



MN-PV-CIS-002

Dry Vac Competency Manual

**MN-PV-CIS-002 – Dry Vac Competency Manual
Rev 8**

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Training Expectation Letter

It is required that this document is completed prior to the Employee starting training on a P&V Dry Vacuum Truck. This document will serve as formal record that all parties have reviewed and understand the expectations for training on the Dry Vacuum Truck.

Trainee Name:

Date of Discussion:

Expectations of Supervisor/Leader

- Ensuring trainee has scheduled time for training.
- Ensure trainee has reviewed and understand the technical documentation
- Ensure trainee has been provided a demonstration on equipment operation
- Verify field competency sign offs once completed
- Ensure trainee is working with a competent mentor until they are competent themselves
- Provide support for the assessor, mentor, trainer and trainee whenever possible.
- Ensure training documentation is sent to CEDA Training Department

Expectations of Trainer, Mentor, assessor

- Must be qualified in the position for which he/she is training.
- Educate and support trainee with technical review package.
- Ensure trainee has been provided a demonstration on equipment operation
- Review trainee's technical knowledge and verify acceptable understanding
- Educate and support trainee with field tasks identified in the competency check sheet
- Verify trainee has the ability to perform tasks identified in the competency check sheet
- Communicate to Supervisor that the technical review and field competency is complete

Expectations of Trainee

- Complete all prerequisites outlined within the training program.
- Understand the training process outlined in this document.
- Understanding systems and spending time in the field.
- Ensure all lessons and tasks are signed off by the appropriate personnel as indicated on the training documents.
- Inform Supervisor/Leader on progress of training through face to face meetings.
- Will utilize all the materials provided to ensure a comprehensive training program is followed.
- Provide feedback on the training process and any updates that are required to the training material.
- Inform Supervisor/Leader of any training barriers that may exist during the training process.

Training Expectation Acceptance Agreement

I, _____ understand the expectations of me as a trainee as outlined in this document

(Operator Name)

Operator/Trainee

Name

Signature

Date (MM/DD/YY)

Supervisor/Leader

Name

Signature

Date (MM/DD/YY)



Acknowledgement

This manual has been developed using information and knowledge obtained from manufacturer's documentation and input from experienced Operators. Additionally, this manual has been validated by numerous Subject Matter Experts at CEDA. We welcome any comments or suggestions pertaining to this manual and its contents.

Many thanks to those who have demonstrated a clear dedication to CEDA and our values by participating in the creation of this program.

Michael Humen (Edmonton, AB)
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Thera Demers-Ortiz (Edmonton, AB)





Objective

Welcome to CEDA Dry Vacuum Truck Training

This program is designed to provide you with the training necessary to carry out your job in a manner that safeguards yourself, those around you and our environment. Upon Completion of this Module you will be able to:

- Review Dry Vac Operations
- Operate Dry Vac Unit
- Maintain/ Care for Dry Vac Unit

Employee(s) will demonstrate knowledge & skill in the proper application of equipment through practical application.

Instructions

All material must be completed in the order presented to ensure that prerequisites are met.

Employees will demonstrate knowledge and skill in the proper application of equipment through practical demonstration and application.

NOTE: All forms and procedures included are those required by CEDA. Work must be performed in accordance with these standards. On Client work sites, there may be additional standards and modified work procedures that will also have to be met.

Description: This is a knowledge and practical skill that requires written material to be reviewed along with the completion of an on-the-job demonstration prior to the test being written.

Whenever possible, the on-the-job demonstration should be completed at a job site or the shop under controlled conditions.

Arrange a time with your Mentor/Supervisor/Trainer to complete the On-the-Job Demonstration, where you will observe the proper operation of the Wet Vacuum unit and its components.

Assessment of Competency: Successful completion of this competency requires:

- A score of 100% on the written examination.
- A successful demonstration by trainee requiring a sign-off from Trainer.



Prerequisites

- CEDA Orientation
- CEDA Introduction to Vacuum Theory
- Specific work location Orientation

Below is a list of the learning resources that are included and others you must obtain the most recent version from your Supervisor.

- Dry Vacuum Operations Procedure
- CEDA Pre-Trip Inspection (Vehicle Inspection Report)
- Site specific documentation
- Job Hazard Analysis for the work
- CEDA FLHA
- Other CEDA procedures and practices that pertain to the job being completed

NOTE: All forms and procedures included are those required by CEDA. Work must be performed in accordance with these standards and can be found in CEDA Health, Safety and Environment Management System (HSEMS) or be requested from your Leader. On Client work sites, there may be additional standards and modified work procedures that will also have to be met.



General Overview

Federal & Provincial Legislation

All work must be completed in accordance with applicable Municipal, Provincial, & Federal Acts & Regulations, including but not limited to:

Transportation of Dangerous Goods (TDG)

- Vehicle must be DOT Approved and be equipped with appropriate safety devices
- DOT approved vehicles will have sticker on side of unit
- Operator must place appropriate placards on side of vehicle
- Operator must prepare bill of lading prior to transporting materials

The Workplaces Hazardous Materials Information System (WHMIS)

- All CEDA field employees working with or around equipment will have WHMIS and TDG training prior to starting work.

Occupational Health & Safety (OH&S)

Seat Belts

Anytime a vehicle (CEDA owned or personal) is being operated during business hours for business use, or on CEDA property, the occupants must be wearing seatbelts.



Personal Protective Equipment (PPE)

To operate the Dry Vacuum unit, employees must have and utilize the following personal protective equipment (PPE):

- CSA Certified Hard Hat
- CSA Certified Safety Boots (Boot Grips when required)
- Fire Retardant Coveralls
- Hearing Protection (plugs or muffs)
- Approved Gloves for the Site/Task including cut resistant gloves
- Close fitting safety glasses
- Rain Gear as Required

For hot materials, the following additional personal protective equipment may also be required:

- Rubber gloves

- Steel-toed rubber boots
- Face shield

Workplace Organization

CEDA's goal is to reduce waste (time, energy and materials) by maintaining an orderly and clean workplace, including our trucks and equipment. We ask that you take pride in the equipment you operate; treat it as if it were your own. A clean and organized vehicle/workspace is a safer vehicle/workspace. There are many ways to eliminate waste:

Allocation & Utilization of Resources: Have the right people and equipment in the right place, at the right time. Use equipment and resources on tasks and activities that are required and add value to our business.

Improve Productivity: Eliminate redundant or unnecessary steps/tasks without negative impact to the safety or quality of our products and services.

Use of Materials: Ensure equipment is stocked with required supplies (filter bags, duct tape etc.) before leaving for jobsite – replace the materials you have used during the shift to ensure that the next crew is adequately stocked. Use the correct materials in the quantities required to do the job safely & correctly.

Preventative Maintenance: Tools and equipment should be assessed as per the performance maintenance schedule to ensure safe operation. Regular maintenance will reduce costly breakdowns in the field.

There are steps we can take to improve our current state and move towards a more productive, organized and safe work environment. Improving workplace organization will reduce costs, improve morale and create a safer work environment. The following steps outline how best to achieve an organized workplace:

Sort, organize and eliminate unnecessary items from the workplace to eliminate clutter. Keep only essential items.

- Tools and equipment that are not utilized for day-to-day operations should be repurposed within the organization or discarded.
- Garbage or loose items should be removed or properly stored.

Prioritize tools, parts and materials based on usage and keep them in easily-accessible places.

- A place for everything and everything in its place.

Create storage areas that are easy to access and clearly laid out:

- Tools and equipment should be stored clean and ready for use.
- Storage areas and stored items should be properly identified using signage, labels or a visual outline.

Set clear standards for workplace organization:



- Hold yourself and others accountable for keeping the work areas clean and safe. Make workplace organization a standard work rule in your area.
- Clean general work areas and equipment after each shift.
- Put clean tools away in the proper place.
- Note any spills, leaks or other messes – clean and report if equipment requires maintenance
- Inspect the area(s) regularly and immediately record and correct any infractions. Handle deviations from work rules in a timely manner.
- Review processes and procedures regularly and adjust as required.

Equipment Overview

Dry Vacuum

CEDA Dry/Wet Vacuum units are used to vacuum and transport both dry and wet materials during cleaning operations.

Materials Most Commonly Handled:

- Mud & Slurry Materials
- Fertilizer
- Sand
- Soil
- Grain
- Insulation

All materials are offloaded at an approved facility for processing.

CEDA uses Dry/Wet vacuum units from different vendors; unit controls may vary. CEDA exercises every caution to ensure that controls are consistent on each unit, however, Operators must be aware of all controls (including safety controls) and operating limits of the unit(s) they are operating.

The content of this learning module describes the general operating overview and is not intended to replace the manufacturer's Operator manual for any given Dry/Wet vacuum truck. Every effort has been made to ensure that key elements of Dry/Wet vacuum truck operations have been included.

Workforce Roles and Responsibilities

CEDA Dry/Wet Vacuum units are typically operated by a two person crew; an Operator and a Labourer. It is the responsibility of both individuals to ensure they are aware of the chemical composition of the materials that are loaded. When necessary, refer to the Material Safety Data Sheets for proper handling guidelines. Both workers receive this technical training.

Specific details for each role were communicated at the point of hire and can be very generally summarized as the following:

Labourer

Responsible for physical removal of materials using the vacuum hose. Spotter for all equipment moves

Operator

In addition to Labourer duties, the Operator is responsible for driving (where applicable), general maintenance and overall operation of the Dry/Wet Vacuum unit.

Any Operator driving CEDA vehicles must hold a valid Class 1 or Class 3 license AND must have passed CEDA's driving assessment.

Equipment Safety Features

Fire Extinguisher & Spill Containment Kit

Every Dry/Wet Vacuum unit is equipped with an ABC Fire Extinguisher and Spill Containment Kit. Trays, absorbent pads and socks should be included in the Spill Kit. The location of these items on the unit should be identified prior to operation.



Grounding System

One of the most important elements of the Dry/Wet vacuum unit is the grounding system. Prior to starting operation, vacuum trucks need to be grounded directly to the earth or bonded to another object that is inherently grounded, such as a large storage tank or underground piping.

Grounding minimizes the electrical potential differences between objects and the earth to prevent a static charge. Grounding brings all parts of any system to zero electrical potential by allowing electrical currents to dissipate to earth.



Single Cable Grounding System

The Dry/Wet vacuum unit relies on a single or dual cable grounding system. The single cable system is pictured to the right. These grounding system are used during every job.

The dual cable or “Posiground” system makes use of a two cables. Both these cables require proper connection to the grounding source.

Confirmation of the ground connection is obtained by verifying the reading on the Posiground indicator.



Posiground Grounding



Good Connection



Bad (Open) Connection

Positive Air Shut off

The positive air shut off, also known as a “Rig Saver”, “ESD”, or “Roda Deaco” valve is mounted to the engine air intake. The switch to activate the positive air shut off is typically located on the dash of the truck and is used in case of a “Runaway Diesel”. Once activated, the valve closes ensuring no air or fumes can enter the engine, and stalls the engine. On most units the valve is air actuated, so sufficient pressure is required in the trucks air system for it to function. This system should be tested once a week in accordance with most manufacturers’ recommendations.



Wheel Chocks

Any vehicle weighing over 4500kg or any trailer regardless of size shall be parked using wheel chocks. Wheel chocks should be placed between the tandem wheels as shown below.



Major Components of the Dry Vac Truck

Boom Intake Hose

The Intake is located on the boom and is used to draw materials into the tank. The Operator may attach vacuum hose (loading line) that extends up to 300 feet. Clamps secured with duct tape must be installed between sections of the vacuum hose to maximize vacuum at the end of the line. The boom is powered by hydraulics and the motion capabilities will vary by model. The motion functions of the boom are controlled using the remote.



Boom Remote Control

There are several factors that determine load rates. Larger hose diameters provide greater loading rates, however rates are reduced as hose length increases. An 8" intake is commonly used on the Dry/Wet vacuum units. A smooth bore hose with few bends will provide the most efficient results.





The Dry/Wet vacuum units are designed to operate with a constant air intake. In other words, the intake line should never be fully submerged into materials. If the line becomes fully submerged, or dead-headed, the vacuum pressure inside the line would greatly increase and may cause the line to collapse. This problem may be costly, especially when 300 feet of vacuum hose is used to perform the job. The Operator must activate the quarter turn valve to break the vacuum in the system and prevent the suction hose from collapsing through its entire length.

Cargo Tank



Pressure tested vacuum cargo tanks are used to collect and transport various materials. The tank is also referred to as the “collector body”. The cargo tanks are made of carbon steel and have a capacity of 13 “cubes” (cubic yards) or roughly 2,600 US gallons.

During normal operation, negative pressure is created within the tank causing a vacuum effect. The entire system must be air-tight so that this negative pressure can be created.

During offloading, the entire tank is raised using a hydraulic hoist and materials are drained from the rear door. The tank is cleaned after each job.

Hydraulic Locking System



The rear of the tank is sealed with a removable door that is secured with a hydraulic locking system.

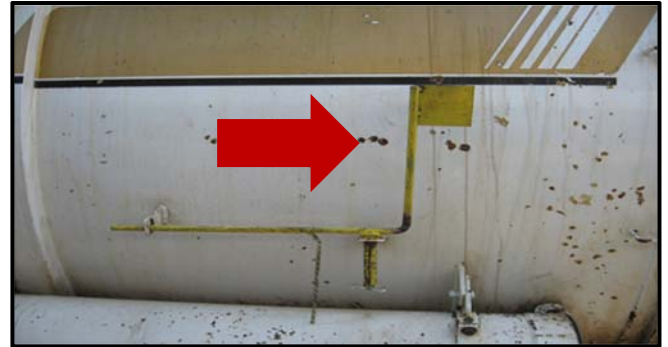
A hydraulic piston is used to rotate a locking pin which latches the door into a locked position. The image to the right indicates the direction the locking pin rotates to lock the door.



Door Prop

The door prop is mounted on the tank (driver's side) and must be placed in the hinges of the rear door when flushing the unit or when accessing the interior of the tank.

The rear door control and door prop must be flagged with Danger Flagging when the rear door is open and/or when someone is in the tank. It is important that the door prop be removed when work is complete. Failure to do so will result in damage to the hinges and rear door.

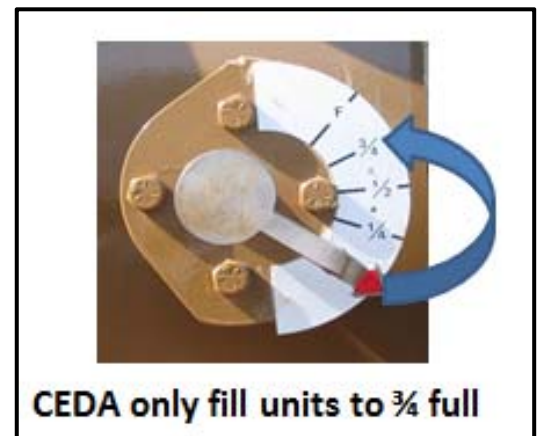


****Note:** Operator should always check to be sure that the prop is in place before starting a job – as these are not affixed to the trucks, they can sometimes go missing.



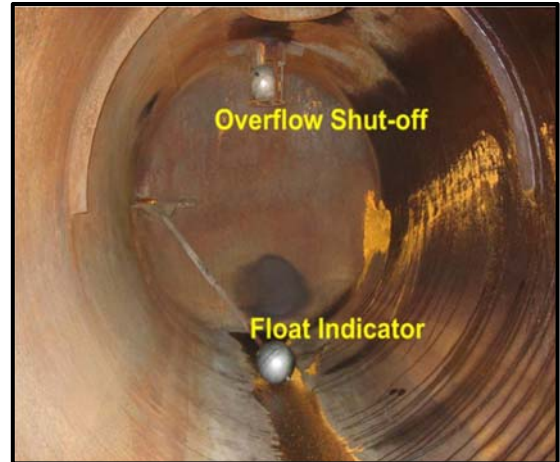
Tank Float & Level Indicator

The level indicator located on the exterior of the tank indicates the level of fluid in the tank. The tank should never be filled to 75% (3/4) capacity.

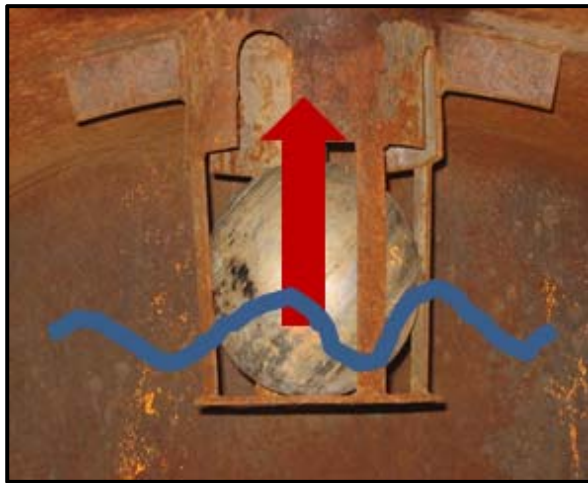


The level indicator float is simply a rod with a hollow steel ball on the end. As the material fills the tank, the ball rises. The indicator on the outside of the tank displays to the Operator the level inside the tank .

When vacuuming dry material, the float may become buried under the debris inside the tank. When this occurs, the tank level indicator will not accurately measure contents. The indicator must be manually adjusted periodically to ensure tank does not overflow.



Overflow Shut-off



The shut-off ball (pictured left) is contained inside a basket directly below the vacuum intake lines.

The ball inside the basket is hollow. As the material inside the tank rises, so too does the ball.

When too much liquid material is drawn into the tank, the ball automatically seals the vacuum line intake, preventing materials from entering the cyclone, bag house, Microscreen and pump. When vacuuming dry material, the ball may become buried and not rise.

Tank Vibrator

Located under the cargo tank and controlled from the hydraulic control panel, the vibrator is used to “shake” materials out of the tank when offloading. To avoid damage to welds in the tank, the vibrator should only be used for eight (8) seconds at a time in 30 second intervals.



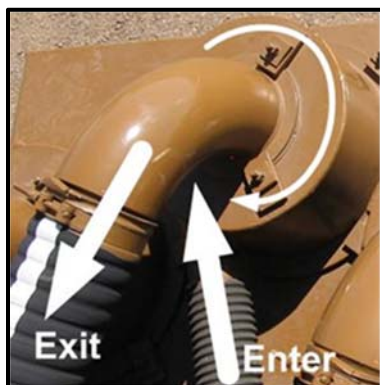
Cyclone Chamber

The cyclone chamber is an auxiliary tank that is used to collect debris, mist and other particles that may escape from the main tank during vacuum operations.

There are four cyclones inside the chamber and air is equally divided among these devices. Heavy materials and moisture collect at the bottom of the chamber. There are two large doors/ports which are used to inspect the chamber.



The image to the right was taken from the top of the cyclones. Air enters the cyclone and spins around the outer perimeter of the cyclone. Heavier materials and moisture fall to the bottom as air leaves the cyclone through the top of the device through a hose called the crossover. Each cyclone has a crossover hose that carries the air to the bag house on the other side of the unit.



The image to the left was taken from the bottom of the cyclone. Air and debris enter the cyclone and travel in a vortex or swirl pattern. The heavier materials fall to the bottom of the cyclone, while the cleaner air moves through the intake and on to the bag house and pump.



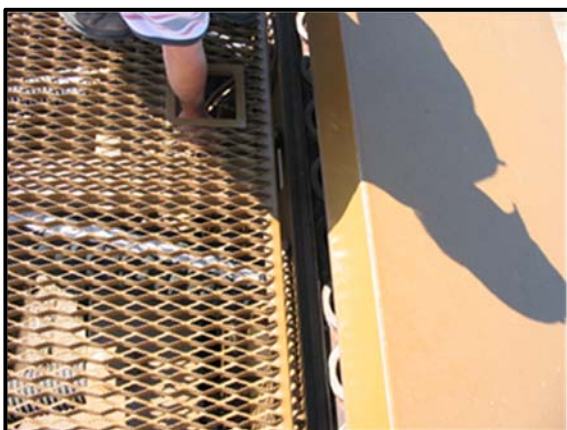
Cyclone Chamber Drain Tube

Connected to the bottom of the cyclone chamber is a long drain tube. A hatch near the back end of the unit can be opened to allow materials that collect in the bottom of the cyclone chamber to drain when the tank is offloaded.



Bag house

The bag house is a chamber that contains several filter bags. Some units contain as many as 72 filter bags made of a cloth-like material that are designed to trap the fine particles of dust that escape the tank and cyclone chamber. All the air that crosses over from the cyclone chamber is directed to the bottom of the bag house. The air then travels through the bag filters and onto the Microscreen.



A large sealed door at the top of the bag house allows personnel to access the filters. The door is hydraulically operated.

Note: Fall protection must be worn when servicing the top of the unit.

Air rises up from the inside of the filter and travels to one end of the bag house where it is directed down a channel toward the Microscreen. A large tubular cage is inserted inside the filter. This cage allows the filter to keep its long slender shape under vacuum.



A View from top of unit with bag house door open

Steel Support Cage is inserted in to Bag Filter

Filter Bags

Filter bags should be accessed through the top door of the bag house. Filter bags are made of a cloth-like material that is designed to trap fine particles of dust that escape the tank and cyclone chamber. A large tubular cage is inserted inside the filter to help the filter keep its long, slender shape under vacuum.



Pneumatic Air System

During routine operations, the filters inside the bag house can become clogged with fine dust particles. A pneumatic air system has been installed to blast air into the each filter. This blast of air 'pops' the filter and shakes off the dust. The dust particles will settle to the bottom of the bag house and will be removed during offloading.



The pneumatic air system - each hose will send air to a set of tubes mounted inside the top door of the bag house. A blast of air will thrust through one tube at a time and the interval between blasts is controlled by the Operator.

Each air hole is aligned directly over a bag filter when the door is closed.



Microscreen

The Microscreen is designed to remove debris from the system by preventing large particles that may have escaped the cyclone chamber and bag house from entering the pump. The Microscreen must be cleaned at the end of each job and should be inspected prior to starting the pump.

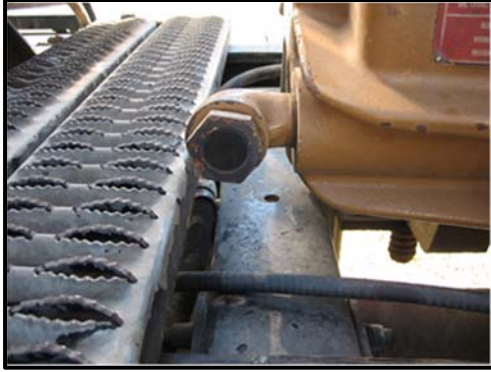
When the vacuum cargo tank is lowered into normal position, the Operator cannot access the Microscreen. The tank must be in the raised position to allow the Operator access to the Microscreen.



Vacuum Pump



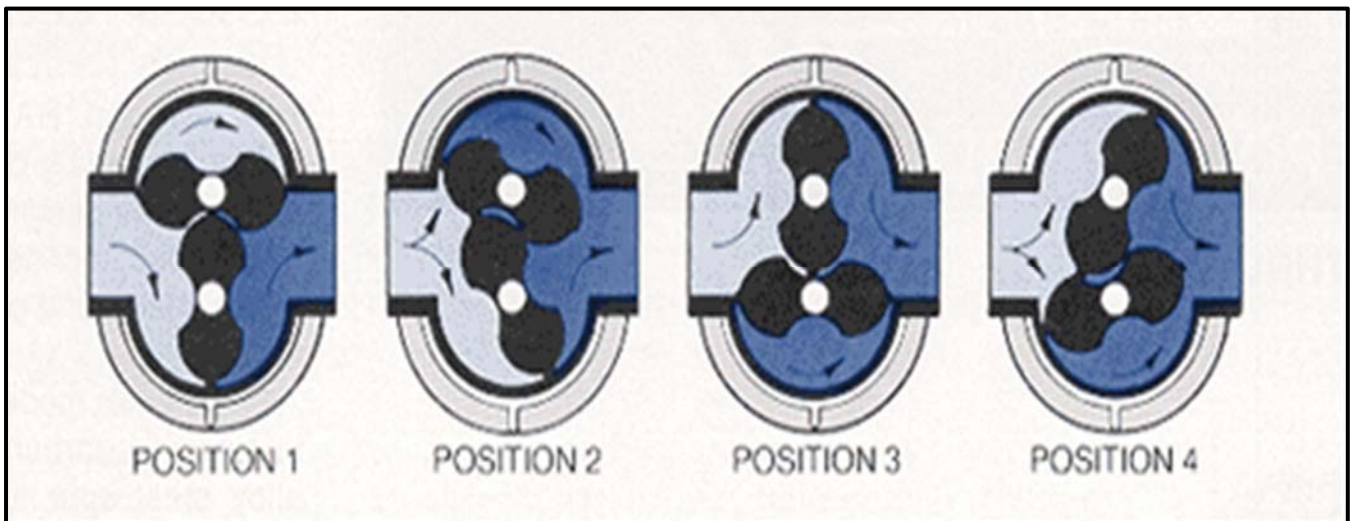
The vacuum pump used on the Dry/Wet vacuum is called a rotary lobe blower. The blower is located between the cab and cargo tank.



Sight Glass

The pump has a sight glass where the Operator can view the level of oil in the pump. The pump should not be operated unless $\frac{1}{2}$ of the site glass is filled with oil. A 'spiral' gauge has been installed to allow the Operator to see the level in the pump.

The diagram below shows the operation of a rotary positive blower. The basic unit consists of two figure eight shaped impellers mounted on parallel shafts.



These impellers rotate in opposite directions within an elongated cylindrical housing. As each impeller passes the inlet, it traps a definite volume of air and carries it around the casing to the discharge, where it is expelled. The cycle repeats four times with every revolution.

The pump is powered by the unit's engine through a transfer case and operates effectively at 1400 – 1800 RPM.

Before engaging the pump, the dry/vac unit must be parked on stable, level ground. The pump is engaged from the inside of the cab. Prior to engaging the pump, the vehicle must be placed in neutral, with the brakes applied.

The image to the right displays the levers used to disengage the axle and engage the pump. This control box is located between the driver and passenger seats. During cold weather operations, the vacuum pump should run at idle speed for at least five minutes without engaging vacuum



Vacuum Relief Valve

The Vacuum Relief Valve is located above the Microscreen and is easily turned by the Operator. This valve is used to relieve pressure on the system during normal operations.

This valve is in close proximity to the Operator and can also be opened in emergency situations to reduce vacuum pressure.



Pump Inlet & Discharge Silencers



Pump Inlet Silencer



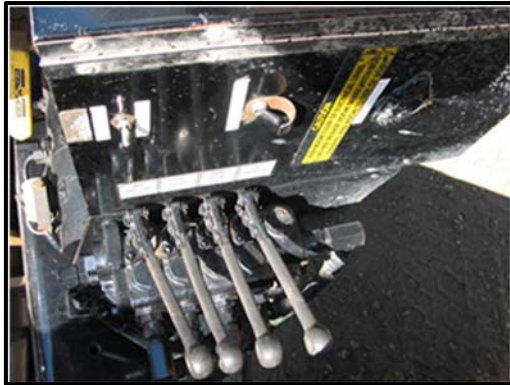
Pump Discharge Silencer

Mounted above the pump is the pump inlet silencer. Air from the atmosphere enters the inlet silencer through the top and cools the vacuum pump during operation. Mounted beside the inlet silencer is the discharge silencer. The air drawn through the vacuum system is discharged through the vent at the top of this device.

Hydraulic System & Control Panel

The hydraulic bank is where the Operator can control various functions of the unit. From this location the Operator controls the hoist, tailgate lift (tank rear door), and tailgate latches.

The Operator also engages the boom remote and can monitor the vacuum pressure and speed gauges, pump exhaust temperature and condition of the filter bags from this location.



Hydraulic System Control Gauge Panel

Hydraulic Reservoir



The hydraulic fluid is stored in this reservoir. A temperature gauge displays the operating temperature of the fluid. Do not exceed 140°F.

Vacuum Pipe

Vacuum pipe is used on larger jobs where the product being vacuumed is a long distance away from the Dry/Wet Vacuum unit. Vacuum pipe is typically made of aluminum and as such, is lightweight.



Steel Flex Hose



Steel flex hose is used on most jobs and is ideal for hot product. Additionally, the hose diverts static electricity through the hose back to the grounded truck. This hose has very sharp edges and **Kevlar gloves must be used at all times** to avoid cut injuries.

Hose Fittings

You will encounter various hose fittings when working on site.

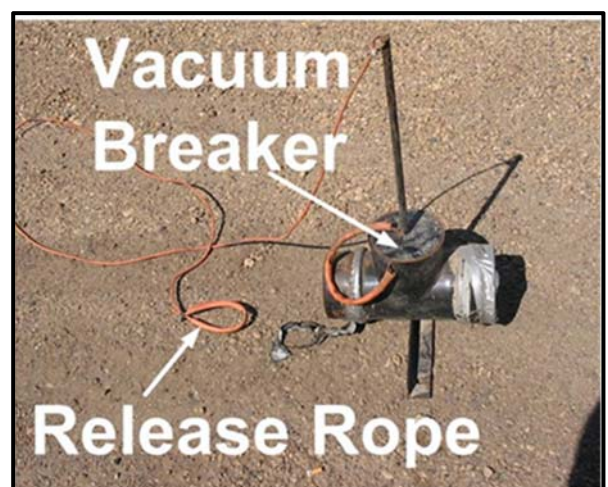


Vacuum Breaker

The vacuum breaker should be placed along the pipe near the Labourer and is installed in the suction hose. The release rope is attached to a simple valve that is held in place by the vacuum created during normal operation. The valve is attached to the Labourer and is activated by pulling the release rope.

When a Labourer pulls the rope, the vacuum in the line will be drawn through the vacuum breaker and will release the vacuum at the end of the vacuum hose.

This valve must be used during each job.





UNDERSTANDING AIRFLOW

The figures below illustrate the direction of airflow when the system is under negative pressure (vacuum). As the pump creates the negative pressure in the system, air is drawn down the boom and into the vacuum cargo tank.

The intake system inside the tank then draws the air out of the tank as it passes into four cyclones, any particles and moisture that escape the tank will be trapped at the bottom of this chamber.

From here the air crosses over into the bag house where 72 bag filters remove tiny dust particles from the vacuum system. Air then moves to the top of the bag house and down a channel into the Microscreen. The Microscreen is the last filter system the air must pass before moving into the vacuum pump.



Airflow into Tank & Cyclones



Airflow through Bag house, Microscreen & Pump

Operating Limits

It is important to operate the Dry Vacuum Truck within the specified parameters set forth by the manufacturer; failure to do so will likely result in premature equipment failure.

Physical Limits	Consequences of Deviations
-----------------	----------------------------



0 to -27 inHg	<i>Equipment wear/ damage</i> <i>Personal injury</i> <i>Overflow/spill of materials</i> <i>Blow-out of seals</i>
Must be on Level Ground For Loading and Unloading	<i>Vehicle could shift</i>
Max 1,800 RPM (as per manufacturer's recommendation))	<i>Max 1,800 RPM (as per manufacturer's recommendation))</i> <i>Burns, hose bursts, hot hydraulic gauges, etc.</i>
Operate Unit in Correct Gear (1:1 ratio)	<i>Vacuum pump may burnout/seize.</i>

Running Efficiently

Efficiency of a Dry/Wet Vacuum Truck can be determined by:

- Amount of airflow that it creates (CFM) or amount of vacuum pressure (inHg)
- A vacuum pump on a Dry/Wet vacuum unit can produce up to 5,300 CFM or up to -27 inHg
- System is airtight
- All vents and mating surfaces are in closed position (i.e. drains, inspection hatches, etc.)
- Most efficient when running at -10 to -15inHg

Procedural Guideline: Load Dry Product

ACTION	NOTES
Loading Dry Product	
1. Complete Pre-Trip & inspect equipment.	
2. Obtain Work & Waste disposal permits	☐ <i>If applicable</i>
3. Conduct Pre-Job meeting to review permits, procedures and MSDS as required	☐ <i>Use Pre-job Checklist. All personnel working the job must attend</i>
4. Complete FLHA as per CEDA standards	☐ <i>All personnel working the job must attend</i> ☐ <i>Must be reviewed and updated if any changes occur on the job</i>



5. Position equipment safely on level ground	☐ <i>Use a Spotter when backing up & lifting the tank</i>
6. Install wheel chocks	
7. Flag & Tag. Install signage & pylons	☐ <i>"DO NOT ENTER"/Caution tape & flagging tags</i>
8. Ensure equipment is grounded	☐ <i>Using Posiground system</i>
9. Rig in hoses.	☐ <i>Minimize tripping hazards</i> ☐ <i>Use Kevlar gloves to avoid cuts</i>
10. Install vacuum breaker	☐ <i>Closest to the working end of hose is best (not very end)</i>
11. Tie off pipe (if applicable)	☐ <i>Use every tie off point possible</i>
12. Engage Blower and idle up to desired RPM	☐ <i>Brakes</i> ☐ <i>Transmission in optimum gear (6th or 7th) as noted on dash</i> ☐ <i>1200-1800 RPM</i>
13. Update FLHA	☐ <i>As required</i>
14. Start vacuum unit	☐ <i>Check for air leaks</i>
15. Turn on pneumatic air system	☐ <i>Verify that it is working</i>
16. Begin vacuuming until full	☐ <i>No more than ¾ full</i>
17. Remove hose from material and vacuum out hose	☐ <i>Reduce spillage</i>
18. Open vacuum relief valve	
19. Idle down engine, disengage Blower & engage rear axle	☐ <i>Pull gear stick out of position, do not push in the clutch, wait until RPM's drop to zero, then disengage</i>
20. Disconnect hoses	
21. Retract grounding cables	
22. Stow hoses, remove flagging & tagging, remove signage & pylons complete housekeeping & prepare for transport.	



ACTION	NOTES
Offload Dry Product	
1. Review Work & Waste disposal permits	☐ <i>If applicable</i>
2. Review/Update FLHA as per CEDA standards	☐ <i>All personnel working the job must attend</i> ☐ <i>Must be reviewed and updated if any changes occur on the job</i>
3. Position equipment safely on level ground at edge of berm	☐ <i>Use a Spotter when backing up & lifting the tank</i>
4. Complete FLHA as per CEDA standards	☐ <i>All personnel working the job must attend</i> ☐ <i>Must be reviewed and updated if any changes occur on the job</i>
6. Install wheel chocks	
7. Flag & Tag. Install signage & pylons	☐ <i>"DO NOT ENTER"/Caution tape & flagging tags</i>
8. Ensure equipment is grounded	☐ <i>Using Posiground system</i>
9. Unchain & raise boom hose	☐ <i>Some trucks have boom remote & others don't</i>
10. Release hydraulic locking system	☐ <i>"Back rollers"</i> ☐ <i>Use Spotter</i>
11. Open cargo tank door	☐ <i>Using lever at hydraulic control panel</i>
12. Raise tank & empty contents	☐ <i>Using lever at hydraulic control panel</i>
13. Engage tank vibrator	☐ <i>No longer than 8 seconds</i>
14. Install door prop	☐ <i>If access to tank interior is required</i> ☐ <i>Flag prop and control lever with red flagging</i>
15. Remove door prop	
16. Lower rear door	
17. Lock rear door	☐ <i>Using hydraulic locking system</i>
18. Lower boom hose & secure in place	



19. Remove grounding equipment, remove flagging & tagging, remove pylons & signage perform housekeeping.	
20. Wash out truck	☐ <i>If required</i>

When loading light materials such as insulation, Operator must ensure vacuum pump runs at lower RPM (reducing vacuum). Too much vacuum created will result in insulation getting drawn through filter bags in bag house & into the vacuum pump.

Intake line should never be fully submerged into materials. If line becomes fully submerged, vacuum pressure inside line would increase & may cause it to collapse. This problem is costly, especially when 300 feet of vacuum hose is used to perform the job.

Operator must activate vacuum relief valve causing a reduction of vacuum in the system to prevent suction hose from collapsing through its entire length.

In extreme cold, pump should operate at reduced speed for first 5 minutes to allow oil to circulate. Pump should remain clean & free from grease. Excessive buildup will contribute to premature wear resulting in damage to the vacuum pump.

Minimizing Hazards

Hazard	Stay Safe By...
1. Line of Fire	▪ <i>Stand off to side when disconnecting hoses</i> ▪ <i>Do not put yourself in the line of fire of the cargo tank door</i>
2. Unauthorized Personnel	▪ <i>Flag and Tag Work area</i>
3. Spills	▪ <i>Valves closed, sealed and in place before starting work</i> ▪ <i>Use appropriate Spill Containment products (spill pan)</i>
4. Backing up / Striking Objects	▪ <i>Utilize Spotter</i>
5. Heavy / Awkward lifting	▪ <i>2 person lifts – lift with legs. Use Crane or forklift when possible to move hose</i>
6. LEL (Lower Explosive Limits) / Vapours / Sour Liquids	▪ <i>H2S training where required.</i> ▪ <i>Confirm area gas test</i> ▪ <i>Confirm material MSDS</i>



7.	Temperature of Product	▪ <i>Know temperature of product before vacuuming</i>
8.	Static Charge	▪ <i>Utilize Ground system</i>
9.	Slips, Trips and Falls	▪ <i>Practice good housekeeping</i> ▪ <i>Use ice melt in winter if ice is present</i>
10.	Tank Contamination	▪ <i>Know the products and clean between loads</i> ▪ <i>Check the “last contained” documentation</i>
11.	Noise Level	▪ <i>Wear Proper PPE</i>
12.	Lack of Experience and/or Training	▪ <i>Attend Training, know your limits. Ask Questions</i>

Sewer Flusher Maintenance

As with any equipment used regularly, all components of the Sewer Flusher must receive the appropriate preventative maintenance in order to operate properly. Perform the required maintenance for routine operation.

Item	Service Required	Frequency
Vacuum Cargo Tank	Clean	Daily
Rear door and gasket	Clean	Daily
Float ball and seal	Clean	Daily
Boom Cannon	Clean	Daily
Cyclone Chamber	Clean	Daily
Bags	Inspect	Weekly
Bag House	Clean	Daily
Microscreen	Clean	Daily
Read Door latches and hinges	Lubricate	Weekly



Vacuum Pump	Inspect	Daily
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Winterization

Due to the cold weather conditions, appropriate winterization of the Dry/Wet Vacuum Unit is critical for proper operation. Winterizing of a vacuum pump must be done after the job is completed and/or if the pump will not be used for a period of time. The winterization procedure is as follows:

ACTION	NOTES
1. Drain off Air Pressure	☐ <i>Ensure bleed valve on bottom of alcohol pot is open.</i>
2. Open drain valve on pot.	
3. Remove fill nut from top of alcohol pot.	☐ <i>Use wrench</i>
4. Close drain valve on alcohol pot.	
5. Fill alcohol pot with brake line antifreeze.	
6. Reinstall fill nut and tighten	☐ <i>Use wrench</i>
7. Close all air bleed valves on system and re-pressurize.	



Troubleshooting Sewer Flusher

To efficiently run the Dry Vacuum Unit, the operator must be aware of the common failures that might prevent smooth operation. The following is a list of common problems encountered.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION(S)
Loss/reduction of Vacuum	Plug in vacuum hose	▪ Check for obstruction in hose ▪ Reverse hose if necessary
	Microscreen is plugged	▪ Remove screen & clean
	Tank is full	▪ Offload tank
	Ball float stuck shut	▪ Inspect & correct
	Rear Door is not latched	▪ Latch door
	Bag House is full	▪ Dump load and clean bag house
	Bag Pulse timer cycle is too fast	▪ Adjust to 10-15 second intervals
	Body not sealed against microscreen	▪ Ensure truck is level ▪ Check gasket
	Hole in Vacuum hose	▪ Replace hose
Boom does not rotate	Hydraulic pump not engaged	▪ Engage Hydraulics
	Transport tie down attached	▪ Remove tie down(s)
	Boom brake engaged	▪ Release boom brake
Tailgate Leaking	Tailgate unlatched	▪ Engage Hydraulics
	Damaged gasket	▪ Remove tie down(s)
	Dirt around gasket or mating surface	▪ Release boom brake
Air Leaks	Bad/Missing Gasket	▪ Clean or replace
	Missing ear on Camlock	▪ Replace Camlock
Dust in Discharge Pump	Bad/Missing Gasket	▪ Replace Bag
Tailgate latch won't close	Rollers / shaft binding / frozen	▪ Lubricate or Free bind



	Low Oil Pressure	▪ <i>Adjust to 2000PSI</i>
No Hydraulic Pressure	Plugged suction line	▪ <i>Repair or replace</i>
	Pump not engaged	▪ <i>Engage</i>
	Low oil	▪ <i>Add oil</i>

General Safety Overview

The following are guidelines to the safe working practices for Dry/Wet vacuum trucks:

1. Always apply the parking brakes when operating the unit.
2. Do NOT open inspection covers, man-ways or other fittings when the tank is under pressure.
3. Do NOT enter the tank without testing the atmosphere and utilizing proper breathing apparatus. The tank is considered a “Confined Space” and should be treated accordingly. Use caution when entering a tank. Use proper protective equipment. Establish proper rescue procedures. Another person should be stationed outside the tank who thoroughly understands rescue procedures.
4. Do NOT make repairs or adjustments while the equipment is operating.
5. Do NOT leave equipment unattended when operating.
6. Do NOT walk on the tank or catwalks without fall protection equipment (i.e. safety harness and lifelines). Please follow all rules/laws in regards to fall protection.
7. When operating PTO’s, pumps, hydraulically operated equipment, etc., please follow the manufacturer’s instructions.
8. Do NOT reach under or stand under any hydraulically operated hoist or rear door without a safety prop or support.
9. Do NOT reach under or go under any vehicle when the engine is running and the PTO is operating equipment.
10. Do NOT operate the unit with any safety guards removed.
11. Stay clear of hoses that are under pressure as they are known to jump and buck thereby causing injury to anyone nearby.



12. Watch for overhead wires while lifting the tank. NEVER move the wet vacuum unit with the tank in the raised position.
13. Ask yourself if the truck is designed to do the job? Make sure the product to be loaded is compatible with the unit's design and construction. If in doubt, contact your Supervisor.
14. Wear hearing protection while operating the system and bleeding the main valves.
15. Prevent potential fire hazards at all times by:
 - o Keeping fire extinguishers in working order and readily available
 - o Keeping the machine clear of dirt and oil
 - o Keeping all electrical wiring and components in good working order
 - o Ensuring that the engine air intake, fuel and exhaust systems are maintained properly.
16. Do NOT load or unload on an incline or grade. Ensure the ground is stable.
17. The rear door must be open to fully raise the tank.
18. Ensure truck is grounded using the grounding straps before performing any operation.
19. Ensure truck has a complete spill kit.
20. Never stand in front of any caps to remove them. Stand off to the side, out of the line of fire.
21. Ensure the area around the back of the truck and around the hoses is flagged off with barrier tape, when offloading.
22. Ensure all cam-lock connections are secured with cam straps & duct tape.



Multiple Choice Questions (Technical Quiz)

Complete the following test, and have it graded by your assessor. If any questions are answered incorrectly, your assessor will explain what the correct answer is, and why it is correct. Once you understand the correct answer, both the assessor and students initials are required to indicate that mentoring or coaching has taken place.

Question	Assessor's Initials	Student's Initials
1. The Dry/Wet Vacuum is most efficient when running at: A. -5 to -10 inHg B. -10 to -15 inHg C. -20 to -25 inHg D. 20 to 25 PSI		
2. The Microscreen must be cleaned at the end of each job and should be inspected prior to starting the vacuum. a. True b. False		
3. Before engaging the pump, the unit must be parked on stable ground. a. True b. False		
4. Which system purges the bag filters by blasting air into each one and shaking off the accumulated dust? A. Hydraulic System B. Vacuum Pump C. Pneumatic System D. Grounding System		
5. Materials that leak from the unit during routine operations must be collected and appropriately disposed of. a. True b. False		
6. The vacuum breaker located near the Labourer is only required when removing heavier materials. a. True b. False		
7. Dry/Wet Vacuums are designed to constantly draw air through the intake line. a. True b. False		
8. Micro screens should be inspected: A. Monthly B. Weekly C. Daily D. None of the Above		
9. To generate vacuum, ports, hatches and valves must be open. a. True b. False		
10. Airflow goes through the tank – cyclone – baghouse – microscreen – pump – discharge silencer. a. True b. False		



Practical Assessment – Dry vacuum

This form is to be filled out by the assessor as they observe the student successfully demonstrate these items in order to be deemed competent.

Assessment Check List

#	Identify the following components, explain their purpose, inspection requirements and preventative maintenance measures	Trainee Initials	Assessor's Initials
Identify...			
1	Boom intake Hose		
2	Cargo Tank		
3	Cyclone Chamber		
4	Bag-house		
5	Micro-Screen		
6	Hydraulic System Control panel		
7	Vacuum Pump / Rotary Lobe Blower		
8	Boom Hose remote		
9	Hydraulic Reservoir		
10	Inlet Silencer		
11	Discharge Silencer		
12	Float level indicator, float ball and basket		
13	Tank vibrator		
14	Fire Extinguisher		
15	Spill Kit		
16	Vacuum Breaker		
17	Grounding Cables (posi-ground or single cable)		



18	Sight glass on pump		
19	PTO switches/levers		
20	Emergency Shut off		
21	Vacuum relief Valve		
Operation <i>The following tasks must be completed in the prescribed sequence. Any exceptions must be noted in the comments section with justification. Assessor will check YES column if the item was actioned satisfactorily, or circle the number in the NO column if it was not. If enough demerits are accumulated to warrant a fail, or employee performs an unsafe or dangerous action, the assessment may be terminated immediately. If necessary, all near-miss/incident reporting requirements must be met.</i>			
Loading			
1	Attend Pre-job meeting/toolbox talk. Review permits and procedures.		
2	Describe troubleshooting problems for leaks in hoses and pumps (Assessor to ask during Toolbox talk)		
3	Describe troubleshooting problems for over and under pressure (Assessor to ask during Toolbox talk)		
4	Describe troubleshooting problems if pump will not engage (Assessor to ask during Toolbox talk)		
5	Complete Pre-trip & inspect equipment		
6	Move to job Location, walk down area and complete FLHA		
7	Install wheel chocks		
8	Flag & Tag, pylons, signs (Dual Hearing signs as required)		
9	Ground Unit		
10	Rig in hoses, tape connections and clamps as required		
11	Install vacuum breaker (last section of hose)		
12	Engage Blower, select proper gear, idle up to proper RPM		
13	Update FLHA as required		
14	Turn on pneumatic air system		
15	Begin vacuuming until $\frac{3}{4}$ full		



16	Remove hose from material and vacuum out hose		
17	Open vacuum relief valve		
18	Idle down engine		
19	Disengage blower and engage rear axle		
20	Disconnect hoses		
21	Retract grounding cables		
22	Stow hoses, remove flag & tag, signs, pylons, do final housekeeping, remove wheel chocks.		
Unloading			
1	Review/Update FLHA		
2	Position equipment safely on level ground		
3	Install wheel chocks		
4	Flag & tag, install signs, pylons		
5	Ensure equipment is grounded		
6	Unchain & raise boom hose		
7	Release hydraulic locking system		
8	Open cargo tank door		
9	Raise tank & empty contents		
10	Engage tank vibrator		
11	Install door prop/remove door prop as required		
12	Lower rear door		
13	Lock rear door		
14	Lower boom hose & secure in place		
15	Retract ground cables		
16	Remove flag & tag, signs, pylons		
17	Complete housekeeping		



18	Stow hoses and secure		
19	Remove wheel chocks & stow on truck		
20	Sign off Permits and FLHA		
The following precautions must be observed at all times. Assessor will check YES column if the item was actioned satisfactorily or NO column if it was not. If the employee fails to adhere to any of these precautions at any time, it constitutes a fail and the assessment shall be terminated immediately. If necessary, all near-miss/incident reporting requirements must be met.			
1	PPE: Has all necessary PPE to perform task. PPE has been inspected and is in good condition. Proper PPE is worn at all times. (Dual Hearing protection as required).	YES	
2	Backing: Operator- Proper spotter briefing and walk down of area with spotter before backing. Window down, radio off, hearing protection removed. Confirmed hands signals with spotter before backing for the first time. Sounds horn prior to backing, keeps spotter in mirror, follows spotters direction.	YES	
3	Backing: Labourer- Proper spotter briefing and walk down of area with operator before backing. Wears high visibility vest, confirms hand signals with operator before backing for the first time. Uses proper hand signals, does not walk backwards while spotting or repositioning, always facing unit while it is in motion.	YES	
4	Line of fire: Does not place themselves in the line of fire at any time. This includes standing off to the side when opening valves, removing caps, and disconnecting hoses. Does not place themselves directly in front of/behind unit while in motion. Uses whip checks on all connections	YES	
5	Communication: Has established and reviewed method of communication with co-workers to ensure equipment is operated safely and all hand signals are understood.		
6	Paperwork: Properly complete or participate in the completion of any required paperwork. Have necessary paperwork completed prior to commencing a task.		
Air System Winterization			
1	Drain-off air pressure.		
2	Open drain valve on pot.		
3	Remove fill nut from top of alcohol pot.		



4	Close drain valve on pot.		
5	Fill pot with brake line antifreeze.		
6	Replace fill nut.		
7	Close all air bleed valve on system and re-pressurize.		
Pump Winterization			
1	Run Vacuum pump for 5-10 minutes		
2	Coat Rear Door Seal with product to prevent freezing to tank/door		

Assessment Sign Off

All boxes must be completed before signing an employee competent.

- ☐ Expectation Letter Signed
- ☐ Minimum 100 hours of on the job training completed
- ☐ On the Job Practical Assessment Completed by an approved Assessor
- ☐ Has reviewed and understands the operator manuals
- ☐ Reviewed and understands Procedures and Safety Documentation
- ☐ Technical review and Knowledge Exam complete
- ☐ Training documentation sent to CEDA Training Department

Assessor

I, _____ have taken the below named employee through this Assessment, and he/she has successfully demonstrated competence in the areas identified.

Signature Date

Student

I, _____ have completed this competency, including the on-job demonstration, practical assessment and multiple-choice questions. I understand the information presented and agree to follow all of the rules and procedures set out by CEDA.

Signature Date



Revision Log

Revision Date	Section Affected	Changes Made
October 21, 2021	All	Updated Template, multiple changes throughout.



Training Change Request Form

Date: _____

Location: _____

Name: _____

Contact information: _____

Email/Phone number

Description

Please use the back of this sheet to make additional comments.

Section Name: _____

Page Number: _____

Description of Problem/ Suggested Resolution:
