



MN-PV-CIS-041

High Pressure Water Cutting Competency Manual

**MN-PV-CIS-041 – High Pressure Water Cutting Competency Manual
Rev 3**

Updated: January 10, 2023

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Table of Contents

<u>Table of Contents</u>	1
<u>Training Expectations Letter</u>	2
<u>Aknowledgement</u>	3
<u>Objective</u>	4
<u>General Overview</u>	6
<u>Equipment Overview</u>	10
<u>Safety Considerations</u>	22
<u>Operational Guidelines</u>	28
<u>Troubleshoot High Pressure Water Cutting Equipment</u>	29
<u>Technical Quiz</u>	30
<u>Practical Assessment</u>	31



Training Expectation Letter

It is required that this document is completed prior to the Employee starting training on High Pressure Water Cutting. This document will serve as formal record that all parties have reviewed and understand the expectations for training on the High Pressure Water Cutting Operations.

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.





Objective

Welcome to CEDA High Pressure Water Cutting Operations Training Process

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:

- 41.01 Review High Pressure Water Cutting
- 41.02 Perform High Pressure Water Cutting Procedure

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 Steamer 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 High Pressure Water Blasting
- 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.

- Automated High Pressure Water Cleaning Checklist
- High Pressure Water Cutting Procedure
- Gullco Operators' Manual
- Jet Edge Operators' Manual
- NLB Operators' Manual
- 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.

Renewal Period

The entire Module must be redone after:

- Leaving the employ of CEDA for a 6-month period,
- Leaving high pressure water cutting operations for a period of 6 months, or
- As deemed required by CEDA.

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)

When conducting High Pressure Water Cutting Operations, employees must have and utilize the following personal protective equipment (PPE):

- CSA Certified Hard Hat with Face Shield
- CSA Certified Safety Boots (Boot Grips when required)
- Fire Retardant Coveralls
- Hearing Protection (plugs or muffs)
- Approved Gloves for the Site/Task
- Safety Glasses with Side Shields.
- Rain Gear as Required



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.

High Pressure Water Cutting Overview

What is High Pressure Water Cutting?

High pressure water cutting is a method of cutting materials such as concrete or steel using a high pressure stream of water. High pressure water cutting is commonly referred to as water jet or jet cutting. Tiny bits of an abrasive sand-like material (garnet) are mixed with the stream of water and helps create the cut. Using an abrasive material like garnet to help make the cut is far more effective than just using water alone. High pressure water cutting is frequently used to remove bad sections of pipe, create manways in vessels or tanks, or to facilitate general demolition.

Common steel cutting methods include saws or torches. Both of these methods produce sparks and a significant amount of heat. High pressure water cutting is preferred when the concentration of combustible atmosphere (LELs) inside a tank or vessel is unknown. Since no heat is produced with the high pressure water cutting process, it is the method of choice on client sites where ignition sources may have devastating effects.

Saws and torches usually leave surfaces very rough and require additional preparation once the actual cut is complete. High pressure water cutting leaves a smooth surface that requires no further preparation.

Jackhammers are commonly used to fragment and remove concrete. However, this method creates significant vibration. High pressure water cutting methods do not cause vibrations, and the angle of the cut helps facilitate the removal of the cut material.

How is High Pressure Water Cutting Performed?

General Overview

Water flows from a high pressure pump, through high pressure plumbing lines, and out a cutting head. The pump is capable of producing a 36,000 psi water stream. At these high pressures, the cutting head is not directly held by a technician. Instead, an automated system is used to move the cutting head along a track as the cut is made. The track is installed along the cut line, and a travel carriage called a “bug” will securely hold the cutting head in position as it travels along the track. The technician controls the motion of the bug using a hydraulic system. The cutting head is usually positioned perpendicular (90°) to the cut and about 1/8” away from the surface. The most common work performed by CEDA is preparing access way into tanks, vessels, and reactors where the wall is between 3/8” – 1 1/2” thick.



All the equipment is shipped to the site in a properly rated CEDA transport vehicle capable of hauling heavy equipment. The largest piece of equipment is the pump, and usually remains in the vehicle while the job is performed. The vehicle is moved as close as possible to the job site while high pressure water lines and hydraulic lines are extended from the vehicle to the work area. High pressure water cutting is usually carried out by a team of 3 – 4 technicians.

The cutting process may result in a large portion of steel that must be safely removed. Often, the client will prepare the section of steel by welding hooks onto the surface so the wedge can be safely rigged and removed once the cut is complete.

Prior to performing the cutting job, a high pressure water cutting technician will gather information from the client in order to properly prepare the equipment.

Basic Concepts of High Pressure Water Cutting

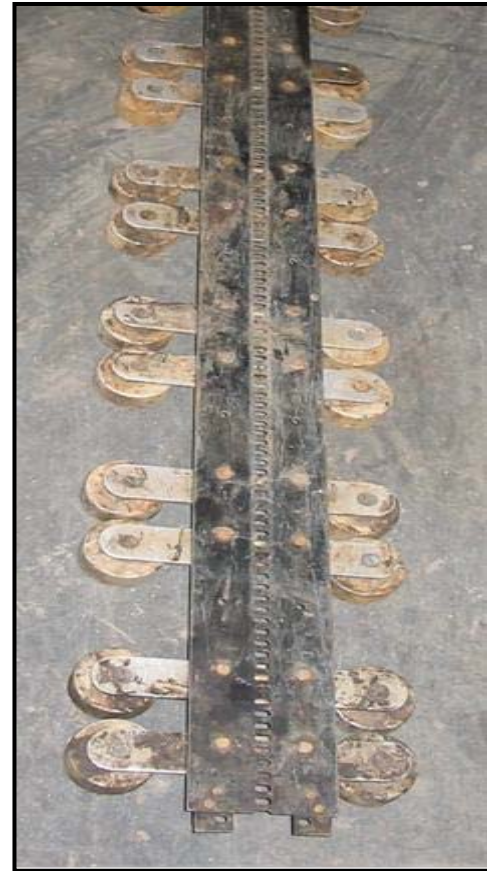
A high pressure water cutting system is made up of several components:

1. Track
2. Cutting Bug
3. Water Jet Nozzle (Cutting Head)
4. Pump
5. Sand Pot/ Abrasive
6. Hydraulic Lines
7. High Pressure Water Lines
8. Hydraulic Control Lever
9. Shut-off/Dump Valve

1. Track

The main function of the track is to guide the direction of the bug. The track is made from flexible tempered steel and can be wrapped around the outside curve of tank, for example. Each section of track is 8 feet in length and can be connected to other track sections as required. The track has holes down the center that are designed to receive the ball drive gear of the bug. The drive gear rotates under the bug and pulls it along the track.

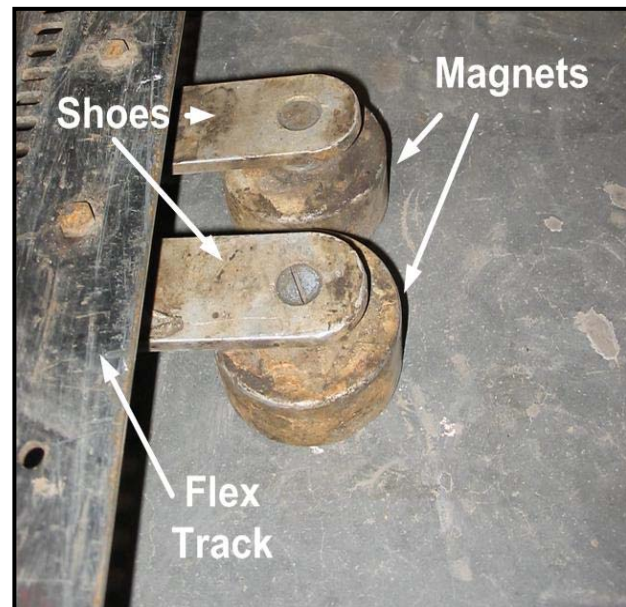
A straight track is used to cut square or rectangular openings. The track is relocated after each side of the opening is cut.



Flex Track

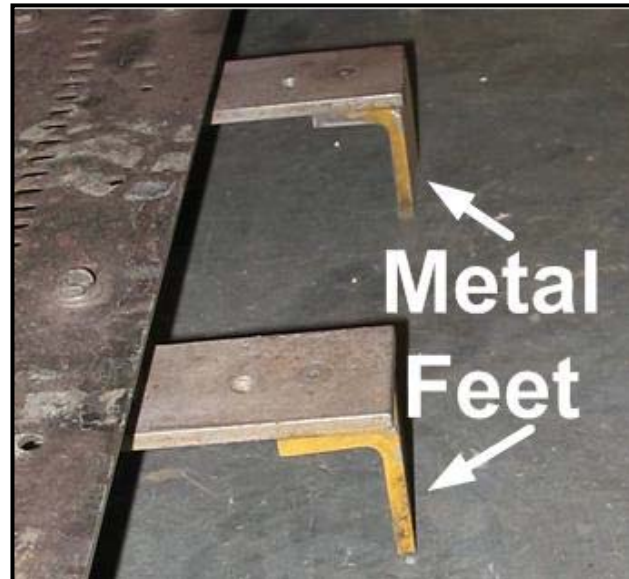
It is very important for the technician to properly install the track so the bug can smoothly move the cutting head over the intended cut line. The technician must also ensure the track is securely mounted to the side of the tank, otherwise, when additional equipment is mounted to the track, the entire assembly may become dislodged.

There are several methods used to mount the track to the side of the tank. The most common method is magnets. If necessary, the technician will ensure the surface is properly prepared to receive the track. For example, if the tank is covered in several coats of paint, the magnets may not securely attach. The technician must ensure the paint is properly removed before the track is installed.



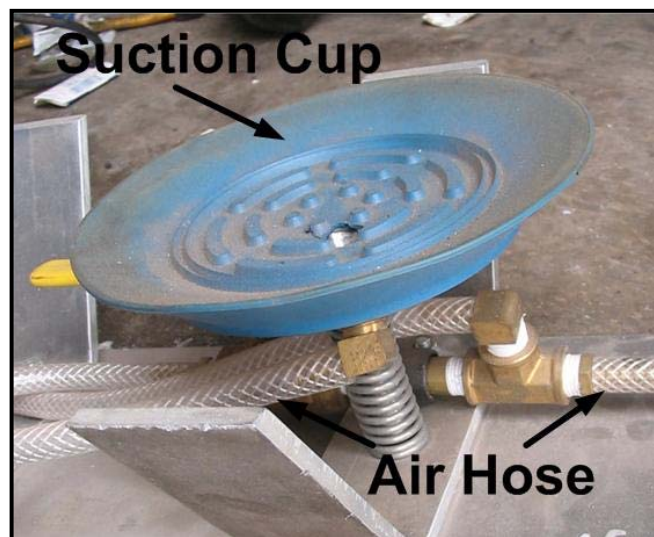
Track with Magnets

There may be instances where magnets are not practical. In these cases, the track may be mounted to the tank by tack welding the metal feet installed on the shoes.



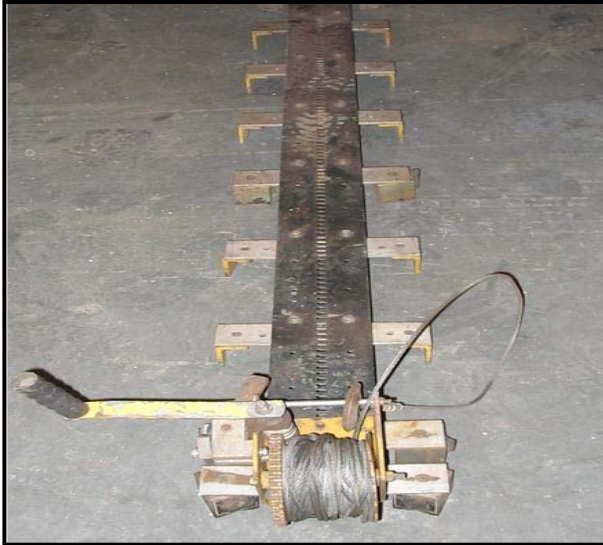
Track with Metal Feet

Suction cups may also be used to fasten the track to stainless steel and concrete. The suction cups are connected to an air system that actively creates the vacuum. This fastening system may be limited in cold weather.



Suction Cup and Air Hose

When a section of large diameter pipe requires cutting, the flex track can be mounted around the outside circumference of the track. The track is firmly secured to the outside of the pipe with a cable winch.



Track with Cable Winch Assembly



Close-up of Cable Winch Assembly

Rigid track is commonly used when cutting sections of large flat surfaces such as concrete flooring. Weights are attached to the shoes in order to keep the track stable during the cutting job. Weights are needed because the cutting head produces a significant amount of back pressure. If weights were not used, the bug and track may flip over due to the high pressure water stream.

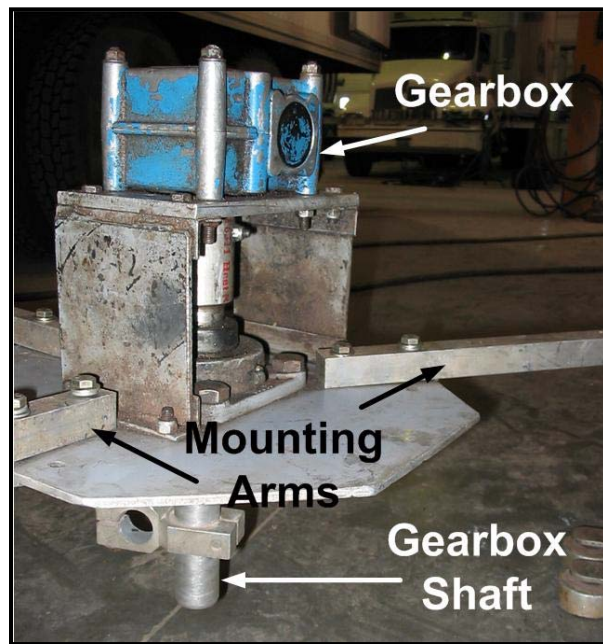


A Rigid Section of Track – Technicians will attach weights to the shoes in order to stabilize the track during concrete floor cutting operations.

The flex track is generally used to make straight cuts. However, when round cuts are required, CEDA can use either a round track or a radial cutter assembly. Round cuts are usually made for branch lines or access from vessels and tanks.



Once the round track is mounted, a bug travels around the outside perimeter. The cutting head will travel with the bug producing the round cut.



With the radial cutter assembly, the cutting head is attached to an arm mounted to a shaft below a gearbox. As the gearbox rotates the shaft, the round cut is formed.

2. Cutting Bug

The bug is a variable speed travel carriage that is hydraulically operated and is used to move the cutting head along the track.

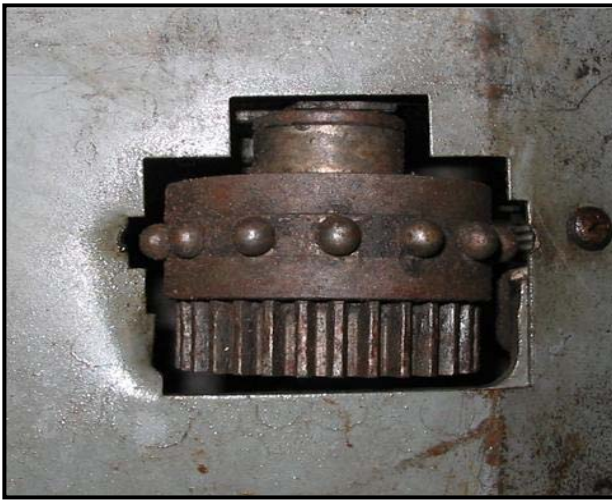


Bug with Cover



Bug with Cover Removed

The bug has a ball drive gear assembly that seats into the center of the flex track and is powered by a hydraulic motor. As the gear rotates it pulls the bug along the track. The gear can be engaged and disengaged using a camshaft lever on the side of the bug.



Ball Drive Gear – View from Bottom

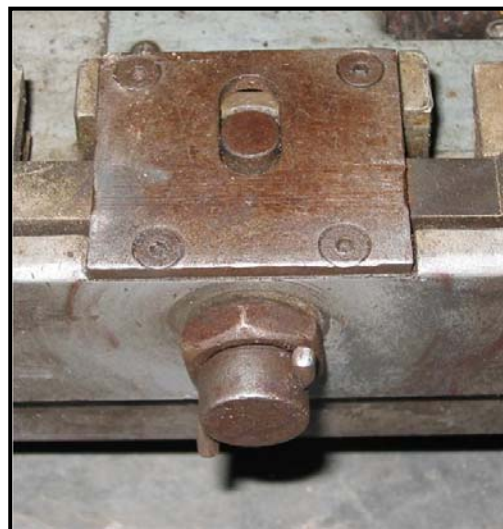


Camshaft Lever

The bug has a self aligning wheel system that grips the top and bottom of the track, allowing the bug to travel upside-down if necessary. Once the technician installs the bug onto the track, the wheel assembly is locked into position, preventing the bug from detaching from the track.

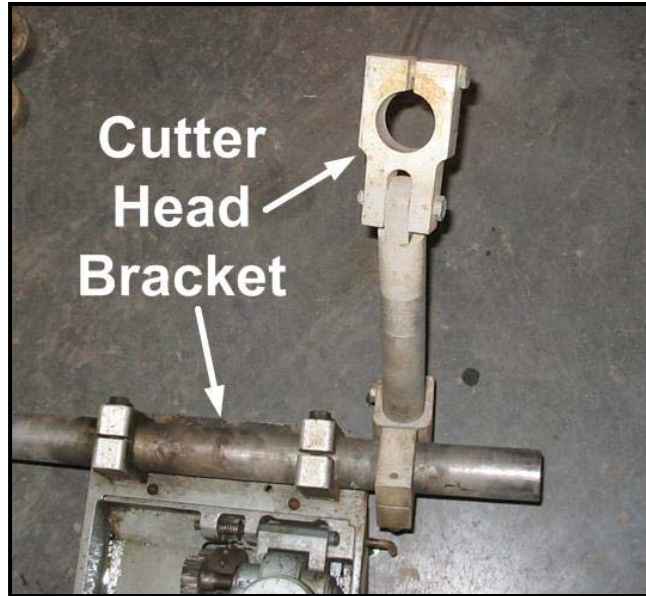


Track Wheel Assembly



Wheel Lock Down Screw

An assembly attaches to the bug and rigidly holds the cutting head in position. The assembly can be adjusted to allow the cutting head to be positioned in any direction. The bug, with assembly, ideally requires 14" of clearance to operate.



Cutting Head Bracket

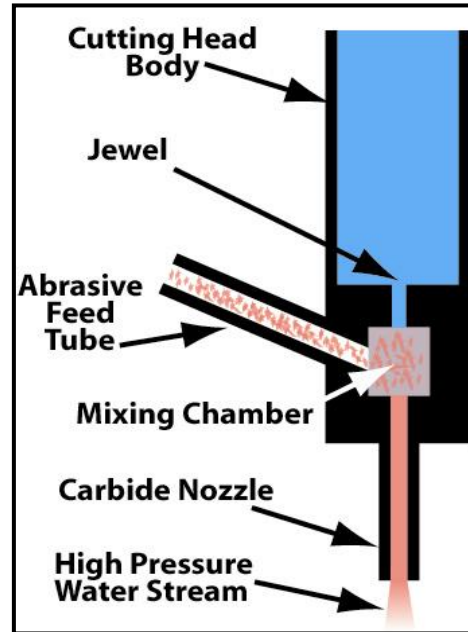
3. Water Jet Nozzle (Cutting Head)

The cutting head is the part of the system that directs the high pressure water stream over the cut line.



Cutting Head

High pressure water is fed into the head on one end, while the abrasive material is added from the side. The mixing tube acts like a rifle barrel to accelerate the abrasive particles. The water stream is ejected from a carbide tip that is approximately 3 mm in diameter. It is important to inspect the head before each job for cracks.



Cutting Head Mixing Chamber Graphic

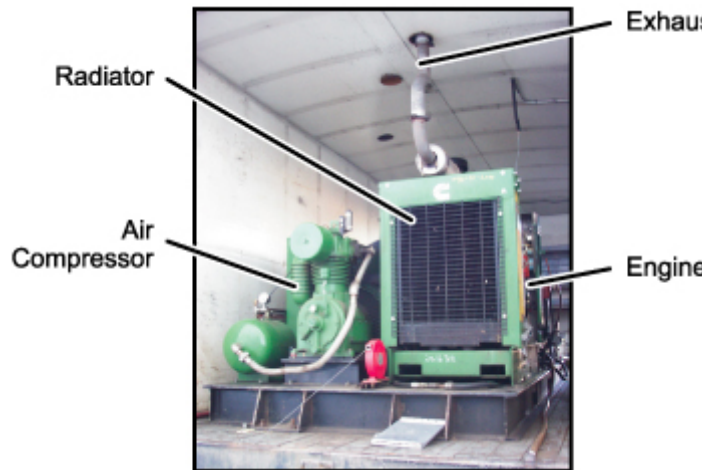


Cutting Head Installed on Cutting Bug

4. Pump

The pump used in high pressure water cutting is the same pump used in high pressure water blasting. The pump is powered by a diesel engine and provides the high water pressure necessary for cutting as well as the hydraulic pressure necessary to operate the hydraulic equipment such as the bug.

The pump is mounted on a skid and is transported to the job site, along with the remaining cutting equipment. Precautions must be taken to ensure pump does not freeze.

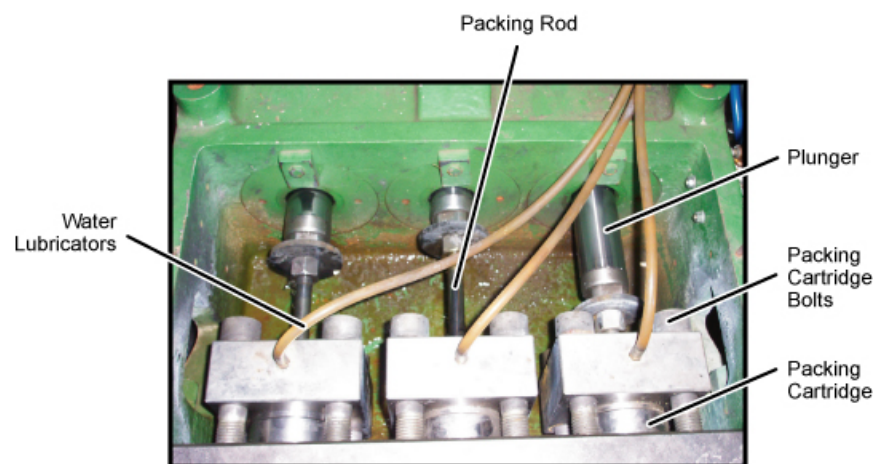


NLB Pump



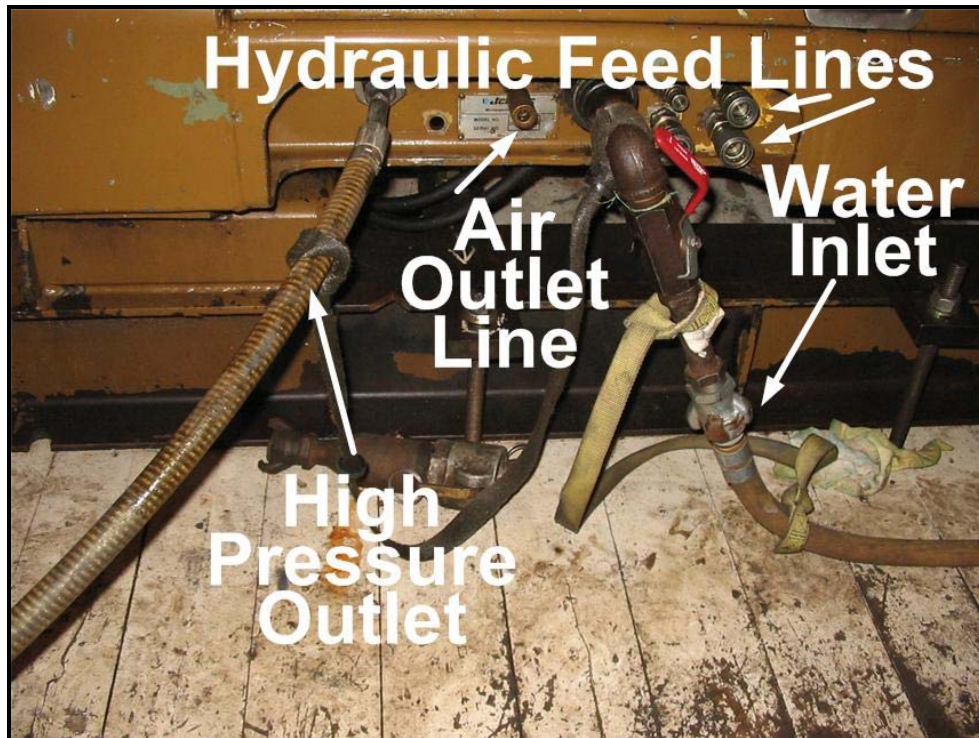
Jet-Edge Pump

The main component of the pressure system is comprised of a set of pistons. The pistons are powered by the diesel motor and produce the high water pressure necessary for the water cutting.



Example of Positive Displacement Pump

A high pressure water hose is connected from the pump to the cutting head.



Inlet and Outlet Connections for Jet-Edge Pump

5. Sand Pot/ Abrasive

The sand pot contains the material that is mixed with the high pressure water stream. The sand pot is connected to the cutting head using a rubber hose

The abrasive used in by CEDA is hard sand called garnet that is specially screened and sized. Garnet is commonly used because it is hard, has sharp edges, is tough and inexpensive. Like the pink colored sandpaper found at the hardware store, different mesh sizes are used for different jobs:

- ✓ 120 Mesh – produces smooth surface, but cutting times are longer
- ✓ 30/60 Mesh – most common, general purpose
- ✓ 20/40 Mesh – results in a slightly rougher surface

Ensure that all bags containing garnet and the hopper remain dry.

6. Hydraulic Lines

The hydraulic lines are connected from the pump to the hydraulic bank. From the hydraulic bank, the lines are connected to the hydraulic motor on the bug.

It is extremely important to recognize damaged/faulty hydraulic lines. If damaged lines are used, serious injury may result. Damaged lines must be “red-flagged” and removed from service.



Orange Hydraulic Lines

These lines are commonly used to connect the hydraulic control lever to the bug.



Damaged Hydraulic Lines

If braids are visible, the line must be red-flagged and removed from service.

Note: Any red-flagged hoses must be returned to the shop for proper disposal. Authorized personnel will make the final determination regarding repair or disposal.



Sand Pot



Garnet

The valve assembly on the bottom of the sand pot helps control the amount of garnet that enters the water stream. A hose extends from the valve to the cutter head.

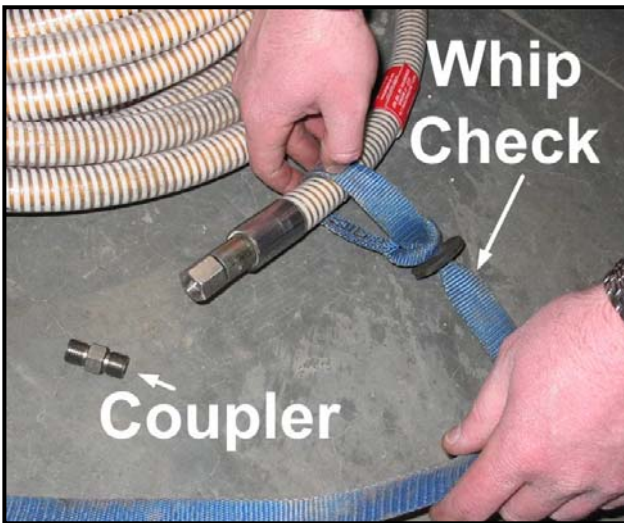
If the valve is moved toward the open position, more air and less garnet will be drawn into the water stream. Conversely, if the valve is moved toward the closed position, less air and more garnet will be drawn.



Sand Pot Valve Assembly

7. High Pressure Water Lines

The high pressure water line is connected from the pump to a safety valve (see Shut-off/Dump Valve) and on to the cutting head. A whip check must be installed at each connection. If an additional water line is needed, a coupler may be used to connect two lines. Like the hydraulic lines, high pressure water lines must be inspected prior to use. Failure in this line may result in severe injury.



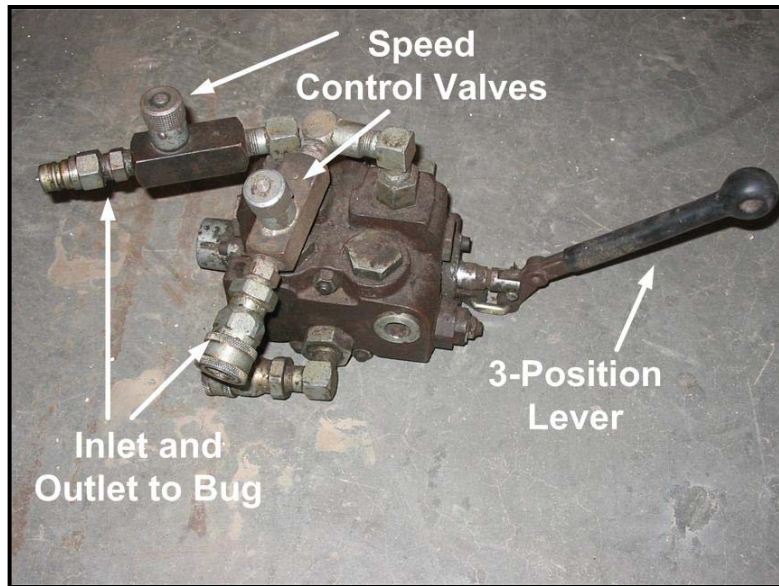
High Pressure Water Line with Whip Check and Coupler



High Pressure Water Line that has been removed from service

8. Hydraulic Control Lever

The hydraulic control lever is used to control the direction and speed of the bug as it travels along the track. The lever has 3 positions; forward, neutral, and reverse.

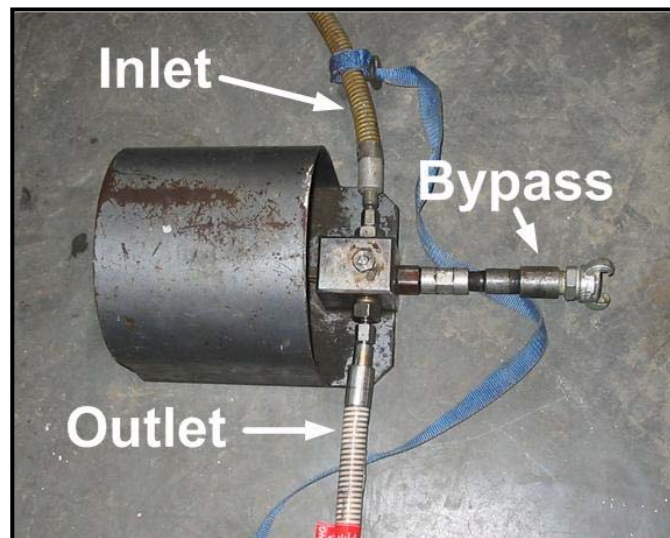


3-Position Hydraulic Control Lever

9. Shut-off/Dump Valve

The shut-off/dump valve is a very important piece of safety equipment when using high pressure water cutting equipment. It is important to know the type of pump in use so the correct shut-off/dump valve is used. These devices must be used on every job.

A foot dump is used on positive displacement pumps. Once this style of pump is operating, it continuously produces water pressure at the source. When an operator is required to disable the cutting head and removes his/her foot from the foot dump, the high pressure water jet is diverted to a bypass line on the foot dump.



Foot Dump Shut-Off

An air activated hand or foot shut-off can be used when the Jet-Edge pump is used. The Jet-Edge pump has the ability to discontinue high pressure water at the source when the shut-off is activated and a bypass is not necessary.



Air Activated Shut-Off



Hand Shut-Off

General Summary

Prior to performing any high pressure water cutting job it is very important for the technician to become familiar with all aspects of the job. One of the first steps to becoming familiar with any a high pressure water cutting job is to obtain all the relevant information from the client. The client will provide information such as the thickness of steel or concrete that will be cut, whether or not bevels are required, and the process in the tank, pipe, or vessel. Once the client information has been received, the high pressure water cutting equipment transported to the work site. The client will ensure the proper dimensions of the cut.

When preparing to cut material such as a manway, the technician will plan each cut. For example, when cutting a rectangular manway, the top and bottom horizontal cuts are performed first, always leaving one of the vertical cuts last. The track is usually kept off the door sheet when preparing the final vertical cut. The technicians must always flag and tag the area before performing the job and ensure that all permit requirements have been met.



Safety Considerations When Performing High Pressure Water Cutting

The high pressure water jet that is created from the nozzle head is very dangerous. The water jet is capable of causing serious injury or death. Additionally, all high pressure hoses used in water



cutting must be inspected for damage. A leaking high pressure hose is also capable of causing serious injury.

An FLRA must be conducted in addition to a pre-job safety meeting.

It is important to determine the size of material that will be cut. For example, when preparing to cut a large man way through quarter inch steel, the material that is cut must be safely removed. These sections of steel are very heavy, and when necessary, proper rigging is required.

The following must also be considered when performing high pressure water cutting procedures.

- Minimize the risk of injury from unsafe scaffolding or work platform installation. Check all tagging instructions.
- In the event of an injury, seek medical attention immediately to ensure that proper treatment is administered, and report injury to supervisor.
- Ensure that all information regarding workers injured on the job is forwarded to the CEDA-HEALTH AND SAFETY DEPARTMENT.

Personal Protective Equipment

In order to ensure that technicians are adequately protected from daily job hazards, the following equipment is the minimum which must be worn at all times when working on the job site:

- approved hard hat
- approved safety glasses with side shields
- approved footwear
- hearing protection.

Alteration to eyewear is strictly prohibited. While high pressure water cutting work is being carried out, safety glasses and full-face shields are the minimum acceptable protection that must be worn when in close proximity to the cutting head. Technicians must ensure face shield is down, protecting face, if there is any possibility of contamination from chemicals, sealants and flying debris.

On occasion when the situation requires increased protective clothing, or when a supervisor or client stipulates the use of increased protective clothing, the following may be required:

- Rain Suit
- Rubber Gloves
- Monogoggles
- Ear protectors, either ear inserts, earmuffs or both
- Safety harness*

Breathing air (SCBA or SAR)**

- Respirators***
- Acid splash suit with entry points taped
- Acid suit – Full containment with SCBA or SAR – (Graylite Type)



- Cooling air
- Any other protective equipment not outlined here which may be required.

When work is being carried out on hazardous chemicals, approved Monogoggles must be worn as the minimum acceptable eye protection. In the event that additional protective eyewear is required, Monogoggles may be used either with safety glasses or without.

- * A full body harness (four point) MUST be worn when working 4.0 feet or more above secured footings (as per CEDA Code of Practice - 02 Fall Protection). In all cases, the safety line should leave from rear of the body to minimize back injury in the event of a fall. Waist belts are NOT allowed.
- ** When CEDA – HIGH PRESSURE WATER CUTTING DIVISION personnel use breathing air equipment, a trained representative (Bottlewatch) should always monitor air bottles and equipment performance.
- *** Cartridges should be of the appropriate type, new for each job, and changed out as required, or when problems arise. Fit tests shall be conducted annually by a representative from the CEDA – HEALTH AND SAFETY DEPARTMENT.

Grounding Cables

Static electricity is generated by the contact and separation of dissimilar material. A spark can occur when there is not a good electrically conductive path between two bodies. The principal hazards created by static electricity are fire and explosion. These hazards occur when the static electricity generates sufficient energy to ignite any flammable or explosive vapor/gasses which may be present.

Hoisting of Equipment and Hardware

During heavy hoisting or lifting operations, the area must be roped off and warning signs placed at key locations by the client to inform fellow workers and plant personnel of the overhead hazard.

Personnel engaged in the actual operation must stay clear of the suspended load and lifting machinery. **DO NOT TRAVEL UNDER THE SUSPENDED LOAD AT ANY TIME.**

Permits

Where applicable, a permit must be acquired before work can commence. Permits for hot work, entering confined spaces or other special permits must be obtained and the work to be carried out according to plant procedures. In most cases the plant will issue a permit which will reflect the type of work to be completed. The different types of permits which may be issued are as follows:

- Hot work – Issued when a source of ignition is present.
- Cold work – Issued when there is no source of ignition or the process being repaired does not pose a risk.
- Excavation – Issued when working in a trench or culvert.

- 
- Confined Space Entry – Issued when working in an area which could pose a risk of asphyxiation.

Reporting of Incidents

All incidents, no matter how minor, must be reported to your Supervisor, plant or client contact and plant medical personnel (if required).

All incidents shall be reported as per the Incident Reporting Policy in the CEDA SIIPP Manual.

Responsibilities

It is the responsibility of EVERY CEDA employee to be familiar with CEDA's Safe Work Practices and Procedures and Work Standards.

Every technician is responsible for reporting any safety concerns or incidents to the area Supervisor and/or Manager.

Scaffolding

Scaffolding shall be used on work which cannot be carried out from ground level or other suitable solid construction. In all cases, scaffolding must be erected by the Client, or a qualified contractor.

The following is a description of tags that may be encountered when working on scaffolding:

- Green Tag – Scaffolding is certified as SAFE.
- Yellow Tag – Scaffolding may be used, but certain conditions must be met.
- Red Tag – Do NOT use scaffolding.

ALWAYS READ THE INSTALLATION TAG

In the event that scaffolding has to be changed or erected, consult your plant contact.

DO NOT:

- Move scaffolding while in use.
- Allow tools and materials to collect on scaffolding.
- Use scaffolding with a red tag or which hasn't been tagged.

Smoking in the Workplace

The Company has restricted smoking in workplace premises to certain designated areas to promote a cleaner and healthier work environment. Designated smoking areas will be clearly posted with signs.

This policy applies to all employees and visitors to Company facilities.

When Company employees are working on a client job site, they will adhere to all client requirements respecting designated smoking/non-smoking areas.



Smoking will not be allowed while work is being carried out.

Only safety matches or approved lighters may be carried by CEDA personnel. Since lighters and matches pose a possible fire hazard, no unauthorized materials are to be used.

It is recommended that matches and lighters not be carried into the field. They should remain in the truck or left at the front gate or security office.

✓ **Automated High Pressure Water Cutting Checklist**

If documentation is not provided by the site or client, the following form must be complete each time a high pressure water cutting job is performed.



Automated High Pressure Cutting Checklist

1. This Document is required for all Automated High Pressure Cutting jobs. It is to be completed by the Supervisor/ Operator at the beginning of every project and when the scope of work changes. The document is to be completed in four stages:
 - a. Prior to Receiving Work Permit
 - b. Set Up
 - c. Prior to Starting Job
 - d. Post Job

Customer: _____ Unit#: _____ Date: _____

<i>Prior to Receiving Safe Work Permit</i>		
1.	Has the operator completed: - the daily Pre-Job check for High Pressure units?	Yes []
2.	- the equipment Pre-Trip inspection?	Yes []
3.	All personnel have minimum PPE for high pressure cutting as outlined in the CEDA Code of Practice for High Pressure Water?	Yes [] N/A []
4.	Any personnel exposed to High Pressure blasting fumes, overspray, and wash water have adequate PPE for conditions exposed to?	Yes [] N/A []
5.	All personnel have required training as outlined in the CEDA Code of Practice? Verified by: _____ Supervisor/ Operator Name Signature	Yes []
6.	Permit issued?	Yes []
<i>Set Up</i>		
7.	Equipment visually checked for physical damage, no broken braids on high pressure hose or unusual wear and all components are properly rated for the pressure being use (as per manufacturer's specifications)?	Yes []
8.	Area barricaded or roped off and warning signs in place?	Yes []
9.	Continuous line of sight or other communication method between the pump operator and water cutting operator is established and can be maintained?	Yes []
10.	Have all hoses been whipchecked including the hose coming off the fire hydrant?	Yes []
11.	Location and operation of nearest eyewash and safety shower known?	Yes []
12.	Identified tripping hazards and overhead obstacles?	Yes []
13.	Have lighting requirements been reviewed?	Yes [] N/A []
14.	Have precautions been taken against the risk of freezing?	Yes [] N/A []
15.	Is location of emergency medical aid and emergency numbers known by all?	Yes []
16.	Chock blocks are properly positioned?	Yes []
17.	All vertical and horizontally suspended hoses need to be adequately supported/ protected from damage (i.e. traffic heat, abrasion)?	Yes []
18.	Flushed all equipment before installing nozzles?	Yes []
19.	Is scaffolding safe for intended use?	Yes [] N/A []



Automated High Pressure Cutting Checklist

<i>Prior to Starting Job</i>		
20.	Are all the personal protective equipment and industrial hygiene requirements in place?	Yes []
21.	Have all chemical hazards been identified and reviewed?	Yes [] N/A []
22.	Have steps been taken to protect electrical equipment?	Yes [] N/A []
23.	Check all hoses, threaded fittings, and anti-withdrawal devices to assure proper make-up.	Yes []
24.	Have hoses been pressure tested prior to use?	Yes []
25.	Complete Pre-Job Safety Meeting, or Pre-Job and/ or Non-Inert Confined Space Hazard Assessment and Permit Meeting, or Tool Box Talk, FLRA and review job specific procedures.	Yes []
26.	Have special safety requirements been discussed?	Yes []
27.	Has the system/ equipment been depressurized/ isolated?	Yes [] N/A []
28.	Has the Supervisor/ Operator verified cut line with client?	Yes []
29.	Hookups, pipes and connections have been pressure tested?	Yes []
30.	Hoses, cutting nozzles, pump are to be checked periodically or before re-start after a break by the equipment operator.	Yes []
<i>Post Job</i>		
31.	Clean work area – remove Danger tape.	Yes []
32.	Paperwork completed (e.g. sign-off Safe Work Permit, obtain customer signature if required).	Yes []

Supervisor/ Operator _____ Date _____

Client Representative _____ Date _____

High Pressure Water Cutting Procedure

The following procedure identifies the steps required when performing a high pressure water cutting job. Cutting large sections of material may result in heavy/large pieces that may require proper rigging and lifting equipment. Ensure appropriate rigging and lifting equipment has been identified with client prior to performing cut.

ACTION	NOTES
1. POSITION equipment...	... use a spotter wearing a reflective vest. ... park equipment as close to the work area without creating a hazard.
2. FLAG and TAG work area...	... use DO NOT ENTER flagging and post high pressure water blasting sign.
3. RIG hoses in a safe manner...	... avoid tripping hazards.
4. INSTALL whip checks at each connection.	
5. INSTALL tracking...	... client determines area to be cut. ... ensure all magnets are clean and have proper bonding. ... ensure cut area is free and clear of all obstructions.



6. INSTALL cutting assembly onto tracking and freewheel assembly to ensure no obstructions.	
7. FLUSH system before installing cutting head and abrasive delivery system...	<i>... ensure failsafe operator is close enough to view the cutting head.</i>
8. ENSURE failsafe operator is close enough to view cutting head.	
9. POSITION backstop and properly secure...	<i>... if required..</i>
10. PRESSURE-UP unit...	<i>... DO NOT exceed 36,000 psi.</i>
11. PROCEED to cut material...	<i>... shut down and repair or replace defective equipment as required. ... do not attempt repairs when system is under pressure. ... if at any time the job becomes unsafe, shot down all equipment and call your supervisor immediately.</i>
12. NOTIFY client once cut is complete...	<i>... client will remove cut material.</i>
13. DISENGAGE pump and shut down system.	
14. SIGN OFF permits and perform final housekeeping.	

Troubleshoot High Pressure Water Cutting Equipment

To efficiently operate the high pressure water cutting equipment, the technicians must be aware of the common failures that might prevent smooth operation. The following is a list of common problems that may be encountered.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION(S)
Cutting Bug not moving	Gear wheel disengaged	Engage gear wheel
	Loss of hydraulics	Check hoses
	Obstruction	Remove obstruction
No cutting	Incorrect positioning of valve on sand pot	Adjust valve
	Problem with garnet	Ensure garnet is dry
	Worn components of cutting head	Replace worn parts
	Insufficient water pressure	Verify pressure on pump and increase accordingly



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. High pressure water cutting is a method of cutting a hole into live/pressurized pipelines and/or tanks. a. True b. False		
2. Magnets are commonly used to secure the track to the object being cut. a. True b. False		
3. The cutting bug is powered by a variable speed hydraulic motor. a. True b. False		
4. The cutting bug ideally requires _____ inches of clearance for smooth operation. a. 10 b. 12 c. 14 d. 16		
5. Sapphire is commonly used as the abrasive agent. a. True b. False		
6. As more air is introduced to the sand pot line, more abrasive material will enter the cutting head. a. True b. False		
7. High pressure water lines must be inspected prior to use. a. True b. False		
8. Shut-off/dump valves must be used on every job. a. True b. False		



Practical Assessment – High Pressure Water Cutting Operations

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

Section 1			
The following items must be identified and their purpose, inspection requirements, and preventative maintenance must be explained. Failure to successfully explain inspection and maintenance requirements does not constitute a FAIL, but will require a mentorship agreement to bring the employees level of knowledge to an acceptable level.			
ITEM		YES	NO
1	Track - Suction cups - Radius Track - Flat Track - Magnets		
2	Cutting Bug - Wheel assembly - Wheel assembly lock down screws - Gear wheel - Gear wheel lever - Hydraulic motor - Cutter head bracket		
3	Water jet nozzle (cutting head) - Adjustment screw		
4	Pump		
5	Sand Pot/ Abrasive - Valve assembly		
6	Hydraulic Lines		
7	High Pressure Water Lines		
8	Hydraulic Control Lever		
9	Shut-off/Dump Valve		



Section 2			
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>*Copies of the completed Daily Inspection, FLHA and Procedure must be attached to the assessment.</i>			
High Pressure Water Cutting			
TASK		YES	NO
1	Position equipment.		
2	Flag and tag work area.		
3	Rig hoses in a safe manner.		
4	Install whip checks at each connection.		
5	Install tracking.		
6	Install cutting assembly onto tracking and freewheel assembly to ensure no obstructions.		
7	Flush system before installing cutting head and abrasive delivery system.		
8	Ensure failsafe operator is close enough to view cutting head.		
9	Position backstop and properly secure.		
10	Pressure-up unit.		
11	Proceed to cut material.		
12	Notify client once cut is complete.		
13	Disengage pump and shut down system.		
14	Sign off permits and perform final housekeeping.		
Comments:			



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
January 10, 2023	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:
