



# **Machine Safety: Entrapment**

**GENERIC BOWTIE SAMPLE  
(PREVENTATIVE & MITIGATIVE CONTROLS)**

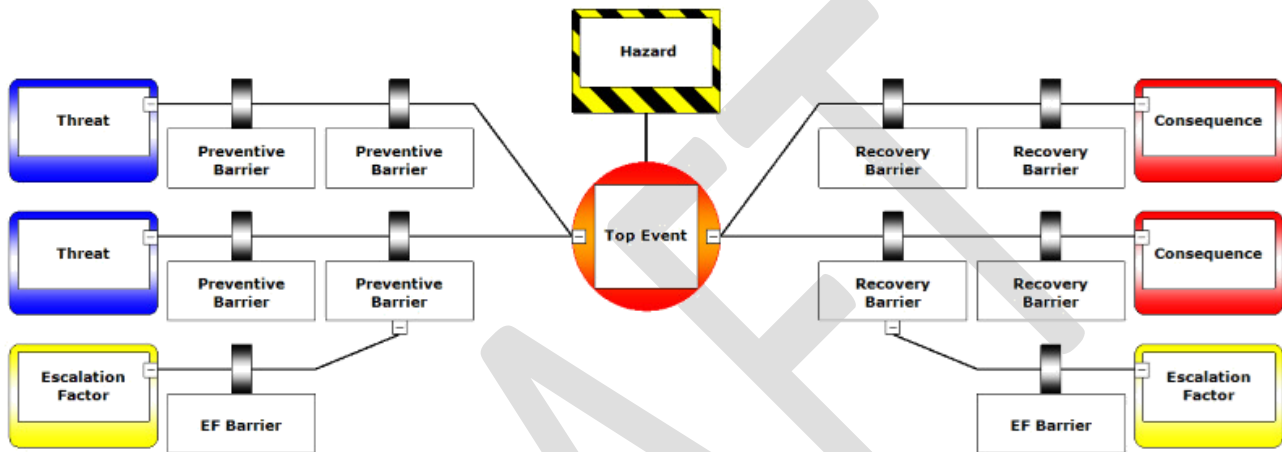
**1<sup>st</sup> December 2022**



## Bowtie Method

Is a risk evaluation method that can be used to analyse and demonstrate causal relationships in high-risk scenarios. A 'bowtie' is a diagram that visualizes the risk you are dealing with in just one, easy to understand picture. The diagram is shaped like a bowtie, creating a clear differentiation between proactive and reactive risk management. The power of a Bowtie diagram is that it gives you an overview of multiple plausible scenarios, in a single picture. In short, it provides a simple, visual explanation of a risk that would be much more difficult to explain otherwise

The following element shows the structure of the bowtie.



We recommend that with any bowtie a Hierarchy of control is developed and used as a system for controlling risks in the workplace. Risks should be reduced to the lowest reasonably practicable level by taking preventative measures, in order of priority. Eliminating the hazard and risk is the highest level of control in the hierarchy, followed by reducing the risk through substitution, isolation, and engineering controls, and then reducing the risk through administrative controls. Reducing the risk with the use of protective personal equipment (PPE) is the lowest level of control.

Consider various control options and effective elimination controls should always be the priority. If elimination is not reasonably practicable, minimise the risk in the circumstances. Reducing the risk may involve a single control measure or a combination of different controls that work together to provide the highest level of reasonably practicable protection.

As an employer, you must consult your workers and their health and safety representatives (HSRs), if there are any when deciding on risk controls.

For simplicity, we display the bowtie in a table format to make it easier to use. The main hazard is displayed on the top left of the document. The first box starting from the left will be the "threats/ Causes" followed by preventative and mitigative (reactive) controls and lastly the potential consequence of the threat/ cause.

## Bowtie Sample – Machine Safety: Entrapment

Cause/ Threat	Preventative Controls	Mitigative Controls	Consequences
<b>Poor Workplace Conditions</b>	<ul style="list-style-type: none"> <li>Building WOF (Building is regularly certified via the annual building WOF process)</li> <li>Waste Management for Machinery Outputs (Waste management mechanisms fitted for machines with outputs example fumes, swarf, dust)</li> <li>Housekeeping Standards (Good housekeeping standards are maintained onsite)</li> </ul>	<ul style="list-style-type: none"> <li>Communication with Emergency Services (Communication available to call for help)</li> <li>First Aid Response (First aid equipment and first aider available to assist)</li> <li>Emergency Response (Site-specific emergency response plans exist including how to contact emergency services)</li> <li>Make Area Safe (Ensure all machine energy sources are isolated, and stored emergency cannot cause further injury.)</li> <li>Trial Simulation Training (Trial drills held to ensure the team are prepared in an emergency)</li> </ul>	Severe Injury / Fatality
<b>Uncontrolled Purchasing</b>	<ul style="list-style-type: none"> <li>Purchasing Process (A process to procure machinery exists and requires approval)</li> <li>Purchasing Standard (A standard exists to outline the minimum performance requirements when procuring/purchasing machinery)</li> </ul>		
<b>Poor Workplace Design/Layout</b>	<ul style="list-style-type: none"> <li>Site Layout (Sites are procured or retrofitted to suit site operations and safe machine configuration)</li> <li>Fit for Purpose (The site is fit for purpose and contains the infrastructure required to safely operate machinery)</li> <li>Ventilation (Machinery operating areas are ventilated adequately)</li> <li>Access Controls (Access into machinery operating areas is controlled)</li> <li>Lighting (Ensure sufficient lighting is available where machinery is operated)</li> </ul>	<ul style="list-style-type: none"> <li>OCP Support (Organisational counselling programme available for team members)</li> <li>Trial Simulation Training (Trial drills held to ensure the team are prepared in an emergency)</li> <li>Communication with Emergency Services (Communication available to call for help)</li> <li>First Aid Response (First aid equipment and first aider available to assist)</li> <li>Emergency Response (Site-specific emergency response plans exist including how to contact emergency services)</li> <li>Make Area Safe (Ensure all machine energy sources are isolated, and stored emergency cannot cause further injury.)</li> </ul>	Severe Injury / Fatality
<b>Lack of Machinery Specification</b>	<ul style="list-style-type: none"> <li>Risk Assessments (Risk assessments undertaken before the purchase of any machinery)</li> <li>Purchasing Standard (A standard exists to outline the minimum performance requirements when procuring/purchasing machinery)</li> </ul>		

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Cause/ Threat	Preventative Controls	Mitigative Controls	Consequences
<b>Machine Malfunction</b>	<ul style="list-style-type: none"> <li>SOPs (SOPs exist to manage machine breakdown scenarios)</li> <li>Asset Management (Machinery assets are maintained throughout its lifecycle)</li> <li>Global Performance Tracking (Enable tracking with other global users to compare the performance of the machine)</li> <li>Budget Assigned for Maintenance/Repair (Budget assigned to ensure all machinery is maintained and repaired effectively and in a timely manner)</li> <li>Supplier Agreements (Agreements with suppliers to enable services like urgent fault repairs, advice, guidance, and training)</li> <li>Monthly Inspections (A formal inspection is undertaken by a trained and competent professional)</li> </ul>	<ul style="list-style-type: none"> <li>Drills (Trial drills are held to ensure team members know what to do in an emergency)</li> <li>First Aid Response (First aid equipment and first aider available to assist)</li> <li>Freeze the Scene (Freeze the scene in line with Notifiable Regulations)</li> <li>Engage Kaumatua (Kaumatua/Matai/Elders engaged to support team members and provide leadership)</li> <li>Wellness Leave (Team members are provided with leave to enable time to recover)</li> <li>Full Incident Investigation</li> <li>OCP Support (Organisational counselling programme available for team members)</li> <li>Engage External Communications (Public Relations team engaged to manage media releases and external communications)</li> </ul>	Permanent Disability
	<ul style="list-style-type: none"> <li>Repair Process for Damaged Equipment (A process exists to ensure machinery is properly repaired in a timely manner)</li> <li>Shut Down Check (A process is followed for shutting down machinery and safely storing it away)</li> <li>Preventative Maintenance (All machinery on a preventative maintenance schedule to prevent breakdown and faults)</li> <li>Pre-Start Checks (Machinery is inspected before use to ensure it is in good working condition)</li> <li>Reporting Process for Damaged Equipment (Team members can report damaged equipment)</li> <li>Machine Training (Team member trained in the safe operation of the machine)</li> </ul>	<ul style="list-style-type: none"> <li>Freeze the Scene (Freeze the scene in line with Notifiable Regulations)</li> <li>OCP Support (Organisational counselling programme available for team members)</li> <li>Engage Legal Counsel (Engage Legal Counsel to provide advice)</li> <li>Notify Regulator</li> <li>Event/Incident process)</li> <li>Engage External Communications (External communications team engaged to coordinate activities and mitigate damage to business reputation)</li> <li>Immediate Thorough Investigation (HSW team engaged and incident investigation team created to conduct a formal investigation)</li> <li>Clinical Counselling (Clinical counselling available for affected team members)</li> <li>Ongoing Monitoring of Affected Team Members (Managers monitor team to ensure they are supported)</li> <li>Notification to GET (GET notified of the incident)</li> <li>Team Member Briefings (Team members are briefed regularly to keep them informed of the status and corrective action taken)</li> </ul>	Damage to Business Reputation

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Cause/ Threat	Preventative Controls	Mitigative Controls	Consequences
<b>Impairment</b>	<ul style="list-style-type: none"> <li>OCP (Organisational counselling programme available for team members)</li> <li>Maximum Working Hours (Rostered hours are capped to ensure team members aren't fatigued.)</li> <li>Organisational Planning (Effective task and resource planning by managers to mitigate pressure on team members)</li> <li>Wellbeing Initiatives (Wellbeing initiatives available to team members to encourage healthy lifestyles)</li> <li>Sick Leave (Sick leave for team members who are unwell and not fit to operate machinery)</li> <li>Pre-Start Meetings (Ensure all team members are fit for work at daily pre-start meetings)</li> <li>Pre-Employment Screening (Pre-employment health, drug and alcohol screening for new team members)</li> <li>Annual Health Check (Annual health screening to ensure team members are physically fit for work)</li> <li>Drug and Alcohol Monitoring (Standard, Procedure and Tools exist to monitor drug and alcohol impairment)</li> <li>Supervision (Team members are supervised to ensure safe working practices are followed)</li> </ul>	<ul style="list-style-type: none"> <li>Freeze the Scene (Freeze the scene in line with Notifiable Regulations)</li> <li>OCP Support (Organisational counselling programme available for team members)</li> <li>Engage Legal Counsel (Engage Legal Counsel to provide advice)</li> <li>Notify Regulator</li> <li>Event/Incident process</li> <li>Engage External Communications (External communications team engaged to coordinate activities and mitigate damage to business reputation)</li> <li>Immediate Thorough Investigation (HSW team engaged, and incident investigation team created to conduct formal investigation)</li> <li>Clinical Counselling (Clinical counselling available for affected team members)</li> <li>Ongoing Monitoring of Affected Team Members (Managers monitor team to ensure they are supported)</li> <li>Team Member Briefings (Team members are briefed regularly to keep them informed of the status and corrective action taken)</li> </ul>	Damage to Business Reputation
		<ul style="list-style-type: none"> <li>Immediate Thorough Investigation (HSW team engaged, and incident investigation team created to conduct formal investigation)</li> <li>Freeze the Scene (Freeze the scene in line with Notifiable Regulations)</li> <li>Notify Regulator (WSNZ notified in line with Notifiable Event/Incident process)</li> <li>Invoke Legal Privilege (Invoke legal privilege to mitigate legal impacts)</li> <li>Engage Legal Counsel (Engage Legal Counsel to provide advice)</li> </ul>	Prosecution

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Cause/ Threat	Preventative Controls	Mitigative Controls	Consequences
<b>Human Behaviour</b>	<ul style="list-style-type: none"> <li>Disciplinary Process (A formal disciplinary process exists to deter team members from unsafe work and discipline team members that knowingly work unsafely)</li> <li>Rules for Mobile Phone Use (Use of mobile phones is prohibited when operating machinery)</li> <li>Guards and Interlocks (All machinery is guarded and interlocked to ensure team members cannot physically access the moving machinery parts)</li> <li>Supervision (Team members are supervised to ensure safe working practices are followed)</li> <li>Machine Training (Team member trained in the safe operation of the machine)</li> <li>Site Induction (Team members inducted to the site to ensure site rules are understood)</li> <li>Workload Planning (Effective task and resource planning by managers to mitigate pressure on team members)</li> </ul>	<ul style="list-style-type: none"> <li>Immediate Thorough Investigation (HSW team engaged, and incident investigation team created to conduct formal investigation)</li> <li>Freeze the Scene (Freeze the scene in line with Notifiable Regulations)</li> <li>Notify Regulator (WSNZ notified in line with Notifiable Event/Incident process)</li> <li>Invoke Legal Privilege (Invoke legal privilege to mitigate legal impacts)</li> <li>Engage Legal Counsel (Engage Legal Counsel to provide advice)</li> </ul>	Prosecution
<b>Poor Organisational Planning</b>	<ul style="list-style-type: none"> <li>Time and Motion Study (Time and motion study undertaken for machinery tasks to ensure planning enables enough time/resources for the work to be undertaken)</li> <li>Workload Planning (Effective task and resource planning by managers to mitigate pressure on team members)</li> </ul>	<ul style="list-style-type: none"> <li>Clinical Counselling (Clinical counselling available for affected team members)</li> <li>Ongoing Monitoring of Affected Team Members (Managers monitor team to ensure they are supported)</li> <li>Team Member Briefings (Team members are briefed regularly to keep them informed of the status and corrective action taken)</li> <li>Immediate Thorough Investigation (HSW team engaged, and incident investigation team created to conduct formal investigation)</li> <li>Engage Kaumatua (Kaumatua/Matai/Elders engaged to support team members and provide leadership)</li> </ul>	Team Member Impact

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<b>Loose Clothing/Hair</b>	<ul style="list-style-type: none"> <li>Uniform Standard (Uniforms are suitable to wear whilst operating machinery. Long hair tied back.)</li> </ul>	<ul style="list-style-type: none"> <li>OCP Support (Organisational counselling programme available for team members)</li> <li>Site Shut Down (Operations cease and site closed to support team members)</li> <li>Rehabilitation Leave (Team members are provided with leave to enable time to recover)</li> <li>Engage Union to provide support to team members</li> <li>Interim Work Process implemented to support affected team members</li> <li>Engage a Case manager assigned to support each team member</li> <li>Engage People Support to support team members</li> <li>Immediate Assessment of Affected Team Members (Team members are assessed immediately to confirm wellness status and receive the support they need)</li> </ul>	Team Member Impact
		<ul style="list-style-type: none"> <li>Business Continuity Plan (BCP processes commence)</li> <li>Notification/Escalation Process</li> <li>Isolate Area (Isolate incident area from operations)</li> </ul>	Operational Impact
		<ul style="list-style-type: none"> <li>Engage External Communications (External communications team engaged to coordinate activities and mitigate damage to business reputation)</li> <li>Business Continuity Plan (BCP processes commence)</li> </ul>	Customer Impact

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