

**Convaire Pneumatic Bulk Silotainer Operation &
Maintenance Manual**



Customer: Sibelco

Serial No: 1432

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GENERAL DESCRIPTION OF EQUIPMENT

The C1-84SC2T-01 Silotainer is a Class 3 pressure vessel manufactured in accordance with AS1210. It is made from carbon steel boilerplate and pressure tested to 1.5 times its design pressure. The vessel is fitted with a pressure gauge and a relief valve to prevent being over pressurised.

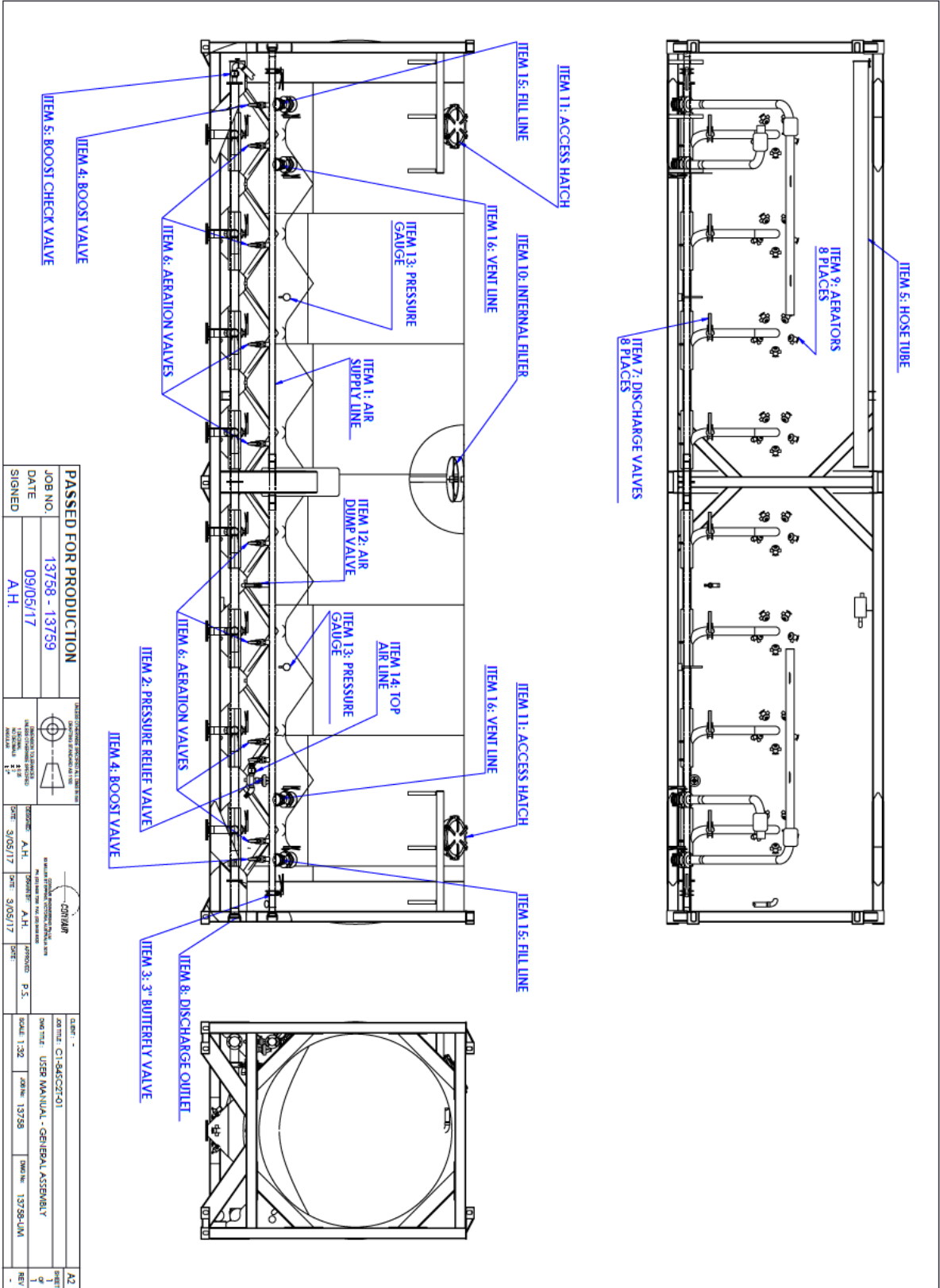
It is constructed with internal "shedder plates" to shed the material towards the outlet where it is fluidised and conveyed out the outlet valve, into the discharge manifold, through the discharge hose and into the silo. These shedder plates are not pressure bearing (e.g. are not part of the pressure vessel) in the interests of low tare weight.

The tanker is fitted with internal filters which allow air to flow freely into and out of the void under the shedders.

The function of the aeration devices at the base of each discharge cone is to mix air with the product such that it can be pumped through the discharge pipework more or less like a fluid. Fine powders such as cement, flyash and flour retain air quite well and are therefore conveyed well pneumatically.

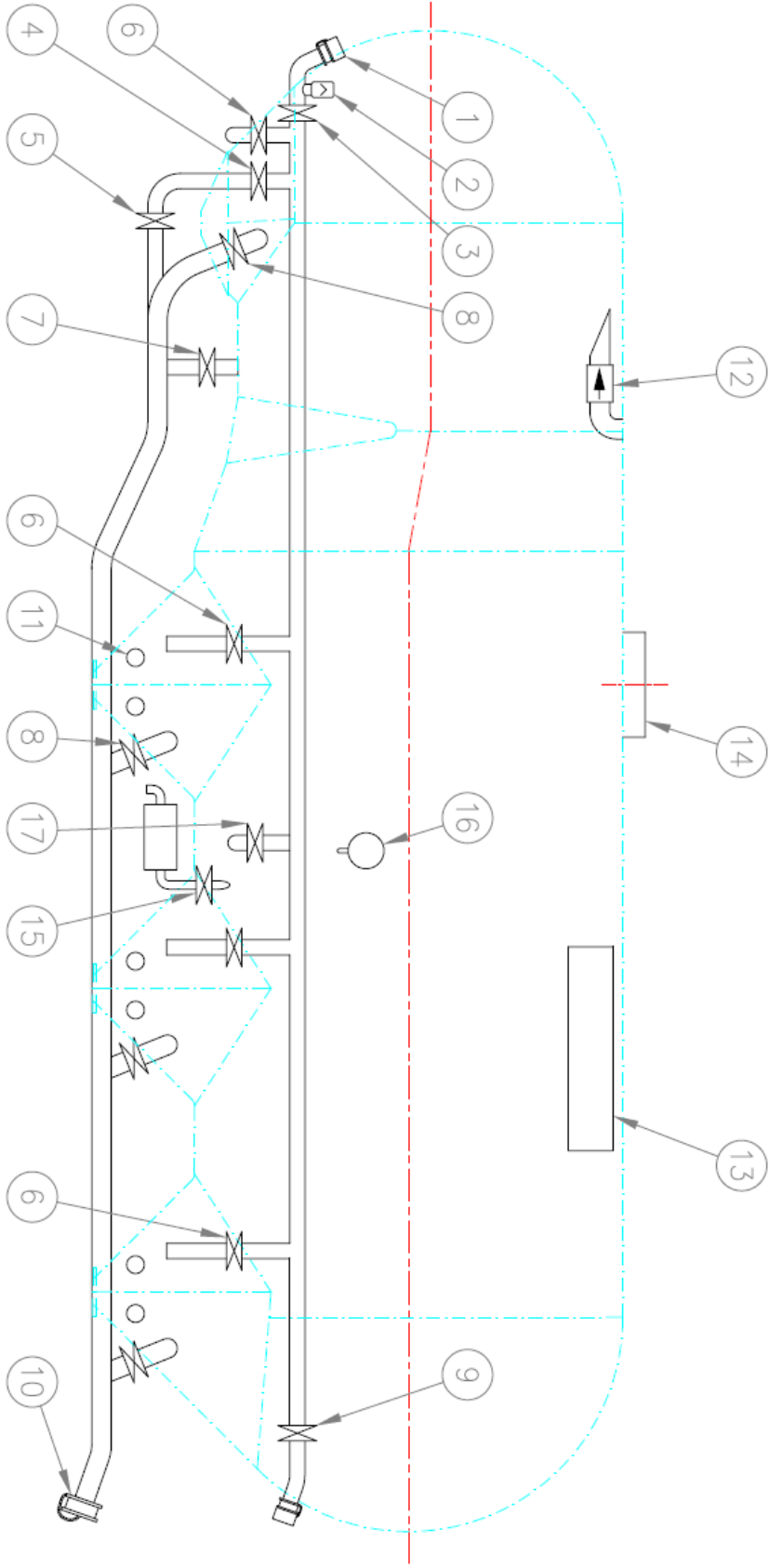
The C1-84SC2T-01 Silotainer was designed to work in conjunction with the *CE-PPASM11-01 Power Pack & Dust Collector trailer*. This trailer will be referred to throughout this document to this trailers and related instructions outlined in its operational manual.

SILOTAINER LAYOUT SCHEMATIC



PASSED FOR PRODUCTION				CLIENT: -	
JOB NO.	13758 - 13759	DATE	09/05/17	DATE	3/05/17
DATE	09/05/17	DATE	3/05/17	DATE	3/05/17
SIGNED	A.H.	SIGNED	A.H.	SIGNED	P.S.
<small>DESIGNED BY: A.H. DATE: 3/05/17</small> <small>CHECKED BY: A.H. DATE: 3/05/17</small> <small>APPROVED BY: P.S. DATE: 3/05/17</small>		<small>DESIGNED BY: A.H. DATE: 3/05/17</small> <small>CHECKED BY: A.H. DATE: 3/05/17</small> <small>APPROVED BY: P.S. DATE: 3/05/17</small>		<small>DESIGNED BY: A.H. DATE: 3/05/17</small> <small>CHECKED BY: A.H. DATE: 3/05/17</small> <small>APPROVED BY: P.S. DATE: 3/05/17</small>	
<small>CONVair Engineering Pty Ltd</small> <small>93 Miller Street, Epping</small> <small>PO Box 141, Epping</small> <small>Victoria, Australia 3076</small>		<small>CONVair Engineering Pty Ltd</small> <small>93 Miller Street, Epping</small> <small>PO Box 141, Epping</small> <small>Victoria, Australia 3076</small>		<small>CONVair Engineering Pty Ltd</small> <small>93 Miller Street, Epping</small> <small>PO Box 141, Epping</small> <small>Victoria, Australia 3076</small>	
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ITEM	DENOTES	DESCRIPTION	ITEM	DENOTES	DESCRIPTION	ITEM	DENOTES	DESCRIPTION
ITEM 1	"	AIR SUPPLY CONNECTION	ITEM 7	"	DISCHARGE VALVE (WHERE FITTED)	ITEM 13	"	INTERNAL FILTER (WHERE FITTED)
ITEM 2	"	PRESSURE RELIEF VALVE	ITEM 8	"	AIR MANIFOLD BUTTERFLY VALVE	ITEM 14	"	LOADING HATCH
ITEM 3	"	AIR MANIFOLD CHECK VALVE	ITEM 9	"	DISCHARGE OUTLET	ITEM 15	"	VENT VALVE
ITEM 4	"	BOOST VALVE	ITEM 10	"	AERATOR	ITEM 16	"	PRESSURE GAUGE
ITEM 5	"	BOOST LINE CHECK VALVE	ITEM 11	"	POSITIVE INTERNAL VALVE	ITEM 17	"	TOP AIR VALVE
ITEM 6	"	AERATION VALVE	ITEM 12	"				



REV	DESCRIPTION	CHKD	DATE	BY
B	ITEM 17 (TOP AIR VALVE) INCLUDED.		27.9.00	AJB

CONVAIR		CONVAIR ENGINEERING Pty Ltd 93 MILLER ST EPPING, VICTORIA, AUSTRALIA 3076 PH. (03) 9408 7255 FAX. (03) 9408 6820	
DRAWN BY	R. Y.	DATE :	20/8/98
APPR'D BY		DATE :	

ITEM	DRG. No	DESCRIPTION	MATERIAL	QTY
TITLE : PNEUMATIC TANKER BREAK ALL SHARP CORNERS & REMOVE ALL BURS --- DO NOT SCALE DWG --- DIM IN METRIC				
SCALE: 1:35 DWG No: CV4179				
CAD FILE NAME: CV4179 SUB DIR: CAD DIR: DATA DATE: 20/8/98 BY: R. Y.				

NOTES ON PNEUMATIC TANKER FUNCTION

Item 1. Air Supply.

The air supply to the tanker can come from a variety of sources. A PTO driven compressor mounted on the primemover, self-contained powerpack fitted on the tanker or in some instances air supply is provided by the plant. In most instances the source of the air supply will be a positive displacement compressor or blower. It is therefore most important that the air supply never be started up or shutdown under load. This places a great deal of stress on the compressor or in the case of a blower will almost certainly result in damage to its rotors. It also greatly increases the likelihood of having a reverse flow of product in the airline/ aeration system, resulting in irreparable damage to the compressor/ blower.

Any air supply will have a balance of volumetric capacity and pressure. The manner in which the tanker is operated is dependent on the product that you have to unload, the silo arrangement that you are unloading into & the type of air supply you have to operate the tanker with.

A high pressure low volume air supply, ie Betico piston compressor will be ideal for products that are easily aerated such as cement, flyash, flour, and lime at times. Products that are easily aerated use pressure in the tanker & only limited airflow to be very efficiently conveyed. Products such as Soda Ash, coarser Lime, sugar, pellets etc are not easily aerated and require higher air volume to be conveyed efficiently.

Item 2. Pressure Relief Valve.

A pressure relief is required by law to be fitted to a pressure tank. Its function is to ultimately limit the pressure that the tanker is capable of achieving. To do this the pressure valve is fitted in the airline manifold so as to prevent product from entering the valve. The valve is also a protection for the compressor or blower and is often set at a pressure for protection of the compressor or blower. It is vital that the relief valve be tested on a weekly basis and maintained in good order.

Item 3. Air manifold Check Valve.

The air manifold check valve is there to provide protection for the air supply against a reverse flow of air & or product. The failure of a check valve can result in very permanent and expensive damage to the compressor/ blower.

Item 4. Boost Valve.

The boost valve is used to control the operating pressure of the tanker and also the consistency of product flow during discharge. The setting of this valve constantly changes during discharge. Generally, the setting of this valve should be just enough to maintain a consistent flow and maintain an optimum pressure in the tanker.

Item 5. Boost Line Check Valve.

The boost line check valve when playing its role is not noticed. If this valve fails product will travel backwards into the air manifold and block the aeration system and possibly cause damage to the compressor.

Item 6. Aeration Valve.

Is an on/off valve that is used to control airflow to the aerators in individual discharge cones.

Item 7. Discharge Valve.

A golden rule when operating a pneumatic tanker. This valve is always the last valve you open and the first you close.

Item 8. Discharge Outlet.

Can be an extremely dangerous place. Make sure camlocks have seals & are in good condition, camlocks are in good condition and the discharge hose is in good order. Importantly ensure that the hose is attached to the camlock with at least two heavy duty type clamps each end. Camlock caps should have a hole drilled to ensure there is no residual pressure build up behind the cap when removing.

Item 9. Aerator.

Very important to the efficient unloading of a tanker. Wear will cause them to leak air backwards. When this happens generally product will follow and cause the air manifold to block. Leaking aerators should be replaced immediately.

Item 10. Internal Filter (where fitted).

Internal filters are used to prevent product from inside the tanker from entering vent lines which enable air to be vented from inside the tanker to either under the shedder plates or to the atmosphere. In either instance it is always important that these filters be kept in good order.

Item 11. Loading Hatch.

Must be kept in good order. Accidents involving hatches are by far the most common cause of injury and death with pneumatic tankers. Great care must be taken when opening hatches, even residual pressure built up during travel will be enough for the hatch to fly open when opened carelessly.

Item 12. Dump Valve.

This valve when opened will vent the tanker to atmospheric pressure. It is a good habit to always leave this valve open at the completion of discharge. This ensures that the tanker is always at atmospheric except when the tanker is being pressurised to unload.

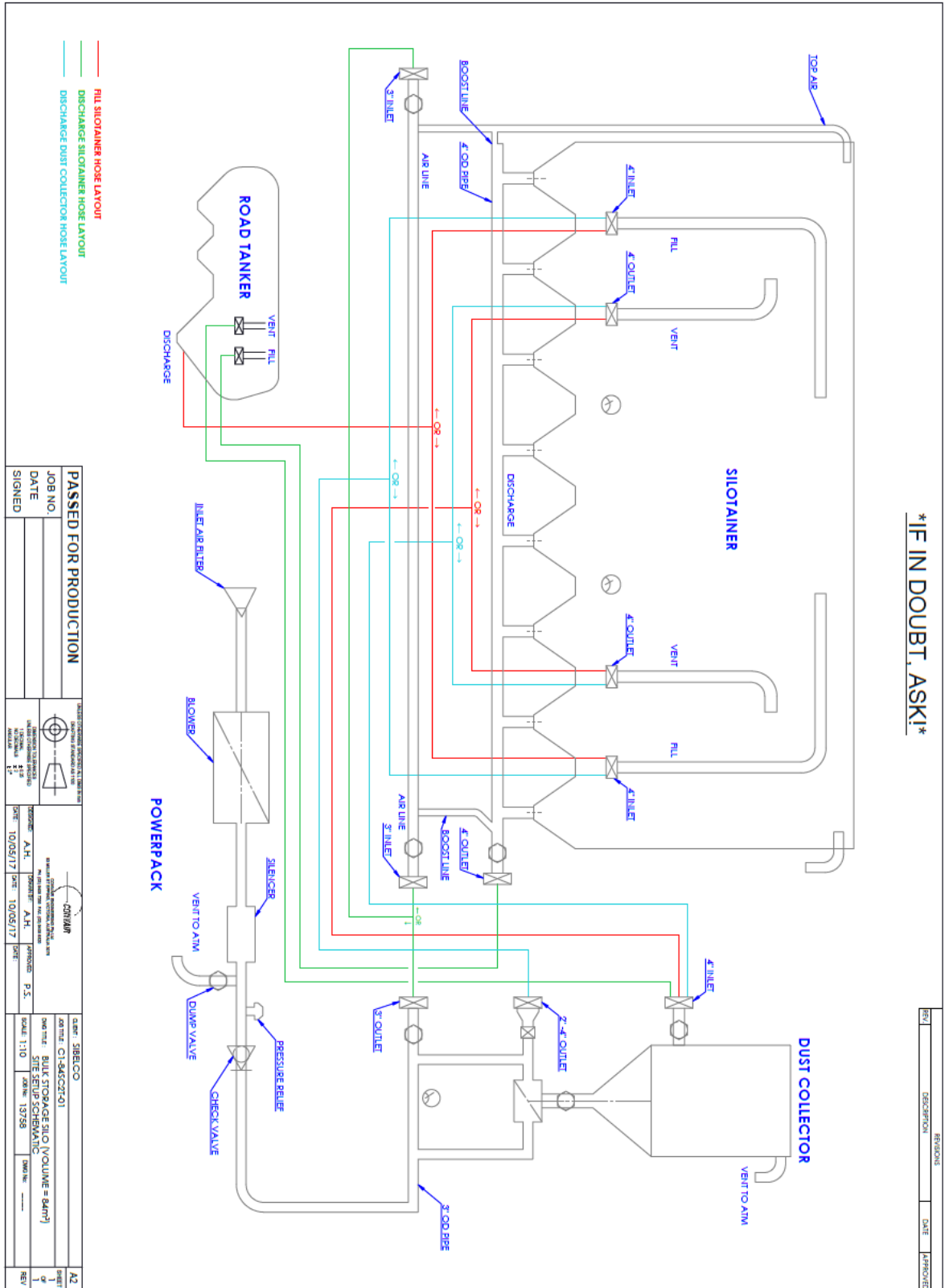
Item 13. Pressure Gauge.

The pressure gauge provides an indication of the internal pressure of the tanker. They should always be kept in good order and be accurate. They should be redlined with the working pressure of the tanker or compressor. Often a second pressure gauge is fitted in the airline. This is of assistance during discharge of difficult products when line pressure can vary from tank pressure.

Item 14. Top Air Valve.

This valve when opened will pass air into the tanker, above the product. It is used in conjunction with the aeration valves to both pressurise the tanker and assist with discharge. This means the operator can pressurise the tanker with the top air valve and one aeration valve, which reduces noise from the aerators and prolongs their life.

SITE SETUP SCHEMATIC



INSTRUCTIONS TO LOAD SILOTAINER PNEUMATICALLY

Pre-starting Check.

Wear hearing protection and any other site specific personal protective equipment.

Ensure that the boost/bypass valve is fully open so that the compressor can be started with no back-pressure.

Ensure all discharge valves are closed.

Ensure that at least, the top air valve and one aeration valve are open (the one on the discharge cone that will be unloaded first).

Operating Procedure.

Connect the discharge hose from the road tanker to the Silotainer 4" fill line.

Connect a hose to the vent line on the Silotainer to a suitable dust collector.

Fully open both the fill & vent lines on the Silotainer.

Ensure all discharge valves are closed on the Silotainer.

Ensure the loading hatch in the top of the Silotainer is closed securely.

The Silotainer is now ready to be loaded pneumatically from a road tanker.

The road tanker being used to load the Silotainer should be operated as per manufacturers instructions.

During loading the pressure gauge on the silo should read zero. If pressure is building in the silo, the operator must stop loading and check the vent line & dust collector for restriction/blockage.

The operator must closely monitor the loading process to ensure the silo is not overfilled or overloaded. Typically, the transfer rate of cement is around 1.0t per minute, depending on the air supply available, the tanker being used & the distance product is being conveyed.

To stop loading the silo, follow the road tanker manufacturers' instructions to stop unloading the tanker.

When loading is complete, close the fill & vent lines & disconnect the hoses.

DISCHARGE OPERATING INSTRUCTIONS

Pre-starting Check.

Wear hearing protection and any other site specific personal protective equipment.

Ensure that the boost/bypass valve is fully open so that the compressor can be started with no back-pressure.

Ensure all discharge valves are closed.

Ensure that at least, the top air valve and one aeration valve are open (the one on the discharge cone that will be unloaded first).

Operating Procedure.

Connect the discharge hose from the Silotainer to the road tanker fill line.

Connect a hose to the vent line on the road tanker to a suitable dust collector.

Start the compressor, blowing air into the silo. This ensures the blower/compressor is **not** started under load, as detailed in the *CE-PPASM11-01 Power Pack & Dust Collector Trailer Instruction Manual*.

Close the boost valves.

Build up pressure to close to the maximum operating pressure.

Do not leave Silotainer un-attended while vessel is pressurised.

Open the boost valves about half way.

Immediately open the discharge valve closest to the tanker.

Check the pressure gauge to see if the pressure is rising or falling.

If the pressure is rising, gradually open up the boost valve in small increments until the pressure stabilises at or close to the maximum operating pressure of the tanker.

If the pressure is falling, reverse the above.

When the first discharge cone is close to empty, the pressure will start to fall. Quickly close the discharge valve and open the next gradually. It should be possible to change from one cone to the next with virtually no drop in pressure. This will minimise the discharge time for the tanker.

Close the aeration valve on the cone that has just been emptied and open --- another.

Always monitor the pressure gauge and adjust the boost valve accordingly.

When the majority of product is emptied from each discharge cone, move progressively back over each cone and allow the pressure to drop slightly as each cone cleans out completely. Total clean-out will be evident when the aerators vibrate freely.

If the Silotainer is fitted with a shallow angle BTI aeration pad in the front of the tanker all other aeration valves must be shut and the boost valve must be gradually closed as the pressure drops during the clean-out process. E.g. all air must be directed to the one pad in order to achieve total clean-out. The front cones should be cleaned out after the rear cones.

When all cones are empty, allow the tank pressure to drop back to atmospheric through one or two discharge valves and fully open the boost valve.

When the pressure has dropped to atmospheric, stop the compressor, close the discharge valves and disconnect the discharge hose from the tanker. Disconnect hot air hose from Silotainer if required.

DO NOT start the compressor under load.

DO NOT stop the compressor under load.

DO NOT leave the silotainer while it is unloading.

ALWAYS have at least one aeration line and the top air valve open at all times.

CHECK the operation of the relief valve every week to ensure that it does function and prevents the tanker pressure exceeding the max. operating pressure by 10%.

ALWAYS operate the silotainer at or close to maximum operating pressure for maximum efficiency of discharge.

Emergency Shutdown, close all discharge valves, open emergency dump valve on compressor/blower outlet **THEN** shut compressor down.

PROCEDURE TO UNBLOCK TANKERS

If a tanker discharge line becomes blocked during unloading it may be possible to unblock the discharge line without the need to disconnect any hoses.

All equipment (valves, hoses and camlocks) need to be in good condition for this to procedure to work.

This procedure should only be carried out by confident competent operator otherwise the blockage could be made worse or equipment could be damaged.

Once a blockage has occurred, close all discharge valves, open tanker dump valve and then shut down the compressor.

With the dump valve open, the tanker pressure will drain down to atmospheric. Determine if the blockage is due to silo being full or lack of pressure during unloading.

The blockage will be easiest to clear back into the tanker cone that is most empty and closest to the blockage.

Close all aeration valves, fully open the boost line and leave tanker dump valve open.

Start up the compressor and set to operating rpm.

The relief valve will most likely go off.

Fully open discharge valve (closest to silo or of most empty cone), and close quickly. Repeat this procedure until the relief valve does not blow off.

Product should run back into the tanker and clear the blockage.

This procedure works by using the blockage to trap pressure between the product blockage and the tanker discharge valve. When this pressure is drained quickly back into the tanker, it creates a vacuum that draws product back with it.

MAINTENANCE

BTI AERATORS.

BTI aerators should give a period in excess of 1000hours of service with no maintenance. They are quick and simple to replace when the need arises. Ensure that there is no wear of the vessel wall where it is contacted by the disc. A sacrificial stainless steel disc is usually fitted between the vessel and the disc. Wear rates of the disc and wear plate vary depending on how the tanker is operated with what product. It is imperative that the wear rate is monitored and from this periodical preventative maintenance can be scheduled.

INTERNAL FILTERS (WHEN FITTED)

The function of these filters is to vent the void area under the shedder plates and to prevent product entering the void. It is therefore important that they are kept in good condition. Check them at least monthly. The usual life is 2-3 years.

DISCHARGE VALVES.

The life of these valves can vary between 3 months (on abrasive products) to 1 or 2 years on non-abrasive products such as flour. Leakage can lead to line blockages, slow pressurising and erratic discharge.

AIRLINE VALVES.

Aeration valves generally last many years.

Boost valves have a lot shorter life due to being exposed to the product being handled and operated in a throttled position. It is important to maintain these valves in easy to operate, leak free condition for maximum efficiency of operation.

CHECK VALVES.

The function of the check valves is to prevent backflow of product into the compressor. They suffer a fairly high wear rate due to the pulsing flow of the air and should therefore be checked for wear on a regular basis - every 3 months.

RELIEF VALVES.

The relief valve performs the very important function of preventing the tanker over-pressurising if the tanker is not operated in such a way as to limit the

maximum pressure. It therefore should not leak or relieve in normal operation. It is possible for the valve to become frozen shut with potentially dangerous results. Tankers are designed with a significant safety factor but there have been several failures of older tankers due to over-pressurising. We therefore recommend that the relief valve be checked for correct function on a weekly basis.

PRESSURE GAUGES.

The pressure gauge is extremely important to the safe, efficient operation of any tanker. The standard oil filled gauge should last 6-18 months and be replaced with a similar quality gauge as soon as its accuracy is suspected.

HATCHES.

Routine maintenance in accordance with manufacturers recommendations. Hatches are an extremely critical component of the tanker. When any component is worn or suspect in any way it should be replaced. Do not attempt to open a hatch when there is pressure in the tanker.

It is extremely important that hatches are kept in as new working condition.

MAINTENANCE SCHEDULE FOR CONVAIR PNEUMATIC BULK SILOTAINER

Item	Check for	How	Daily	Weekly	Monthly	Bi Annually	Annually
Hatch levers	adjustment, condition	Visual & manual function		•			
Hatch seals	Condition and sealing	Visual		•			
Discharge valves	sealing	Air test		•			
	operation	manual function		•			
	remote controls	Visual & manual function			•		
Aeration valves	operation	manual function			•		
Boost valves	operation	manual function		•			
	sealing	Air test		•			
Check valves	operation	Air test		•			
Relief valve	operation	Air test			•		
	Leakage at operating pressure	Air test			•		
Posivent Valve & internal & ext. check valves	operation	Air test & visual		•	•		
Internal Filters	condition	visual			•		
	replace						•
BTI Aerators	operation	Air test		•			
	wear	Visual			•		
	blockage	Inspect/Air test	•				
Hose	condition	Visual			•		
	leakage	Air test			•		
Hose Clamps	tightness	Visual			•		
Pipework	leakage	Air test			•		
	wear	Visual	•				
Camlocks	wear	Visual		•			

Vessel	Condition	Visual						•
In accordance with AS3788	Corrosion	Visual						•
Frames & corner castings	condition	Visual					•	
Pressure Gauges	Appearance – oil level	Visual				•		
	function	Air Test	•					

This maintenance schedule should be treated as a guide only, as service demands on equipment may vary. Ensure the Silotainer and its' components are well maintained for optimum operation and performance.

TANK CLEANING INFORMATION

The following procedure has been outlined for tanker washout. This procedure should be used as a base and should be cleared with your customers. Their cleanliness and QA procedures would need to be met and some areas may be able to be relaxed others may be more attention.

Dry and wet wash is described and a combination of these will give the best cleanout. If a dry wash only is needed several steps could be omitted.

Additional care should be taken on flushing out as much product at the silo as possible prior to conducting a clean out. This minimises product to be collected at clean out.

Before entering a tanker Confined space entry guidelines must be followed.

The unit must be clearly identified/restricted so that it can't be moved.

A cursory internal inspection should be made from the hatches to check product level prior to opening any washout valves.

Washout valve outlets and or caps for clean out should be opened/removed and a suitable container placed to collect product.

Residual product in the tanker on the walls should be dry swept where possible with the use of a stiff broom and or a plastic flexible type scrapper. Work from top down and care should be taken not to use the Aerators as steps, this can easily damage them.

It is possible that a dry sweep with the operator outside the vessel is all that is needed.

Particular attention should be given cleaning the inside top of the tanker and build up in the tide line area. Moisture will tend to enable more product build up in those areas.

Attention should also be given to cleaning the inside of the hatches.

When as much product as is practicable has been removed the operator should determine if the tanker is suitable for reloading, or if further steps are needed.

If the tanker is ready for another load the washout valves and plugs should be replaced.

The tanker should then be run up to clear any product from around the aerators and to blow the discharge line clean. Use two to three aerators at a time to clear product. Give the discharge valves short bursts to clear product. Tanker only needs to be at approximately 20kPa. Product and dust blown out line will

depend on cleanliness of tank and depending on the location of cleanout a container/bag may be needed.

If more cleaning is needed the tanker could be manually vacuumed out. The tankers are not designed to cope with a vacuum pressure and can only be cleaned out by local manual vacuuming it is common to use small industrial type cleaners to do this.

Warning: Under no circumstances should a Pressure tanker be closed up and subject to a Vacuum pressure.

If the tanker has aeration type cloths it should only ever be dry cleaned out by sweeping and vacuuming. Otherwise the cloths can become blanked or blinded off and will not aerate product. If a cloth aeration type tanker needs to be wet washed it may be necessary to replace the cloths afterwards.

If the tanker is an aerator type they can be wet washed out.

For a wet wash care should be taken in a few particular areas inside the vessel.

Determine whether the tanker is a "Posivent System" or not and if the tanker has any internal filters. Pancake or tube type in the vessel roof.

Posivent tankers have a check valve in the roof area. This valve needs to be kept clean and it should not be flooded with water. There is an elbow on the outlet and generally it is safe to spray in the area around the valve.

If the tanker has any filters in the roof that area should not be wet washed.

Wet washing could be with cold or hot water and detergents can be used. You would need to check with your end customer as to the suitability compatibility of detergents with the product and to make sure that the detergent isn't a contaminant for your given product.

Care must be given if a Truck wash solution was to be used on the inside of a food grade tanker.

When the tanker is wet washed the care must be taken that there is not too much product residue in the tanker to begin with otherwise this may be washed into the discharge line.

If it is not fully cleaned out may latter form a dry plug of product in the line.

Make sure that the water level during wet cleaning doesn't submerge the aerators or the entire discharge pipe at the bottom of the cone.

It may be necessary to scrub product off the walls while washing depending on the level of build up and time interval between cleanouts.

Once the vessel is cleaned the excess water should be drained and could also be blown out of the vessel.

The tanker should then be dried. It is best to dry the tanker out straight away. This ensures that wet product is able to be cleared from the tanker and minimises the potential risk of loading onto excess water.

For stockfeed and flour tankers it is also recommended to dry the tanker out to reduce the chance of mould/bacteria growth.

To dry the tanker out the blower should be run up and air should be run into the tanker through all the aerators with the rear discharge valve open and the boost valve closed.

After 3-4 minutes and some initial warm up all but the front aerators should be closed off.

Air will then be able to flow through from front to rear through the tanker. Initially some moisture will come through then warm dry air should be easily felt at the tanker outlet.

When warm air is felt each discharge valve should be opened and closed in turn to drive any moisture from the lower section of each cone. The tanker should be dry after approximately 15 minutes of running.

It is important after a wet wash to ensure that all aerators are functioning properly. This is generally done by feeling and hearing the noise from each cone as the aerators are switched on and off. If any cone is suspect (No noise or hoses not warm) it should be more thoroughly checked out prior to loading.

The blower should be shut down and the discharge valve of the tanker closed. The air drain dump should be open so as the tank can breathe while it cools back to ambient temp.

The period between washouts will be quite varied depending on the products being carted and the customer's expectation on cleanliness.

Cement and mineral tankers would generally require a minimum of clean out and may only require cleaning to reduce build up on the walls. Possibly a clean out is only needed every six months this would probably be in combination with some other servicing.

Cleaning may be needed to enable a product change. (Lime to cement or for special strength cements)

For flour and food grade tankers the time between cleanouts would again vary. With flour we would recommend tank be cleaned out once a week and more

frequently if a product change requires it. For pelletised stock feed clean out should be approximately monthly with main emphasis on the inside top of the vessel, hatches and tide mark. For sugar approximately two to three weeks dependant on product change and build up on the walls.

Cleanout intervals could be varied and with the establishment of a cleaning history. The large variety of products and conditions means that this is best established with your customers, and to suit your operational conditions. (Metro vs Long haul. Dry vs humid)

Once the inside of the tanker has been cleaned and the lids are securely closed. The top of the tanker should also be cleaned. Special attention should be given to the hatch ring areas, any product build up on nonskid surfaces as well as debris in mesh walkways.

Truck exhaust soot may also need to be cleaned off.

Depending on the products being transported the demand on the cleanliness for the top of the tanker will vary. Food and plastics industry are usually quite involved and tankers used in mining and mineral products areas are less demanding.

HATCH ADJUSTMENT

Insert Knappco Hatch pdf here