLING AIR INTAKE MUFFLER

Pulls clean air into system. This component is replaceable and should be changed every 6 months



Inspection & Maintenance

Fletcher® MINING EQUIPMENT

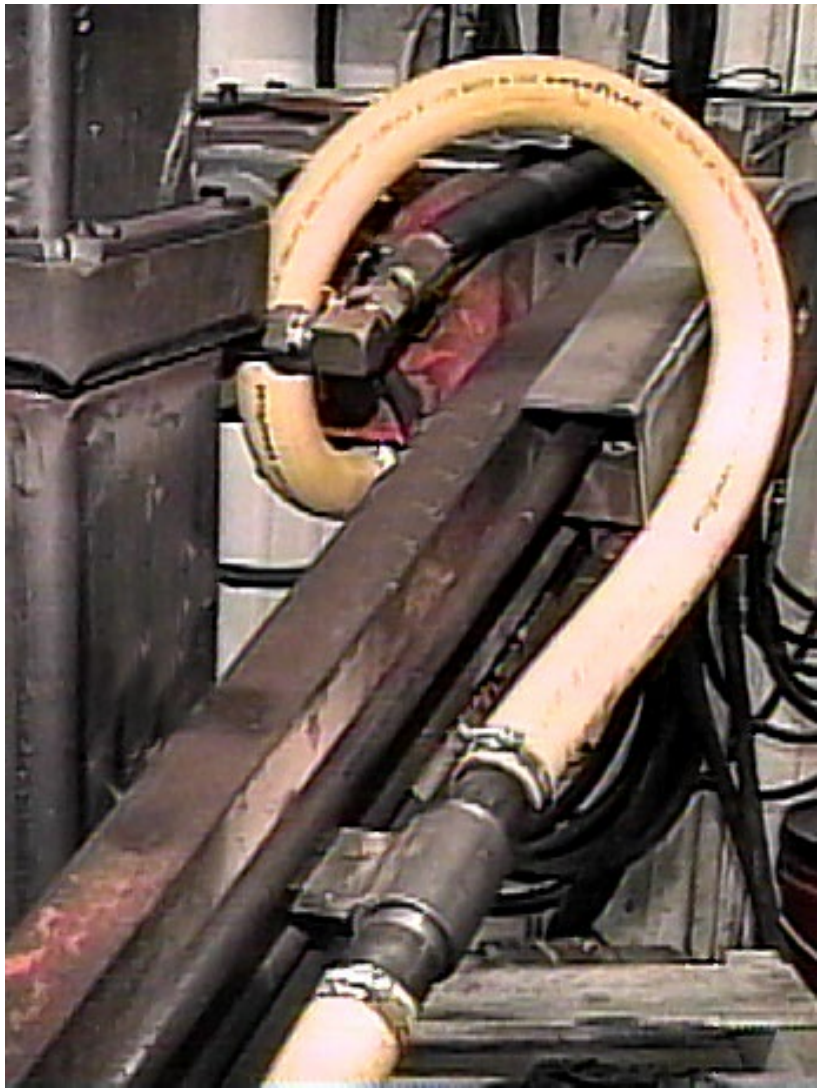
Inspection & Maintenance:
Drillhead & Chuck

CRACK

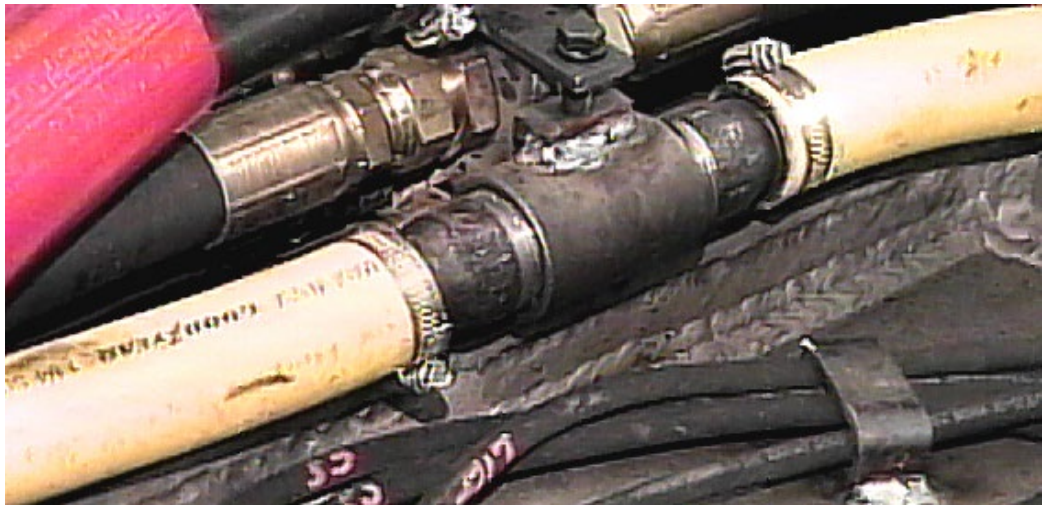
OLD DRILLHEAD

Check Chuck for Cracks and Excessive Wear

Inspection & Maintenance:
Fittings & Clamps



- Check for and Fix any Leaks
- Check for Hose Wear and Replace if Required
- Hose Clamps – Installed and Tight



Skirt on Pre-Cleaner

Fletcher® MINING EQUIPMENT

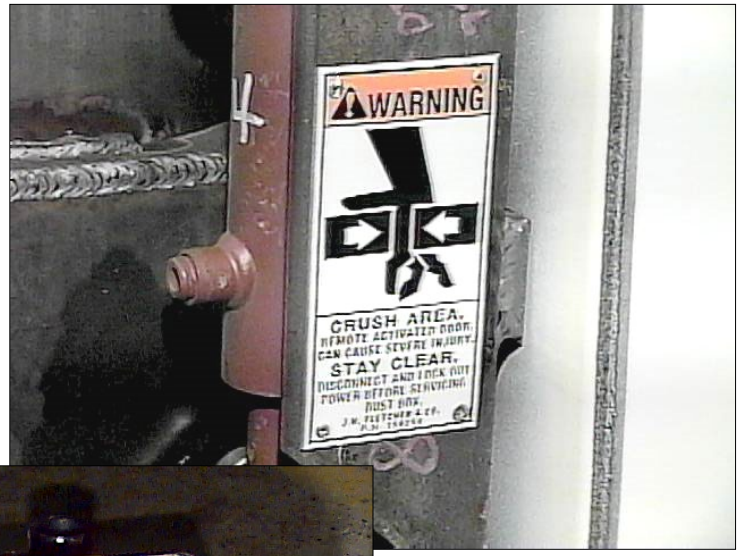
Inspection & Maintenance:
Pre-Collectors

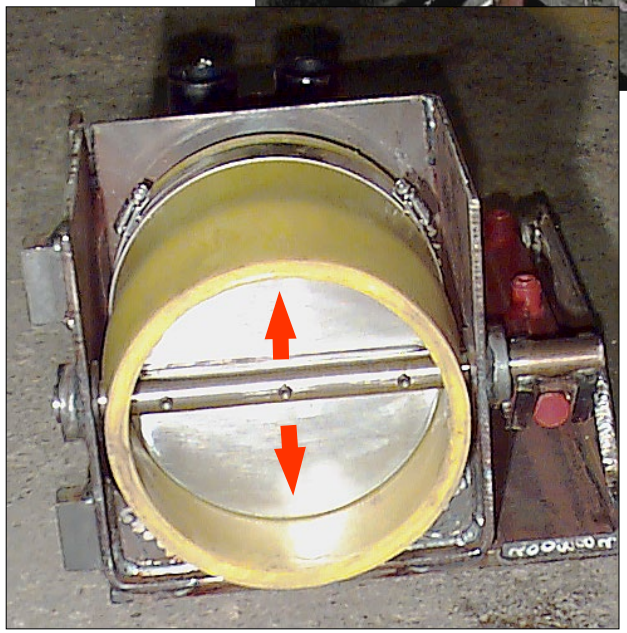
WARNING

Operation of the Pre-Collector is controlled by other machine functions. Operation may occur at any time while machine is running.

Before performing any inspection, maintenance or repair on the Pre-Collector unit always remove the power to the machine at the power center, lock and tag out.

Serious injury can occur from failure to remove power, lock and tag out prior to performing inspection, maintenance or repair on the Pre-Collector Unit.





Inspection & Maintenance

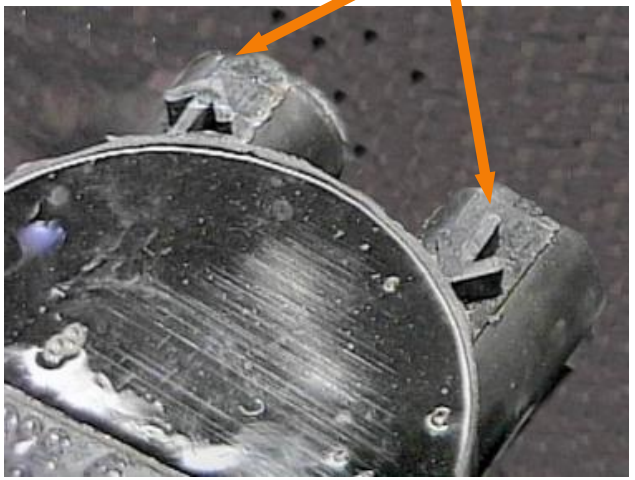
Pre-Collectors

Butterfly Valve Sleeve

Inspection & Maintenance:
Cyclone Cap PN:56362

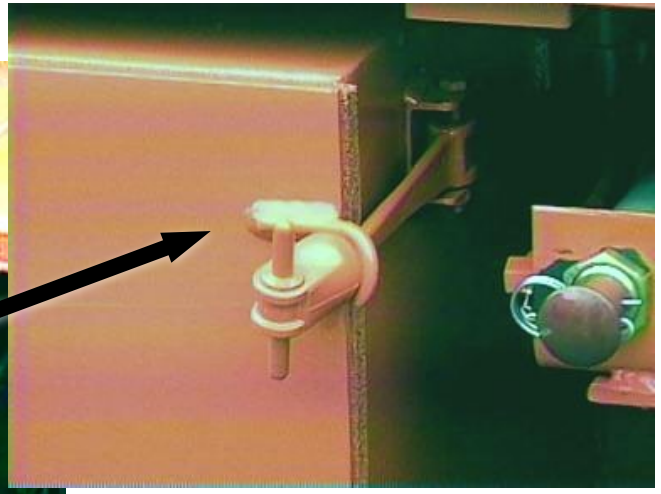
Make sure hoses are connected correctly.

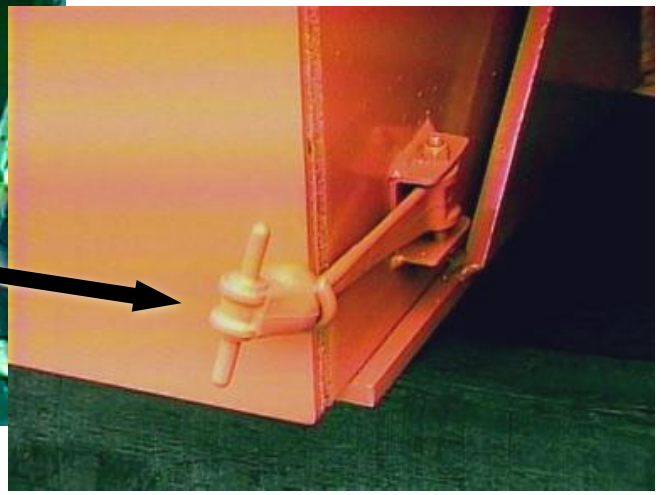
Airflow Direction Arrows



Inspection & Maintenance:
Dust Boxes & Filter Elements

If door latches become damaged, replace with Fletcher OEM dust tank latch only.





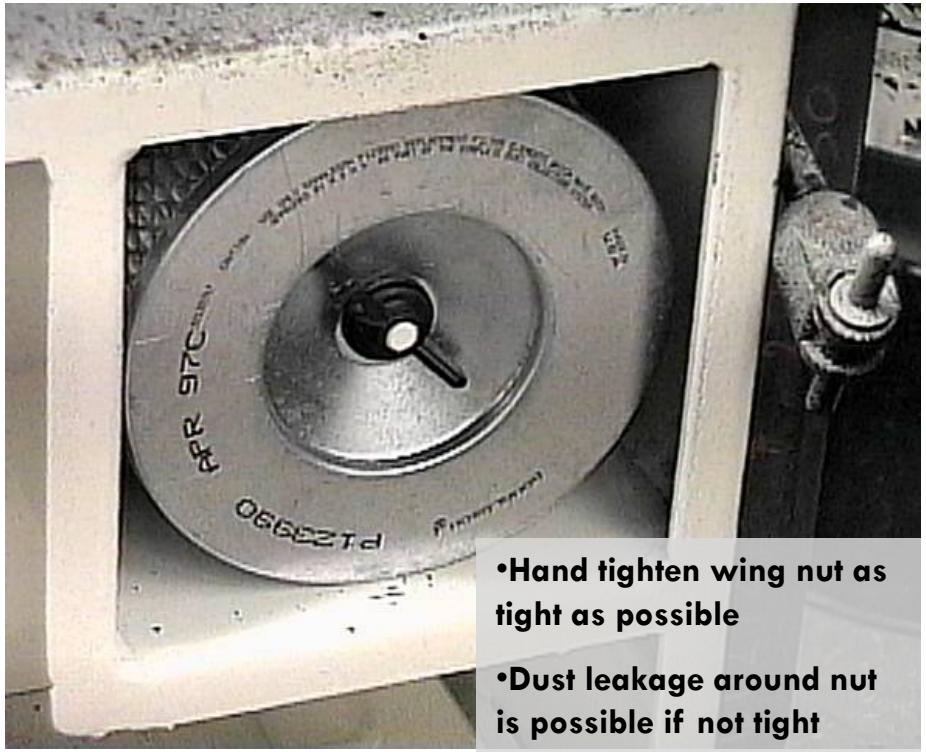
Inspection & Maintenance:
Doors and Door Latches

- Doors not warped or bent
- All gaskets installed, in good condition and clean.
- Each chamber must be separated. Check for air leaks and replace gasket if necessary.
- Use only OEM gaskets.

Inspection & Maintenance:
Cyclone Separator Units

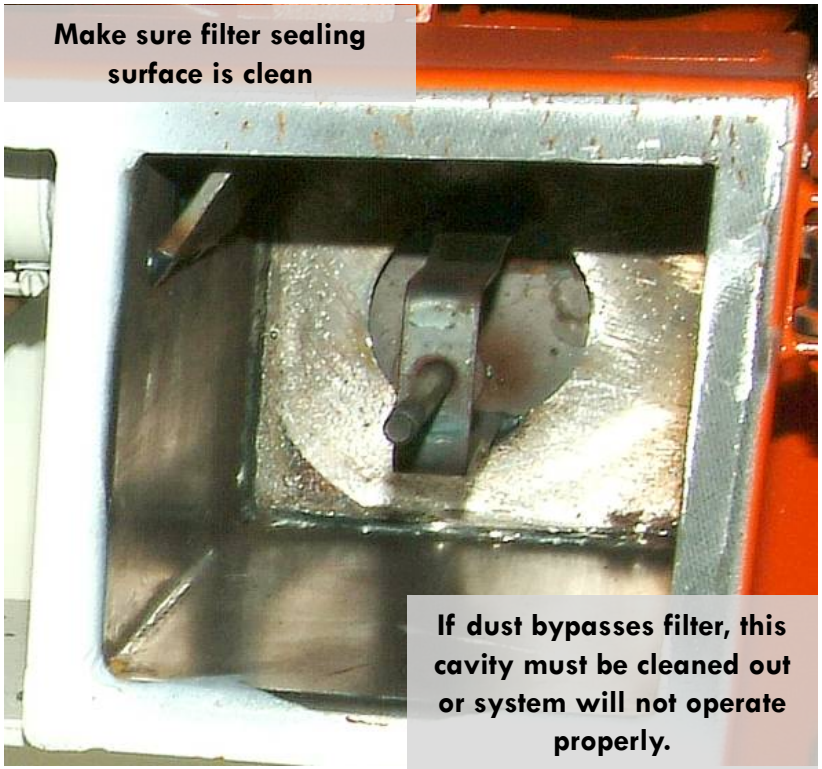
- Properly installed with clamps in place and tightened.
- Check for leaks
- **NOTE:** If your machine is equipped with a Donaldson dust box, parts are no longer available. If repairs are needed, replace box with a Fletcher dust box.

Filter Elements



- Hand tighten wing nut as tight as possible
- Dust leakage around nut is possible if not tight

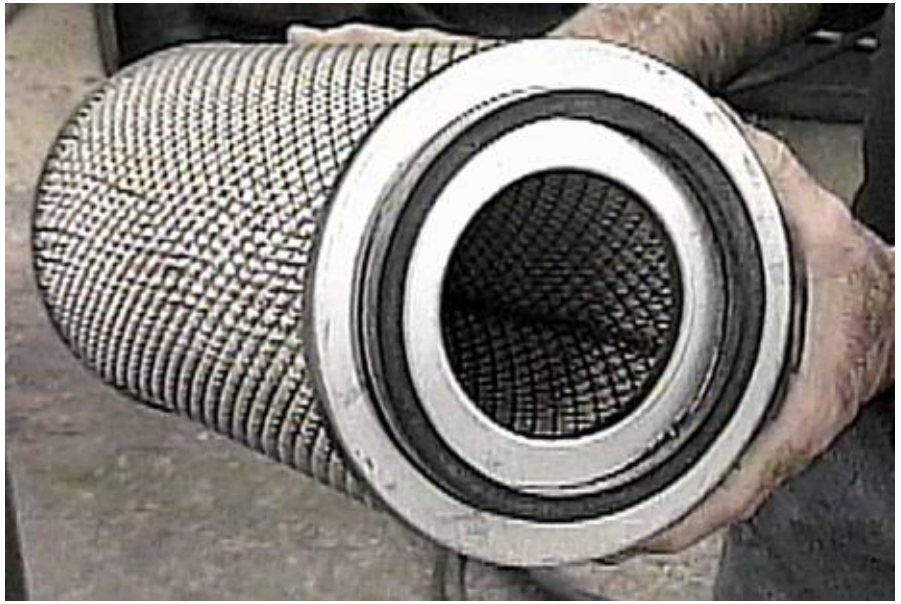
Make sure filter sealing surface is clean



If dust bypasses filter, this cavity must be cleaned out or system will not operate properly.

Inspection & Maintenance:
Filter Elements

- Never attempt to clean filter elements
- Remove and properly dispose of dirty element
- Install new approved element when dust collection efficiency decreases to the point that drilling rate is reduced. Clean box area of dust before installing new clean filter or dust can contaminate clean side of system



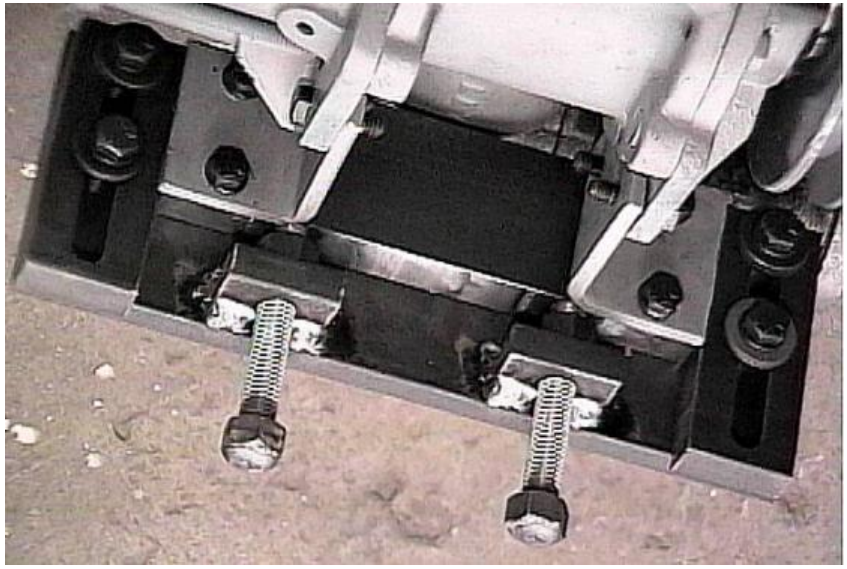
Inspection & Maintenance:
Filter Elements

Active test with filters installed in a dust box found the following conclusions:

- Filter will bypass id completely plugged, collapsed, and nut is not tight
- A mostly plugged filter could bypass only if nut is not tight
- Alternate filter designs and sealing methods are being investigated

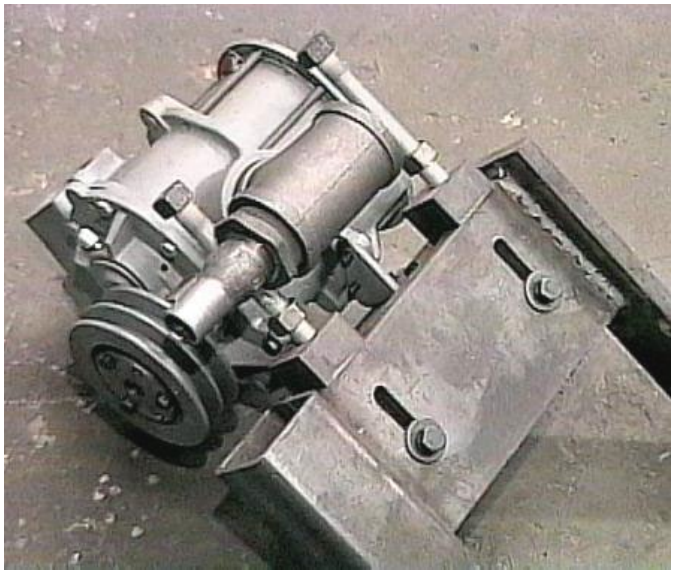
Inspection & Maintenance:
Blower Belt Tension

HORIZONTAL BLOWER MOUNT



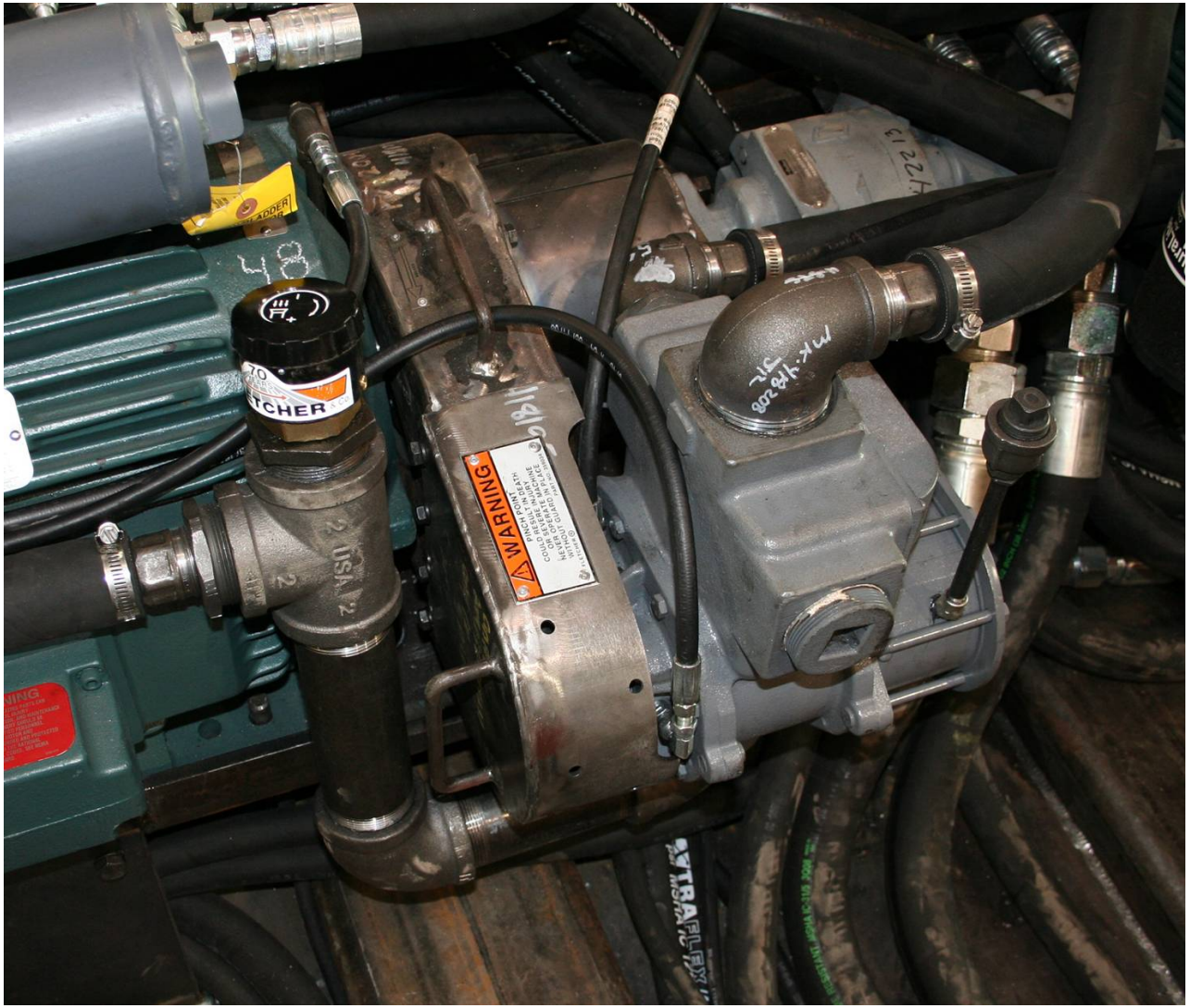
The belt tension is checked by applying moderate pressure midway between the sheaves – the belt deflection should be between ¼” and ½”

VERTICAL BLOWER MOUNT



For specific instruction on belt tension, see the service manual. Make sure to follow all safety precautions.

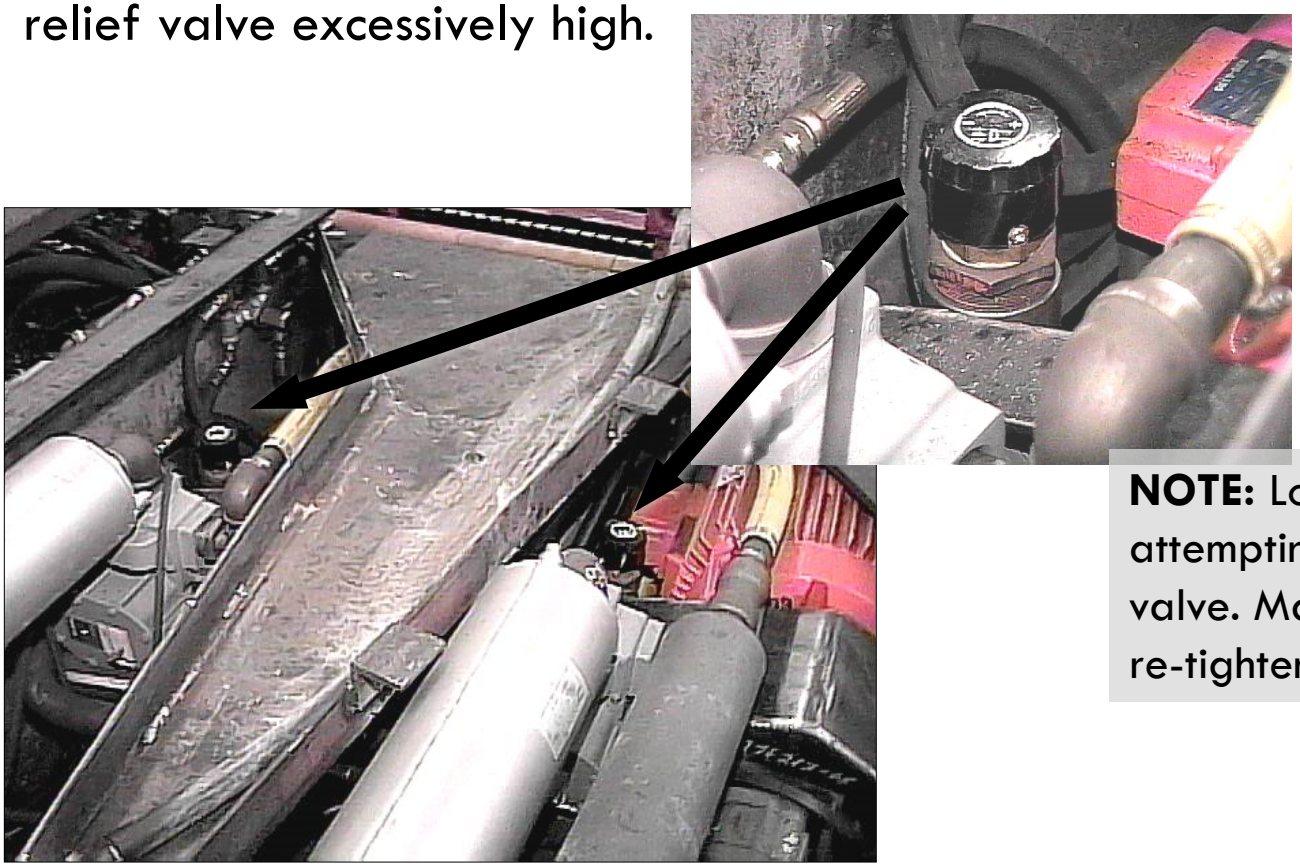
Inspection & Maintenance:
Blower Belt Tension



Blower belt guard should be in place.

Inspection & Maintenance:
Vacuum Relief Valve

Blower vacuum relief valve must be set to maintain the minimum vacuum level specified on the Dust System Approval Plate. However, do not set vacuum relief valve excessively high.



NOTE: Loosen set screw before attempting to adjust relief valve. Make sure set screw is re-tightened after relief is set.

Inspection & Maintenance:
Vacuum Relief Valve

CHECK VACUUM BLOWER RELIEF VALVE BY INSTALLING VACUUM GAUGE OVER DRILL HEAD CHUCK.

- If needle doesn't return to zero perforate plug on side of gauge.
- If needle doesn't return to zero gauge may be broken and need replaced.
- If gauge reads under 12 in. Hg. and vacuum system seems to be working gauge may be broken and need replaced.

FLETCHER 132121 VACUUM ASSEMBLY

The 132121 Vacuum Gauge Assembly has been provided to assist in maintaining the dust suppression of your Fletcher Roof Drill in proper operating condition.

There are three (3) important reasons for maintaining the drilling vacuum within the specified operating range.

FIRST, the dust suppression system is a safety device, designed to prevent potentially harmful fines from escaping into the mine atmosphere. Due to this, the design and maintenance of this system is regulated by MSHA (30 CFR—Part 33). Every roof drill must be equipped with an approved dust suppression system and display a tag indicating the dust suppression system approval number along with the minimum vacuum relief valve setting.

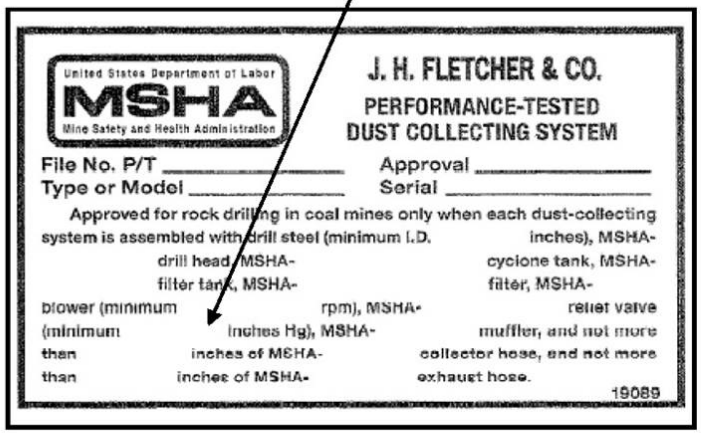
SECOND, drilling cannot occur any faster than the cuttings can be removed from the hole. Therefore maintaining the system properly, with the vacuum set correctly will assure maximum drilling efficiency.

FINALLY, maintaining the vacuum within recommended limits will prevent damage to the blower.

The first step in using the vacuum gauge assembly is to determine the proper vacuum operating range for your machine.

The minimum vacuum relief valve setting, which must be maintained to satisfy MSHA approval, is stamped on the permissibility plate (generally located in the tram deck).

MINIMUM VACUUM RELIEF VALVE SETTING



TYPICAL LOCATION OF PERMISSIBILITY PLATE IN TRAM DECK

FLETCHER®

Document P/N: 359398 Revised 1/18/2006
Document P/N: 359398 Revised 7/19/2007
Document P/N: 359398 Revised 1/31/2008

The maximum vacuum level should never exceed 20 in-hg. Operation at vacuum levels above 20 in-hg will result in decreased blower life.

PREPARING TO CHECK DRILLING VACUUM:

Make sure the dust system is in proper operating condition:

- Dust tank clean
- Dust filter element in operating condition (not clogged)
- All clamps installed on dust hoses
- Dust tank door– all gaskets and sealing surfaces are clean and in proper operating condition
- Dust tank latches– installed in operating condition and latched
- Blower drive belts properly tensioned

CHECKING DRILLING VACUUM

1. Locate the machine in a safe area—outby—under permanent roof support.
2. Start the machine.
3. If the machine is equipped with a pre-cleaner, make sure the pre-cleaner is closed—there is airflow through the drill chuck.
4. Perforate rubber plug to vent gauge.
5. Place the vacuum gauge in the drill chuck as shown in the photograph to the bottom right.
6. Allow the gauge reading to stabilize, then note the gauge reading—this will be the vacuum reading in in-hg. (inches of mercury)

⚠ WARNING

DO NOT ENGAGE DRILL ROTATION OR DRILL FEED:

JUST BEFORE INSERTING VACUUM GAUGE IN CHUCK

WHILE VACUUM GAUGE IS INSERTED IN CHUCK

SERIOUS OR FATAL INJURY CAN OCCUR AS A RESULT OF OPERATING DRILL FEED OR ROTATION WITH VACUUM GAUGE INSTALLED IN DRILL CHUCK.

⚠ NOTICE

J. H. FLETCHER & CO.: DUST COLLECTION SYSTEM

1. SHUT THE MACHINE OFF.
2. OPEN THE DUST BOX DOOR.

NOTE: IF MACHINE IS EQUIPPED WITH DUST BAG, REVIEW PROCEDURES IN OPERATOR'S MANUAL FOR ADDITIONAL INFORMATION.

3. LOOK AT THE DUST FILTER (DO NOT ATTEMPT TO CLEAN THE FILTER, AS THIS FILTER WILL CONTAIN A HIGH CONCENTRATION OF RESPIRABLE DUST.
4. IF THE DUST FILTER IS EXTREMELY CLOGGED, HAVE MAINTENANCE REPLACE THE FILTER WITH A NEW ONE. IF YOU ARE CHANGING THE FILTER, WEAR APPROPRIATE PPE PROTECTION.
5. PULL OUT THE HEAVIER DUST "FINES" WHICH HAVE GATHERED AT THE BOTTOM OF THE BOX. REMOVE THE FINES BY GRABBING THE TRAY AND PULLING OUT THE DUST "FINES".
6. WHEN YOU ARE REMOVING THE DUST, MAKE SURE YOU STAND ON THE SIDE OR END THAT IS PUSHING FRESH AIR AGAINST YOUR BACK SO THAT THE DUST "FINES" THAT COME OUT ARE BLOWN AWAY FROM YOU.
7. REPLACE THE TRAY IN THE TANK.

NOTE: TRAY NOT SUPPLIED IF DUST BAGS ARE USED.

8. USE A TOWEL/RAG TO REMOVE DUST FROM AROUND THE GASKET ON THE DOOR.
9. CHECK COMPLETE SYSTEM FOR LEAKS OR RESTRICTIONS.
10. SECURE THE DOOR.

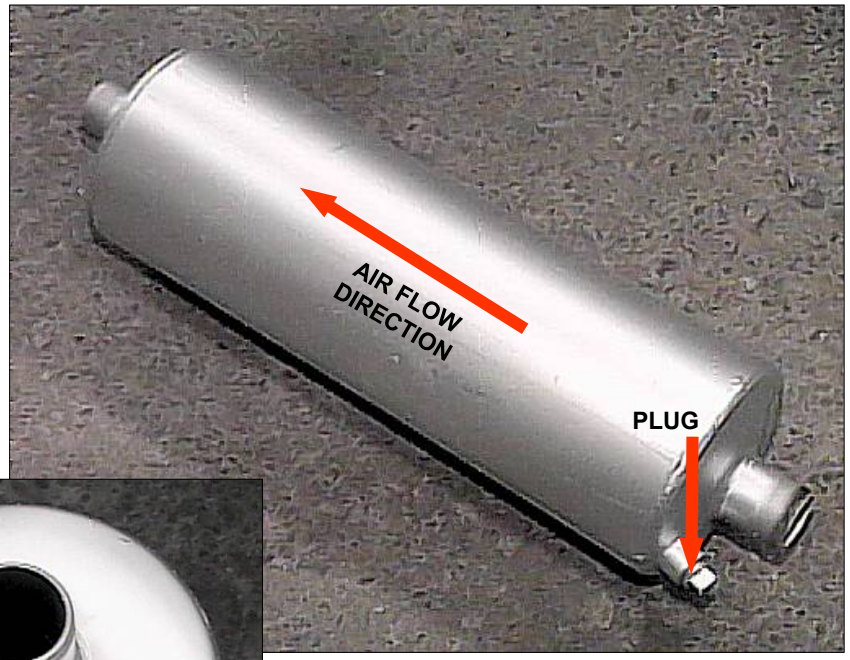
SEE SERVICE AND PARTS MANUALS FOR INFORMATION ON THIS SYSTEM.

USE ONLY J. H. FLETCHER & CO. REPLACEMENT PARTS TO MAINTAIN MSHA DUST SYSTEM APPROVAL (30CFR PART 33).

J. H. FLETCHER & CO. PART NO. 359126

After installation, perforate plug to vent gauge.

Inspection & Maintenance:
Mufflers (Silencers)



- Generally no maintenance required
- If the system gets “dusted out” then the mufflers can get filled with dust to the point that their performance is adversely affected. The mufflers can be removed and flushed with water. A plug is provided for draining the muffler after flushing.

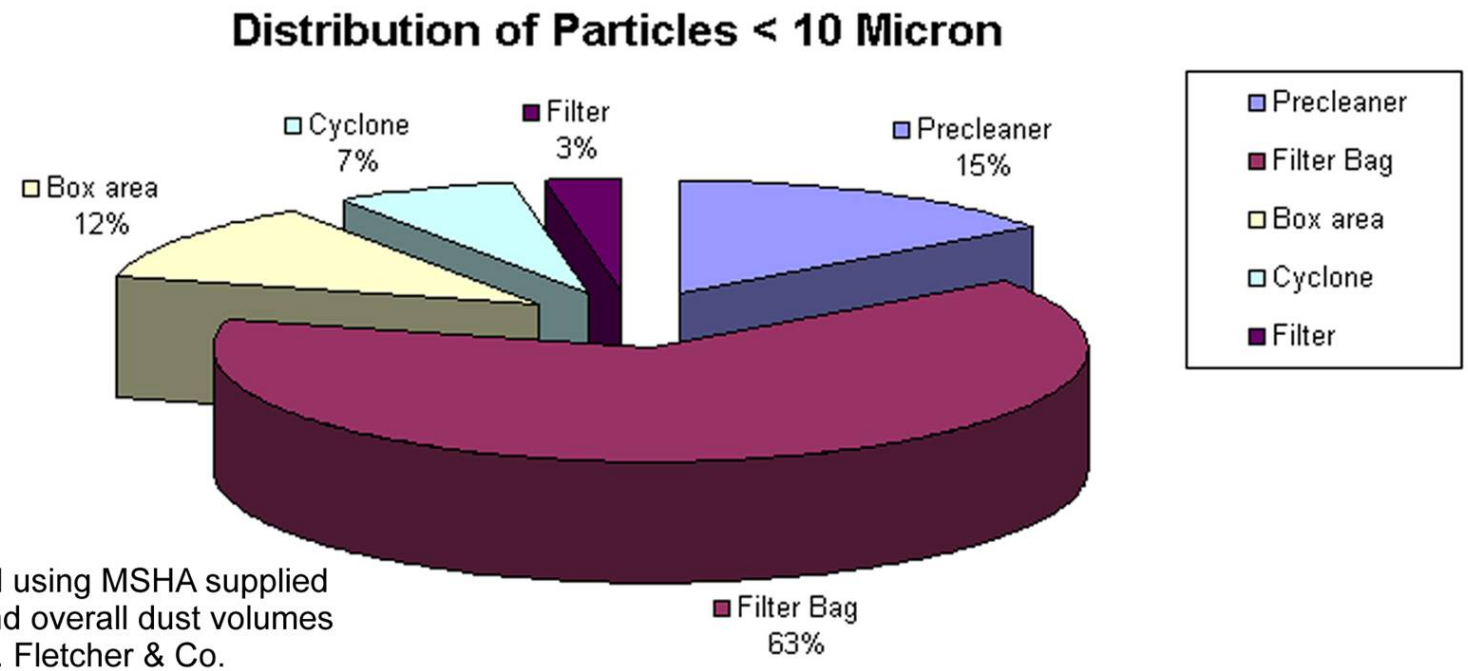
Suggested Method to Clean the System

1. Open the dust box; remove all loose dust and the filters.
2. Remove the hoses attached to the “Roots” blower, both inlet and outlet.
3. With the machine off, clean water through the hoses/muffler/dustbox. (Also, follow the manufacturer’s recommendation given in their 20005-2 News Letter http://www.jhfletcher.com/newsletter.htm Maintenance Q&S on p.2 concerning the muffler) Run water through both the inlet and outlet blower hoses.
4. Dry or mop up the leftover water and reattach hoses.
5. Install new filters.
6. Check for leaks.

Important Notes

1. Dust may resist water or be too caked to remove. Replace certain components or use other aggressive methods (digging or scraping)
2. Separate components to really "get" to the trouble spots, especially behind the cartridge filter.
3. Each type of dust collector may need some additional thought to the cleaning process. Same cleaning method, just different components.
4. Don't get water in the blower.
5. Most dust-boxes are not equipped for water cleaning. If operators want to install their own drain plug(s) in the bottom of the dust-box for cleaning purposes this would not affect the performance of the system as long as the plug was leak free from normal operation (contact MSHA before installing plug). In most cases, if the machine is tilted the water should train out the open dust-box door.

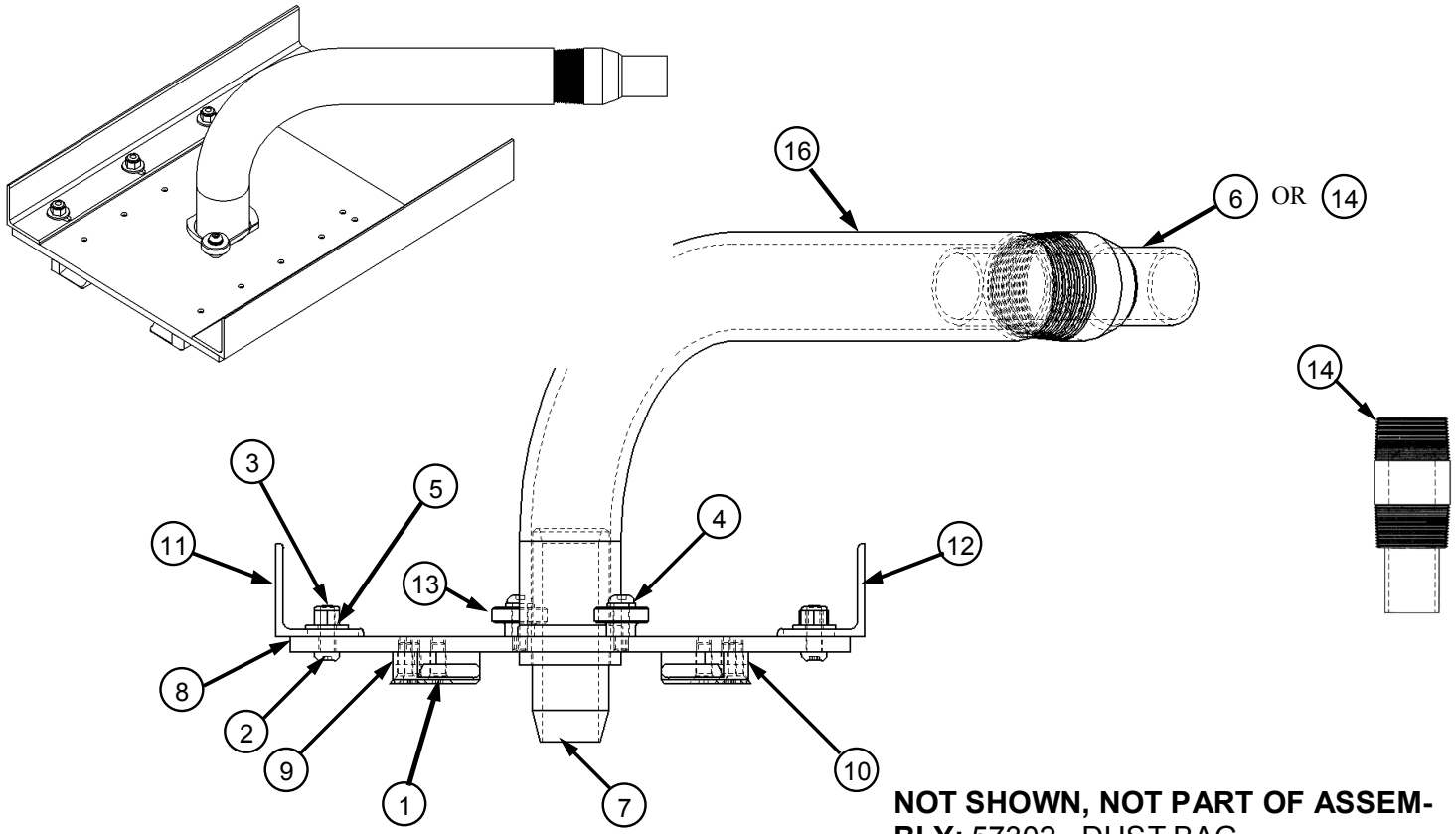
Dust Bags



Results calculated using MSHA supplied qualitative data and overall dust volumes measured by J. H. Fletcher & Co.

Dust Bags

Adaptable with most dust systems



NOT SHOWN, NOT PART OF ASSEMBLY: 57302 DUST BAG

ITEM	DESCRIPTION	PART #	QTY	ITEM	DESCRIPTION	PART #	QTY
1	¼"-20x½" FLAT SOCKET HEAD CAP SCREW	20038	12	**9**	L.H. BAG GUIDE	364183	1
2	¼"-20x¾" BUTTON HEAD CAP SCREW	20094	8	**10**	R.H. BAG GUIDE	364184	1
3	¼"-20 HEX NUT	20757	6	**11**	L.H. ANGLE	364185	1
4	¼" LOCKWASHER	22021	2	**12**	R.H. ANGLE	364186	1
5	¼" FLAT-WASHER	22191	6	**13**	LOCK BUTTON	364187	2
6	DUST BAG FITTING ADAPTER	362757	1	**14**	DUST BAG ADAPTER NIPPLE	365311	1
7	DUST CONNECTOR	363576	1	**15**	HOSE CLAMP 1" TO 2" (**NOT SHOWN**)	53513	2
8	DUST BAG MOUNTING PLATE	364182	1	**16**	DUST HOSE	57320	1

SHEET NO.	TITLE	DATE	J. H. FLETCHER & CO.
SP-110	300178 DUST BAG MOUNTING KIT	10-31-00	402 HIGH STREET HUNTINGTON, WV

CDC NIOSH Workplace Safety and Health

Technology News

No. 523 Milestones in Mining Safety and Health Technology February 2007

Evaluation of Dust Collector Bags for Reducing Dust Exposure of Roof Bolter Operators

Objective

To evaluate the effectiveness of dust collector bags for reducing dust liberation from a roof bolter dust collection system.

Background

Respirable dust exposure in underground coal mines during the roof bolting process continues to be a problem for roof bolter operators. During 2000–2004, Mine Safety and Health Administration (MSHA) inspectors collected nearly 5,000 respirable dust samples for roof bolting occupations. Of these samples, 20% exceeded a respirable silica dust concentration of 100 $\mu g/m^3$, a level that MSHA considers excessive. From these data, it is clear that roof bolter occupations exhibit a continued risk for overexposure to respirable silica dust.

Most roof bolting machines use an MSHA-accepted (30 CFR 33) vacuum dust collection system to capture dust as holes are drilled. A vacuum pump on the machine draws the dust through the bit and drill steel into an enclosed dustbox. The box has several compartments and functions as a rough size classifier, allowing the coarser dust sizes to settle out of the airstream first in the large compartment (about 95% of all the dust entering the box). The dust that passes through the large compartment is routed through cyclones and then into the filter chamber for deposition on a paper canister filter. The filtered air flows through the vacuum pump, a noise-reducing muffler, and then is exhausted into the mine environment. The dustbox and filter are usually cleaned on a preselected schedule to avoid overfilling the box and/or overloading the filter. Normally the dustbox is emptied at the end of every cut. As the filter accumulates fine particles of dust, resistance increases and flow through the system decreases, requiring removal and cleaning of the filter, usually after several cuts.

The majority of the dust is collected in the main (large) chamber of the collector. This dust is removed from the collector box by opening the door and pulling a "rake" toward the opening to drag the dust out, allowing it to dump onto the mine floor. Operator exposure occurs when this dust is entrained into the air as it falls from the box to the floor. Another source of exposure is from the canister filter. Dust that is too fine to be captured in the main and subsequent dustbox chambers passes through to the filter. Typically, filters are cleaned by shaking or tapping against the rubber tire of the bolter or a hard surface. This method of cleaning often creates a respirable dust cloud that contaminates the breathing area of the operators. The operator must take care not to damage the filter, filter seal, or dustbox door seal during the cleaning cycle, as dust not captured by the filter or that bypasses the filter seal is exhausted into the mine air. In addition, care must be taken to stay upwind of the dustbox during cleaning.

Approach

A laboratory study was conducted to evaluate the use of vacuum bags in the dust collector for improving dust capture efficiency. A Fletcher® dust collector box, typical of many found on underground bolters, and a model AP–228 dustbag were configured in the lab to simulate roof bolter drilling dust collection. The bags are MSHA-accepted for retrofit in Fletcher® dustboxes. Testing was performed with and without the bag installed. Airflow through the box was provided by a vacuum pump rated at 60 cfm at 20 inches Hg. Dust was fed into the box using an AccuRate bulk dust feeder with a 2¼-in screw.

Fifty pounds of ground limestone, similar in size distribution to dust collected from bolter dust collectors in use, was used as feed material for each test. The bags and canister filter were weighed after each test to determine the dust capture inside the box. Dust concentrations in the exhaust were recorded continuously in a 6-in-diam pipe using a RAM–1 instantaneous dust monitor. Aerodynamic particle sizes were measured in the exhaust using a TSI Aerodynamic Particle Sizer (APS). A laptop computer was interfaced with the APS and data acquired using the available TSI software. Aerosol was drawn isokinetically into the diluter at 5 L/min through a 4-ft length of 0.31-in ID conductive tubing. Particle sizes were measured in the 6-in-diam pipe, roughly 8 ft away from the entry of the 2-in hose into the PVC pipe. Vacuum pressures within the box and across the filter were also recorded continuously during each test. A total of 60 tests were conducted (30 with the bag installed and 30 without).

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Laboratory and field evaluation of dust collector bags for reducing dust exposure of roof bolter operators

J.M. LISTAK AND T.W. BECK

J.M. Listak and **T.W. Beck**, member SME, are research engineers with the National Institute for Occupational Safety and Health (NIOSH), Pittsburgh, PA. Paper number TP 07-047. Original manuscript submitted December 2007. Revised manuscript accepted for publication March 2008. Discussion of this peer-reviewed and approved paper is invited and must be submitted to SME Publications Dept. prior to October 31, 2008.

Abstract

The National Institute for Occupational Safety and Health conducted laboratory and field tests to evaluate the effectiveness of dust collector bags for reducing dust liberation and operator exposure from a roof bolter's dust collection system. The laboratory tests evaluated the bag's effectiveness to contain dust and the effect on canister filter loading in both a bag and bagless condition. The dust emissions from the collector's exhaust were also measured in each condition during laboratory testing. Laboratory results show that nearly 100 percent of the test dust fed into the collector was captured by the dust bags. Loading and pressure drop on the dust collector's canister filter is greatly decreased when using the bags, enabling longer periods of drilling without filter removal/cleaning. The field results showed that, even though dust standards were met, respirable dust in exhausted emissions was reduced around the bolter. Laboratory and field results show that benefits from use of the bags are realized in all areas of operator exposure.

Introduction

Respirable dust samples taken by the Mine Safety and Health Administration (MSHA) show that roof bolter operators are still at high risk for overexposure. From 2000 to 2004, MSHA inspectors collected nearly 5,000 respirable dust samples at roof bolting occupations (MSHA, 2004). Of these samples, 20 percent exceeded a respirable silica dust concentration of 100 $\mu g/m^3$, a level that MSHA considers excessive. Previous studies have shown that the contents of the roof bolter dust box can contain high amounts of respirable silica dust (Colinet et al., 1985; Kok et al., 1985). A study by Ondrey et al. showed that mining downwind of the continuous miner was the major source of dust on roof bolting operations (Ondrey et al.). However, improper ventilation and poor dust-box cleaning procedures can add to the overexposure of bolter operators.

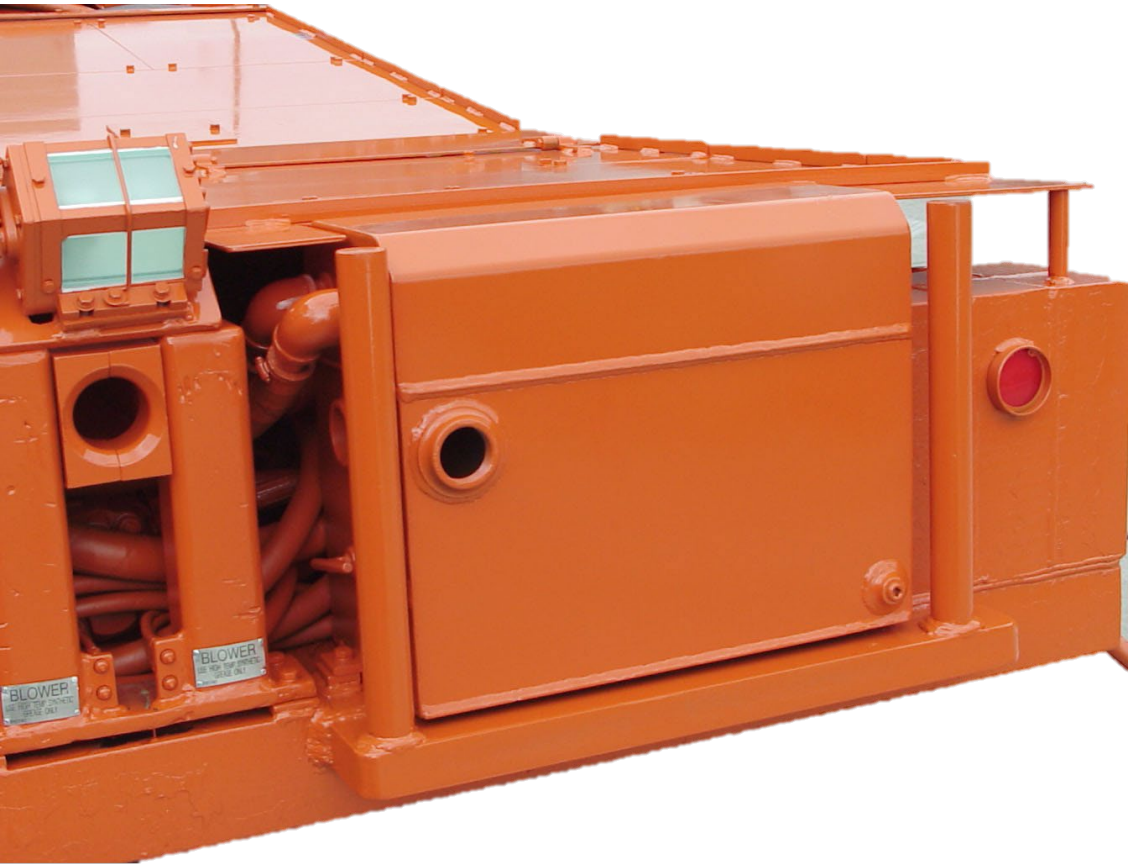
Most roof bolting machines use an MSHA accepted (30CFR, Part 33) vacuum dust collection system to capture dust as holes are drilled. The drill steel, bit, dust box, filter and hoses together form a single unit approved by MSHA for use in underground coal mines. It is not possible to modify or change any part of this dust-control system without violating approval from MSHA.

The system uses a vacuum pump on the machine to create negative pressure at the drill bit and draw the drill cuttings through the bit and drill steel. Many of these dust collection systems are equipped with a precleaner that collects the larger drill cuttings before they enter the dust box. These cuttings are deposited onto the mine floor, while the remaining, finer, dust proceeds to the collector box. The dust box itself has several compartments and functions as a rough size classifier allowing the coarser dust sizes to settle out of the dust stream in the main chamber (about 95 percent of all the dust entering the box). A field sample showed that 36 percent of the dust in the main chamber is <10 µm. The dust that passes through the main chamber is routed through cyclones and then into the filter chamber for deposition on a paper canister filter. The filtered air flows through the vacuum pump, a noise-reducing muffler and then into the mine environment. Figure 1 shows a schematic of the dust-collector system. Normally, the dust box is emptied at the end of every cut. As the filter accumulates fine particles of dust, the resistance increases and the flow through the system decreases. This requires the removal and cleaning of the filter, usually after several cuts.

The dust that is collected in the main chamber of the collector box is removed by opening the door and pulling a rake toward the opening to drag the dust out, allowing it to dump onto the mine floor. If cleaned improperly or in poorly ventilated workings, exposure can occur as the operator drags the dust from the box, entraining it into the air as it falls to the floor. A study by Goodman and Organiscak (2002) showed that using open containers constructed of either steel or line brattice helped contain dust in the main chamber for disposal against the rib, thus reducing operator exposure during cleaning. The four-sided reusable containers are fitted into the bottom of the main chamber and contained the dust as it settled. The containers are then removed, carefully dumped near the rib and then replaced.

Another source of operator exposure comes from the canister filter. Dust that is too fine to be captured in the main and subsequent dust box chambers passes through to the filter. When the filter is removed for cleaning, it is shaken or tapped against the rubber tire of the bolter or a hard surface to dislodge the dust. This method of cleaning often creates a respirable dust cloud that contaminates the breathing area of the operator if he or she is not upwind of the dust. The operator must take care not to damage the filter or filter seal while cleaning, as dust not captured by the filter or that bypasses the filter seal is exhausted into the mine air. Care must be taken

Water Box



- Maintain water level for optimum effectiveness
- **Optional:** Not required to operate dust system.

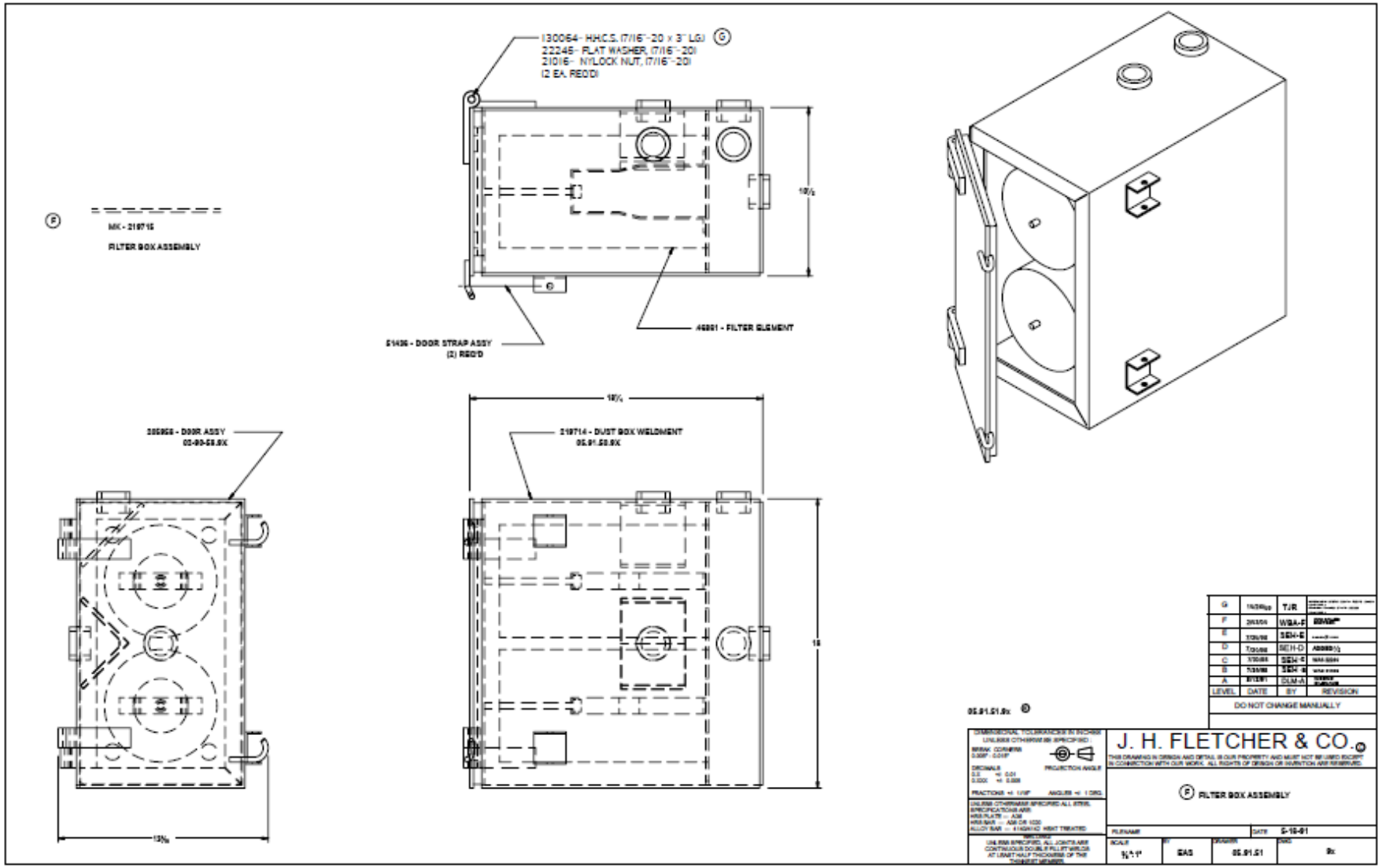
Dust System Summary

- The drill feed control valve package must be correctly set to allow the dust system to operate properly.
  - Proper penetration rates
  - Cannot drill any faster than dust can be collected
- Sharp drill bits improve dust collection
- OEM components must be used in order to maintain the dust collection system. J.H. Fletcher & Co. can not guarantee operation when non OEM components are used.
- The dust suppression system of the machine is covered by an MSHA 25B federal approval. Maintaining the validity of this approval requires that the dust suppression system be operated and maintained as approved.

Innovations

Secondary Filter Box

Final Filter Box



Precleaner Skirt Installation

TYPE 1

PRECLEANER IDENTIFICATION

NOTE:
Currently there are two different types of precleaners in use. Machine ground clearance, mine conditions, precleaner type, and precleaner location will determine which extension tube length is best suited for the machine.

Type 1 precleaner requires either a 14" or 28" precleaner extension tube, attached using a clamp. The clamp is located at the bottom of the precleaner, just above the housing and at the top of the extension tube.

Type 2 precleaner requires a 28" precleaner extension tube, attached using clamps as shown. Two clamps are located at the top of the precleaner & at the top of the extension tube.

PRECLEANER EXTENSION TUBE KIT INSTALLATION PROCEDURES:
(This precleaner extension tube kit is an optional feature to our precleaners with the aim of reducing the spread of dust during the dumping of the precleaner.)

1) Shut down the machine and use the proper tag out/lock out procedure.

2) Three different extension kits are available, 423387, 423388 or 423389. Select the best kit for your machine and mine conditions.

3) Install the appropriate extension kit for your machine and mine conditions using the information shown on this drawing.
Note: Fletcher installs the precleaner extension 1" from the floor but your floor conditions may warrant an increased height from the floor.
420972 is to prevent the extension tube from being sucked into the precleaner.
Eight slits, 3 inches long from the bottom can be used as an alternate. If wet conditions require the precleaner extension to be very short, slits may not be necessary.

4) Type 2 precleaners will require two slits to be made in the extension tube to accommodate slipping the tube beyond the flapper pivot shaft.

TYPE 2

LEVEL	DATE	BY	REVISION
A	11/12/09	TJR	RELEASED

DO NOnot CHANGE MANUALLY

MAT'L. WT.

DIMENSIONS AND TOLERANCES IN INCHES UNLESS OTHERWISE SPECIFIED :

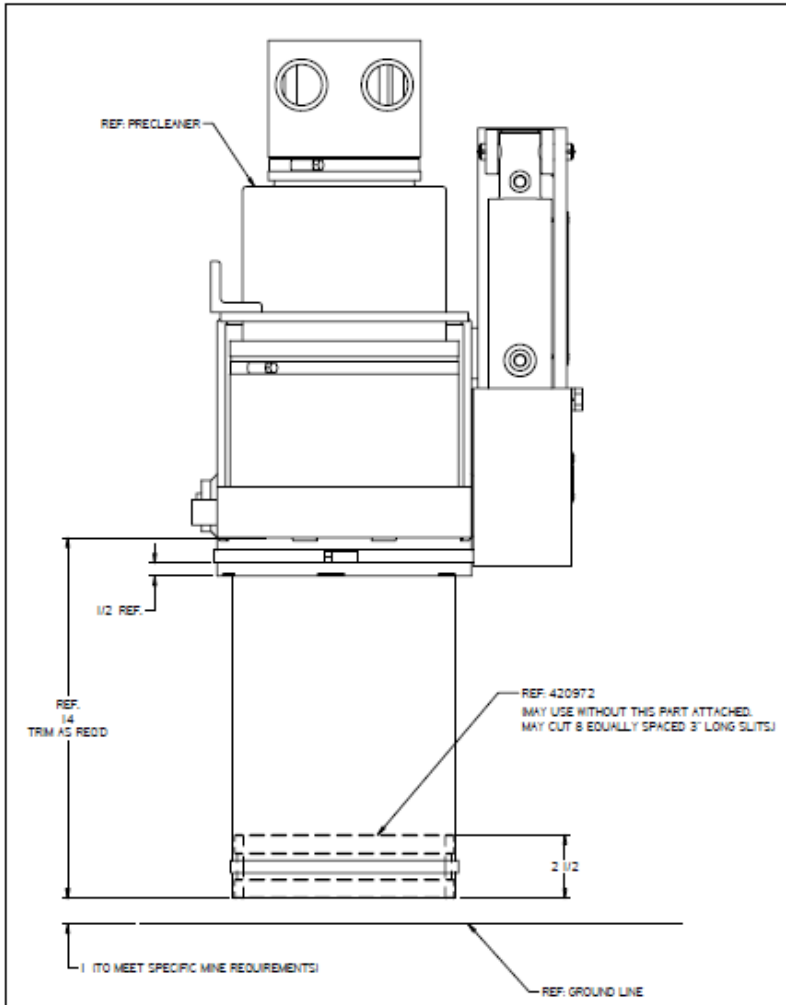
J. H. FLETCHER & CO.

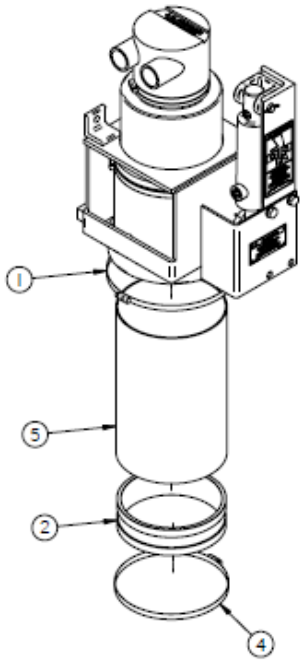
PRECLEANER EXTENSION TUBE INSTALLATION

FILENAME	MODEL FILE
423390.SLA.drt	

BY	SHEET	DWG	REV
TJR	1 OF 1	423390.9X	A

Precleaner Skirt





item	part no	drawing	description	qty
1	20472		HOSE CLAMP	1
2	420972	420972A	TUBE	1
3*	423390	423390.9X	PRECLEANER EXTENSION TUBE INSTALLATION	1
4	8233		HOSE CLAMP	1
5	8263	8263.9X	PRECLEANER EXTENSION TUBE (14")	1

LEVEL	DATE	BY	REVISION
A	11/12/09	TJR	RELEASED

DO NOnot CHANGE MANUALLY

MAT'L | WT.

DIMENSIONS AND TOLERANCES IN INCHES UNLESS OTHERWISE SPECIFIED :

BREAK CORNERS 0.005" - 0.015"

PROJECTION ANGLE

DECIMALS
0.0 +/- .03
0.00 +/- .01
0.000 +/- .005

FRACTIONS +/- 1/16"
ANGLES +/- 1 DEGREE

UNLESS OTHERWISE SPECIFIED ALL STEEL SPECIFICATIONS ARE
HRS PLATE — A36
HRS BAR — A36 OR 1020
ALLOY BAR — 4140/4142 HEAT TREATED

WELDING STANDARDS:
SEE SHEETS DOCUMENT ON JHF WELDING STANDARDS AND SPECIFICATIONS. WELD SYMBOLS OR NOTES ON DRAWING SUPERCEDE SHEETS DOCUMENT

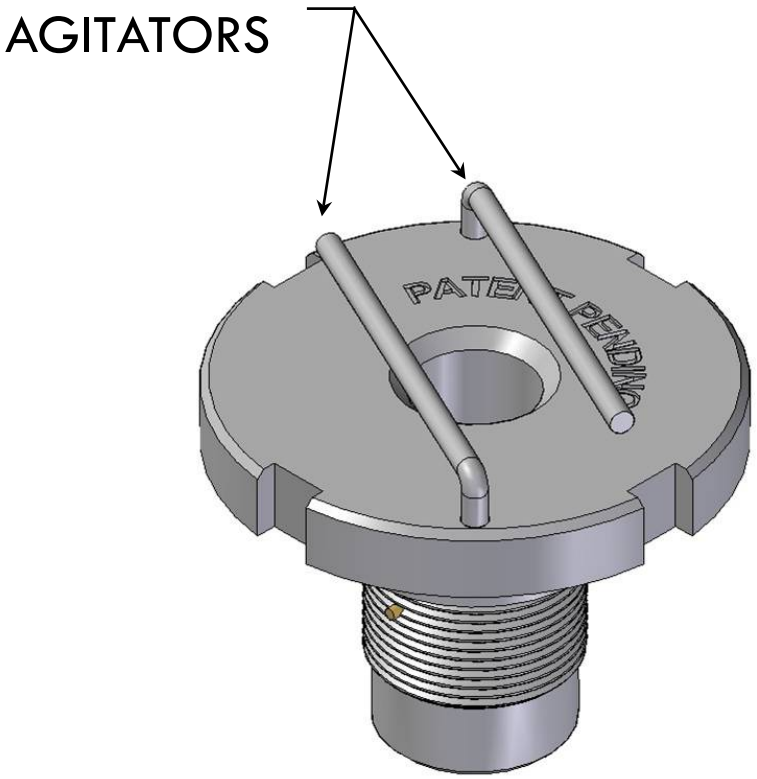
J. H. FLETCHER & CO. ©

PRECLEANER EXTENSION TUBE KIT
(NEW VERSION PRECLEANER W/14" TUBE)

FILENAME	MODEL FILE	BY	SHEET	DWG	REV
423387.SKA.dft	423387.dsm	TJR	1 OF 1	423387.9X	A

Dust Agitator

- Common dust clog area
- Agitator reduces clogs



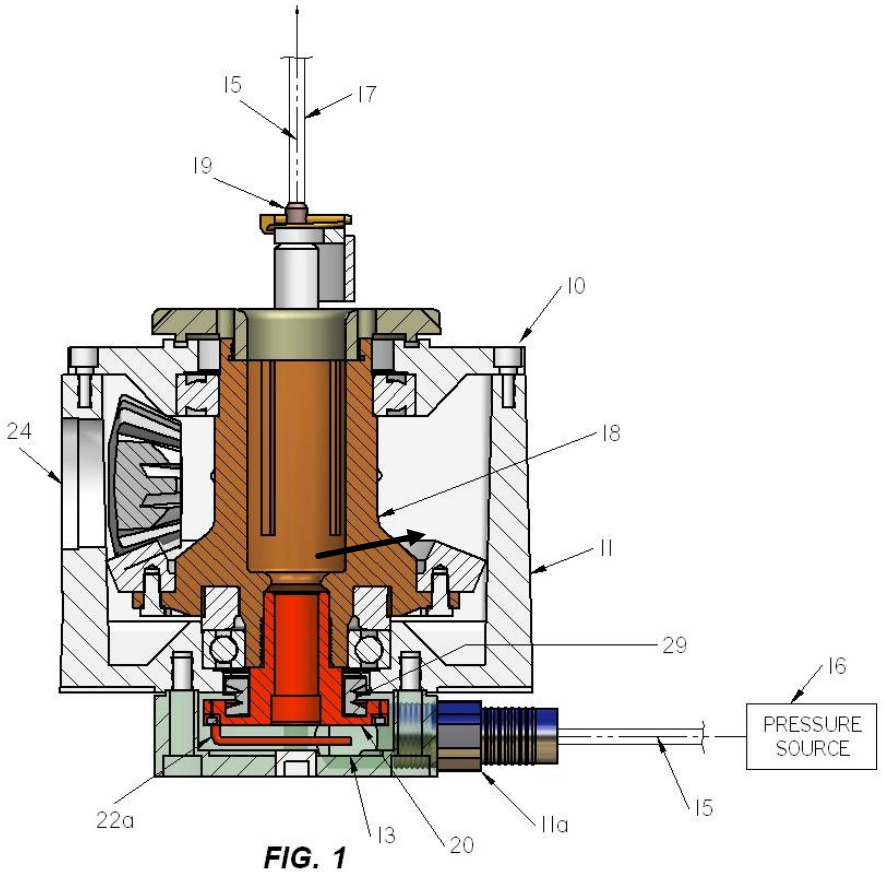
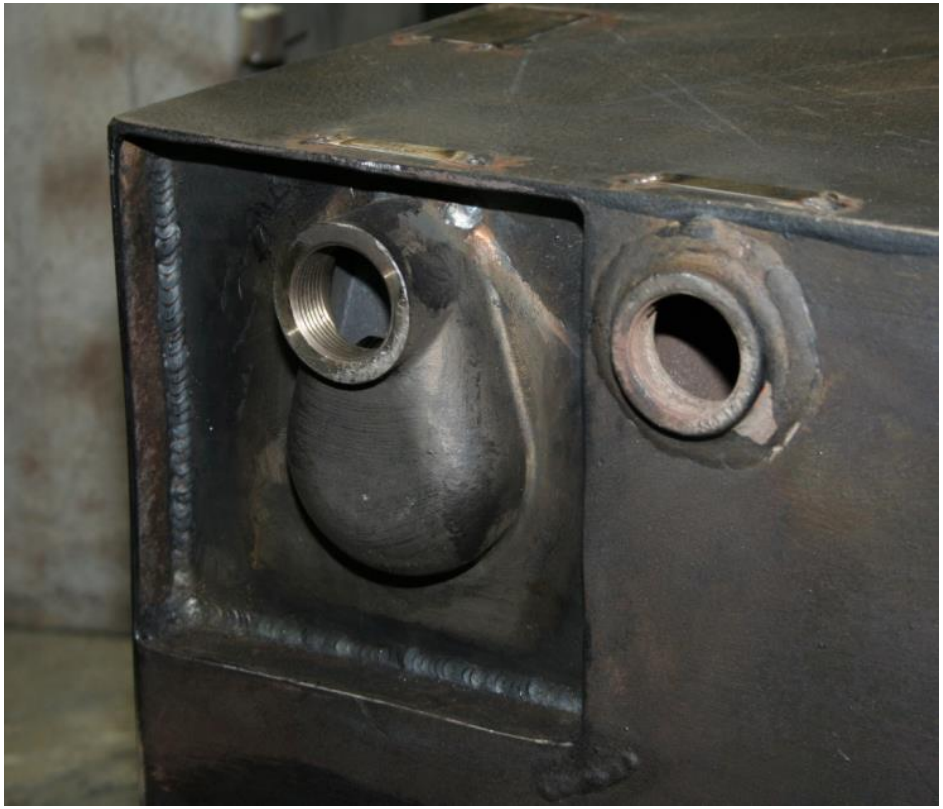


FIG. 1

Dust Tank Advancements

Dust Tank Advancements

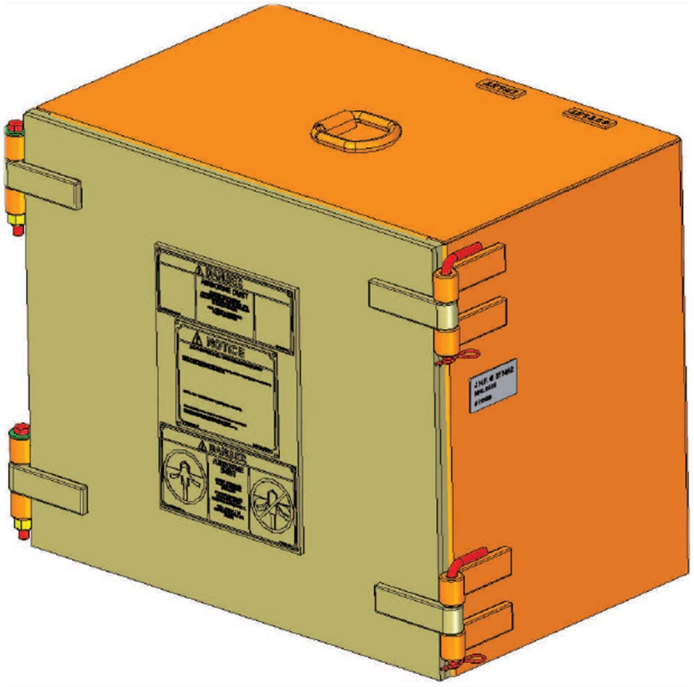


Dust Tank Advancements

Dust Tank Assembly

56298 DUST TANK W/ 198314 DOOR

56298 DUST TANK W/ 513456 DOOR



"Our goal is to manufacture equipment for underground mining that increases safety and production through engineering innovation, quality control, experienced service and ownership stability"

J. Robert Fletcher, Chairman

Phone: 304-525-7811
Fax: 304-525-3770
E-mail: sales@jhfletcher.com
Website: www.jhfletcher.com

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www.jhfletcher.com • 304.525.7811

402 High Street • Huntington, WV 25705