

# *Category 1: Work Health and Safety*

## Using Artificial Intelligence to Control Plant Pedestrian Interaction Risk

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*2024 AustStab Awards of Excellence*

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# Background

## – Controlling PPI is Critical to Safety

In the Pavement Recycling and related Civil Construction industries, Pedestrian and Plant Interfaces (PPI) present one of our greatest Critical risks to Worker safety and to some extent Public Safety.

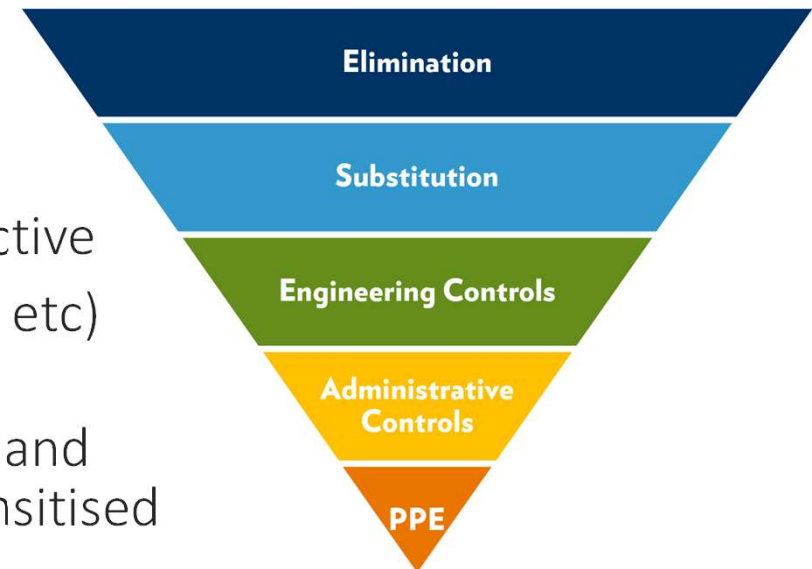
As a result too many people have been Fatally or Critically injured in our Industry!

Short Comings of other solutions;

- PPE/Hi Viz – no real protection from harm, not effective
- Administrative controls (Downer Red zone, spotters etc) – Not reliable, Humans make mistakes
- Other Engineering controls – Many systems trialled and substantial improvement, however Operators desensitised and frustrated with false stops.

Solution: Engineering Control with AI

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# Engineered Solution with Artificial Intelligence

Managing PPI risks paramount to the protection of people and continued success of Downer

- The application of Artificial Intelligence to detect people entering the Red Zone was investigated.
- In early 2022 we partnered with BrightPath AI (now Strata) to develop a system that could be fitted to a mobile equipment that could detect humans slow and stop the machine if needed and importantly respond differently than when detecting objects



‘Downer Safe Site’

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# How does it work?

- Video data captured through twin HD Cameras
- Processed in real time by Strata Level 9 AI black box
- Integrated into machine operating controls to slow and stop machine depending on proximity of person
- AI Level 9 trained with over 80,000 pictures to discern between humans and objects
- Warning lights on inside and outside of machine
- Incursion alerts can be immediately sent to Supervisor

Demo: [www.youtube.com/watch?v=avNiZAqGwes&si=YJftU8\\_sM4cB0i-d](https://www.youtube.com/watch?v=avNiZAqGwes&si=YJftU8_sM4cB0i-d)



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# Operation

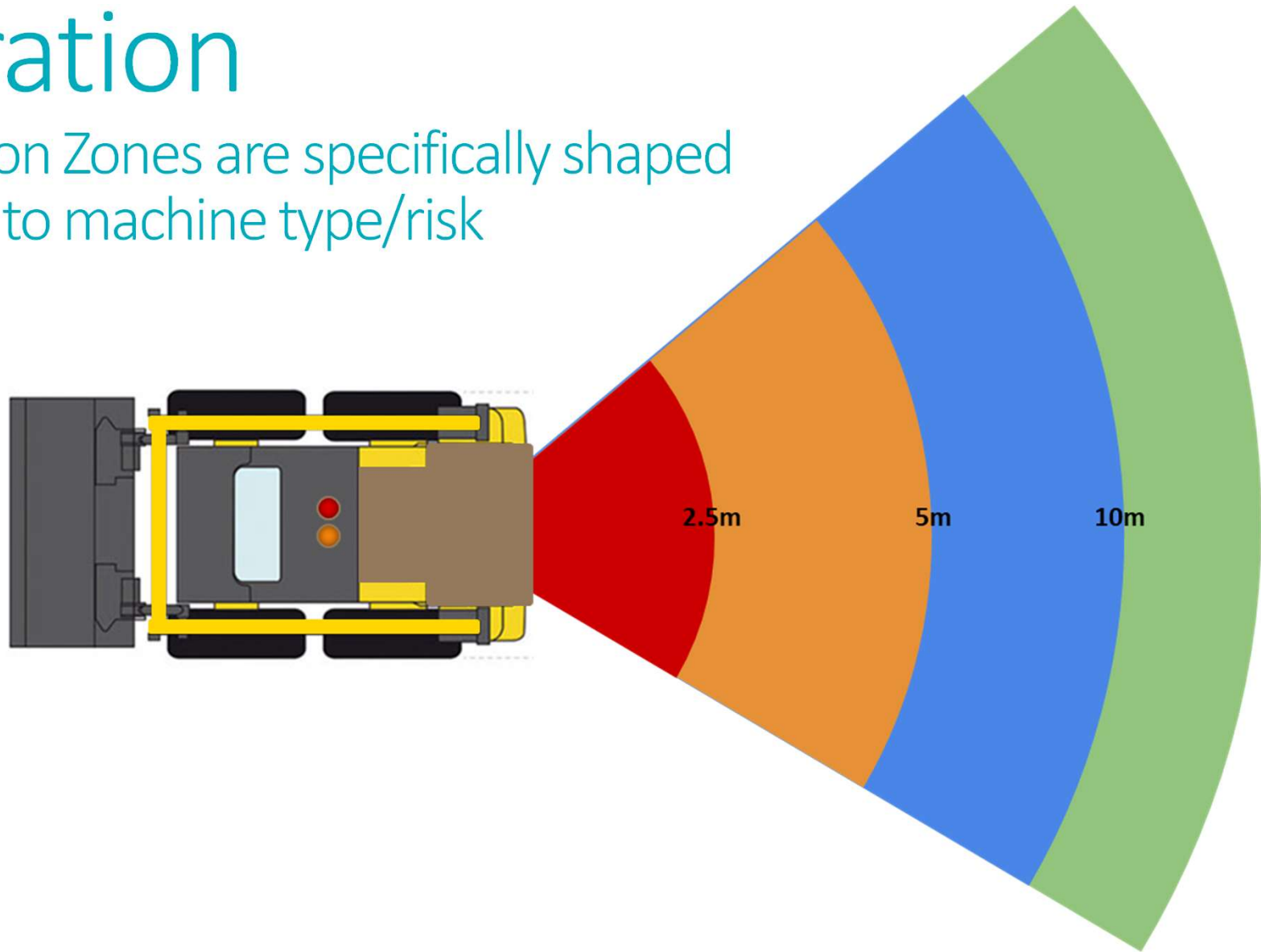
The technology allows detection of potential human shapes within the field of vision (RedZone) and provides different warning signals

EVENT	DISTANCE ACTIVATED	CONTROLS	ACTION TO RESET
1	5-10 metres	<p>Visual warning of encroachment</p> <ul style="list-style-type: none"> <li>▪ Strobing RED light external to equipment visible 360 degrees to crew members;</li> <li>▪ Strobing BLUE light bar external at rear indicating incursion;</li> <li>▪ Strobing BLUE lights internal on side of incursion to alert operator;</li> <li>▪ On screen LIGHT GREEN BOX showing potential incursion</li> </ul>	Automatic when incursion removed
2	2.5-5 metres	<p>Visual warning of encroachment</p> <ul style="list-style-type: none"> <li>▪ Strobing RED light external to equipment visible 360 degrees to crew members;</li> <li>▪ Strobing ORANGE light bar external at rear indicating incursion;</li> <li>▪ Strobing ORANGE lights internal on side of incursion to alert operator;</li> <li>▪ On screen LIGHT GREEN BOX showing potential incursion</li> </ul> <p>Audible warning of encroachment</p> <ul style="list-style-type: none"> <li>▪ Pulsating buzzer audible to external crew members and internal operator;</li> <li>▪ Equipment reduced to half speed/power</li> </ul>	Automatic reset <b>ONLY</b> when equipment comes to complete stop for 3 seconds <b>OR</b> operator pushes control lever to travel in opposite direction to incursion
3	0-2.5 metres	<p>Visual warning of encroachment</p> <ul style="list-style-type: none"> <li>▪ Strobing RED light external to equipment visible 360 degrees to crew members;</li> <li>▪ Strobing RED light bar external at rear indicating incursion;</li> <li>▪ Strobing RED lights internal on side of incursion to alert operator;</li> <li>▪ On screen LIGHT GREEN BOX showing potential incursion</li> </ul> <p>Audible warning of encroachment</p> <ul style="list-style-type: none"> <li>▪ Pulsating buzzer audible to external crew members and internal operator;</li> <li>▪ Equipment slowed to stop as soon as practicable</li> </ul>	NO automatic reset. Equipment must be at complete stop for 5 seconds and operator must press override button to recommence activity

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# Operation

Intervention Zones are specifically shaped according to machine type/risk



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# Operation

Once human shape is detected to be within zones, AI Control first slows (<10m), then stops machine (<2.5m)



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# Operation

## Live System Reports of Zone Intrusion



**Case No:**

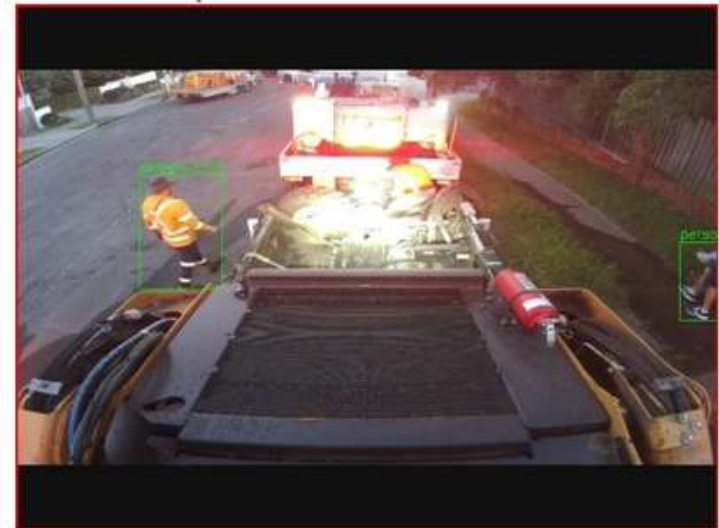
**Site:** Bathurst (170129)

**Zone/Plant:** SS153

**Date:** 12/06/2024 06:53:AM

**Description:** Zone intrusion

**Hazard Description:**



[Go to hazard details](#)

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# Summary

- Downer believe this technology is a game changing improvement in industry safety – commenced pilots in field in 2022
- Units have been fitted to Stabilisers, Spreader trucks, rollers, Skidsteers and crew trucks – plan to have 40 units operational by end 2024 (currently approx. 50%)
- Many evolutionary learnings along the way with the system being retrained and reprogrammed
- Has improved safety culture on site and compliance to safe clearance between machines and people

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