



# Safe High Pressure Water Washing (HPWW) Requirement



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## Introduction

- **Definition:** High pressure water washing (HPWW) equipment is defined as manual or automatic, mobile or stationary, equipment operating at 50 bar or above.
- **Scope:** This requirement is relevant to all high pressure water washing activities (i.e. sewage system, pipe, tank, heat exchanger cleaning & paint stripping etc.) at Mondi Kraft Paper Operations and relates to both Mondi employees and equipment as well as any contractor activities and equipment.
- **Purpose:** The purpose of this requirement is to ensure that all high pressure water washing activities at Mondi Kraft Paper Operations are conducted in a manner that guarantees safe operation of such equipment.

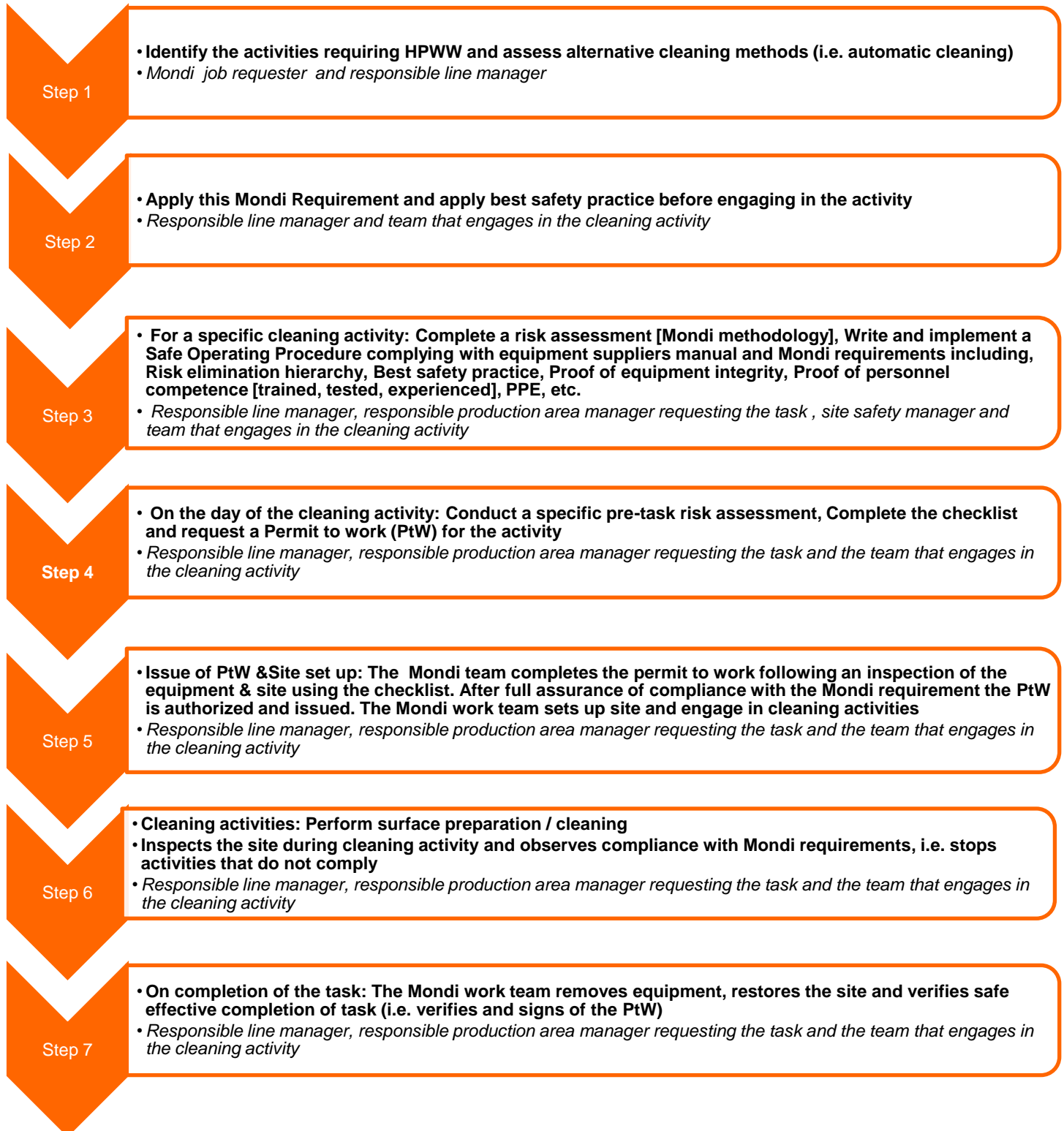


## ● Flowchart of Process Steps for Contractor HPWW Activity





## ● Flowchart of Process Steps for Mondri Site HPWW Activity





## ● Responsibilities

***The Person Raising the Work Order (Contract owner or responsible line manager )*** for high pressure cleaning is the contract or activity owner and responsible for :

- ensuring that there is not another less hazardous method available or appropriate
- that the chosen contractor complies fully with the Mondi requirements and rules
- inspects the safe job method, ensures safe and fit for purpose equipment including back-out prevention devices, proof of competency etc.
- Issuing and verifying the permit to work

***The Purchasing Manager*** before allocating the work communicated all requirements to potential service providers and selects only those contractors that provide written proof of compliance with the Mondi requirement in their tender reply documentation

***The Contracting Cleaning Company or Mondi Cleaning Team (PtW acceptor)***

- assesses the risk of the planned activity with the contractor owner or responsible line manager
- assures the Mondi contract owner/responsible line manager in writing that it complies fully with all relevant Mondi requirements
- resents safe job methods, safe and fit for purpose equipment including back-out prevention devices, proof of competency etc . to the contract owner/responsible line manager before a PtW is issued)

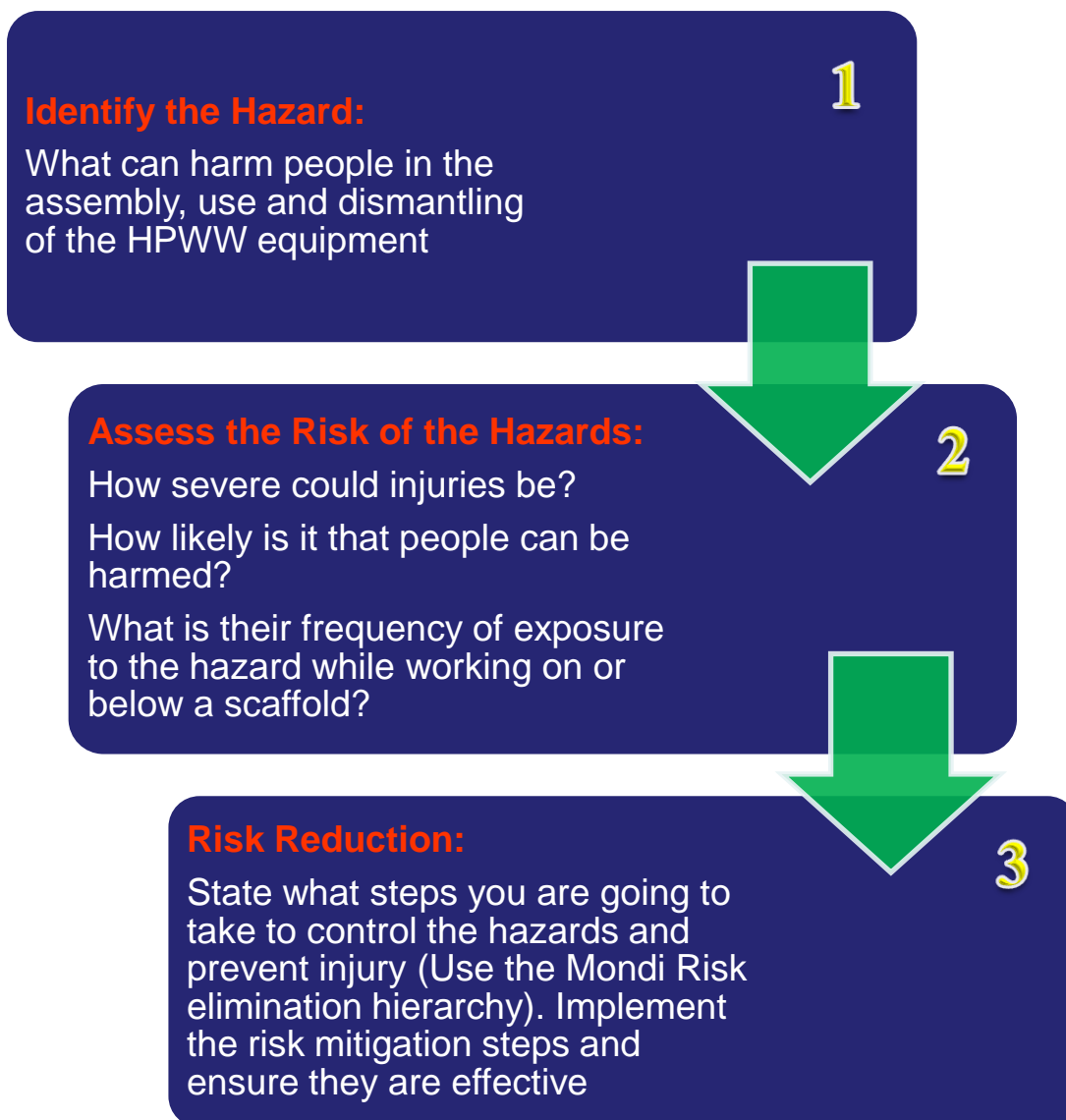
***The Operators*** carrying out the work must be satisfied that all hazards have been identified and minimized. They must also be satisfied that the training they have received is adequate for them to start the job. They are responsible for compliance with their own company's written procedures and the Mondi requirements.

***Everyone Involved*** must be prepared to stop the work if they become aware of any change to the agreed procedure, or changes in circumstances. They must also cease the work immediately if a malfunction occurs, or if an un-authorized or inadequately protected person enters the barricaded area.



- Risk Assessment Process

- Completed by Mondi Personnel and the HPWW Contractor before arrival on site to engage in the activity





# HPWW Requirement



## Risk Assessment Example

Determination of the Limits of the Process			
1.1 Company / area / building	1.1 Machine / equipment / activity	2. Risk Assessment number	3. Date
4. Type of Risk Assessment	5. Persons at risk: employees / customers / contractors / visitors / general public	6. Additional, relevant informations (equipment life phase, use, users, training, other boundaries)	
7. Risk Assessment executed by		8. Company / contractor involved	

Hazard Identification, Risk Estimation and Evaluation, Risk Reduction												
Hazard Identification		Risk Estimation and Evaluation			Risk Reduction: new control measures identified							
Hazard description	Actual control measures in place (for example, Isolation Procedures, Permit to Work, PPE, etc.)	Risk Before or with Current Corrective Action					Note: after implementation of new control measures, determine post control risk level.	Risk after Corrective Action (RL = S * F * L * P)				
		(1 - 5)	(1 - 5)	(1 - 3)	(1 - 2)	(1 - 150)		S	F	L	P	RL
		S	F	L	P	RL		S	F	L	P	RL

**HAZARD** Anything with the **potential** to do harm to people, property or the environment

**PROBABILITY** The **probability** that the hazard will be realized. It may be very likely, probable or improbable.

**RISK** = **POTENTIAL** x **PROBABILITY**

**Evaluation of the Risk Level .The Risk Level RL is the outcome of multiplication of four items, being:**

- S → Severity of the possible harm that can result from considered hazard (rating: 1 – 5)
- F → Frequency and duration of exposure (rating: 1 – 5)
- L → Likelihood or probability of occurrence of hazardous event (rating: 1 – 3)
- P → Possibility to avoid or limit harm (rating: 1 – 2)

$$\text{Risk Level RL} = S * F * L * P$$

$$\text{Lowest possible Risk Level} = 1 * 1 * 1 * 1 = 1$$

$$\text{Highest possible Risk Level} = 5 * 5 * 3 * 2 = 150$$

Risk Level	Risk Category	Measure
1 - 6	Insignificant	Basic Safety Training
7 - 18	Low	Specific Task-Related Safety Training
19 - 39	Moderate	Formal Procedure / Safe System of Work
40 - 74	High	Physical Controls
75 - 150	Extreme / Intolerable	Avoid the activity / stop





## ● Risk Mitigation Example

Risk Level	Risk Category	Measure
1 - 6	Insignificant	Basic Safety Training, No additional controls required Work may start or continue
7 - 18	Low	Specific Task-Related Safety Training, No additional controls required Work may start or continue
19 - 39	Moderate	Formal Safe System of Work that applies the hierarchy of risk reduction control strategies. Efforts should be made to reduce the risk, but the cost of prevention should be carefully estimated. Urgent implementation of Risk Reduction Controls required.
40 - 74	High	Formal Safety System of Work that applies the hierarchy of risk reduction control strategies. Considerable resources to reduce the Risk Level If applying additional controls reduces the frequency factor, ensure that additional controls are truly independent. Very urgent action is required.
75 - 150	Extreme	Avoid the activity / stop, In case the Risk Level can't be reduced (even with unlimited resources), work will remain prohibited!

### Hierarchy of Risk Reduction Control Strategies

- 1. Eliminate the Task or Process:** aim to eliminate the Process altogether
- 2. Substitute the Task or Process:** selecting safer work practices, which can reduce the risk considerably
- 3. Apply Engineering controls:**
  - Isolation of the Process: remove workers from the hazardous environment, e.g. by preventing access
  - Containment of the Process: contain workplace hazards, e.g. by the use of fixed or interlocking guarding / noise enclosures
  - Exposure: where possible, worker's exposure to the hazard should be reduced.
- 4. Apply Procedural Control:**
  - workers must be formally briefed on the hazards and risk identified,
  - Workers must be formally briefed on the Safe Systems of Work developed for the tasks
  - All workers following a formal briefing must sign a document confirming they will comply
- 5. Personal Protection Equipment:** if there is no other way of controlling the risks adequately, Personal Protection Equipment may need to be introduced, but this should only be done as a last resort measure.



- Job safety analysis considerations
- Hand lancing hazards:
  - Operator contact with water jet due to modification of equipment
  - Loss of control of jetting gun or lance due to poor footing/positioning
  - Component failure due to improper use or equipment integrity related failure
  - Failure to maintain an adequate safe working zone
  - Exposing others or self to risk of contact with water-jet or deris
- Flex lancing hazards:
  - Operator loses control of flex lace and nozzle exist the pipe (back-out)
  - Nozzle turns around in the pipe and exists the open end
  - Nozzle exists the far end and exposes other to the water-jet
  - Not enough room between the nozzle and the wall of the tube to allow water or debris to pass – pressure build up and the flex lance is forced backward towards the operator
  - Loss of control of flex lance due to poor footing/positioning
  - Component failure due to improper use or equipment integrity related failure
  - Failure to maintain an adequate safe working zone
  - Exposing others or self to risk of contact with water-jet or debris
- General hazards:
  - Noise
  - Slip, trip & fall
  - Confined spaces
  - Falling objects
  - Working at height
  - Fire and explosion
  - Electrocution
  - Fatigue
  - Lack of an emergency plan



- Job safety analysis considerations cont.
- Other methods of cleaning, potential use of automatic cleaning devices (to avoid personnel access)
- Layout of site and ergonomics
- Method for emergency stopping
- Communication between operators and with the control room
- Competency and experience of high pressure cleaning operators
- Equipment adequacy for the task (checklist)
- Availability and suitability of own/contractor's procedures (safe work method)
- Any special procedures, due, for example, to the nature of the substances involved.

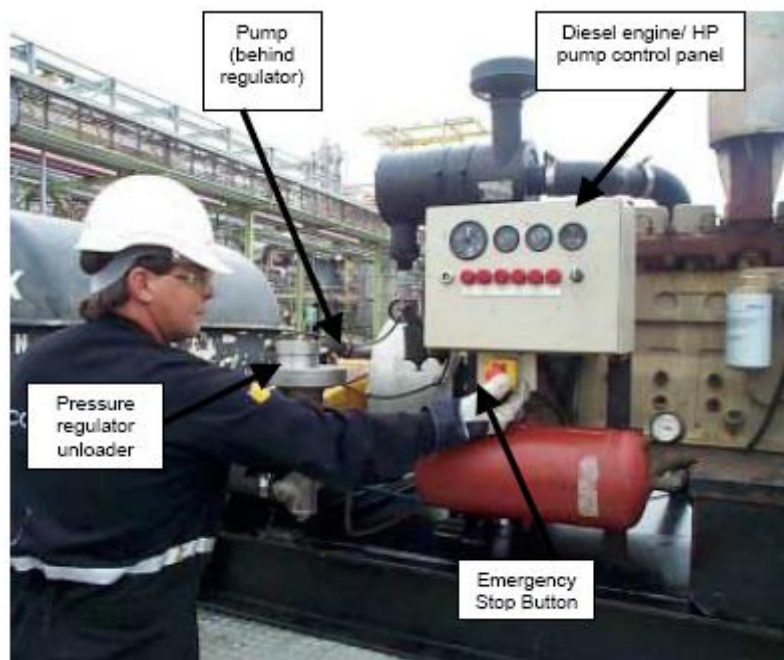


Figure 10: Control Devices for High Pressure Water Pump Assembly



- Compliance
  
- Mondi Requirements
- Mondi Rules
- National Legislation
- EU Norms
  - EN 1829-1:2010, *High pressure water jet machines – Safety requirements - Part 1: Machines*
  
  - EN 1829-2:2008, *High-pressure water jet machines - Safety requirements - Part 2: Hoses, hose lines and connectors*
  
  - EN 166, *safety face shields for particles travelling at < 120m7sec (Class A or B face shields required)*



- Mondi Requirements
- Safe Use of Power Tools - Mondi Requirement 18.17

## PR 18.17: Safe Use of Powered Tools

This Performance Requirement implements GS 18, Employee & Contractor Safety, Occupational Health and Security

### 1. Scope

This Performance Requirement applies to all Mondi operations that use powered tools and it covers the safe use of powered tools, including both fixed and portable equipment and applies to work carried out by all Mondi personnel, including contractors. It requires safe systems of work to be implemented and in use.

### 2. Requirements

- 2.1 In general, Line Managers shall have systems and procedures in place to ensure that:
  - a. Mondi owned or operated powered tools are identified and registered as controlled work equipment.
  - b. A task assessment (task-based risk assessment) is carried out for the use of powered tools so that all likely hazards are assessed and evaluated, including health hazards such as vibration white finger.
  - c. Job methods and/or operating instructions are specified based on good international industry or national code of practice or Mondi guidance. These shall define precautions including any need for personal protective equipment and a permit-to-work.
  - d. The equipment is considered fit for purpose, it is the right tool for the task and it is constructed to relevant standards and has, where relevant, appropriate guarding.
  - e. Powered tool operation is only possible through the manual action of the operator.
  - f. Powered tools are used by competent persons that are provided with the necessary training and validation.
- 2.2 Powered tools include:
  - a. Chainsaws.
  - b. Grinding machines.
  - c. Compressed air tools.
  - d. High pressure water washing (HPWW) equipment.
  - e. Cartridge operated and portable electrical tools.



- Safe Use of Power Tools - Mondi Requirement 18.17 cont.

2.5 Jetting operators must be thoroughly vetted and approved, including their competence, medical fitness and training received. The definition of high pressure is typically 50 bar or more. HPWW equipment shall be operated under a Permit-To-Work. The issuers of permits shall understand the hazards of the HPWW operation and the precautions to be taken. HPPW work shall require a minimum of two operators in the team, who shall give particular attention to the high pressure components. HPWW work areas shall be marked with hazard notices or barriers at a safe distance to protect Mondi personnel and equipment against water jets and dangerous materials. The use of HPWW equipment in confined spaces shall be avoided where possible. Where it is unavoidable, special attention shall be given to make sure it is safe to manipulate lances and the water jet.





## ● Plant Equipment and Integrity - Mondi Requirement 19.7

### **PR 19.7: Plant and Equipment Integrity**

**This Performance Requirement implements GS 19, Plant and Equipment Safety**

#### **1. Scope**

All operations and locations over which Mondi has control are required to have safe systems of work for the design, installation, operation, maintenance and integrity of equipment, tools and plant or installation. It specifies the principles required to be incorporated into procedures and practices to ensure integrity of safety-critical and controlled work equipment as defined by this Performance Requirement. It applies to new, re-used, modified and existing work equipment, tools, plants and installations.

#### **2. Requirements**

- 2.1 Chief Executives shall have systems to ensure that suitable arrangements that meet the intent of this requirement are in place at all operations.
- 2.2 Responsible Executives shall ensure that systems are in place for the formal appointment of Operations Managers, Responsible Engineers and Project Managers as required, including limits of authority.
- 2.3 Operations Managers shall have systems for identifying and managing safety-critical and controlled work equipment that:
  - a. Ensure formal assignment of responsibilities, appointments and detailed arrangements for compliance with this requirement.
  - b. Identify all safety-critical and controlled work equipment. The assessment will normally be based on a risk assessment technique that assesses the hazards, the likelihood of failure and the consequences presented if the plant or equipment or its protective system should fail.
  - c. Ensure operation and use of safety-critical and controlled work equipment is subject to formal local work procedures. These shall ensure that plant and work equipment is fit for service and only operated or used if:
    - (1) The intended design specification has been established and communicated prior to being used.
    - (2) Used within the design specification.
    - (3) Safety-critical plant and controlled work equipment are within the specified inspection due dates or if written approval has been given by a competent person for operation or use beyond the required inspection interval.
    - (4) Personnel authorised to use and operate safety-critical plant and controlled work equipment are assessed as competent with the appropriate knowledge, training and experience.



- Plant Equipment and Integrity - Mondi Requirement 19.7 cont.

- 2.4 Responsible Engineers shall have procedures in place for managing safety-critical plant and controlled work equipment to ensure that:
- a. Engineering responsibilities, appointments and requirements for compliance are assigned in writing and included in local procedures.
    - (1) Equipment identified in clause 2.11 is considered safety-critical plant or equipment.
    - (2) Equipment identified in clause 2.12 is considered controlled work equipment.
  - b. In addition, other plant and equipment is assessed using an appropriate risk assessment technique to determine whether it is to be classified as safety-critical or controlled work equipment.
  - c. A formal review procedure has been applied to those items identified as safety-critical plant/equipment or controlled work equipment:
    - (1) To ensure that the duty has been clearly defined.
    - (2) To ensure that the appropriate design standards and construction materials are used.
    - (3) To establish the safe design and working limits for containment and the control of other hazards.
  - d. Any modification or re-rating of safety-critical plant or equipment or its protective systems is subject to a formal review procedure.





- Plant Equipment and Integrity - Mondi Requirement 19.7 cont.

- 2.5 The Design Review (Design Verification) applies to those items assessed as safety-critical plant/equipment or controlled work equipment and it shall ensure that:
  - a. Appropriate design standards, specifications and construction materials are used.
  - b. The Safe Design specifications are adhered to and working limits and protective systems for the control of hazards are established and communicated.
  - c. All new items are designed, manufactured or purchased to national or international standards.
  - d. Modifications or re-rating follow the requirements for modifications (PR 19.5: Management of Change applies) and are not carried out without the written approval of the responsible Person.
- 2.6 Planned and preventative maintenance schedules shall be defined. All safety-critical plant/equipment and controlled work equipment shall be periodically inspected during the equipment manufacture, repair or modification and during its service life at a frequency defined by the Responsible Person and at a frequency defined within local legislation and the Responsible Person's advice and, where appropriate, calibrated against defined criteria. The inspection and any work carried out shall be recorded. The inspection status shall be made visible to users.
- 2.7 All safety-critical plant/equipment and controlled work equipment shall be uniquely numbered, listed in a register and individual records kept for each item. The documentation file for each item or groups of items, of safety-critical plant/equipment and controlled work equipment shall be maintained up-to-date and shall record design specifications, limitations and records of inspections and repairs. The record system shall include notification of the next due date for inspection.



- Plant Equipment and Integrity - Mondi Requirement 19.7 cont.

2.10 Contract (Project) Managers shall have systems in place to ensure that plant and equipment listed in clause 2.11 and clause 2.12 is managed as safety-critical plant/equipment or controlled work equipment. In addition, other plant or equipment shall be assessed using an appropriate risk assessment technique to determine whether it is to be classified as safety critical plant/equipment or controlled work equipment. The appropriate responsibilities shall be defined, including the registration and preparation of documentation.

2.11 The following shall be identified as safety-critical plant or equipment:

- a. Pressure equipment which, because of its inventory of a hazardous substance, is required by legislation to be formally registered or controlled.
- b. Fired pressure equipment such as recovery boilers.
- c. Pressure vessels.
- d. Instrumented protective devices (including programmable electronic systems).
- e. Rotating machinery such as drying cylinders, pumps, fans, compressors, turbines, centrifuges and agitators.
- f. Presses such as balers and compactors.
- g. Atmospheric pressure storage tanks.
- h. On-site piping systems and piping systems which are outside plant boundaries.
- i. Pressure relief streams.
- j. Flexible hoses on hazardous duties.
- k. Pipe-bridges and supporting civil structures.



## ● Plant Equipment and Integrity - Mondi Requirement 19.7 cont.

2.12 The following shall be identified as controlled work equipment:

- a. Electrical equipment:
  - (1) Equipment or systems for use in flammable or potentially explosive atmosphere.
  - (2) Equipment supplied via plugs and sockets, except those where the risk of harm or damage due to equipment failure is low.
  - (3) Equipment known or suspected of deterioration and if used in a specific area could increase the possibility of an explosion.
  - (4) Lockout test equipment.
- b. Machine Guards:
  - (1) Isolators, interlocks or switches to prevent operation of machinery or parts thereof.
  - (2) Emergency stop buttons or switches.
  - (3) Emergency pull wires or switches.
- c. Lifting equipment as any equipment used at work for lifting and lowering loads:
  - (1) Lifting appliances such as lifts, hoists, cranes, hydraulic ramps, etc.
  - (2) Lifting gear (rigging devices) such as slings, wires, chains, ropes, shackles, etc.
  - (3) Forklift trucks (hand-propelled and powered trucks).
- d. Transport vehicles:
  - (1) On-site and off-site transport vehicles.
  - (2) Robots and automatic guided vehicles.
  - (3) Vehicles used for transport Mondi personnel at forestry or logging operations.
  - (4) Locomotives, railcars.
  - (5) Abnormal vehicles.
- e. Mechanised harvesting machinery.
- f. Warehouse and pallet racking systems.
- g. Fire detection, fixed fire protection and fire fighting facilities:
  - (1) Smoke, heat, flame/radiation detectors and alarms.
  - (2) Sprinklers, water spray and/or foam systems, gas systems, process and electrical power isolation.
  - (3) Fire extinguishers, fire blankets, hose reels and hydrants.
  - (4) Emergency lighting and escape.
  - (5) Protective earthing devices, earth leakage units.
- h. Fixed and portable gas and radiation detectors.
- i. Temporary access structures such as mobile elevating working platforms, scaffolds, ladders, stepladders, trestles, etc.
- j. Emergency rescue and communication tools for confined space entry.
- k. Portable Powered Tools:
  - (1) Chainsaws.
  - (2) High pressure water wash (jetting) equipment.
  - (3) Portable electrical tools.



- Permit to Work - Requirement 19.3

## **PR 19.3: Control of and Permit-to-Work**

**This Performance Requirement implements GS 19, Plant and Equipment Safety**

### **1. Scope**

All operations over which Mondi has control are required to assess risks to Mondi personnel from all hazards, security threats and risk reduced ALARP. The general objective is to enable potentially dangerous work to be carried out under safe conditions. The function of the Control of Work and Permit-to-Work system is to ensure that sufficient consideration is given to the high risks of certain activities, that are documented and that a particular job/task is authorised to commence within a certain timeframe and that the precautions are in place as defined in the permit. Certain activities shall require a Permit-to-Work before activities can commence, irrespective of the risk assessment rating.



- Permit to Work - Mondi Requirement 19.3 cont.

2.3 Line Managers shall have systems in place to ensure that:

- a. The Permit-to-Work Control Procedure is carried out in its entirety.
- b. Only authorised individuals approve the permits to work.
- c. All affected personnel are adequately trained to identify these permit-required tasks and situations.

2.6 Line Managers shall provide exact definitions of the types of activities which are subject to a Permit-to-Work in accordance with the nature and extent of the risk identified, including where:

- a. It is deemed necessary for a given complex task on the basis of prior risk assessment where any error could have significant adverse consequences.
- b. The work is carried out by Mondi personnel not under the direct supervision of the person in charge of the area and equipment.

2.7 Permits-to-Work shall be issued as defined by the risk assessment and in any case for the following activities, these shall be issued as special permits:

- a. Entry into a Confined Space.
- b. Hot Work.
- c. Work involving High Voltage (> 600 Volt) equipment.
- d. Service and maintenance on equipment with potential exposure to hazardous energy.
- e. Cutting into lines and tie-ins, including pipeline breaking where toxic, flammable, corrosive, asphyxiative or explosive materials are present, could be present or where the line is under pressure and/or above 60°C or below minus 5°C.
- f. Excavations and Break-ins.
- g. Working at Heights, especially for work on fragile roof areas and scaffolds.
- h. Safety-critical mechanical lifting.
- i. There is an impact on another team's activities (e.g. when more than one group is working with the same set of lockouts/tag-outs, or for work on online process equipment)





- Permit to Work - Mondi Safety Rule 1

Applying permits, controlling modifications and managing change.

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## Rule One:

### Applying Permits to Work, Controlling Modifications and Managing Change

Work arising from permanent or temporary changes either to the organisation, personnel, systems, plant, equipment, procedures, materials, products, laws or regulations cannot proceed unless a modification process is completed, where applicable. Managers shall ensure that work under a permit only proceeds if:

- A permit-to work or work plan is in place that clearly specifies the time-table for the change and all hazards have been identified and assessed and any control measures have been put in place and checked from design to operation regarding:
  - Plant, equipment, process and facilities;
  - Procedures for operations, maintenance and inspection;
  - Personnel competencies and responsibilities;
  - Communication and documentation.
- Communicate conditions with everyone involved in, or affected by the work;
- Provide clear instruction on close-out and return to normal operation;
- Ensure that the work plan is authorised by a Responsible Person for the change through to completion.



- Permit to Work - Mondi Safety Rule 1 cont.

**Employees and contractors shall:**

- Undertake a task assessment to assess the potential impacts that might affect them;
- Put in place personal controls that are checked for efficacy;
- Communicate conditions with everyone involved in, or affected by the work;
- Be aware of recurring, multiple or conflicting activities;
- Stop work when circumstances change, make safe and re-assess the situation.

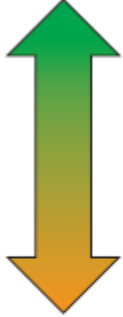


# HPWW Requirement



## Requirement 18.17 Explanations:

- HPWW equipment is regarded as a power tool by Mondi.
- Requiring to be numbered and registered
- Regularly maintained and inspected by certified personnel
- Task based risk assessment completed including hazards such as:
  - A hazardous area or location (i.e. Confined space or working at height etc.)
  - Falling over
  - Injury to limbs and body (injection and cutting hazards)
  - Noise
  - Whipping
  - Overriding or modification of equipment and safety devices
  - In-competent operators (seasonal, students, part time)
- Hierarchy of risk reduction control will be applied:

HIERARCHY OF HAZARD CONTROLS		EXAMPLES
<p><b>MOST EFFECTIVE</b></p>  <p><b>LEAST EFFECTIVE</b></p>	1. Elimination or substitution	<p>Eliminate the use of hand-held equipment.</p> <ul style="list-style-type: none"> <li>• Remove workers from potential contact with the waterjet.</li> </ul> <p>Substitute the use of manual equipment with mechanization.</p> <ul style="list-style-type: none"> <li>• Use a rotary lancing machine for cleaning heat exchangers.</li> <li>• Use a deck cleaner for large floor areas.</li> </ul>
	2. Engineered control	<p>Use safeguards to protect workers from the hazard.</p> <ul style="list-style-type: none"> <li>• Use a backout preventer when cleaning piping systems.</li> <li>• Use a jetting gun positioner for high-flow applications.</li> </ul>
	3. Administrative control	<p>Use safe work procedures for high pressure washing tasks.</p> <ul style="list-style-type: none"> <li>• Use a jetting gun to clean the first 36 centimetres (14 inches) of a pipe.</li> <li>• Use a mark on the flex-lance to indicate 60 cm (24 in.) to nozzle.</li> </ul>
	4. Personal protective equipment (PPE)	<p>Use PPE appropriate for the hazard.</p> <ul style="list-style-type: none"> <li>• Use hardhat with face shield and safety glasses.</li> <li>• Use cut-resistant suits to help protect workers from contact with waterjets when no other controls are practicable.</li> <li>• Use respiratory protection.</li> </ul>



Automatic tube cleaning eliminated human contact





## Requirement 19.7 Explanations:

- HPWW equipment is regarded as controlled equipment that has to comply with the Mondi equipment integrity requirement 19.7.
- Operations managers have systems in place for identifying and managing safety-critical and controlled work equipment
- Responsible engineers have procedures in place for managing safety-critical plant and controlled work equipment (including contracted services)
- Design review & verification applies to items assessed as safety-critical plant or controlled work equipment
- Periodical, recorded, certificated inspections in place
- Uniquely numbered, registered, next inspection due date and records kept
- Contract (or project) managers shall have systems in place to ensure equipment is assessed and identified as that safety critical plant or controlled equipment fully complies with Mondi requirements



**Automatic tube cleaning**



**Manual cleaning**



## Requirement 19.3 and Safety Rule 1 Explanations:

- The function of a control of work and Permit to work system is to ensure that sufficient consideration is given to the high risks of certain activities and specific precautions are taken to eliminate or mitigate these risks. Some activities shall require a permit to work before activities can commence irrespective of the risk assessment!
- Line managers ensure that the site PtW procedure complies with the Mondri requirement and is carried out in its entirety
- Only authorized individuals approve (issue and verify) PtW
- All affected personnel are adequately trained to identify the PtW required tasks and situations





- Requirement 19.3 and Safety Rule 1 Explanations cont.:

- Site permit to work (PtW)
- Supporting guidance

Those calling for HPWW to take place must be satisfied that all alternate methods of cleaning have been ruled out due to inadequacy or inefficiency.

A PtW will be issued for the full activity - set up, cleaning, equipment removal and site restoration including :

- a. A documented Hazard Analysis with any special instructions noted (part of PtW)
- b. A Layout Sketch (See Appendix 1 for a typical example)
- c. Completed pre-cleaning checklist (See Appendix 2 for a typical example)
- d. A safe works method (operating procedure) has been provided
- e. Proof of equipment integrity, best safety practice and regular certified maintenance checks are provided
- f. Back out prevention equipment is available and in place
- g. Proof of operator competence (instructed, tested, experienced) is provided
- h. A document, equipment and site inspection have been completed

- The PtW will not be issued until the permit issuer has reviewed the field set up and is satisfied that it complies with the sketch, the operating instructions, & Mondi requirements



- Best Practice Guidance

- Best practice examples & useful information:

- <http://www.sirfrt.com.au/Download/QenosHPCLEANI.pdf>  
Good Guidance Document
- [http://www.worksafebc.com/publications/high\\_resolution\\_publications/assets/pdf/bk123.pdf](http://www.worksafebc.com/publications/high_resolution_publications/assets/pdf/bk123.pdf)  
Good Safe Work Practice
- Suppliers of equipment, safety devices and PPE
- <http://www.peinemannequipment.com/home/contact/>
- <http://www.peinemann.ru/>
- <http://www.woma-products.com/english.htm>
- <http://www.uraca.de/uk/about-uraca/>
- <http://www.turtleskin.com/Waterjet-Swipe-Protection.aspx>



# HPWW Requirement



- Type of cleaning units
- Stationary Units – fixed high pressure water pump supplies high pressure water via high pressure pipes to jetting (hose and lance) points



- Mobile Units

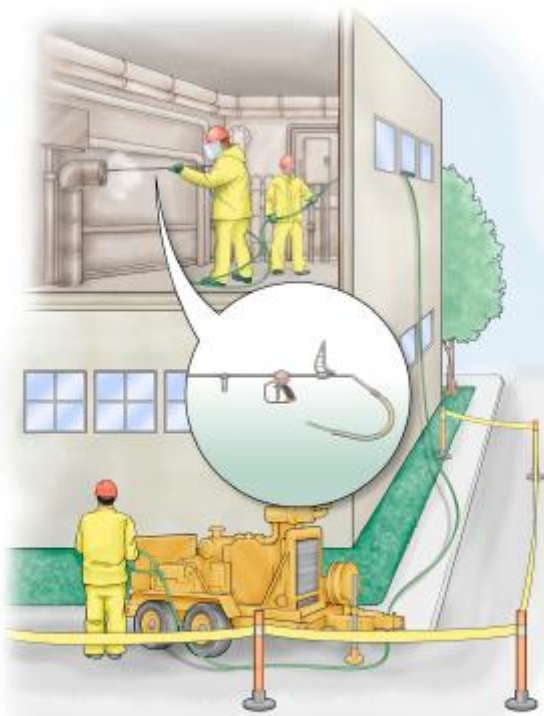


Figure 18. Hand lancing involves the use of a manually operated jetting gun. In the image above, a worker uses a jetting gun to clean the open end of a pipe.







# HPWW Requirement

- Type of cleaning
- Lancing (shot gunning – using a high pressure gun or lance)



- Flex Lancing (using a high pressure flexible hose)

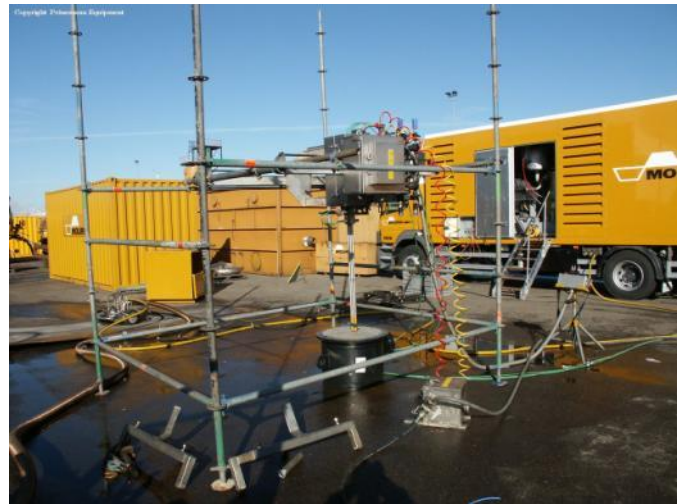
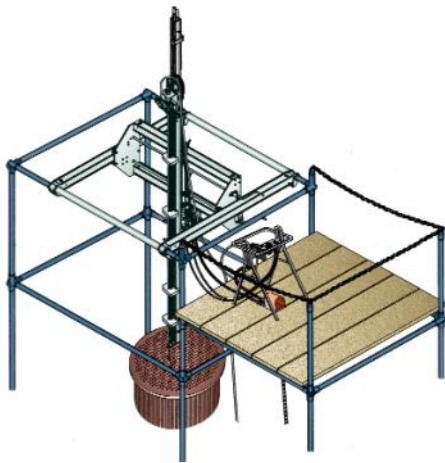




# HPWW Requirement



- Safe work practice example
- Automated & Mechanized Cleaning – the alternative







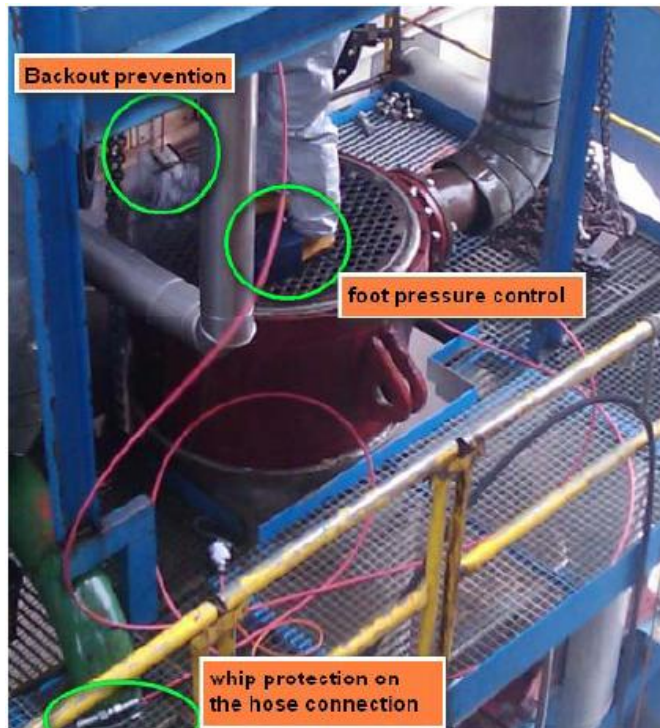
# HPWW Requirement



- Safe work practice example
- Safe Manual Vertical cleaning



- Safe Manual Horizontal cleaning







# HPWW Requirement



- Safe work practice example

- Safety Devices

- Examples of Back-out prevention devices for pipe diameters of up to 1200mm

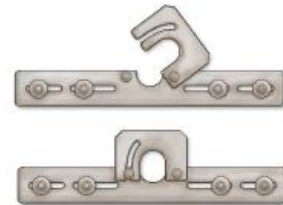


Figure 14. Backout preventer showing the adjustable opening.

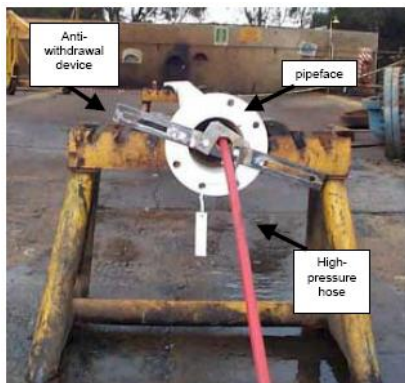


Figure 7: Typical Anti-Withdrawal Device Setup



Figure 5: Various Anti-Withdrawal Devices

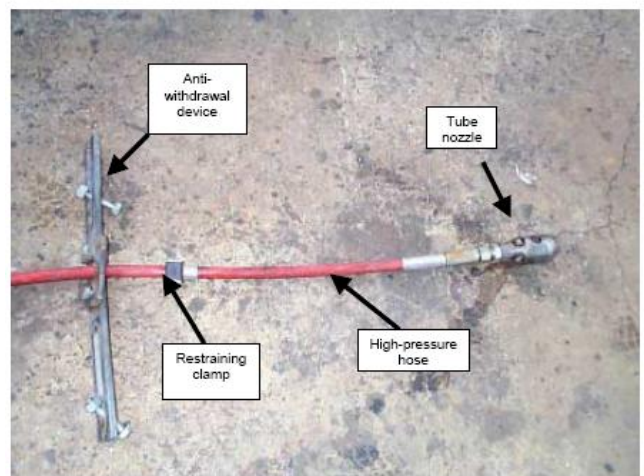


Figure 6: Typical Anti-Withdrawal Device Setup (prior to tube insertion)



# HPWW Requirement



- Safe work practice example
- Safety Devices
  - Examples of Whip-prevention (hose restraining) devices

Hoses must be connected by means of properly rated couplings, with “whip checks” in place. A whip check is a short length of reinforced nylon cloth or cable looped over each end of two hoses that are connected by a coupling. Whip checks are designed to prevent the ends of the hoses from whipping around if the coupling breaks.

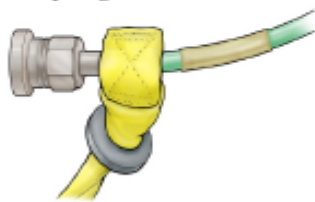


Figure 16. A whip check.

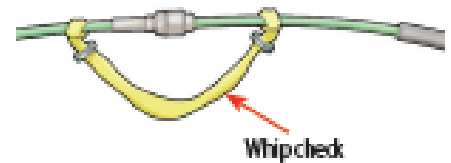


Figure 12: Restraining a Hose Joint

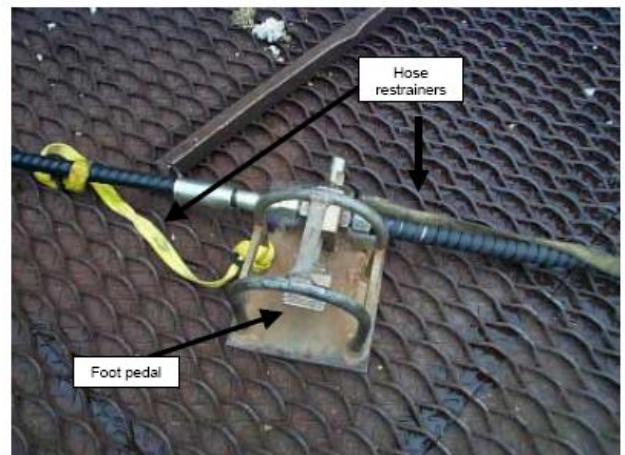
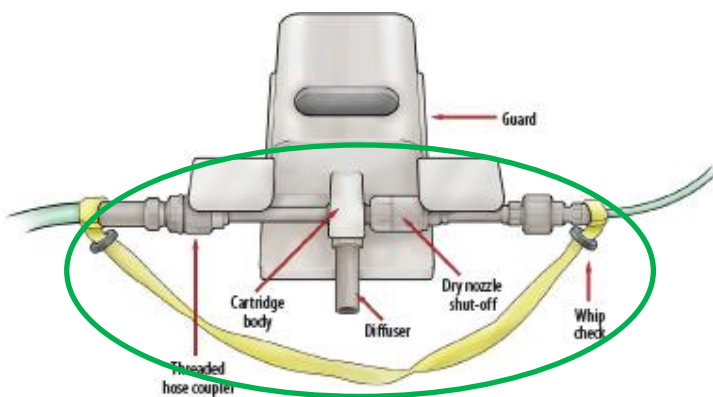


Figure 13: Foot Pedal with Hose Restrainer



- Safe work practice example
- Safety Devices
  - Flex lance safety devices: Foot-dump; tested certified safe for use lance hose; 60 cm marker; pressure rated rigid metal connecting tube (stinger)

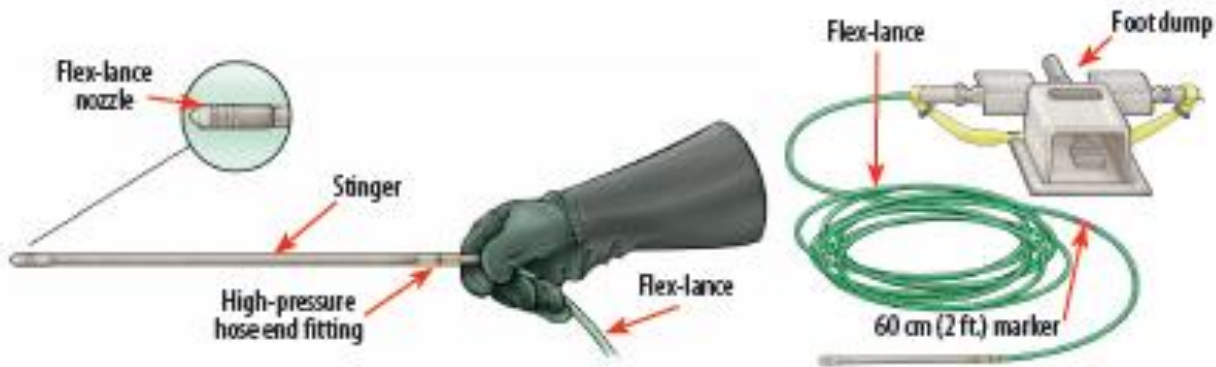


Figure 12. A stinger is a rigid metal connecting tube between the flex-lance hose end fitting and the cleaning nozzle.

To prevent the nozzle from turning around inside the pipe (line reversal) and shooting out under pressure from the open end of the pipe, attach an appropriately pressure-rated, rigid metal connecting tube (called a stinger) between the flex-lance hose end fitting and the cleaning nozzle

- Lance or jet gun safety devices: Handgrip; shoulder brace; safety shroud; whip check; trigger safety latch

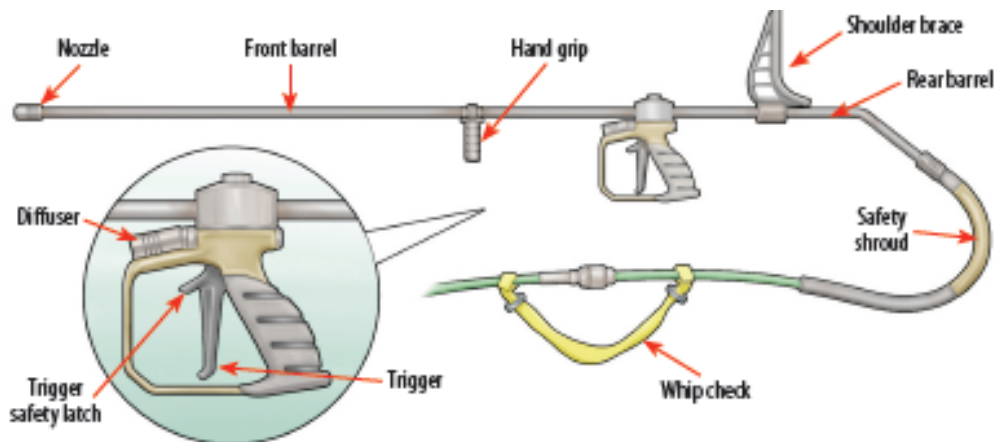


Figure 4. Dump-style jetting gun.





- Safe work practice example
- Area barricading, demarcation and set up example

### Work area

The work area must be clearly identified and controlled with effective signage and barrier tape to restrict access to authorized workers only. Additional personnel or physical barriers may be required to restrict access to areas not visible to the operators.



Figure 11: Barricade and Signage

- Safe working at height

### Work platforms

Adequately sized work platforms must be used to provide workers with safe access to elevated work areas (Figure 17). Work from ladders or surfaces not intended for workers can lead to loss of control of high pressure washing lances.

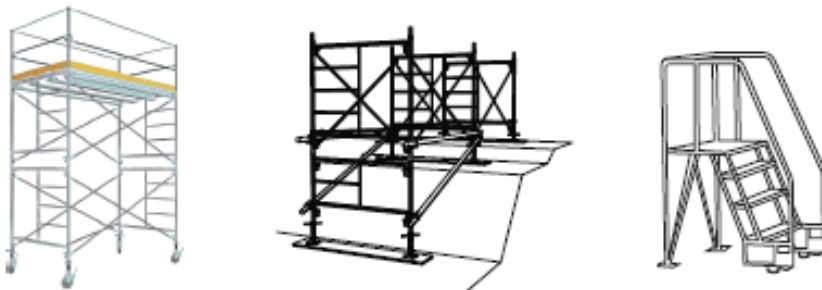
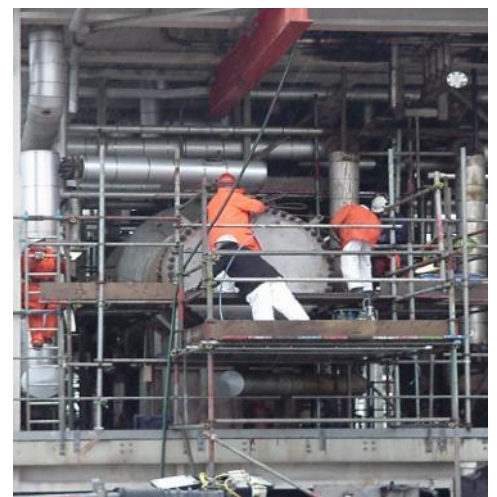


Figure 17. Different types of work platforms.





# HPWW Requirement



- Safe work practice example
- PPE





# HPWW Requirement



## Appendix I

### ➤ Checklist - example

#### PRE-JOB CHECKLIST FOR HIGH-PRESSURE HYDRO-BLASTING

CONTRACT COMPANY:			DATE:
EQUIPMENT BEING SERVICED:			LOCATION:
METHOD			MAXIMUM kPag:
<input type="checkbox"/> SHOTGUN	FLEXIBLE LANCE OR PIPE CLEANING	AUTOMATED CLEANING	

YES	NO	N/A
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#### TRAINING REQUIREMENTS

1	Employees are adequately trained to perform this specific task.			
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#### SAFETY REQUIREMENTS

2	All employees have proper safety and personal protective equipment for the job.			
3	Employees will not be required to work more than 14 hours in the shift.			
4	The equipment operator has the ability to control the pump pressure and flow.			

#### SITE REQUIREMENTS

5	Site selected for equipment setup/location is out of major personnel traffic area and is a safe distance from operating equipment.			
5	Contractor has set up equipment in location designated by Process or Mechanical Supervisor.			
7	Barricade tape is extended around the hydroblast equipment as required for personnel and operation safety. Signs are adequately placed.			
8	If hydroblasting equipment cannot be adequately spaced from process equipment or personnel traffic, additional sturdy barriers/panels are installed to provide protection.			
9	Hoses are properly protected and barricaded and they do not present a tripping hazard.			
10	Equipment to be cleaned is unable to move and secured as necessary.			

#### CONTAINMENT

11	Arrangements are in place to ensure that the material being blasted is contained or being disposed of properly.			
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#### EQUIPMENT REQUIREMENTS

12	Hoses and fittings are of the correct pressure rating and in good condition.			
13	All hoses are joined by threaded female couplings, of the correct pressure rating. No quick connect fittings are used.			
14	Hoses have indicators that reflect regular inspection as per the Australian Standard.			
15	Hoses have safety bridges (restraining devices) across couplings.			
16	Hoses are free of damaged wire braids.			
17	All pressure control valves have a guard to prevent inadvertent actuation.			
18	Pumping unit is equipped with safety relief devices and have been checked.			
19	The pump suction filter is clean and rated correctly.			

*Continued over*



## Appendix I

### ➤ Checklist – example cont.

YES	NO	N/A
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#### FLEXIBLE LANCING AND PIPE CLEANING REQUIREMENTS

20	The starter bar length is at least 300mm.			
21	A deflector shield has been placed at the outlet end of the tube bundle.			
22	The starter bar has a mark 300mm from the end to indicate nozzle location.			
23	The starter bar and tube nozzle are of the correct pressure rating.			
24	An anti-withdrawal device is attached to the inlet flange to prevent the nozzle from coming out of the pipe.			
25	The line mole has a mark 50mm from the end of the nozzle to indicate nozzle location.			
26	The line mole extension exceeds the inside diameter of the pipe being cleaned, for pipes exceeding 500mm.			

#### SHOTGUN REQUIREMENTS

27	The gun barrel is at least 1.2m long.			
28	The shotgun has at least one control valves to control water flow and pressure, and two control valves where necessary.			
29	The pump pressure regulator/unloader will unload the pump.			

\_\_\_\_\_  
WORKGROUP LEADER

\_\_\_\_\_  
DATE