Hydroblasting Guideline

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<th>Revision</th>
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<th>Date</th>
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<tr>
<td>0</td>
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<td>18/02/2004</td>
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1 PURPOSE

To provide minimum requirements for the safe operations of hydroblasting or water jet cleaning equipment with rated pressures up to 2700 bar (40,000 PSI).

For the purposes of this Guideline, the term “hydroblasting” covers all hydroblasting and water jetting activities.

2 SCOPE

This Guideline provides guidance for the operation of hydroblasting equipment. It describes methods for eliminating or reducing hazards and risks associated with hydroblasting.

This Guideline provides guidance for:

a) High pressure hydroblasting systems pressurized by positive displacement pumps with an output capability greater than 400 bar litres/minute;

b) High pressure hydroblasting operations carried out at pressures above 200 bar and includes hydroblasting operations involving the use of additives and abrasives; and

c) Hydroblasting operations below 200 bar where there is a foreseeable risk of injury to operators or other persons.

All personnel who have the need to perform hydroblasting on WMC sites must use this Guideline. The Guideline applies to all WMC employees, Contractor Employees and Principal Contractors.

Immediate Supervisors of personnel operating hydroblasting equipment are responsible for ensuring the requirements of this Guideline are followed by their respective work crews.

3 INTRODUCTION

The use of hydroblasting equipment is a potentially hazardous activity. Special precautions must be taken in order to operate the equipment safely and effectively.

Hydroblasting is identified as:

<table>
<thead>
<tr>
<th>AS/NZS 4233.1 Category</th>
<th>Pressures</th>
<th>Use</th>
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<tbody>
<tr>
<td>Class A</td>
<td>800&gt; Class A &lt; 5600 bar litre per minute</td>
<td>General use, steam cleaners, pressure washing equipment</td>
</tr>
<tr>
<td>Class B</td>
<td>Class B &gt; 5600 bar litres per minute</td>
<td>Special use, very high pressure, high volume</td>
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Class A high pressure Hydroblasting equipment may be operated by a single individual. This person is usually a mechanic, labourer, or process person and not a specialty contractor. Common use for this equipment is concrete cleaning, cleaning pump bases, and other routine housekeeping work.
Class B Hydroblasting is normally performed by a specialty hydroblasting contract firm. They are expected to have detailed safety procedures considering equipment requirements, operating procedures, and operator qualifications. The hydroblasting contractor is responsible for compliance with their written procedures. In accordance with AS/NZS 4233.1:1999 single person operation of this equipment is permitted under the following conditions:

- Where the operator is physically isolated from the pressurized water flow;
- Where there is no risk of the operator being exposed to the jet impact; or
- Where the presence of other hazards does not expose the operator to other occupational, health and safety risks.

4 RESPONSIBILITIES

4.1 Operations

- Provide proper location for setup of equipment.
- Verify hydroblasting equipment set-up does not interfere with plant, equipment or operations.
- Ensure electrical equipment in the work area has been isolated and protected from water ingress.
- Operations personnel or Equipment Owner must issue the appropriate Work Permit or Isolation Permit prior to Hydroblasting work commencing (in accordance with site procedures).
- Ensure barricades and signage are in place. Signage must indicate: “DANGER: HIGH PRESSURE WATER JETTING EQUIPMENT IS IN USE”

4.2 Maintenance / Contractors

- Review procedures to ensure the minimum requirements are met.
- Ensure hydroblasting equipment is in good operational condition and safety features are functional. Equipment must comply with the requirements of AS/NZS 4233.1:1999.
- Maintenance to coordinate with Operations regarding the selection of a location for the equipment and to ensure spacing requirements are met.
- Maintenance Supervisor to verify completion of items on Appendix B and that appropriate signage is in place.
- Contractor to ensure personnel operating the equipment are appropriately trained and follow established procedures.
- All operators engaged in Class A and Class B Hydroblasting operations should carry an immediately accessible, waterproof medical alert card outlining:
  - Possible nature of injuries and post-accident infections that can be caused by high pressure water jetting;
  - Provide details of immediate first-aid treatment until medical treatment can be arranged; and
  - Provide the name/s of medicos who should be contacted for expert medical advice.
5 HAZARDS AND CONTROL MEASURES

Hydroblasting is an activity with significant inherent hazard. If work tasks are approached inappropriately, significant risks with the potential for serious injury, including fatality are possible.

As such, hydroblasting activities should be approached with a risk control hierarchy approach:

- Firstly, where possible, hydroblasting activity is to be avoided and other methods of cleaning reviewed for practicality (eg. chemical cleaning).
- Secondly, where hydroblasting activity is required, remotely controlled mechanical cleaning devices should be considered in order to separate the operator from the high pressure water hazards.
- Thirdly, where manual hydroblasting is required, only experienced operators are to be used, appropriate procedures are to be followed and minimum mandatory PPE is to be worn.

When manual flexi-lance cleaning of exchanger tubes is required, fail safe (anti withdrawal) devices attached to the equipment must be used to prevent the lance exiting the tube in a uncontrolled manner. The manual use of hydroblasting equipment will only be utilized as a last resort where the use of other automated or mechanical equipment cannot be used.

The adoption of this philosophy significantly reduces risk exposure, and the potential for personal injury.

5.1 Operator Training

The hydroblasting contract firm is responsible for ensuring all personnel assigned to hydroblasting operations are satisfactorily trained in the safe operation of equipment required to perform the task at hand. At a minimum training should encompass the requirements outlined in AS/NZS 4233.1:1999. Areas which should be addressed are:

- System Operation
- Personal Protective Equipment
- Cutting Action
- Control Devices
- Equipment maintenance
- Compatibility
- Hoses
- Stance

It is the responsibility of the Supervisor of the job to verify proof of training.

5.2 PPE Requirements

The PPE worn by operators of hydroblasting equipment should reflect the activities being performed.

Whatever the nature of the job, the following PPE is mandatory for operators or those within the blasting area when hydroblasting:

- Hard hat
Guideline – Hydroblasting

- Mono Goggles
- Face shield
- Hearing protection
- Heavy duty rain suit or hydroblasting suit
- Protective gloves (dependent on the material / substance being handled or exposed to and the hazard and risk presented to the operators)
- Hydrojet safety rubber boots (with built in metatarsal protection) with steel toe caps
- Other equipment as required if a hazardous chemical is involved.

The Work Permit and Task Hazard Analysis (THA) will identify if any additional or specialised personal protective equipment as necessary.

6 MINIMISING HAZARDS – HYDROBLASTING GUIDELINE

To minimise the hazards associated with the use of hydroblasting equipment, follow this general hydroblasting Guideline:

6.1 General Considerations

NOTE: Hydroblasting equipment has varying working pressures and flow rates. The operating pressure should never exceed the rated pressure of the equipment. Use of equipment with pressures above 2700 bar (40,000 PSI) is not covered by this Guideline.

WARNING:

WHEN HYDROBLASTING WITH HAND HELD EQUIPMENT, A COMBINATION OF PRESSURE AND FLOW RATE CAN PRODUCE SIGNIFICANT TORQUE THAT MAY CREATE AN UNCONTROLLABLE SITUATION

a) The blasting equipment should be set-up in an area that is not congested, out of major personnel traffic routes, and is a safe distance from operating equipment as determined by the operating pressure and flow rate of the hydroblasting equipment.

NOTE: If possible, the hydroblasting equipment and work should be located off-site and equipment to be cleaned (e.g. exchanger bundles) transported to the remote cleaning site.

b) If access to a blasting area is requested or an unauthorized person enters the blasting area, the contractors' employee must stop operations. Work must not be resumed until the area is cleared.

c) Hydroblasting systems should be depressurised if not in use and left unattended, or replacement of components or repairs are being made to the system.

d) Special hydroblasting techniques such as two-person operation when water lancing, adding fittings onto shotgun, etc., should be discussed with the WMC job supervisor before initiating. It is mandatory for a THA to be developed for all hydroblasting activities.
6.1.1 Equipment

a) The hydroblasting equipment area must be barricaded using red barricade tape with white lettering stating "DANGER: HIGH PRESSURE WATER JETTING EQUIPMENT IS IN USE". Barricade tape should extend out 10 metres (30 feet) in all directions from blasting equipment. Hoses extending from equipment to blasting area should be surrounded by barricade tape and signs. (Contractor to supply barricade tape).

b) If it is not possible to isolate the prescribed area, sturdy barriers/panels must be placed/erected to shield operations.

c) The pumping unit must be equipped with a safety valve and/or rupture disc capable of rapidly relieving the full capacity of the pump. These safety devices should be checked to ensure a tag is attached indicating they have been properly tested and are operational.

d) The pumping unit should be located to minimize the length of hoses required. Considerations should be given to the distance from operating equipment. Select a location that does not require running hoses through an active access way or work area. Care must be taken to protect hoses from damage by vehicular traffic, hot lines/equipment, or external abrasion.

e) The operating pressure of the high pressure hose and fittings should not exceed 1/3 of the rated pressure. Hoses should be inspected before each job and tested every three months at 125 percent of rated pressure. Hoses must be tagged with the latest test date and test pressure.

f) Blasting equipment must be grounded to minimize static electricity build-up. Equipment being blasted must also be grounded.

g) Quick connect/disconnect fittings are not permissible for use for hydroblasting. Hose connections must have a secondary joining mechanism to prevent whipping if the connection is broken.

h) Minimum length of the shotgun barrel (nozzle) is 120cm (48-inches). The minimum length of entire shotgun is 165 cm (66-inches).

i) Shotguns shall be equipped with double-action switches. The double-action switches should be positioned so that both the operator’s hands are required to initiate high pressure water flow.

NOTE: A dump valve which will immediately dump all the water pressure when the control is released is the only approved fail safe control.

j) When lancing, a foot or hand operated fail safe control with guard should be manipulated by the lance operator. In some operations such as lancing exchanger tubes or line moleing another person must be used to assist with the lance or hose. Only the lance operator (person nearest the working end of the lance) should operate the fail-safe device.

WARNING:

AT NO TIME SHOULD THE FAIL-SAFE CONTROL BE TIED DOWN OR LOCKED INTO POSITION. INJURY COULD RESULT IF THE FAIL-SAFE IS BYPASSED OR LOCKED
k) Stinger rods, longer in length than the diameter of the pipe will be used when line moleing large bore piping 15cm and larger. A stinger rod is a rigid piece of pipe affixed to a line mole to prevent reversing of mole in the line.

l) A marker should be placed no less than 120cm (4 feet) from the end of the hose to indicate the end of the lance or line mole. This marker should be a highly visible type material. This will serve as a signal to the operator that the end of the lance is near and pressure should be relieved. This marker should be on the hose and not on the stinger rod or lance.

m) When line moleing operations are to be done, an "anti-withdrawal" device securely fastened to the pipe flange must be installed to prevent the removal of the mole nozzle while still under pressure. Appendix C details the design of this device. No exceptions are permitted.

6.1.2 Housekeeping

During cleaning operations, accumulations of materials may form at the pipe/tube openings. Work should be stopped and the materials removed when a safe work position or working surface cannot be maintained. This is particularly important where the work area is confined, such as platforms and scaffolds and where material debris may accumulate from the cleaning process.

6.1.3 Working Surfaces

Blast equipment must be operated from approved work surfaces. Due to excessive back thrust exerted on the operator, the use of ladders and "A" frames are not acceptable as work platforms.
7 APPENDICES

Appendix A  Hydroblasting Requirements
Appendix B  Hydroblasting Operation Checklist
Appendix C  Anti-Withdrawal Device
Appendix D  Safety and Environmental Precautions
Appendix E  Definitions
APPENDIX A

Hydroblasting Requirements

1. Site selected for equipment setup/location is out of major personnel traffic area and is a safe distance from operating equipment.
   WARNING: HYDROBLAST EQUIPMENT MAY INCLUDE INTERNAL COMBUSTION ENGINES. SELECT SUITABLE LOCATION TO SETUP EQUIPMENT.

2. Contractor has set up equipment in location designated by Process or Maintenance Supervisor.
   - Red Barricade tape with white lettering stating "DANGER WATER BLASTING" is extended around the hydroblasting equipment as required for personnel and operation safety.

3. If hydroblasting equipment cannot be adequately spaced from process equipment or personnel traffic, additional sturdy barriers/panels must be installed, such as installing plywood, to provide equipment and personnel protection.

4. Hoses properly installed/attached and pressure test inspection tags verified.
   - Inspection tag date is within last 3 months.
   NOTE: Quick connects / disconnects are not permissible for hydroblasting use.

5. Hoses are properly protected and barricaded.

6. Hydroblasting equipment/hoses are grounded to prevent static electricity.
   - Verify equipment being cleaned is grounded.

7. Pumping unit is equipped with safety relief devices and have been checked.

8. Entire shotgun lance and barrel (minimum length of barrel/nozzle is 120cm) are at least 165 cm long.

9. Equipment has foot or hand operated fail safe controls that are manipulated ONLY by the lance operator.
   - For exchanger cleaning an additional operator may be required to walk the lance.

10. Mechanical to complete Appendix B, Hydroblasting Operation Checklist. (Checklist must remain at job site)
## APPENDIX B

### Hydroblasting Operation Checklist

Work Permit may be required to complete checklist

<table>
<thead>
<tr>
<th>Unit or Area</th>
<th>Work Date</th>
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<table>
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<tr>
<th>Description of Process Equipment</th>
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<table>
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<tr>
<th>Work to be Done</th>
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</table>

<table>
<thead>
<tr>
<th>Hydroblasting Equipment</th>
<th>Maximum Pressure</th>
<th>Flow Rate</th>
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</table>

<table>
<thead>
<tr>
<th>Signature of Persons Performing Work</th>
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**Mechanical Supervisor or Contractor can initial Initial if Completed**

- Equipment connected to proper water supply source?
- Training and experience verified?
- Personal protective equipment available and inspected?
- Hydroblasting equipment does not interfere with process operations?
- Pump positioned, levelled, and safety relief device operational?
- Fail-safe valves, switches or devices operational?
- Hoses properly inspected, assembled, and tested?
- Barricades in place and warning signs posted?
- Waste handling considered and properly managed?

**REVIEWED BY:**

<table>
<thead>
<tr>
<th>Maintenance Supervisor</th>
</tr>
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<thead>
<tr>
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<th>TIME</th>
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**COMPLETED FORM TO REMAIN ON JOB SITE**
**APPENDIX C**

*Anti-withdrawal Device*

0.6 cm (1/4-inch) Flat Steel

0.6 cm (1/4-inch) Wall Inside Diameter to Allow Free Movement of Hose.

Slots To Accommodate Flange Bolts

**Note:** More than one device will be required to fit the wide range of pipe flanges.
APPENDIX D
Safety and Environmental Precautions

- When hazardous waste may be generated proper containment and disposal must be addressed.
### APPENDIX E

#### Definitions

<table>
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<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Lancing or rodding</td>
<td>an operation where a lance and nozzle combination is inserted into and retracted from the interior of pipe or tubes. (This is often a two person operation.)</td>
</tr>
<tr>
<td>Moleing</td>
<td>an operation where a specially designed hose and nozzle arrangement feeds itself through a pipe by means of side and rear nozzle jets.</td>
</tr>
<tr>
<td>Shotgunning</td>
<td>an operation where a short lance and nozzle arrangement can be directed in virtually all planes of operation.</td>
</tr>
<tr>
<td>Double deadman</td>
<td>Two valves or switches, either of which when released will cause water pressure to drop.</td>
</tr>
<tr>
<td>Double-action switches</td>
<td>Two hand activated switches. Water pressure will drop if either switch is released.</td>
</tr>
<tr>
<td>Single-action switch with foot operated deadman</td>
<td>Safety switches that must be activated at the same time to use high pressure. Water pressure will drop if either switch is released.</td>
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