



Couple of takeaways

- High Pressure Spraying and Blasting involves using equipment that propels a stream of high pressure water, air or other material against a surface to clean, abrade, etch, paint or otherwise change the condition of the surface.
- A number of risks are present during these activities and relate to the equipment and plant itself, the type of material or surfaces being changed, the material being used with the high pressure equipment, the resulting hazardous waste and more.
- Examples of common hazards and risks include injection and piercing injuries, being struck by flying debris, exposure to noise and hazardous chemicals and explosive atmospheres.



What is this procedure for?

This procedure outlines the processes and standards to be used across the Hydro Tasmania group to manage the risks associated with High Pressure Spraying and Blasting Activities. Such activities include, High Pressure Water Jetting (HPWJ), Abrasive Blasting and Airless Spray Painting.



How do we work safely with high pressure spraying and blasting equipment?

The first step is understanding the risks specific to the piece of equipment that is being used. Refer to the manufacturers operating manual of the piece of equipment for further information.

For HPWJ equipment, it is important to first identify the class of the water jetting system as this determines the level of training and controls to be in place. See Appendix A for instructions on how to determine the class of the HPWJ System.

Class	Definition
Class A	Refers to systems with an output capability of greater than 800 bar litres per minute and less than 5600 bar litres per minute.
Class B	Refers to systems with an output capability in excess of 5600 bar litres per minute.
Not classified	Water jetting equipment that operates below 800 bar litres per minute

All work related to HPWJ and blasting equipment must be risk assessed in accordance with Hydro Tasmania group's risk assessment processes, which may include a Take 5, SWMS or work instruction.

A SWMS is required for all work involving Class B HPWJ work and all work involving abrasive blasting not contained within a blasting cabinet.

All risk assessments, regardless of the type of assessment being used, must take the following into consideration:

- Are all hoses, fittings, nozzles and equipment correct for the task, free from blockages and in good operating condition?
- Have all environmental aspects and controls related to the capture, storage and disposal of waste material (water, chemicals, blasting medium etc.) been identified?
- Is the work area clearly defined and hazards related to the work environment, site access and electrical risks identified and controlled?
- Have all hazardous substances related to the spraying or blasting medium and the surface being changed, including any natural surfaces, been identified and controlled?

Note: Where the work activity involves crystalline silica, lead or any other substance with an exposure standard, controls must be in place to ensure exposure standards are not exceeded.



What are some of the minimum standards we expect to see for High Pressure Water Jetting?

- All components of the high pressure water jetting system are to be inspected, serviced and maintained in accordance with the manufacturer specifications. The owner of each unit is responsible for ensuring the recommended maintenance is scheduled and completed.
- Maintenance records are to be kept and made available for inspection for each piece of equipment. These records are to include:
 - The pre-service condition of the equipment
 - Any repairs or adjustments performed
 - The date when the inspection or maintenance was carried out
 - The name of the person performing the task
- All HPWJ guns are to be fitted with safety triggers. Class B jetting guns must be fitted with a double action (hold to activate) mechanism to prevent inadvertent operation.
- Work area is to be suitably delineated and signposted to prevent unauthorised entry and inform workers of HPWJ operations in progress. The perimeter of this area should be outside the hazardous range of the equipment.



- Where a solid screen barrier is used, it must be able to withstand a direct and sustained force of the water jet.

- Any water additives are to be used in accordance with the manufacturer specifications and SDS requirements for safety and environmental hazards.
- Ensure electrical equipment in water jetting work area is isolated and protected from water and other debris.
- Reaction force of the gun for hand-held jetting (calculated using manufacturer's charts), are not to exceed 250 N (less if that is what the operator is capable of controlling). Operator fatigue is to be managed through work crew rotation.
- Where a reaction force of 250 N is exceeded, a mechanical device will be used.
- All HPWJ hoses are to be protected from abrasion damage.



What are the extra requirements for Class A and Class B High Pressure Water Jetting work?

Class A

- Single person operation is allowed for Class A systems. However, where a risk assessment determines that the risk cannot be reduced to an acceptable level, the multiple person controls for a Class B system are to be applied.
- All components, including hose assemblies and attachments, of Class A systems must be used in accordance with the manufacturer's specifications and meet the requirements outlined in the relevant Australian Standards.

Class B

- Class B systems may only be operated by a single person where the operator is physically isolated from the pressurised flow and there is no risk of the operator being exposed to the jet impact.
- Class B systems operated by a multi-person team are to ensure the following roles are assigned:
 - *Nozzle Operator* – Control the water jetting nozzle for the work.
 - *Safety Observer* – Must maintain visual contact with the operator, control access of persons into the barricaded area and be in control of the emergency stop of the jetting unit.

High Pressure Spraying and Blasting

- *Team Leader* – Trained and competent in all aspects of the jetting operation and controls the water jetting work.
- Team members should rotate their duties to minimise fatigue to the nozzle operator.
- A means of communication or code of signals must be established that can be used by all members of the work team.
- Hose connections are to be restrained with appropriate hose restraints, braided stocking or other suitable means to restrict their movement in the event of a failure. Whip checks are not to be used as a hose restraint.
- Hose must be covered by a hose shroud where the hose connects to the gun.
- Water jetting guns and foot control devices must be fitted with a double action safety trigger mechanism.
- All components, including hose assemblies and attachments, must be used in accordance with the manufacturer's specifications and meet the requirements outlined in the relevant Australian Standards.
- Must be fitted with an emergency stop device.



What are some of the minimum standards we expect to see for Abrasive Blasting?

The strongest and most reliable controls need to be assessed first and can be used in combination with other controls – for example:

- elimination (i.e. safe design, plant or material replacement)
- substitution (i.e. using a less hazardous abrasive material)
- isolation (i.e. using a blasting cabinet where practical)
- engineering (i.e. using vibration minimising equipment; ventilation and cooling systems)
- administration controls (i.e. this procedure, exclusion zones; planning works outside confined spaces; regular breaks from vibration, noise and heat; working outside business hours; shift work; plant maintenance; housekeeping) and,
- PPE.

Minimum controls include:

- Maintenance records are to be kept and made available for inspection for each piece of equipment.
- All controls in place must ensure that no person is at risk of exposure to airborne contaminants in excess of exposure standards. Where there is any possibility or uncertainty that exposure standards may be exceeded, air monitoring must be carried out by an occupational hygienist.
- Assess the material being used in the abrasive blast process as well as the surface being blasted, including any natural surfaces, for hazardous chemicals and dust.
- Where permanent enclosed blast facilities are being used (blasting chambers and cabinets), these must adhere to the relevant Australian Standards and Code of Practice for Abrasive Blasting and be used in accordance with manufacturer specifications.
- Where permanent enclosed blasting facilities are not being used, temporary enclosures, or other recognised control must be in place to ensure no person may be exposed to airborne contaminants from the blasting activities.
- Temporary enclosures must be constructed of a suitable material, extend 2 metres above the structure and should have a dust extraction/collection system fitted.
- Prohibited and restricted hazardous chemicals are not to be used for abrasive blasting. This includes any substances that contain chromate, lead or nitrite when performing wet abrasive blasting.
- An exclusion zone should be established and maintained to exclude other persons. Warning signs should be located so that they are clearly visible before entering the area.
- Decontamination facilities are to be available to allow workers to clean and change after completion of blasting work.

High Pressure Spraying and Blasting

- Abrasive blasting equipment is to be fitted with a self-actuating cut-off device (hold to activate).
- Hose whip checks or hose coupling safety locks are to be fitted to the hose.
- Hoses are to be constructed with anti-static rubber linings or fitted with an earth wire or similar to prevent static electricity build up which may shock workers or provide an ignition source.
- An environmental management plan (EMP) is required from the contractor outlining the methodology of capturing blast material.
- Where lead based paint is being blasted, the paint and blast medium dust will be collected via an extraction fan and dust sock, the remaining dust will be swept up and removed from the pipe manually.
- All waste collected by the blasting must be stored in a sealed impermeable container and samples taken to a NATA accredited laboratory to be assessed for its chemical make-up. Any heavy metal over 0.1% will be considered 'hazardous' and must be disposed of by a licensed waste contractor.



What are some of the minimum standards we expect to see for Airless Spray Painting?

- The following measures are to be in place to prevent an injection injury:
 - Tip guard installed on spray gun
 - Spray gun to have a functional trigger lock
 - Isolate and use tooling (spanners etc.) when performing any maintenance on equipment.
- An exclusion zone should be established and maintained to exclude other persons. Warning signs should be located so that they are clearly visible before entering the area.
- Assess the materials being used in the spraying for hazardous chemicals. Exposure to hazardous chemicals is to be controlled utilising the hierarchy of control and the Hazardous Chemical Management Procedure.

- Airless spray painting unit, connections and any conductive articles being sprayed are to be earthed.



What PPE is required?

Note that PPE requirements should be identified through the risk assessment process. Further PPE than identified here may be required or identified based on assessments of the blasting or spraying medium and the surface being changed. Those containing crystalline silica, lead or other substance with an exposure standard may require further PPE or other controls. PPE needs to be inspected daily, maintained, repaired or replaced as per the manufacturer's specifications.

High Pressure Water Jetting

Minimum requirements

- All persons within the vicinity of high pressure water jetting activities are to wear minimum mandatory PPE including eye protection.
- The person operating the nozzle of a high pressure water jetting system must wear minimum mandatory PPE including eye and face protection (double eye protection).
- A thorough risk assessment which takes into account the activity being conducted, specifications of the machine, manufacturer recommendations, any hazardous substances and other foreseeable factors must be undertaken to identify further PPE requirements.
- Mono-goggles with a face shield are required where a risk from chemicals exists.
- Hearing protection and respiratory protection may be required where a risk assessment determines it to be necessary.
- A risk assessment will need to be conducted to determine the PPE requirements for remotely operated HPWJ operations.

Class A Requirements

- All persons operating a Class A high pressure water jetting system must wear minimum mandatory PPE including eye and face protection (double eye

protection). A risk assessment is to be undertaken to determine additional PPE requirements.

- It is recommended that the operator wear waterproof protective clothing, adequate hand protection and appropriate waterproof foot protection.
- Leg guards or shields and suitable body armour capable of withstanding the direct force of the water jet may be required for Class A equipment where a risk assessment or manufacturer specifications require it.

Class B Requirements

- All PPE is to be capable of withstanding the direct force of the water jet.
- Face shield and safety glasses are to be worn at all times whilst conducting Class B HPWJ operations.
- Waterproof protective body armour and gloves capable of withstanding a direct force of the water jet are to be worn.
- Feet or lower leg guards or shields manufactured from material capable of withstanding the direct force of the water jet are to be used.

Abrasive Blasting

PPE is to be selected based on the level of risk and methods used. However, the following may generally be required:

- An airline respirator of a hood or helmet type, fitted with an inner bib and high visibility shoulder cape, supplying breathing air of a suitable quality at a minimum of 170 litres/min.
- Other workers in area are to wear an air purifying respirator.
- Respiratory protective equipment is to be selected, fitted, used and maintained in accordance with the manufacturer's instructions and relevant Australian Standards.
- Industrial safety gloves or mittens capable of reducing penetration of particulate matter
- Blasting suit or other protective suit or clothing to keep out dust and abrasive grit
- Hearing protection

- Carbon monoxide monitor.

Airless Spray Painting

PPE is to be selected based on the level of risk and methods used. However, the following may generally be required:

- Eye, face and head protection
- Gloves and clothing should protect the skin from hazardous chemicals and injection injuries
- Respiratory Protection dependent on the hazardous chemicals used.



What training is required?

Equipment	Training requirement	Refresher
Class A HPWJ	VOC or industry certificate to operate Class A and/or Class B equipment and evidence of assessing competency and safe operation.	2 years
Class B HPWJ	Certificate provided by an RTO to operate Class B High Pressure Water Jetting Equipment	2 years
Other (below 800 bar litres per minute) HPWJ Equipment	No specific training required. Must be trained to manage the hazards and risks associated with the task	N/A
Abrasive blasting equipment	No specific training required. Must be trained to manage the hazards and risks associated with the task	N/A
Airless Spray Painting	No specific training required. Must be trained to manage the hazards and risks associated with the task	N/A



How do we ensure contractors are working to our minimum standards?

- Contractors are to submit their SWMS and Environmental Management Plan, where required, for relevant work to the contract manager. SWMS and

High Pressure Spraying and Blasting

Environmental Management Plans are to be reviewed to ensure they meet our site specific requirements.

- Maintenance and repair records should be reviewed to ensure equipment has been maintained in accordance with manufacturer recommendations.
- Ensure training records are submitted for review and are appropriate and up-to-date.
- Ensure controls identified in the SWMS are implemented on site through regular reviews of the work.



How do we manage emergencies or incidents?

- Emergency considerations should be identified within the SWMS for the work.
- Injuries resulting from High Pressure Spraying and Blasting equipment may be worse than it appears visually. In some cases where skin penetration has not occurred due to effective body armour, there may still be internal trauma.
- Medical treatment should be sought for all injuries or suspected injuries as soon as possible.
- Commercial and industrial HPWJ operators must carry a waterproof medical alert card which:
 - a) Outlines the possible nature of the injuries and post-accident infections that can be caused
 - b) Provide details of immediate first-aid treatment until medical treatment can be arranged

Appendix A

To determine the class of the High Pressure Water Jetting System, the maximum flow rate (volume of water) and the maximum pressure that the unit is capable of must be known. These are determined from the unit's compliance plate and not the settings that the user has set it at.

The formula for determining the Class of the system is: Pressure (bar) x Flow (L/min) = bar Litres/minute.

Class	Definition
Class A	800 – 5600 bar litres per minute.
Class B	Greater than 5600 bar litres per minute.
Not classified	Below 800 bar litres per minute

Where a compliance plate displays this data in an alternate unit than bar or litres per minute, these measurements will need to be converted using conversion rates below.

Conversion rates		
Pressure		Flow
1 kPa = 0.01 bar Kilopascal to bar	1 PSI = 0.0689 bar Pounds per square inch to bar	1 gallon = 4.546 litres Imperial gallon to litres

Alternately, where pressure (bar) and flow (L/min) are known, Figure 1 may be used to calculate the class of equipment.

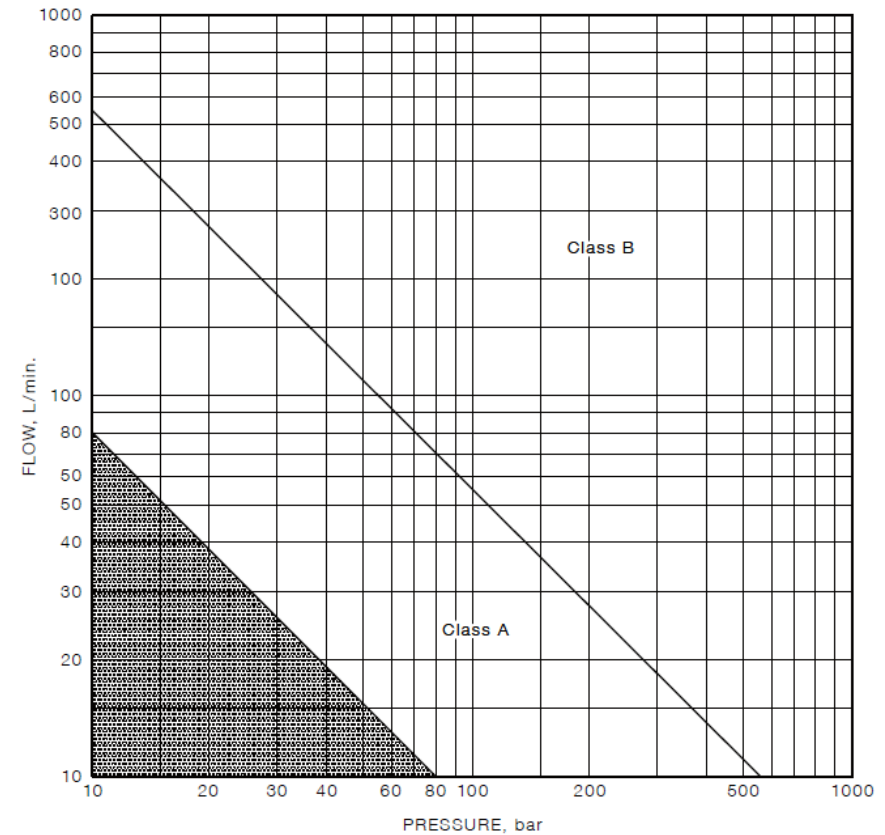


Figure 1 Pressure Flow Diagram (From AS/NZS 4233.1)