



Engineering a Safer Future Symposium

November 11th, 2026

Prospectus

Engineering a Safer Future 2026

Design Intersection with Health

Engineering shapes the foundations of our society—not only through infrastructure and innovation, but through the health and safety of the people who use, operate, maintain, and respond to the systems we create. This symposium brings engineers, researchers, practitioners, and health and safety leaders together to explore how engineering can create healthier, safer environments, systems, and processes.

Purpose

The symposium is designed to showcase practical leadership, original thinking, and evidence-based approaches to pressing safety challenges. It provides a forum to share experience across disciplines, examine how design decisions influence real-world outcomes, and strengthen the integration of health and safety throughout engineering practice.

What to expect

The programme combines expert presentations, practical case studies, an interactive workshop, a panel discussion, and a student poster exhibit. Topics span infrastructure, construction, transport, manufacturing, digital technologies, emergency response, education, and system assurance—highlighting both immediate workplace risks and the long-term consequences of engineering decisions.

Who should attend

This is a cross-sector event for engineers and designers, health and safety professionals, researchers, educators, asset owners, regulators, project leaders, operators, maintainers, and anyone interested in how better engineering decisions can safeguard people and communities.

Event details

Engineering NZ, 40 Taranaki St, Wellington (take lift to level 6)

November 11th - Arrive from 8.15am.

COST TO ATTEND: \$60 – NZSES members, \$80 for non-members.

A light breakfast, lunch, morning and afternoon tea are provided.

TO REGISTER – visit www.nzses.org.nz/symposium or scan the QR code



An informal gathering will be held at the Gibbons Hotel, 52 Taranaki St following the event

Join the conversation. Share knowledge. Challenge assumptions.

Help engineer a healthier and safer future.

Symposium Timetable

Time	Presentation	Presenter
8:30	Light breakfast	
9:00	Official Welcome	MC - Rob Holland
9:05	Rethinking Performance-Based Fire Design for Health and Safety**	Michael Belsham
9:35	Who Carries the Risk? Lessons from a Career in Engineering Safety	Dominique Tharandt
10:00	Morning Tea	
10:20	The First Five Minutes: Engineering Emergency Response Before the Ambulance Arrives	James Hayter
10:40	Hands That Tell a Story: Understanding and Preventing HAVS - Hand and Arm Vibration Syndrome	TBC
11:00	Remembrance Day acknowledgement	
11:05	Heritage on the Main Line: Managing Safety in the operation of heritage rolling stock on the New Zealand main line**	Andrew Hunt
11:25	Implementation of European Train Control System (ETCS) within Auckland's mixed-use metropolitan rail network	Gabriella Solti
11:50	Drone assistance for search and rescue operations	Matthew Bakker
12:15	Lunch & Student poster exhibit	
1:15	When SFAIRP Isn't Enough: A Workshop on Balancing Asset Risk and System Safety	Jennifer Critchley
2:20	Prevention of Potential Technological Disasters by Adopting an Innovative Pedagogical Strategy in Engineering Education and Professional Development	Dr Sergiy Klymchuk
2:45	PEN Faults in Practice: Lessons from Recent Regulatory Changes**	Daniel Muller
3:00	Afternoon Tea – Poster judging and award	
3:15	Discussion panel - Health AND Safety, why don't we give equal attention to both sides of the equation?	Rob Holland MC
4:00	Symposium close	MC - Rob Holland
4:30	Informal networking event - Gibbons Hotel	

** Also offered online

Presentations

Rethinking Performance-Based Fire Design for Health and Safety

Presented by Michael Belsham

Has a building that achieves building consent but fails its occupants, facilities managers, or fire-fighters truly performed?

The presentation examines how performance is perceived differently by building owners, tenants, facilities managers, customers, and Fire Services; and the health and safety implications when these perspectives are overlooked. It highlights real-world consequences of design features that satisfy Building Code but create hazards in practice for example fire curtains on access routes, high volume smoke extract systems or escape routes through loading zones. These are ongoing maintenance burdens that compromise long-term safety system reliability.

This presentation calls for a paradigm shift: designing buildings that not only meet regulatory standards but deliver true functional safety for all users. It invites engineers to adopt a multi-stakeholder lens; embedding health, usability, and long-term operational safety into performance-based design from the outset.

Who Carries the Risk? Lessons from a Career in Engineering Safety

Presented by Dominique Tharandt

Engineers make decisions every day that affect the health and safety of people they may never meet. While hazards can be identified, risks assessed, and controls documented, risk does not disappear simply because it has been captured in a design, a drawing, or a register. Someone still has to live with the consequences.

Drawing on more than 25 years of experience across engineering, design, delivery, and operations, this presentation explores how safety risk flows through the lifecycle of engineered systems, from concept and construction through to the operators and maintainers who inherit the outcomes of our decisions. It examines how assumptions, design choices, and project trade-offs can unintentionally transfer risk to others, often long after the original decision has been made.

Rather than focusing on risk management processes, this session asks a series of human-centred questions: Who carries the risk? Do they understand it? Were they involved in the decision? And would we accept that same risk ourselves?

The presentation challenges attendees to look beyond compliance and consider what it truly means to engineer for safety by recognising hazards, questioning assumptions, understanding consequences, and making informed decisions about the risks we eliminate, reduce, accept, or pass on to others. Ultimately, the lessons extend beyond engineering and into everyday life, where understanding who carries the consequence remains one of the most important decisions we make.

The First Five Minutes: Engineering Emergency Response Before the Ambulance Arrives

Presented by James Hayter

Workplace emergency response is often viewed as a first aid and compliance requirement, yet the outcome of a serious incident depends on far more than training alone. Factors such as likely workplace hazards, equipment accessibility, responder capability, communication, scene control, and emergency service response times all influence the effectiveness of the initial response.

This presentation introduces the Emergency Response Model, a site-specific framework built around credible workplace emergencies rather than generic first-aid checklists. It examines the First Five, focused on maintaining circulation, oxygenation, and blood volume, before transitioning to the Stable 60, where trained responders assess, stabilise, and support injured workers until professional medical assistance arrives.

The session will explore common weaknesses in workplace preparedness, including poorly located equipment, unclear responsibilities, limited emergency access, and unrehearsed response plans. A practical, tiered response structure defining the roles of Trauma Responders, Site Medics, and Emergency Response Leads will be presented. Particularly relevant to construction, manufacturing, forestry, agriculture, and remote operations, attendees will leave with a practical framework for assessing and improving emergency response capability to reduce both injury severity and operational impacts following serious incidents.

Hands That Tell a Story: Understanding and Preventing HAVS

Presenter TBC

Hand Arm Vibration Syndrome (HAVS) remains one of the most significant occupational health risks for workers who regularly use powered hand tools and vibrating equipment. Often developing gradually, HAVS can cause permanent damage to blood vessels, nerves, muscles, and joints, leading to symptoms ranging from tingling and numbness to reduced grip strength and debilitating vibration white finger. This presentation examines the key risk factors associated with vibration exposure, how HAVS develops, and why early recognition is critical to preventing long-term injury.

The session will also explore practical strategies for reducing exposure, including equipment selection, maintenance, work practices, exposure monitoring, and worker education. Attendees will gain an understanding of current approaches to treatment and symptom management, as well as the importance of health surveillance and early intervention. Designed for engineers, health and safety professionals, managers, and frontline workers, this presentation provides practical insights into how HAVS can be prevented before it becomes a life-changing condition.

Heritage on the Main Line: Managing Safety in the operation of heritage rolling stock on the New Zealand main line

Presented by Andrew Hunt

Aotearoa New Zealand has a vibrant rail heritage sector, with six preservation organisations operating vintage equipment on the national rail network. Unlike many transport sectors, rail operates within a largely self-contained regulatory environment, while heritage operators face the additional challenge of maintaining and running equipment that does not meet modern engineering design standards.

Over the past two decades, heritage mainline operations have evolved from individual safety-case licensing towards a stronger focus on risk assessment as the foundation of their safety systems. However, these organisations are typically small and lack the engineering and operational resources found in fully commercial rail businesses.

This presentation provides an overview of the heritage rail sector, the unique risks associated with operating historic equipment, and the industry framework developed to manage those risks. Particular attention will be given to the role of sector engineering and operational committees in setting standards and overseeing the admission of operators and rolling stock to the main line.

The session will also explore a key challenge facing the sector: determining where operations conducted primarily for heritage value become commercial activities, and whether different safety expectations should then apply. Attendees will be invited to consider how adequate safety should be assessed when balancing heritage preservation, practical constraints, and modern risk management expectations.

Implementation of European Train Control System (ETCS) within Auckland's mixed-use metropolitan rail network

Presented by Gabriella Solti

This case study presents KiwiRail's implementation of the European Train Control System (ETCS) Level 1 system on freight and locomotive-hauled passenger services within Auckland's mixed-use metropolitan rail network. While ETCS has an established safety record in metro passenger operations, extending it to freight presents unique design and operational challenges due to fundamentally different train characteristics, including variable braking performance, consist variability, and complex yard operations.

The presentation focuses on the intersection of engineering design and safety outcomes through a systems assurance lens. It demonstrates how safety-led design decisions were used to adapt an existing protection system to a new operational context without degrading existing safety performance. Key themes include the project assurance process, Concept of Operations, integration of onboard and trackside subsystems within a live operational environment, as well as human factors considerations (such as driver data input).

A core feature of the project is KiwiRail's progressive assurance approach, including staged implementation, Safety Stage Gates, and explicit residual risk management aligned with SFAIRP principles. This has enabled earlier risk reduction while supporting operational readiness and continuous learning.

Globally, very few mixed-use railways operate ETCS Level 1 across both passenger and freight services due to these complexities. This case study highlights how KiwiRail is leading in this space, demonstrating how thoughtful engineering design, underpinned by robust assurance and governance, can deliver improved system safety outcomes.

Drone assistance for search and rescue operations

Presented by Matthew Bakker

Search and rescue operations often occur in hazardous, inaccessible, or time-critical environments where visibility, mobility, and safe access severely limit the effectiveness of traditional response methods. From collapsed structures and flood zones to remote wilderness areas, locating people quickly can be the difference between life and death.

This presentation explores how Unmanned Aerial Vehicles (UAVs), or drones, can enhance search and rescue through aerial localization of people, vehicles, and other targets. Particular focus is given to the use of cooperative drone swarms, which share information and work together to improve coverage, overcome GPS limitations, and accelerate target detection in challenging environments.

Drawing on real-world disaster response applications and an ongoing honours research project, the session demonstrates how UAV localization technologies can be adapted for environments where conventional search methods are slow, difficult, or unsafe. Attendees will gain insight into a simulated implementation of swarm-based localization and the potential benefits of improved search accuracy, faster response times, and reduced risk to rescue personnel. The presentation highlights how engineering innovation can improve operational outcomes while keeping responders out of harm's way.

When SFAIRP Isn't Enough: A Workshop on Balancing Asset Risk and System Safety

Presented by Jennifer Critchley

SFAIRP provides a well-established basis for demonstrating that risks have been reduced so far as is reasonably practicable. But does applying SFAIRP to individual assets always lead to the safest outcome for complex systems?

Using bridge assets in a national transport network as an example, this interactive workshop will challenge participants to consider the difference between two deceptively similar questions: *“Have we addressed the risks to a SFAIRP level?”* and *“Is this where the next intervention should be made (and dollar spent)?”*

Through a series of facilitated decision-making exercises, attendees will explore how engineering decisions can change as wider system context is introduced and discuss whether an asset-focused approach to risk management can sometimes lead to unintended or sub-optimal safety outcomes. The workshop will examine how engineers can balance local risk reduction with system-level risk optimisation to achieve the greatest overall improvement in safety.

Prevention of Potential Technological Disasters by Adopting an Innovative Pedagogical Strategy in Engineering Education and Professional Development

Presented by Dr Sergiy Klymchuk

This talk presents an innovative pedagogical strategy of the use of deliberately misleading questions in engineering education and professional development. For example, engineering students/trainees might be asked to design a bridge using given parameters that make the task impossible or dangerous – without being told that this is the case. Or to create a faulty electrical circuit diagram, again without being informed of the flaw. The idea is to enhance their critical thinking skills to a level where they can recognise mistakes at the planning stage and prevent potential technological disasters. The rationale of the strategy can be illustrated using real-world examples where simple and avoidable mathematical mistakes at the engineering design stage caused loss of income, a company's reputation or even contributed to tragedy.

The talk relates to the theme “Innovative engineering solutions that prioritize safety in design and execution”. Feedback on the suggested strategy is welcomed.

PEN Faults in Practice: Lessons from Recent Regulatory Changes

Presented by Daniel Müller

This practical, hands-on session examines the real-world implications of a change introduced by the Electricity Safety Amendment Regulations 2025, which deleted two clauses from Part 2 of the Wiring Rules — clauses that had prohibited switching of the Protective Earth and Neutral (PEN) conductor.

Using custom-built demonstration equipment, the session will visually illustrate the consequences of an open-circuit PEN conductor and the risk it poses to anyone near such an installation.

Attendees will come away with a clearer understanding of the underlying electrical principles, the stated intent behind the regulatory change, and why the two deleted clauses must be reinstated to ensure safe, compliant installations.

Designed to prompt discussion, the presentation offers practical insight for engineers, electricians, regulators, and other industry stakeholders.

Presenter Bios

Michael Belsham is a Chartered Professional Fire Engineer with more than 25 years of experience and a Masters degree in Fire Engineering from the University of Canterbury. His career spans New Zealand and Scotland, where he served as Principal Fire Engineer on major projects in Glasgow, Edinburgh, and Aberdeen.



Following his contribution to the MBIE Fire Programme Review, Michael founded BelshamFire Ltd in 2020, providing specialist fire engineering design, peer review, and training services across New Zealand. His technical focus areas include cold storage facilities, modular construction, and electric vehicle safety.

Michael is also an active educator, leading the New Zealand Diploma of Engineering (Fire Engineering), teaching fire safety for the Diploma of Building Survey (Level 6), and lecturing the micro-credential Means of Escape.

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Dominique Tharandt is a chemical engineer with more than 24 years of industry experience spanning chemical development, product development, process optimisation, project engineering, and project management. She holds a Bachelor of Science in Chemical Engineering and a Master of Science specializing in corrosion resistance. Dominique is a Chartered Member of Engineering New Zealand and a member of the Institution of Chemical Engineers (IChemE).



Currently a Project Manager with Apex Water, Dominique specializes in the design and delivery of water and wastewater treatment facilities. Throughout her career, she has worked on a wide range of projects, including industrial effluent treatment systems, precious metals refining facilities with water recovery processes, and large-scale water treatment infrastructure. Notable projects include the design and delivery of the Motueka Water Treatment Plant, providing safe drinking water to approximately 3,500 residents.

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James Hayter is a Principal Safety Engineer and founder of Safety Engineering Services, an independent New Zealand consultancy specialising in machinery safety, engineered risk controls and workplace emergency response. He has more than 10 years' experience across engineering leadership, operations, health and safety management, and safety project delivery in manufacturing, construction and other high-risk industries.



James holds a Bachelor of Engineering with Honours in Mechanical Engineering, a Postgraduate Diploma in Occupational Health and Safety Management, and is a Certified Machinery Safety Expert through TÜV NORD. He also holds Marine Medic training.

His work focuses on translating standards and risk assessments into practical, field-ready systems that perform under real operating conditions. Drawing on this operational experience, James developed the Emergency Response Model, a site-specific system built around credible workplace emergencies and effective team performance.

Andrew Hunt is a chartered professional (mechanical) engineer, a fellow of Engineering NZ and the Chartered Institute of Logistics and Transport (NZ). He has over 45 years of experience across the engineering, operating and commercial environments of Aotearoa New Zealand's rail industry.



A respected industry leader, Andrew received the inaugural RTSA Railway Professional of the Year Award in 2020 for his contribution to railway engineering and safety. He was instrumental in establishing the New Zealand chapter of the Railway Technical Society of Australasia (RTSA) and has served in numerous leadership roles within the organisation, promoting technical excellence and professional development across the rail sector.

Andrew is recognised for his practical, evidence-based approach to engineering and his unwavering commitment to maintaining high safety standards. His extensive experience provides valuable insight into rail engineering, safety governance, and the challenges of operating both modern and heritage railway systems.

He has had lengthy connection with heritage organisations operating vintage rolling stock on the main line in the context of network access standards, and in semi-retirement has continued to serve on the joint industry Heritage Technical Committee as an appointment of the Federation of Rail Organisation of NZ (or FRONZ), which he does in a voluntary capacity.

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Gabriella Solti is a system safety and assurance leader with extensive experience across a range of high-risk industries including rail, oil and gas, and chemical.

Over the past 14 years in the rail sector, she has worked on large and complex projects on both the client and delivery sides and held system safety lead roles on City Rail Link, Auckland Light Rail, and KiwiRail, as well as roles with the Auckland Metro Rail Operator.



In her current position, Gabriella leads the systems assurance function at KiwiRail, supporting successful project delivery across a large programme of works. She specialises in the assurance and demonstration of achievement of system safety and operational outcomes.

Gabriella won the TrackSAFE Foundation New Zealand Safety Leadership Award in 2025 for her sustained and exemplary safety leadership in the New Zealand rail industry.

Matthew Bakker is a final-year Bachelor of Engineering (Honours) student in Software Engineering at Victoria University of Wellington. He has developed a strong foundation in software development, engineering design, and technology problem-solving through his academic studies and practical project work. Matthew is passionate about creating innovative digital solutions and is building expertise in software engineering principles, systems development, and emerging technologies. As he completes his degree, he is focused on applying his technical skills to real-world challenges and contributing to the advancement of New Zealand's technology sector.

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Jennifer Critchley is a highly experienced Chartered Professional Structural Engineer with specialist expertise in asset management and condition assessment of all types of structures.

She brings over 20 years of experience, spanning buildings, rail infrastructure and government sectors. Jennifer is passionate about finding pragmatic, simple solutions to complex problems—whether in the design of new residential and commercial buildings or the management of existing infrastructure. Her career spans hands-on technical practice and senior leadership roles, consistently delivering value through systems thinking and strategic insight.



Jennifer has specialist experience in the emergency recovery of damaged structural assets (including both bridges and buildings), providing rapid condition assessments, risk evaluations, and stabilisation strategies under urgent or evolving conditions.

She also brings strong expertise in asset data—supporting clients to collect, structure, interpret, and apply data effectively to inform decision-making, prioritisation, and long-term planning.

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Dr Sergiy Klymchuk is an Associate Professor of Mathematics at Auckland University of Technology (AUT) and founding Director of the STEM Tertiary Education Centre (STEM-TEC). He has taught university mathematics since 1980 and joined AUT in 2000. His research focuses on mathematics education, critical thinking, creativity, and innovative approaches to STEM learning.

Sergiy has authored or co-authored more than 250 publications, including the award-winning *Counterexamples in Calculus* and the internationally acclaimed *Money Puzzles: On Critical Thinking and Financial Literacy*. A Fellow of the Institute of Mathematics and its Applications (UK) and a member of Royal Society Te Apārangi, he is internationally recognised for developing teaching methods that strengthen problem-solving, adaptive thinking, and decision-making skills in STEM education.



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Daniel Müller is an electrical and industrial engineer with extensive hands-on experience across building services, industrial controls, automation, telecommunications, energy, water infrastructure, defence systems, and engineering safety. A graduate of the University of Pretoria, he has worked in both military and civilian sectors, combining field experience with engineering design, project delivery, and technical leadership.

Daniel is Director of Debulec Limited, a Chartered Member of Engineering New Zealand, and a Registered Electrical Engineer with the Electrical Workers Registration Board. He serves on the committees of both the Electrical Engineering Group (EEG) and the New Zealand Society for Engineering Safety (NZSES) and has previously contributed to AS/NZS Standards development.

Daniel leads the EEG's effort in support of Engineering New Zealand's opposition to PEN conductor switching and has worked closely with the Electrical Inspectors Association and the wider engineering profession in examining the safety and regulatory implications of the PEN switching issue.

ABOUT US

Founded in 2014 the New Zealand Society for Engineering Safety (NZSES) is a Technical Interest Group of Engineering New Zealand.

In 2025 we changed our name from the New Zealand Society for Safety Engineering to more accurately convey our purpose and appeal to a wider audience whose professional activities influence health and safety outcomes.



OUR PRINCIPLES:



That the health and safety of people in current and future generations is important



That engineering design and technology should be used to solve problems and drive improvements in health and safety outcomes



Health and Safety is of equal importance to all other engineering considerations (such as cost, schedule, constructability and environmental impact).



That as designers, project managers and reviewers, engineers are in a pivotal position to influence H&S outcomes