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Safety in Design: Front-End Loading Risk Management for Projects

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ABSTRACT

Engineering project delivery methods for developing an initial idea through concept selection and detailed design into an operational facility are well-defined. It is also well understood that front-end loading, the investment of time and effort to understand the scope, costs and risks of a project, leads to improved project effectiveness [1].

For process safety and critical risk management, early identification of hazards and risks is essential to ensure the project's design eliminates or minimises risk so far as is reasonably practicable (SFAIRP), while avoiding unnecessary project costs and schedule delays. Using an integrated Safety in Design approach supports front-end loading of risk management into engineering project delivery, enabling the implementation of control measures that eliminate and significantly minimise critical risks early in a project when they are the cheapest to implement [2]. This paper sets out a methodology for effectively integrating Safety in Design into engineering project delivery.

Safety in Design involves anticipating hazards in advance and designing appropriate control measures ahead of time. A hazard identification is conducted early in the feasibility/concept phase of a project to identify hazards and risks for each stage of a facility's lifecycle. The temporal HAZID provides a framework for planning the project's critical risk management deliverables and reviews, defining the key risk decisions and the timing that is required to demonstrate that the design eliminates or minimises risks so far as is reasonably practicable.

This approach aligns with the requirements in both New Zealand's Health and Safety at Work Act 2015 and Australia's Model Work Health and Safety Act 2011. Both place a duty on employers to:

1. Identify hazards that could give rise to reasonably foreseeable risks to health and safety,
2. Eliminate risks so far as is reasonably practicable, and
3. If it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks SFAIRP by applying a hierarchy of risk minimisation methods (Hierarchy of controls)

The Safety in Design approach ensures projects know their risks, and make the right decisions at the right time to reduce their risks so far as is reasonably practicable.

[1] Smallwood, N (2020) Setting up for success: The Importance of Front-End Loading – Infrastructure and Projects Authority
[2] McMullan, R (2019) A study of the application of Safety in Design in recent transportation infrastructure projects in New Zealand
[3] Ruth, D (2025) *Safety in Design*, Safety Solutions Ltd

KEY WORDS

"Safety in Design", Inherent Safety, Critical Risk Management

BIOGRAPHY

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