

# Water Blasting & Pressure Washing Program

<b>Document Title:</b> Phosphates Water Blasting & Pressure Washing Program		<b>Document Identifier:</b> <Generated by Content Server>	
<b>Applies To:</b> North America Phosphates		<b>Managed By:</b> Enterprise EHS PMO	
<b>Document Owner:</b> Director, NA Health & Safety Department		<b>Document Approver:</b> VP EHS, Enterprise Operations	
<b>Current Version Effective Date:</b>	02/15/2024	<b>Formal Review Cycle Due Date:</b>	August 2028

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### 1. PURPOSE

To establish safety guidelines for high pressure water blasting and pressure washing operations used for cleaning equipment and facilities. This Program provides the minimum requirements for Water Blasting operations; additional requirements affecting High Pressure Water Blasting may be found in “Recommended Practices For The Use Of Manually Operated High Pressure Water jetting Equipment” (see References 9.1).

### 2. SCOPE

This Program applies to all High Pressure Water Blasting and Pressure Washing operations performed at Mosaic facilities by Mosaic employees and contractors conducting this type of work.

### 3. DEFINITIONS

- 3.1 Anti-withdrawal device – device affixed to or held in close proximity to tube sheet or line being miled that prevents unintended nozzle withdrawal and loss of control.
- 3.2 Anti-reversal device – sometimes referred to as a “stinger”, is used to prevent nozzle reversal during cleaning. It shall be connected to the end of the mole line and shall be 1-1/2 times the ID of tube/pipe being cleaned. When cleaning pipe with a tee, stinger shall be 3 times the pipe ID.
- 3.3 Dry Shutoff Valve – Valve that is manually controlled by the Nozzle Operator to start and stop the flow of water to the nozzle. Closing this valve maintains the pressure in the supply line at the system’s working pressure. Sometimes referred to as a deadman valve.
- 3.4 Dump Valve – A valve that is manually operated by the Nozzle Operator used to rapidly shutdown the equipment or dump the water to atmosphere. Sometimes referred to as a deadman valve.
- 3.5 High Pressure Water Blasting – The use of pressurized water to remove unwanted matter from various surfaces, and where the pump pressure is 4000 psi or above.
- 3.6 JSHA – Job Safety and Hazard Analysis of the hazards associated with the activities involved in a performing a job or task.



- 3.7 Lance / Lancing – An application whereby a rigid or flexible lance and nozzle combination is inserted into, and retracted from, the interior of a pipe or tubular product.
- 3.8 Mole / Moleing – A hose fitted with a nozzle that can be inserted into and retracted from the interior of a tube.
- 3.9 Operator – A person who has been trained in accordance with the manufacturers training program or equivalent and has demonstrated the knowledge, skill and experience to perform a High Pressure Water Blasting operation.
- 3.10 Pressure Washing – The use of pressurized water to remove unwanted matter from various surfaces, and where the pump pressure is between 100.5 and 4000psi, generally using a small “house” type pressure washer.
- 3.11 Shotgun / Shot gunning – A hand-held application whereby an assembly of a Lance and a nozzle can be manually manipulated in virtually all planes of operation.
- 3.12 Snorkel – piping used as part of anti-withdrawal device that mole line passes through to guide lance position.
- 3.13 TRA – A written assessment of a job-related task which identifies hazards and lists specific safety precautions and procedures for that task. (Mosaic’s program for performing JSHA’s)
- 3.14 WaterJet – A rapidly moving stream of water of different shapes and types exiting from a nozzle. The speed of the jet depends on the pressure drop across the nozzle orifice.
- 3.15 Ultra High Pressure (UHP) - Use of pressures from 20,-000 PSI to 100,-000 PSI to water jet, cut or machine materials.

#### 4. GENERAL REQUIRMENTS

##### 4.1 General

- 4.1.1 High Pressure Water Blasting operations shall apply to all water blasting at 4000 psi or above and shall be performed by two (2) or more operators.
- 4.1.2 Pressure Washing operations shall apply to operations below 4000 psi and can be performed by a single operator.

##### 4.2 High Pressure Water Blasting

- 4.2.1 High Pressure Water Blasting operations performed by Mosaic employees in Mosaic facilities shall be for cleaning purposes only (including removing hard scale buildup). Any High Pressure Water Blasting required for cutting shall be performed by a qualified contractor.
- 4.2.2 All High Pressure Water Blasting operators shall be trained prior to performing any blasting operations.
- 4.2.3 A minimum of two persons are required while performing any High Pressure Water Blasting operations – a Nozzle Operator and a pump operator. The pump operator, or an additional operator if the Nozzle Operator is out of his sight, shall be able to monitor the Nozzle Operator at all times. Either the Nozzle Operator or additional operator shall have direct control of the dump valve.
- 4.2.4 Work Area
  - a. The area around the High Pressure Water Blasting operations shall be defined by the area owner in conjunction with the High Pressure Water Blasting operators or contractor.
  - b. Barricades, red barricade tape, or a watchman shall be used to warn employees of High Pressure Water Blasting operations and restrict entry into the area.
  - c. During blasting operations barricades shall be at least 25 feet from the blasting operation.
  - d. Signs or notices that use wording similar to “Danger – Keep Clear, High Pressure Water Blasting in Progress” shall be posted.

- e. Equipment to be water blasted should be taken to an area that has been set aside for High Pressure Water Blasting when possible.
- f. Any electrical equipment in the immediate area of the High Pressure Water Blasting that may present a hazard to the High Pressure Water Blasting operators shall be de-energized, shielded, or otherwise made safe.

#### 4.3 Pressure Washing

##### 4.3.1 Work Area

- a. The area around the Pressure Washer operations shall be defined by the area supervisor in conjunction with the Pressure Washer operator.
- b. Barricades or tape should be used to warn employees of Pressure Washer operations and restrict entry into the area.
- c. Equipment to be water blasted should be taken to an area that has been set aside for Pressure Washer cleaning when possible.
- d. Any electrical equipment in the immediate area of the Pressure Washer operations that may present a hazard to the Pressure Washer operator shall be de-energized, shielded, or otherwise made safe.


#### 4.4 Accident Reporting

4.4.1 All incidents involving High Pressure Water Blasting operations and Pressure Washing operations must be reported.

4.4.2 In the event of an injury in which high pressure water penetrates the skin, the employee shall immediately report the injury to his supervisor, who will direct the employee to the nurse or Safety Department for prompt medical attention.

High pressure injection injuries are serious injuries with life and limb threatening potential and should be considered "Surgical Emergencies." Medical personnel shall be notified of the cause of the injury - "high pressure injection." To ensure the injury cause is not overlooked, each operator shall carry a waterproof card reading:

*"This person may have been involved with pressure water jetting at pressures up to 15,500 lb./in<sup>2</sup> (100 Mpa, 1,000 bar, 1,019 kg/cm<sup>2</sup>) with a jet velocity of 900 mph (1,440 km/h). This should be taken into account when making a diagnosis. Unusual infections with microaerophilic organisms occurring at low temperatures have been reported. These may be gram negative pathogens such as those found in sewerage. Bacterial swabs and blood cultures may therefore be helpful."*

 **Note:** Cards shall be issued to personnel involved with Water Blasting for them to carry in on their person.

#### 4.5 PPE

4.5.1 When operating a High Pressure Water Blaster the following PPE shall be worn:

- a. Hard hat
- b. (Polycarbonate Impact resistant Full Face shield
- c. Long safety toed rubber boots (knee boots at least 14" high)
- d. Safety glasses with side shields (or goggles)
- e. Chemical Goggles are required when corrosive or caustic materials are being cleaned.
- f. Gloves
- g. Hearing protection

- h. Rain suits (pants and jacket) or other chemical protective clothing
  - 4.5.2 Visitors or any other personnel in the vicinity of and observing High Pressure Water Blasting operations shall also wear the below in addition to normal PPE:
    - a. Safety glasses with side shields (or goggles)
    - b. Hearing protection
  - 4.5.3 When operating a Pressure Washer the following PPE shall be worn:
    - a. Hard hat
    - b. Face shield
    - c. Long safety toed rubber boots (as required – footing risk dependant)
    - d. Safety glasses with side shields (or goggles)
    - e. Rain suits (pants and jacket) when appropriate
- 4.6 Equipment – High Pressure Water Blaster
  - 4.6.1 High Pressure Water Blasting hose, pipe and fittings shall be designed to meet or exceed the manufacturers OEM specifications and be suitable for the intended purpose. All components shall have a rated design pressure of 2.5 times the maximum design pressure of the system.
  - 4.6.2 High Pressure Water Blasting hose shall be marked with the maximum permissible operating pressure.
  - 4.6.3 Dump Valves and Dry Shutoff Valves
    - a. Hand held Shotgun wands shall be equipped with a hand operated Dump Valve.
    - b. Mole or flex line shall be fitted either with a Dump Valve or Dry Shutoff Valve.
    - c. Rigid Lances shall be fitted either with a Dump Valve or Dry Shutoff Valve.
    - d. Hand held and foot operated Dump Valves shall be equipped with guards to prevent accidental operation.
  - 4.6.4 Hose with frayed reinforcing braids, kinks, or other visual damage shall not be used.
  - 4.6.5 All Shotgun and Lance hose connections shall be shrouded by a protective device such as a heavy duty hose, shoulder guard, etc. to prevent injury from hose, pipe or fitting leak or rupture.
  - 4.6.6 High Pressure Water Blasting machines shall be equipped with pressure relief devices. Pressure relief valves shall not be adjusted in the field.
  - 4.6.7 Modification of High Pressure Water Blasting equipment or accessories will not be performed without the prior written approval of the manufacturer.
- 4.7 Operations – High Pressure Water Blasting
  - 4.7.1 A High Pressure Water Blasting Prior-to-Use Checklist (Appendix A or Contractor Equivalent) shall be completed prior to the start of High Pressure Water Blasting operations.
  - 4.7.2 Blasting pumps and blasting equipment shall be inspected semi-annually by a qualified vendor.
  - 4.7.3 If the Dump Valve, Dry Shutoff Valve, or relief valves do not function properly when tested initially or anytime during the blasting, the system shall be shut down.
  - 4.7.4 Non-verbal communications should be understood and agreed upon prior to starting blasting.
  - 4.7.5 Objects to be cleaned shall never be held manually.
  - 4.7.6 High Pressure Water Blasting operations shall stop when:
    - a. Any unauthorized person enters the area
    - b. A hazardous or potentially hazardous condition is detected
    - c. An alarm is sounded within the facility

- d. Any part of this Program is not being followed.
- 4.7.7 A Shotgun wand shall be a minimum of 66" in overall length with a barrel of a minimum of 48".
- 4.7.8 High Pressure Water Blasting shall not be performed above eye level unless a TRA has been written which addresses the additional safety precautions.
- 4.7.9 Fittings and couplings on hoses shall not be tightened or tampered with while the hose is pressurized.
- 4.7.10 Hoses shall be arranged so that they do not present a tripping hazard, and shall be protected from being run over and crushed by vehicles, forklifts, etc. Hoses, pipes and fittings shall be supported, to prevent excessive sway, wear (or both) or stress on the end connections created by vibration, when they are laid on the ground, over sharp objects or on vertical runs.
- 4.7.11 Using Moles
  - a. Automation of flexible lance insertion/retrieval with anti-withdrawal device is the preferred method of tube cleaning and line moling; it requires:
    - i. Follow normal safe work permitting procedures
  - b. Manual management of flexible lance **with** anti-withdrawal device requires:
    - i. Job safety plan and Mosaic pre-job walk down
    - ii. Hourly Mosaic inspections
  - c. Manual management of flexible lance **without** anti-withdrawal device requires:
    - i. Job safety plan and Mosaic pre-job walk down with evaluation of alternatives means of cleaning
    - ii. If no alternatives, Initial 2' of tube/line must be cleaned with shotgun or other means. Lance shall be marked 2' from nozzle and be inserted to this point prior to engaging pump.
    - iii. GM, Maintenance Manager or Area Manager approval
    - iv. Continuous Mosaic observation
  - d. A pipe extension equal to the diameter of the pipe to be cleaned shall be installed on all moleing lines to prevent nozzle reversal.
  - e. Water pressure shall be turned on only after the Mole is inserted into a tube or pipe and turned off prior to removal.
  - f. Anti-withdrawal devices used on tube sheets when flex lancing or rigid lancing must include use of a snorkel 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, that gap (between snorkel and tube sheet) must be protected from the lance operator by utilizing some type of physical barrier. There are some situations where manufactured fixed anti-withdrawal devices do not fit to all applications. This is where hand or foot held anti withdrawal devices may be used.
- 4.8 Operations – Pressure Washing
  - 4.8.1 If using a gasoline driven Pressure Washer it shall be operated in a well-ventilated area.
  - 4.8.2 The Pressure Washer operator, or anyone else, shall not place their hands in front of the nozzle when the Washer is running.
  - 4.8.3 All wands used for Pressure Washing shall be a minimum of 48" (inches) in length and be equipped with a mechanical device that can prevent the trigger from being squeezed inadvertently when the device is engaged. See example picture:



- 4.8.4 The pressure spray shall be directed away from self and all other persons at all times.
- 4.8.5 Objects to be cleaned shall never be held manually.
- 4.8.6 Pressure Washing operations shall stop when:
  - a. Any unauthorized person enters the area
  - b. A hazardous or potentially hazardous condition is detected
  - c. An alarm is sounded within the facility
  - d. Any part of this Program not being followed
- 4.8.7 The pressure hose shall not be allowed to come into contact with the muffler during operation.
- 4.8.8 The cleaning wand or hose fittings shall never be attached or removed while the system is pressurized.
- 4.8.9 The Pressure Washer shall not be left unattended while the unit is running.
- 4.8.10 The system pressure should be relieved by shutting down the unit and bleeding the pressure from the hose.
- 4.8.11 Only hose and accessories rated for pressure higher than the Pressure Washer's rating shall be used.

## 5. TRAINING

### 5.1 High Pressure Water Blasting

- 5.1.1 Before being assigned to their first High Pressure Water Blasting job, employees shall be trained. The training shall include at a minimum the following in 5.1.2:
- 5.1.2 Training
  - a. Cutting action of High Pressure Water Blasting and the potential hazard it poses to the human body shall be demonstrated through the use of visual aids or actual use of equipment.
  - b. The minimal PPE shall be explained.
  - c. The operation of High Pressure Water Blasting systems shall be explained. Potential problems and proper corrective actions shall be pointed out.
  - d. The need to operate at or below the manufacturer's recommended working pressure shall be stressed.
  - e. The operation of all control devices shall be explained, as shall be the importance of not tampering with any control devices.
  - f. How to properly perform the prior to Use Inspection including pass/ fail requirements for operational tests.
  - g. The importance of proper and timely maintenance shall be presented, and when the equipment must be returned for maintenance by qualified employees.
  - h. The proper method of identifying and connecting hoses, including laying out, supporting and protecting hoses.
  - i. The proper stance for sound footing and how to use the various devices for lancing, Shot gunning, and Moleing shall be demonstrated.



- j. Non-verbal communications
- k. Seeking immediate medical attention if water is injected under the skin.
- 5.1.3 Proficiency
  - a. Personnel shall demonstrate knowledge and skill in the proper operation of equipment through practical applications before performing High Pressure Water Blasting.
- 5.1.4 Contract operators shall be certified to operate the specific equipment being used in accordance with the manufacturers training program or a nationally recognized training and certification program such as NCCER.
  - a. Operators shall be specifically trained in the inspection, operation, limitations and maintenance on any special equipment they will be operating.
  - b. Operators of Ultra High Pressure water jetting equipment shall be specifically trained on the use of this equipment due to the increased risks that this equipment poses.
- 5.2 Pressure Washing
  - 5.2.1 Prior to initial use of a Pressure Washing unit the operator should be familiarized with:
    - a. The Pressure Washer and its operation
    - b. Hazards of using the high pressure
    - c. The work area
    - d. PPE required while using the washer
    - e. Seeking medical attention if water is injected under the skin
- 6. PROGRAM REVIEW / INSPECTIONS
  - 6.1 A review of this Procedure shall be conducted every 7 years for accuracy and completeness. The review shall be initiated by the Safety Dept. and documented by the placement of a letter to file.
  - 6.2 The High Pressure Water Blasting Prior-to-Use Checklist shall be completed by the blasting operators or contractor performing the work prior to commencing blasting operations.
  - 6.3 Blasting pumps and blasting equipment shall be inspected semi-annually by a qualified vendor.
- 7. CONTRACTORS
  - 7.1 Contractors shall be responsible for:
    - 7.1.1 Knowing the regulations, standards, codes, and best management practices that apply to High Pressure Water Blasting operations; and
    - 7.1.2 Following Mosaic's Water Blasting Program.
- 8. APPENDICES
  - 8.1 Appendix A - High Pressure Water Blasting Prior-to-Use Checklist
- 9. REFERENCES
  - 9.1 "Recommended Practices For The Use Of Manually Operated High Pressure Water jetting Equipment" Third Edition, WaterJet Technology Association, St. Louis, MO
  - 9.2 ASTM E 1575 – 08 Standard Practice for Pressure Water Cleaning and Cutting
  - 9.3 The Greater Baton Rouge Industry Alliance (GBRIA) Safety Fundamentals for Hydro blasting
  - 9.4 CDC- High-Pressure Water Injection Injury Management



10. REVISION LOG

Revision Log				
Rev. No.	Requested By	Approved By	Revised By	Rev. Date
0	Initial Issue	Safety Advisory Panel	Task Team	4/29/04
1	Logo Change	Safety and Health	J. Marshall	10/31/2006
2	Minor revisions to standardize format	D. Allen	D. Allen	5/14/07
2	Reformat for ISO		D. Allen	9/16/2011
3	Safety Department	Mike Neal	R. Moran	10/5/2012
3	Reformat for ISO		R. Withers	10/8/2012
4	Operations	EHS Services	A. Willard	10/27/2017
5	RCA Corrective Action	Director Health and Safety	PMO	8/16/2021
6	Field Request	Health & Safety	PMO	02/15/2024

Contact the Subject Matter Expert for additional information on this program.