HSS-606 Hydroblasting

Overview

Purpose

The purpose of this Standing Instruction is to develop and implement a Hydroblasting Standing Instruction for the Marathon Petroleum Company LP (MPC) Los Angeles Refinery (LAR). It represents a composite of petroleum industry safe practices for this type of task.

Note: More stringent requirements may augment this Standing Instruction for any situation. If a special need or problem is encountered during a Hydroblasting job, consultation with a Safety Professional should be considered before proceeding, keeping in mind that any alternative procedures must be at least as effective as the requirements in this Standing Instruction in providing a safe work environment.

Scope

The scope of this Standing Instruction applies to all water jetting activities that occur at or above two thousand (2000) psi, which are performed at the LAR.

Note: Water jetting activities outside the scope of this Standing Instruction (e.g., less than 2000 psig) and pressure washing do have hazards and can create a water injection risk. Those risks will be covered by other risk mitigation processes including but not limited to Safe Work Permits and Job Safety Analyses.

Records Retention

Printed copies of this document should not be retained more than 12 months. Any revision to this document will be retained indefinitely.

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1.0 References

1.1 Refining References

The table below lists the Refining references used with this document.

Number	Description
HSS-201	Safe Work Permit
RSP-1708-000	Hydroblasting
RSP-1127-000	Confined Space Entry
RSP-1128-000	Safe Work Permit

1.2 Industry References

The table below lists the industry references used with this document.

Number	Description
General Industry References	
--	National Center for Construction Education and Research (NCCER) – Proposed NCCER – GBRIA Hydroblast Training Curriculum
Revision 1 April 4, 2011	The Greater Baton Rouge Industry Alliance (GBRIA) Safety Fundamentals for Hydroblasting
Water Jetting Technology Association	
Fourth Edition Third Printing October 2012	Recommended Practices for the Use of High-Pressure Water-jetting Equipment

1.3 Terms

The following terms are used in this document:

- Abrasive Cutting and Cleaning
- Anti-Withdrawal Device
- High Pressure (HP) Hydroblasting
- Lancing
- Line Moling
- Nozzle
- Orbital Jetting (2-D & 3-D Jetting)
- Safety Dump Valve
- Shot-gunning
- Ultra High Pressure (UHP) Hydroblasting

References: For details, see **Appendix A**, Terms and Definitions.

2.0 Roles and Responsibilities

2.1 Roles and Responsibilities

The table below describes the roles and responsibilities related to this document.

Roles	Responsibilities
Safety Department	**(a)** Develop, maintain, and update this Standing Instruction. **(b)** Evaluate industry standards and specifications of Safe Work Practices as they become available or change for inclusion into this Standing Instruction.
Permit Writer	**(a)** Act as owners of the location where hydroblasting takes place and issue/manage the Safe Work Permits process. **(b)** Ensure communication of any hazardous chemical last contained in equipment to the hydroblasting crew. **(c)** Inspect hydroblasting jobs for compliance per Safe Work Permit Standing Instruction (e.g., once per shift). **(d)** If hydroblasting water is to be sent to the wastewater treatment plant and has the potential to contain Benzene, the Permit Writer (Operations) must notify the Waste Water Control Room and obtain permission prior to each shift.
MPC Maintenance Coordinator	**(a)** Ensure personnel who fall within his/her area of responsibility have completed required training.
Contractors Conducting Hydroblasting	**(a)** Follow the practices required by this Standing Instruction. **(b)** Conduct daily inspections of all hydroblasting equipment and complete required documentation. **(c)** Ensure that all contractor personnel operating hydroblasting equipment are trained per Section 3.11.1 of this Standing Instruction and can provide documentation of that training upon request. **(d)** Ensure that all contractor personnel on the hydroblasting crew are trained per Section 3.11.2 of this Standing Instruction. **(e)** Monitor and operate the hydroblasting pump per the manufacturer recommendations. **(f)** Obtain all required Safe Work Permits. Ensure that the Hydroblasting Form (H26) is completed prior to receiving a permit for hydroblasting. **(g)** Ensure that all equipment meets the specifications required by this Standing Instruction.

3.0 Guidelines

3.1 Hydroblasting Injury General Information

3.1.1 Hydroblasting pumps can generate high pressures and can easily cut through wood, concrete, and heavy gauge metal as well as human tissue.

3.1.2 Hydroblasting operations are inherently hazardous because of the high or ultra-high water pressure involved. Individuals may become subject to harmful water pressure either by operator fault and/ or equipment malfunction (e.g., hose rupture, absence or removal of safety devices, etc.). Individuals near hydroblasting operations may also be exposed by inhalation or direct contact, if not properly protected, to any chemicals (e.g., acids, caustics, benzene, hydrogen sulfide, etc.) which may be imbedded in the material being hydroblasted.

3.1.3 When jobs are preplanned and handled properly, hydroblasting is safe; but when potential hazards are ignored or underestimated serious injury and death can result.

3.1.4 Dangers of hydroblasting are often underestimated especially because the real extent of the injury is hidden behind a small and sometimes painless injection point. The severity of the injury depends on a handful of factors some of which include the type, amount, velocity, depth, and anatomical location of the penetration. Some of the more common injuries caused by contact with high-pressure water during hydroblasting include:

(a) Tissue and organ damage depending on velocity and depth of the injury.
(b) Infection caused by contaminants injected into the body along with the water stream. If left untreated infections can be fatal or lead to amputation.
(c) Embolisms from high-pressure water and air injection under the skin.

3.1.5 Anyone with a possible hydroblasting injection injury shall notify MPC Medical immediately. The person that is suspected to have an hydroblasting injury shall be accompanied to the hospital by someone familiar with hydroblasting injection injuries. If the injured person cannot be accompanied for treatment, they shall be sent with a note for the attending physician. See paragraph below for an example (see Appendix D for a pull-off copy of this note):

"***This person has been injured with high pressure water with pressures possibly in excess of 10,000 psi and a jet velocity in excess of 900 mph. Unusual infection with microaerophilic organisms occurring at lower temperatures have been reported. These may be gram negative pathogens such as found in sewage. Bacterial swabs and blood cultures may be helpful.***"

3.2 Pre-Job Planning

Apply the following pre-job planning requirements for hydroblasting operations:

3.2.1 Check the surrounding areas to determine what effect the hydroblasting may have on personnel or what effect the surrounding environment may have on the hydroblasting.

3.2.2 Barricades shall be erected at a distance that would prevent anyone outside the barricade from being injured (including overhead operations) by a failure of the equipment or from the high pressure water stream. Barricaded area must be a minimum of 25' around the area. This barricaded area shall include the backside of exchangers or exit points of lines and equipment where the high pressure water stream could exit.

3.2.3 Ensure that everyone on the hydroblasting crew understands that hydroblasting operations will be shut down if unauthorized personnel enter the barricaded area.

Continued on next page

3.0 Guidelines, Continued

3.2 Pre-Job Planning (continued)

3.2.4 Provisions must be established for the collection and/or disposal of the hazardous waste and runoff.

3.2.5 Determine if special personal protective equipment is required due to the chemicals involved in the hydroblasting operation or on the equipment or parts being hydroblasted.

3.2.6 Determine if there is adequate room for storage of bundles, etc., and consider if additional traffic or specific routes will be required.

3.2.7 Consider the accessibility of utilities, such as water or electric. Avoid running hoses, electric cords, etc., across roads and high traffic areas. If hoses must be placed across roadways, hose ramps shall be used, or the road must be closed to protect from damage.

3.2.8 Ensure that good housekeeping is maintained throughout the job. Poor housekeeping, especially tripping hazards, could lead to serious injuries.

3.2.9 Make sure permission to set up, attaching to utilities, Safe Work Permits, etc., are obtainable in the area.

3.2.10 During long jobs, worker fatigue should be considered, and appropriate steps taken to control it.

3.2.11 If hydroblasting is being performed near other work crews, ensure there is adequate spacing to prevent one job from creating a hazard to another job.

3.2.12 Hazards associated with freezing weather shall be pre-planned to prevent slip hazards, frozen hoses, etc.

3.2.13 Ensure that all required approvals are in place if fire hydrants are used as a water utility. Make sure that fire hydrants are operated properly.

3.2.14 Verify energy isolation has been completed if required.

3.3 Personal Protective Equipment

The following personal protective equipment (PPE) shall be required when conducting Hydroblasting operations:

3.3.1 **Head Protection:** All personnel shall wear an approved hard hat.

3.3.2 **Eye/Face Protection:** All personnel operating hydroblasting equipment shall wear safety glasses and face shields. When blasting acidic or caustic containing materials, personnel shall wear a full face respirator.

3.3.3 **Body Protection:**

- **(a)** At a minimum, all personnel operating hydroblasting equipment that will be exposed to hydroblasting water or mist shall wear a rain suit. Neck protection shall be worn when applicable.
- **(b)** Suitable chemical protective clothing shall be worn when a rain suit will not protect the operators against the chemicals that he/she may come into contact with during the job.
- **(c)** Personnel that are operating remote hydroblasting equipment and are not exposed to hydroblasting water or mist can wear FR Tyvek® over their FR clothing.

3.3.4 **Hand Protection:** All personnel shall wear PVC chemical protective gloves as a minimum when operating hydroblasting equipment. Gloves must be of the type to protect the operators against the chemical that he/she may come into contact with during the job.

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3.0 Guidelines, Continued

3.3 Personal Protective Equipment (continued)

3.3.5 Foot Protection:

(a) All operators shall wear waterproof boots with safety toes.

(b) Metatarsal protection and shin guards are required for all shotgunning operations.

3.3.6 Hearing Protection: Hearing protection shall be worn by all operators of hydroblasting equipment. In some instances, double hearing protection may be required. Use of a hornet/turbo shotgun nozzle requires double hearing protection. While Hydroblasting is taking place at a bundle slab with the automated tool lance, individual in open cab is required to wear double hearing protection.

3.3.7 Respiratory Protection: Respiratory protection must be worn where chemicals may be present above the permissible exposure limit. Consult the Safety Department Representative or Refinery Industrial Hygienist if there are any questions.

3.4 Inspection of Equipment

Because of the extreme pressure and the hazards of high pressure water injection injuries, all hydroblasting equipment must be inspected as described below and as required by the LAR Hydroblasting Form (Appendix C):

3.4.1 Hose Inspection and Testing:

(a) All High pressure hoses must be marked with manufacturer's name or symbol, serial number, and Maximum Allowable Working Pressure (MAWP).

(b) High pressure hoses and hose ends must be inspected prior to use. Those with visible metal braiding obvious kinks, or with damaged ends/fittings must be tagged and taken out of service.

(c) High pressure hoses and lances must have a thorough visual inspection (e.g., entire length of hose and hose fittings) every three months. Color coded tags or similar method should be used for easy identification of the visual inspection date. Quarterly visual inspection of rental equipment will be the responsibility of the rental company and/or the contractor using the equipment.

(d) High pressure hoses must be visually inspected and hydrostatically tested at least annually. **Note:** Hoses must be marked individually with the hydrostatic test date OR the Contractor must be able to positively identify each hose and provide MPC documentation that the hose has been hydrostatically tested within the last 365 days.

Inspection Frequency	Inspection Type
Daily	Visual
Quarterly	Visual and Tagged
Annually	Hydrotest

3.4.2 Nozzle and Tip Inspection:

(a) Check nozzles to be sure it is free from any debris prior to installing nozzle.

(b) Periodic checks should be made to ensure tip is secure during the job.

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3.0 Guidelines, Continued

3.4 Inspection of Equipment (continued)

3.4.3 Relief System Inspection:

- **(a)** Hydroblasting pumps must be equipped with rupture disc assembly rated no greater than 1.2 times the MAWP of the pump. An inspection of the assembly prior to use must show visual evidence (color code banding/tagging) of having been inspected at least quarterly for integrity of the rupture disc.
- **(b)** Personnel must never bypass or otherwise disable the pump rupture disc assembly.
- **(c)** Only rupture disks of the same type and rating as supplied and recommended by the manufacturer may be used.
- **(d)** The pressure relief system must discharge vertically, never horizontally so the high pressure water would not injure a worker standing or working near the unit.
- **(e)** Personnel must never work on or change any elements of the pressure relief system while pumps are operating.

3.4.4 After pressurization hoses and equipment shall be inspected for leaks, bulges, etc. before use.

3.5 Safety Procedures while Operating Hydroblasting Equipment

Personnel operating hydroblasting equipment must be trained on the proper operation of the equipment and familiar with how to safely set up and operate the equipment. The following minimum safety procedures must be followed to ensure a safe hydroblasting operation:

3.5.1 Necessary Safe Work Permits (e.g., hot work, confined space, etc.) shall be obtained before the start of any hydroblasting job. The hydroblasting crew must always check for current permits at the beginning of each shift.

3.5.2 Hose end restraining devices (whip checks) shall be used on all connections to prevent hose whipping and adjusted in such a way that any pulling or tugging stresses are absorbed by the whip check and not stress the connection.

3.5.3 All fittings used to connect nozzles and hoses must be rated at least to the MAWP of the pump.

3.5.4 Be parked on stable ground and at least one tire on a hydroblasting pump unit must be double chocked against accidental movement when parked on location.

3.5.5 A ***trained pump attendant*** is required to be in attendance of pump(s) at all times. The attendant must be close enough to shut down the pump(s) in an emergency. The attendant must not leave his/her responsibility for any length of time while the pump(s) is operating without another trained attendant relieving that person or shutting the pump(s) down. A pump attendant is not allowed to attend more than two pumps in operation within the same barricaded area. **Note:** This requirement applies in the event of an emergency as well.

3.5.6 Personnel must never place hoses under arms, near neck or face, or between the legs.

3.5.7 Hoses must be protected from traffic damage. If hoses must be placed across roadways, hose ramps shall be used, or the road must be closed to protect from damage.

3.5.8 Barricading of the pump(s) and job site hazards is required on every hydroblasting job and should be a minimum of 25 feet. All barricades should have four sides and have signage or tags that indicate “Danger Hydroblasting” or similar language to identify that hydroblasting work is being done.

3.5.9 Personnel should never step on high-pressure hoses.

3.5.10 If the pump hose or lance appears frozen, the pump must not be engaged or the engine started until the equipment has been thawed out, and low pressure water flowed through the system to the nozzle end of the lance. **Note:** If the line cannot be cleared of ice using low pressure water flow, then alternative safe mean of clearing the hose and lance or shotgun can be used. The alternative safe procedures must be approved by MPC Safety and Maintenance Coordinator.

Continued on next page

3.0 Guidelines, Continued

3.5 Safety Procedures while Operating Hydroblasting Equipment (continued)

3.5.11 No attempt shall be made to adjust any nut, hose connections, fittings, etc., while the system is under pressure. The pump shall be stopped and any pressure in the line discharged prior to making any adjustments.

3.5.12 All water flow to the low/high pressure hose shall be actuated by a dump valve and equipped with a guard to prevent accidental actuation. The dump valve may be foot or hand operated. The fail-safe system must only be controlled by the worker closest to the nozzle. The dump valve must never be gagged or disabled.

3.5.13 Personnel must never tie down, lock, or bypass a fail-safe system. **Note:** Anyone caught tampering with, locking or otherwise bypassing a hydroblasting fail safe system will be disciplined up to and including removal from the LAR.

3.5.14 Personnel must never stand on top of or directly behind the pump while it is operating.

3.5.15 When approaching the operator, have your presence acknowledged. Approach only after the high-pressure cleaning tool has been stopped.

3.5.16 If possible, all jobs shall include a direct line-of-sight between the pump operator/attendant and the hose end equipment operator. If direct line-of-sight cannot be achieved, radio communication or use of an additional person for line-of-sight must be utilized to assist in quickly de-energizing the pump.

3.5.17 High-pressure hoses must never be kinked or intentionally damaged or mishandled.

3.5.18 After the pump, hose, and gun (or lance) are assembled, water must be pumped through the system at low pressure to flush any debris out of the line before the nozzle is attached.

3.5.19 Prior to the start of the job, test the nozzle/switch/foot valve to make sure the water flow ceases. If water bleeds through any of these positive shut off devices, they must be repaired or replaced before the work can proceed.

3.5.20 Elevated runways, platforms, etc., must have standard guardrails and toe boards which meet OSHA standards. These walkways and platforms must be kept clear of oil, grease, waste materials, and all tripping hazards. Non-skid surfaces shall be added where the walking surface is such that a person might slip.

3.5.21 No operation shall be left unattended while under pressure. The operation shall be shut down and the pump taken out of gear. Never depend entirely on the fail-safe system when lances, hoses, etc., are left unattended.

3.5.22 One control valve or switch shall control hydroblast task.

3.5.23 When the hose drop or rise exceeds ten feet, it shall be securely tied off to a rigid support to limit the strain due to hose weight. Additional tie off locations may be required for longer vertical runs of hydroblasting hose. Good judgment and experience shall be used to determine how many tie off locations are needed to minimize strain on the hydroblasting hose.

3.5.24 On long duration jobs, lubricating oil, hydraulic fluid, water, gearbox oil, fuel, and other required lubrication should be checked every shift (not to exceed 12 hours) or more often if recommended by the manufacturer.

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3.0 Guidelines, Continued

3.6 Lancing (Stiff and Flex Lancing)

High pressure lancing can be a high hazard task if the correct equipment and procedures are not implemented. The following minimum procedure must be implemented to ensure safe lancing operations:

3.6.1 Anti-withdrawal devices must be used on all manual flex lancing jobs and secured to prevent separation during operation. The anti-withdrawal device must be attached to the equipment being cleaned. The flex lance must be secured (e.g., lance stopper or equivalent) for the maximum length of travel.

3.6.2 Anti-withdrawal devices used on tube sheets when manual flex lancing must include use of a snorkel/focus tube that does not exceed 1 inch clearance from the tube sheet. In vertical tube sheet applications, the maximum gap clearance of the snorkel and the tube sheet must be additionally protected from the potential of the lance coming out under hydraulic pressure. To prevent the potential of a water-cut to the foot, the gap (between the snorkel/focus tube and the tube sheet) must be protected from the lance operator by utilizing some type of physical barrier (wood or steel).

3.6.3 Apply pressure only after the lance or mole is inserted into the tube.

3.6.4 An adequate shield should be placed on the exit point of the tube bundle being cleaned to prevent debris from striking personnel or equipment. **Note:** Special care must be taken when jetting U-tubed bundles (e.g., lance stops).

3.6.5 During jetting/lancing the worker operating the lance shall be in control of the pressure (e.g., foot dump valve.)

3.6.6 During manual operations, use adequate shielding when using nozzles containing backjets to clean the entrance of a line. **Note:** The first two feet of a line or tube shall be cleaned by shotgunning before lance is inserted.

3.7 Line Moling

High pressure pipe and line moling can be a high hazard task if the correct equipment and procedures are not implemented. The following minimum procedure must be implemented to ensure safe line moling operations:

3.7.1 An anti-withdrawal device, securely attached to equipment, shall be used while line moling to prevent accidental removal of the line mole while still under pressure at the insertion point. The line mole line must be secured (e.g., lance stopper or equivalent) for the maximum length of travel.

3.7.2 In addition to the use of anti-withdrawal devices when line moling, a stinger rod must be attached to the end of the nozzle 1.5 times the inner diameter (ID) of the largest diameter of the pipe being cleaned must be used. This keeps the line from reversing. **Note:** If the pipe contains a "T" then the stinger rod shall be 2 times the ID of the largest diameter pipe being cleaned.

3.7.3 Line moles shall be equipped with back thrust nozzles that pull the hose/line forward.

3.7.4 Apply pressure only after the lance or mole is inserted into the tube.

3.7.5 The barricaded area shall include the exit end of the piping to prevent access at that location.

3.7.6 The first two feet of the line shall be cleaned by shotgunning.

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3.0 Guidelines, Continued

3.8 Shotgunning

The use of a hand held hydroblasting gun (aka: shotgunning) can be a high hazard task if the correct equipment and procedures are not implemented. The following minimum procedure must be implemented to ensure safe shotgunning operations:

3.8.1 The six feet of hose closest to the shotgun shall be enclosed by a shroud rated for at least 1 ½ times the working pressure to protect the operator in the event of a hose failure or a leak.

3.8.2 The shroud shall be marked or otherwise have indication of its pressure rating.

3.8.3 A hydrojetting gun or shotgun shall have a minimum length of 66 inches from butt to nozzle with a barrel length of no less than 48 inches.

3.8.4 The target shall never be hand held.

3.9 2D & 3D Vessel Cleaning

The following additional requirements must be followed when utilizing 2-Dimensional (2D) and 3-Dimensional (3D) hydroblasting equipment for vessel cleaning:

3.9.1 Where equipment is manually positioned, a foot pedal or other form of dump valve controlled by the worker closest to the equipment shall be used.

3.9.2 In all cases the water jetting pump operator will remain in close proximity to the water jetting pump and have a means to immediately shut off the pressure. The water jetting pump pressure may only be turned on by the designated water jetting pump operator.

3.9.3 A single crew member must be assigned the duties of monitoring the entire vessel being cleaned. This person shall also have means of immediate communication with the water jetting pump operator.

3.9.4 The single crew member assigned to monitor the entire vessel shall ensure the following:

- **(a)** The vessel and vessel openings and barricaded areas are clear of all personnel each time the pressure is engaged and while the nozzle is running.
- **(b)** Vessel openings that are not required to be open must either be bolted shut or securely covered with a warning tag attached.
- **(c)** Vessel openings that are required to remain open during the cleaning process shall be barricaded with red tape for a distance of at least 10 feet.
- **(d)** In all cases, proper barriers or restrictions must be applied in order to prevent the jet stream or tool from exiting the vessel, including the possible event of a cable or fastener failure.

3.9.5 Confined space entry shall not be permitted concurrently when orbital jetting in the space is in operation. The orbital jetting machine shall be lock/tagged out when entry is required, and the machine is in the space.

3.10 Special Considerations

Apply the following special considerations:

3.10.1 All electrical equipment that may be impacted by the hydroblasting (including overspray) must be covered or de-energized or otherwise protected. All 110 volt electrical equipment required to support the hydroblasting operation must be properly grounded and protected with a ground fault circuit interrupter to prevent the possibility of electrocution.

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3.0 Guidelines, Continued

3.10 Special Considerations (continued)

3.10.2 Abrasive jetting can be an ignition source. Never use abrasive jetting in atmospheres or areas where flammable or combustible materials are above 10% LEL. Ensure that this hazard is recognized on the Safe Work Permit (see ***Note*** below).

3.10.3 Precautions shall be taken when jetting lines, tubes, or equipment with pyrophoric iron sulfides to ensure the pyrophoric iron sulfides are controlled (wetted) at the exit point to the atmosphere.

3.10.4 When hydroblasting lines, tubes, and equipment that contain corrosive solids and liquids, consideration shall be given to reactivity and appropriate precautions taken (e.g., PPE, runoff, barricading, perform during low activity periods, etc.).

3.10.5 When using Hydroblast methods to remove lead-based paint, requirements stipulated in the OSHA Lead Standard shall be adhered to.

3.10.6 Variances from the requirements of this Standing Instruction are only acceptable after all other measures have been exhausted and require approval per HSS-004. Examples of these may include but are not limited to not being able to make use of an attached anti-withdrawal device for either flex lancing, rigid lancing, or line moling.

Note: The following recommendation is taken from a study conducted by Exponent Failure Analysis Associates in 2001and provided to MPC by PSC:

"It is our recommendation that metal cutting operations using abrasive water jets be restricted to areas where the LEL is 10% or less. This is in line with good safety practice regarding other methods of metal cutting which produce sparks. Although research has shown that sparks produced by water jets do not cause ignition in flammable atmospheres under most conditions, there are some conditions under which ignition does occur. In addition, the research in this area is still sparse. The mechanism of spark formation is not yet well understood, and the possible synergistic effect of spark formation, electrostatic discharge, and piezoelectric effects has not been studied."

3.11 Training

Personnel conducting hydroblasting operations must be trained both on the hydroblasting equipment and the operation that they will be performing. The following are the minimum training requirement for personnel conducting hydroblasting at the LAR:

3.11.1 Hydroblasting personnel must have documented training in the use of hydroblasting equipment and use including, but not limited to:

- **(a)** Energy isolation of the hydroblasting equipment,
- **(b)** Confined Space Entry,
- **(c)** Correct body positioning for hydroblasting operations,
- **(d)** Inspection and proper use of hydroblasting shotguns,
- **(e)** Inspection and proper use of flex lancing equipment,
- **(f)** Inspection and proper use of rigid lancing equipment,
- **(g)** Inspection and proper use of line moling equipment, and
- **(h)** Installation and use of anti-withdrawal safety devices.

3.11.2 Every employee on the hydroblasting crew must know how to properly shutdown a pump and disconnect its energy source (e.g., electric or diesel) in the event an adjustment or maintenance to the cleaning system needs to be performed.

3.11.3 Contractors shall maintain, and provide upon request, documentation of hydroblasting training as described above.

3.12 Auditing

The auditing of hydroblasting jobs (in process units and jet pads) must be performed during a Tier 1 audit using the Audit Form in Appendix B of this Standing Instruction.

Appendix A: Terms and Definitions

A.1 Abrasive Cutting and Cleaning	***Abrasive Cutting (also known as Hydrocutting) and Cleaning*** is a water-directing device with or without abrasive cutting material for the purpose of cutting or cleaning materials or equipment.
A.2 Anti-Withdrawal Device	***Anti-Withdrawal Device*** is a device installed on the equipment to prevent the nozzle on the end of the hose from being pulled out of the equipment under pressure.
A.3 High Pressure (HP) Hydroblasting	***High Pressure (HP) Hydroblasting*** is hydroblasting operations from 2,000 psig up to 10,000 psig.
A.4 Lancing	***Lancing*** is an operation where a lance and nozzle combination is inserted and retracted from pipes or tubes (e.g., tube bundles).
A.5 Line Moling	***Line Moling*** is an operation where a hose and nozzle combination feeds itself through a pipe or tubes.
A.6 Nozzle	***Nozzle*** is a water-directing device on the end of a shotgun, lance, or other water directing device.
A.7 Orbital Jetting (2-D and 3-D Jetting)	***Orbital Jetting (2-D and3-D Jetting)*** is a waterjetting operation that utilizes a rotating nozzle. **Note:** This operation is utilized for internal vessel cleaning without requiring confined space entry.
A.8 Safety Dump Valve	***Safety Dump Valve*** is a foot or hand operated contact-type switch or dump valve which when released by the operator, interrupts pressure at the nozzle. The valve or switch must have a guard to prevent inadvertent actuation and be controlled by the worker closest to the nozzle.
A.9 Shotgunning	***Shotgunning*** is an operation where a specially designed, hand-held device is used to clean equipment (e.g., outside of tube bundles or walls of storage tanks).
A.10 Ultra High Pressure (UHP) Hydroblasting	***Ultra High Pressure (UHP) Hydroblasting*** is hydroblasting operations greater than 30,000 psig.

Appendix B: Hydroblasting Audit Form

B.1 Form The Hydroblasting Audit Form can be found on the Safe Work Permit Sharepoint Site.

Marathon Petroleum Company LP

Hydroblasting Audit Form

Company Performing Work: _____

Date: _____ **Time:** _____ **Area/Unit:** _____ **Permit No.:** _____

Hydroblast Equipment Type /Number: _____ **Auditors:** _____

	AUDIT QUESTIONS	YES	NO	N/A	COMMENTS
1	Has Safe Work Permit been properly filled out?				
2	Is proper PPE being worn for hydro blasting task?				
3	Does this hydroblasting task require any additional PPE due to possible chemical hazards?				
4	Are personnel trained on hydroblasting equipment/procedures being used?				
5	Are all hoses in use for this job been hydrstatically tested within the last year?				
6	Have all hoses in use on this job been visually inspected within the last three months (tagged/ colorcoded per RSP)?				
7	Area all hoses and fittings of the correct pressure rating?				
8	Are all the nozzles free from plugging and in good operating condition?				
9	Has hookup, including pipes, hoses, and connections, been pressure tested with water at the maximum operating pressure?				
10	Is fall protection being worn, if needed?				
11	Are all openings on equipment being hydroblasted in the general area and adequately barricaded with proper warning signs posted?				
12	Is equipment being hydroblasted stabilized to prevent movement?				
13	Have environmental issues been adressed for any hydroblasing not preformed on the ash pad?				
14	Has all electrical in the hydroblast area been protect from overspray?				
15	If this job involves flexible lancing or line moling does the operator control the foot dump valve?				
16	If this job involves flexible lancing does it have an anti-withdraw device?				
17	If this job involves flexible lanceing does it have an anti-whip check?				
18	If this job involves line moling does the the flexible lance have a stinger 1.5x the diamter of the pipe?				
19	If this job involves hand held hydroblasting is the gun equiped with a 6 foot shroud on the hose to protect the operator?				
20.	Hand held hydroblasting guns are equipped with at least 4-foot barrel?				
21.	Are Hydroblasting pumps equipped with a rupture disc assembly rated no greater than 1.2 times the MAWP of the pump? Has an inspection of the assembly prior to use shown visual evidence (color code banding/tagging) of having been inspected at least quarterly for integrity of the rupture disc?				

Additional Comments: _____

Appendix C: Hydroblasting Form

C.1 Form The following is page 1 of the LAR Hydroblasting Form, H26.

Marathon Petroleum Company LP

HYDROBLASTING FORM

Permitted Task List ID#H26 **PERMIT #:**

Date: *This form is to be completed by the Hydroblasting Crew Leader.

Refinery: **Work Location:**

Task/ Equipment Description:

Crew Leader: **Pump Operator:**

Equipment Information

Hydroblast Unit #: _____ Maximum Allowable Working Pressure: ☐ 10K ☐ 15K ☐ 20K ☐ 40K

Check all that apply: ☐ Shotgun ☐ Line Mole ☐ Lance ☐ Pressure Wash (at or over 2,000psi)
☐ **2-D Nozzle** ☐ **3-D Nozzle** ☐ Automated ☐ Vertical ☐ Horizontal

Personal Protective Equipment (PPE)

☐ Hard Hat ☐ Safety Glasses ☐ Hearing Protection ☐ Face Shield ☐ Slicker Suit ☐ Rubber Gloves
☐ Rubber Boots *Other PPE:* ☐ Metatarsal Protection ☐ *Goggles* ☐ *Shin Guards* ☐ *Respirator*

Operational Protective Equipment – GENERAL HYDROBLASTING OPERATIONS

Number of High Pressure Hoses from Pump to Shotgun or Lance: _____ Hose Maximum Working Pressure: _____K

☐ Whip Check at Every Connection Hose to Hose; Pump to Hose ☐ All Fittings Rated for max. pressure ☐ Filter on Pump inspected and clean ☐ Rupture Disc in Place, properly rated, and inspected.

☐ Adequate Barricade ☐ Two (2) Pressure Relief Devices ☐ Flush Water Source & Hoses
☐ Hydroblast Unit Grounded ☐ Fire Extinguisher Present ☐ Wheel Chocks in Place
☐ Hoses Kept Out of Walkways ☐ Hoses are Free of Doors/Equipment That Could Damage the Integrity of the Hose
☐ Hose Protected from Mobile Equipment (e.g., Road Ramp in Place) ☐ All Hydroblast Equipment / Fittings / Hoses Visually Inspected
☐ Electrical Equipment Shielded from Water ☐ Hydroblasting PPE Available to All Personnel Entering Barricade
☐ All Camlock Fittings/Caps are Pinned, Wired, or Taped Closed.
☐ All employees are properly trained ☐ Internal combustion engines have the required air emissions permits.
☐ Water supply for machine is from an approved source. ☐ Clean water drains are covered and a debris disposal plan in place.
☐ Lances/wands/HP control valve/Foot pedal and other safety devices are operational.
☐ Anti-withdrawal device being used and whip is marked to prevent pull out too far.
☐ Machine operator and wand/whip operator have clear communication.

Note: A high pressure hose fails inspection if: the PVC outer covering has a hole, if any metal braids are exposed; if the PVC outer covering has moved from the crimp; if any defects are found that questions the integrity of the hose.

Operational Protective Equipment – SHOTGUN OPERATIONS

Shroud Information:

Manufacturer: _____ Shroud Rating: _____K
≥ 1 ¼ times MAWP

☐ 6 Feet or Greater ☐ Shroud Covers Whip Hose and Crimp-to-Gun Connection

Shotgun Information:

☐ 48" Barrel or Greater ☐ Trigger Safety Latch ☐ Trigger Guard in Place ☐ Tip / Nozzle Free of Debris

Operational Protective Equipment – FLEX LANCE / RIGID LANCE / LINE MOLE OPERATIONS

☐ Pedal In-Line and In Position to be Controlled by the Lanceman ☐ Pipe Exit Properly Guarded

Anti-Withdrawal Device (AWD) Information:

Type of AWD: _____ ☐ AWD is Mechanically Attached ☐ Die is Correct ☐ Die is Secure

☐ Less than 1" gap between snorkel and tube sheet ☐ Lanceman Trained on AWD Use

Lance / Tip / Nozzle / Stinger Information:

Size of Lance (inches): _____ ☐ Tip / Nozzle Free of Debris

Inside Diameter (ID): _____ Stinger Length (For Line Moling stinger rod must be 1.5x ID): _____

_____ _____
HYDROBLASTING TEAM LEADER SIGNATURE DATE / TIME

Appendix C: Hydroblasting Form (continued)

C.1 Form The following is page 2 of the LAR Hydroblasting Form, H26.

HYDROBLASTING FORM
Permitted Task List ID#H26

Controls – HYDROCUTTING OPERATIONS

- ☐ The location of the cut has been identified on a P&ID or piping schematic and in the field.
- ☐ Cut tag has been hung at the cut location.
- ☐ Personnel have double hearing protection.
- ☐ If loading grit, all personnel have the respiratory protection available as required on the grit's SDS.
- ☐ Equipment to be cut has been properly supported/rigged to prevent movement once the cut is complete.
- ☐ Pressure will be increased slowly to check for leaks prior to reaching highest level of pressure required for the cut (Use only the amount of pressure required to make the cut.)

Appendix D: Water Injection Injury Note

D.1 Note

"This person has been injured with high pressure water with pressures possibly in excess of 10,000 psi and a jet velocity in excess of 900 mph. Unusual infection with microaerophilic organisms occurring at lower temperatures have been reported. These may be gram negative pathogens such as found in sewage. Bacterial swabs and blood cultures may be helpful."

Revision History

Document Revision History Complete the following table for each document revision.

Rev. No.	Description of Change	Author	Approved By	Rev. Date	Effective Date
0	First issue of document.	Alek Hamparian	Safety Manager	06/15/20	06/15/20
1	Updated Hydroblasting Form (H26) to change pressure wash at 750 psi to 2,000 psi to match scope of Standing Instruction.	Alek Hamparian	Safety Manager	05/13/21	05/13/21
2	Reviewed no changes	Dave Van Ginkel	Safety Supervisor	6/16/2023	6/16/2023