

HIGH PRESSURE WATER JETTER INCIDENT CAUSING SERIOUS INJURY

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ABSTRACT

In February 2020, a Wannon Water employee was seriously injured while using a High Pressure Water Jetter when undertaking works to clear a sewer blockage. This presentation will look at the lessons learned and communicate our experiences to ensure other organisations hear about the incident, its impact, the steps we've taken to improve our practices, and the risks of different types of high pressure water jetting activities.

The incident occurred after an unrestrained hose coupling disconnected during use. The immediate control measure implemented was to remove the use of leader hoses (that are attached to the main hose of the Jetter) to eliminate the risk of unrestrained coupling detachment. In addition, measurement marks were then placed on Jetter main hoses in lieu of the use of leader hoses. These initial actions were undertaken with full consultation of all stakeholders.

AS 4233.1 High pressure water jetting systems for the safe operation and maintenance of water jetting equipment provides requirements and guidance with methods to eliminate or minimise risks associated with high pressure water jetting. The Standard applies to high pressure water jetting systems with a rating of 800 bar litres per minute and less than 5600 bar litres per minute (Class A) and those rated at over 5600 bar litres per minute (Class B).

The trailer mounted high pressure water jetting units utilised at Wannon Water are classified as class B units, while our Hydrovac trailer mounted units are classified at Class A units.

A review of our safe systems of work for High Pressure Jetting equipment and the related Australian Standard was undertaken with the application of the OHS Hierarchy of Control (Elimination, Substitution, Engineering, Administration and PPE) to implement and manage our improvement processes.

1.0 INTRODUCTION

A plumbing contractor attended the National Hotel at 70 Whyte Street Coleraine on Saturday 8 February 2020 in response to a blocked house sewer drain.

They noted that the inspection shaft on the customer drain line was full of liquid, which indicated that the blockage was between the inspection shaft and the sewer main.

The blockage in the House Connection Branch was then cleared by our Civil maintenance team members using a High Pressure Water Jetter (HPWJ).

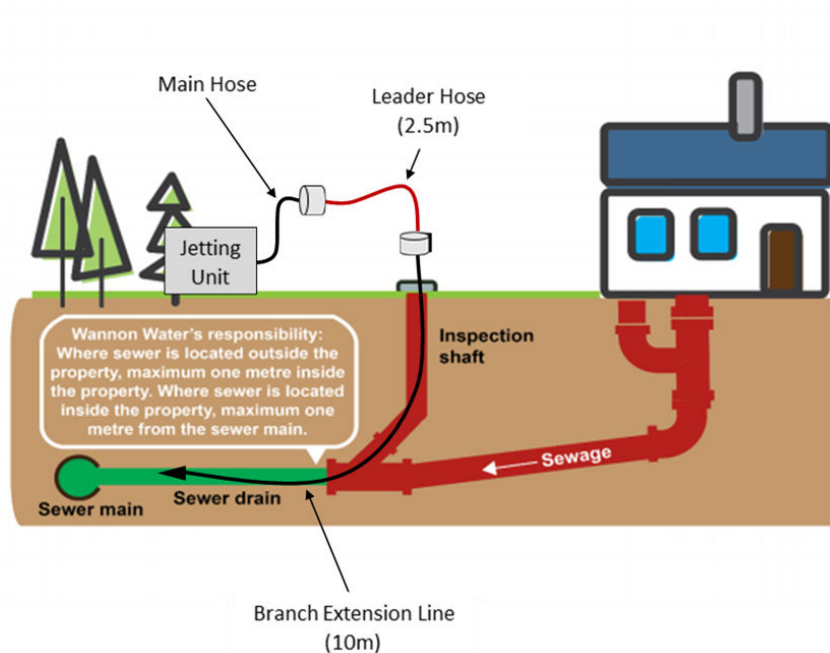
Figure 1. Typical High Pressure Water Jetter used for drain cleaning



During the drain cleaning process, the hose connection from the Leader hose to the Branch extension line separated allowing the unrestrained end of the Leader hose to suddenly strike

the operator in the head.

Figure 2. House connection branch drain cleaning arrangement.



Employees rendered first aid to the injured employee who was then air lifted to Melbourne. WorkSafe issued an improvement notice immediately after the incident and subsequently laid 3 charges that alleged that Wannon Water was in contravention of the Occupational Health and Safety Act 2004.

2.0 DISCUSSION

2.1 Immediate Actions following the Incident

The drain cleaning HPWJ unit involved in the incident was tagged out to prevent further use until it was inspected and permitted for return to service by Worksafe.

The use of Leader hoses was suspended for all other drain cleaning HPWJ units pending review of the safe systems of work to eliminate the risk of hose connection separation.

In lieu of the use of Leader hoses, a visible contrasting tape marking system of 1 metre in length was applied at approximately 3 to 5 metres from the end of main hose as an alternative safety indicator.



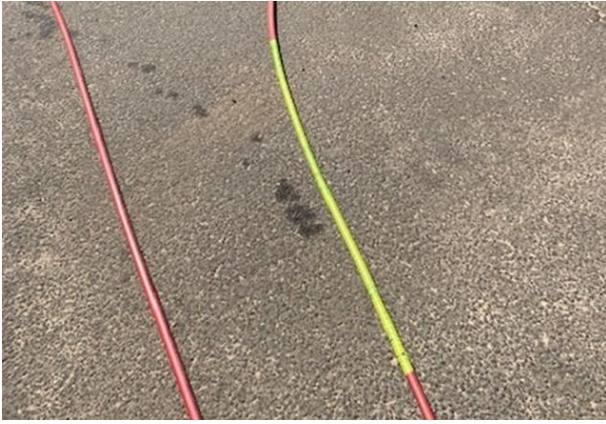
Figure 3. Leader Hose connected to the Main Hose

Notes:

- Leader hoses are typically 3m in length of the same or greater pressure class as the main hose.
- Leader hoses act as a safety indicator by providing a different colour to contrast with the Main hose, to warn the operator that the jetter nozzle is approaching the pipe opening.
- Leader hoses also provide a sacrificial length of hose that is more susceptible to wear in close proximity to the cutting jet, to protect the life of the main hose.

Figure 4. Application of contrasting tape to main hose

(in lieu of leader hose)



Note:

An effective safety indicator was created using PVC electrical earthing tape, which is easily installed & maintained, while providing good contrast.

The use of our HPWJ units was also suspended for house connection drains cleaning and all planned works (other than to unblocked mains affecting our customers that could be undertaken without the use of branch extension hoses) pending the safe systems of work review outcomes.

An internal safety alert was issued to all employees operating high-pressure water jetting equipment with the interim safe use instructions.

2.2 Investigation / Outcomes

An Incident Management Team was stood up to coordinate the incident and risk assessments of our safe systems of work.

The separation of the leader hose connection from the main hose resulted in an injury to our civil maintenance operator.

The industry practice of using Leader hoses does not highlight the potential risk associated with the lack of suitable hose restraint devices for leader hoses, i.e., that will allow normal operation and not get caught-up or snagged within a sewer main.

The risk assessments undertaken for the HPWJ equipment had not fully considered changes to operational manual updates over time, or alignment with the Australian standards. Consequently, our safe systems of work, including the JSA did not require the use of hard hats or face shields at the time of the incident.

Hoses repairs and connection replacements require hydrostatic testing and recertification, so all hoses re-ended without certification were replaced with new.

Whilst civil maintenance operators had already been trained in accredited HPWJ drain cleaning courses, following the incident our external training specialist (RTO) was engaged to assist with updating our safe systems of work, including JSA & procedural improvements.

Handheld lances are no longer permitted for our Class B HPWJ units (drain cleaners) and have been removed from this equipment.

Our preventative sewer maintenance programs are aimed to reduce the number of unplanned / reactive HPWJ drain cleaning activities.

Plant risk assessment documentation processes have been improved to support the completion of good quality risk assessments to support development and improvements to our safe systems of work.

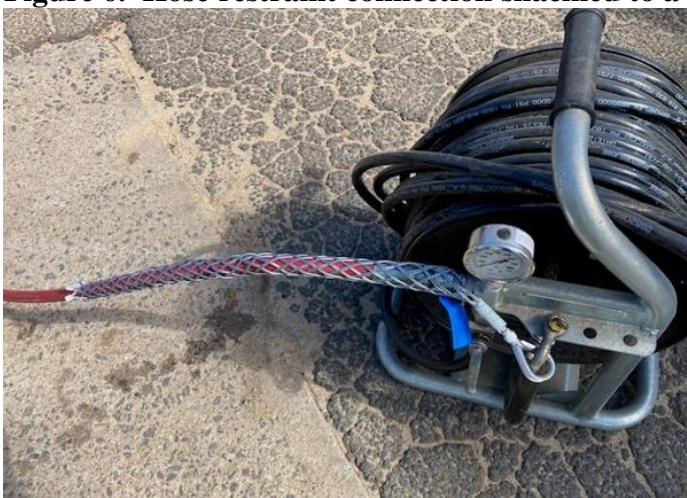
2.3 Braided hose restraints

The Australian standard AS4233.1:2013 High pressure water jetting systems, provides guidance on the application of hose restraints, such as braided stockings or other suitable means to restrict hose movement, hose separation, or end failure. The standard also clarifies that Whip checks shall not be used as hose restraints for HPWJ systems.

Figure 5. Typical braided hose restraint fitted to a HPWJ main hose



Figure 6. Hose restraint connection shackled to a HCB hose reel



Note:

- Hose reel with HPWJ rated hose to suit House Connection Branch (HCB) cleaning.
- The hose is of smaller diameter and more flexible to suit HCB cleaning.

2.4 OHS Hierarchy of control assessment

Elimination

Remove hose connections in the vicinity of HPWJ operators by not using leader hoses or house connection branch extension lines that are connected directly to the main hose.

Substitution

Add a contrasting marking system to the main hose to provide a safety indicator in lieu of the use of leader hoses. Remove the use of branch extension lines and substitute with hose reels to eliminate connections directly the main hose without a hose restraint system.

Engineering

Restrain any hose connections that could separate and cause injury, such as at the House Connection Branch hose reels, with the use of braided hose restraints connecting the main hose to the reel.

Administration – Improved Plant Risk assessments to ensure safe work methods are updated to include Operational Manual and Australian Standards requirements.

Personal Protective Equipment – Head, face and eye protection, hearing protection, hands and feet protection and appropriate body protection improvements implemented.

2.5 Impacts

Serious injury with life changing results.

Multiple impacts across business (the individual employee and family, civil maintenance teams and employees across the business, local community, etc.).

Financial impact – Workcover premium increase, costs to investigate, legal fees,

Enforceable Undertaking costs – possibly in excess of \$1m.

Personal Level (Andrew Jeffers – MD Wannon Water)

Devastating impact on so many people across the business.

Loss of confidence in the system we thought was reasonable.

It's healthy to be uncomfortable about your systems because that leaves you in a constant & genuine place of enquiry & review.

You can't turn back the clock, but you can make safety your #1 priority amongst all other competing demands.

2.6 Worksafe Enforceable undertaking

An enforceable undertaking (EU) is a written undertaking which contains commitments by the applicant to do certain things within a particular timeframe.

The acceptance of an EU by Worksafe is an alternative to prosecution of the applicant in respect of the particular contravention. Wannon Water has entered into an enforceable undertaking with Worksafe comprising of the following undertakings:

1. Internal and External Lessons Learned Presentations

- We have committed to undertake presentations to Senior Leaders across our service region and the Victorian water Industry.
- In these presentations we will share its lessons learnt from the Incidents, highlight the risks of the differing types of High Pressure Water Jetting activities and detail the improvements in practices that we made following the incident.

2. Training to enhance the safety of people undertaking HPWJ Activities

- We have committed to fund the development of a program that will educate employees, contractors, sub-contractors and any interested parties in the South West region of Victoria in the risks associated with HPWJ activities.
- We will engage the services of a suitable expert to develop the course content and training to elevate safety standards in HPWJ activities.
- We will provide funding for 12 information sessions to be provided across Warrnambool, Hamilton, Portland and Camperdown over the next 12 months.

3. Enhance the management of OHS and safety culture across all Wannon Water sites and facilities

Focusing on People Managers, Team Leaders and Coordinators we have committed to developing a program which aims to:

- Establish a shared understanding of OH&S leadership.
- Manage the risk - the role of leaders in understanding and minimising the risks associated with the organisation's operations, especially those risks that have the potential to cause serious harm or death. The risks considered will extend beyond safety to include those related to physical and mental health.
- Getting personally involved – the role of leaders in actively engaging in OHS activities like site visits and conversations with staff to better understand the nature of work and risk.

4. Develop an internal safety award program

- We have committed to development of a quarterly safety award program that will run for at least 12 months.

3.0 CONCLUSION

The use of leader hoses is not permitted for use on Wannon Water HPWJ drain cleaners. Employees who operate HPWJ jetting units are required to wear safety helmets with face shields, safety glasses or goggles, hearing protection, high pressure rated gloves, and suitable protective clothing - which may include high pressure aprons and boots for lancing

activities such as with HPWJ Hydrovac units.

Employees are required to undertake specialised accredited HPWJ drain cleaning and HydroVac training courses.

Braided hose restraint systems are required to secure the main hose to the house connection branch hose reel and other connections where applicable.

Repairs / re-ending to main hoses is not permitted without testing and recertification by qualified service providers.

Plant risk assessment processes need to align with manufacturers specifications & relevant standards to ensure our safe systems of work are maintained.

The impacts of a serious injury are immense both financially and non-financially.

The legal process since the incident has taken nearly 3 years with an EU application being accepted by WorkSafe.

4.0 ACKNOWLEDGEMENTS

To Mick Mahoney and the Civil Maintenance teams for support and assistance with the development of the paper; and special acknowledgement of Andrew Jeffers and Kellie King for information providing the basis of this paper.

5.0 REFERENCES

- AS 4233.1:2013 High pressure water jetting systems – Part 1: Safe operation and maintenance
- *Serious Incident – Our learnings*. Presentation by Andrew Jeffers. November 2022.