



PLANNING MALAYSIA:

Journal of the Malaysian Institute of Planners

VOLUME 24 ISSUE 2 (2026), Page 408 – 421

AN EXAMINATION OF DESIGN FOR SAFETY LEGISLATION IN CONSTRUCTION ACROSS MALAYSIA, UNITED KINGDOM, NEW ZEALAND, AUSTRALIA, AND SINGAPORE: A DOCTRINAL ANALYSIS APPROACH

**Mashitah Mohamad Hanafiah^{1,5}, Mazlina Zaira Mohammad²,
Nor Syamimi Samsudin³, Natasha Khalil⁴, Siti Azira Abd Rahim⁵**

^{1,2} Faculty of Civil Engineering,

UNIVERSITY OF TECHNOLOGY MARA, SHAH ALAM

^{3,4} Department of Built Environment Studies and Technology,

Faculty of Architecture, Planning and Surveying,

UNIVERSITY OF TECHNOLOGY MARA, PERAK BRANCH.

^{1,5} Faculty of Engineering and Quantity Surveying,

UNIVERSITY OF TECHNOLOGY MARA

INTI INTERNATIONAL UNIVERSITY

Abstract

This study undertakes a doctrinal analysis of Design for Safety legislation within the construction sectors of Malaysia, the United Kingdom, New Zealand, Australia, and Singapore. The research identifies commonalities and divergences in how each jurisdiction integrates safety considerations during the design phase to mitigate construction risks by examining statutory frameworks, regulatory duties, and enforcement mechanisms. The study further contextualizes legal provisions through a comparative evaluation of construction accident data from 2023, revealing correlations between legislative rigor and safety outcomes. The findings indicate that while all jurisdictions emphasize early hazard identification and risk elimination, differences in enforcement practices and stakeholder responsibilities impact effectiveness. Malaysia's recent 2024 regulations demonstrate progressive alignment with international best practices. The paper contributes to legal scholarship by highlighting the pivotal role of design-focused legislation in advancing occupational safety, offering insights for policymakers and industry stakeholders aiming to enhance construction safety through proactive legal frameworks.

Keywords: Design for Safety, Construction for Safety Legislation, Doctrinal Analysis, Malaysia, United Kingdom, New Zealand, Australia, Singapore

¹ Corresponding author. Email: mashitahhanafiah@gmail.com

INTRODUCTION

The construction industry is recognized for its high incidence of occupational injuries and fatalities globally, demanding robust legislative frameworks to mitigate risks (Lingard & Rowlinson, 2004) (J. A. Gambatese et al., 2008). Legislative approaches have varied across jurisdictions but have typically focused on clear allocation of responsibilities, comprehensive risk management, and enforcement to ensure safety during design and construction phases (Haslam et al., 2005) (Loosemore & Andonakis, 2007).

Malaysia's new Occupational Safety and Health (Construction Work) (Design and Management) Regulations 2024 (Government of Malaysia, 2024) represent a significant development in its occupational safety and health (OSH) legal landscape. However, to evaluate the effectiveness and potential gaps of this legislation, a comparative analysis with established frameworks such as the United Kingdom's Construction (Design and Management) Regulations 2015 (UK Government, 2015), New Zealand's Health and Safety at Work Act 2015 (New Zealand Government, 2015), Australia's Work Health and Safety Act 2011 (New South Wales Government, 2011), and Singapore's Design for Safety Regulations 2015 (Minister of Manpower, 2015) is critical.

In Design for Safety (DfS) legislation, the main legal key player is duty holders who are assigned to manage safety risk and typically include clients, designers and contractor (Hussain et al., 2025). Whereas in United Kingdom jurisdiction, Principal Designer is formally appointed to manage safety consideration during pre-construction stage to ensure risk information communicated at the earliest possible among project participants (Gambatese et al., 2008) and similar approach adopted by Malaysia (Government of Malaysia, 2024)

This paper uses doctrinal legal analysis to systematically examine these legislations, focusing on their provisions regarding duty holders, risk management, worker participation, and enforcement. The paper thus seeks to identify lessons for Malaysia's regulatory improvements and contribute to the broader academic discourse on construction safety law.

LITERATURE REVIEW

Construction as a globally hazardous field of employment

Construction has been widely recognized as a high-risk industry, consistently exhibiting elevated rates of occupational accidents and fatalities worldwide. Referring to Figure 1, data recorded in 2023, Malaysia reported 88 construction-related fatalities and approximately 5379 major injuries, indicating significant safety challenges within its construction sector (Malaysia, 2024). The United Kingdom recorded 51 fatalities and around 2390 major injuries, reflecting

ongoing efforts to improve safety despite persistent risks (Statistics, 2024), while Australia's construction industry saw 53 fatalities and roughly 16,600 major injuries in 2023 (Safe Work Australia, 2024). New Zealand reported close to 100 fatalities and 33,000 injuries related to the construction industry during this period, showcasing considerable risks (WorkSafe New Zealand, 2024). Singapore reported 54 fatalities and 167 major injuries, indicative of its rigorous safety regulations and enforcement mechanisms (Ministry of Manpower, 2023). The data show a significant number of the incidents reported have resulted in fatality. These figures underscore the critical importance of effective design for safety legislation and enforcement in mitigating risks in this inherently hazardous sector.

Country	Construction (2023)	
	Fatality	Serious Injuries
Malaysia	88	5378
United Kingdom	51	2390
Australia	53	16,600
New Zealand	100	33,000
Singapore	54	167

Figure 5: Construction Industry Fatalities and Major Injuries 2023

Source: Department of Statistics Malaysia (2024), Safe Work Australia (2024), WorkSafe New Zealand (2024), Ministry of Manpower Singapore (2023), and National Statistical United Kingdom (2024)..

Design for Safety

Design for Safety (DfS) is an increasingly influential approach within occupational safety and health (OSH) which advocates for integrating hazard identification and elimination during the design phase of construction projects, rather than relying solely on controls implemented during construction or operations (J. A. Gambatese et al., 2008). This preventive strategy aligns with the hierarchy of controls, placing elimination and substitution above administrative controls and personal protective equipment (Hinze & Wiegand, 1992). Scholars have argued that engaging designers early in the safety process is critical since many hazards originate in design decisions such as choice of materials, construction methods, or sequencing (Smallwood & Haupt, 2005). For instance, design can reduce the need for work at heights or eliminate confined spaces, thus minimizing exposure to risks (Gambatese, 2005).

Furthermore, DfS facilitates more comprehensive risk assessments by including a broader range of stakeholders at the project inception stage (Loosemore & Andonakis, 2007). Several empirical studies have supported the

efficacy of DfS. Gambatese et al., (2008) highlighted case studies in which design modifications led to substantial reductions in on-site accidents. Similarly, Hinze & Wiegand (1992) have underscored that over 50% of construction accidents could be prevented through design changes. However, challenges remain in embedding DfS principles in practice, including limited awareness among designers, lack of regulatory enforcement, and fragmented communication among project participants (Loosemore & Andonakis, 2007).

Proactive Legislation

In response, jurisdictions like Singapore have pioneered statutory requirements mandating design hazard elimination, evident in their Workplace Safety and Health (Design for Safety) Regulations 2015 (Minister of Manpower, 2015). The UK's CDM Regulations 2015 also reflect this shift by establishing the Principal Designer role with explicit safety duties (UK Government, 2015). These legislative innovations aim to overcome traditional barriers by formalizing safety responsibilities during design.

Despite these advances, Malaysia's previous OSH framework had limited explicit focus on safety through design, often resulting in reactive rather than proactive safety management. The introduction of Malaysia's Occupational Safety and Health (Construction Work) (Design and Management) Regulations 2024 (Government of Malaysia, 2024) marks a critical opportunity to embed DfS principles into national law, improving risk elimination at source and aligning with global best practices. In summary, the literature demonstrates that design for safety is essential for effective construction safety management. Legal frameworks which explicitly mandate and enable DfS are more likely to reduce occupational accidents and foster a culture of proactive hazard prevention.

Mandatory enforcement as a Design for Safety implementation force

Effective enforcement is vital to the successful implementation of social legislation, and legislation that is not enforced rarely fulfills its social objectives (Gunningham, 2010). It is one of the undeniable barriers to implementing PtD is the legal requirement and enforcement (J. A. Gambatese et al., 2017) (J. Gambatese et al., 2005). Researchers believe that a mandatory legal framework is important to ensuring the successful implementation of PtD. For example, Christermaller et al., (2022) and Asmone et al., (2022) suggested that mandatory legislation is more effective in compliance among construction key players due to its punitive nature.

Despite increased awareness of PtD in construction, Poghosyan et al. (2018) indicated that only a small amount of research investigating legislation issues in regard to the said concept. Similarly, Martínez-Aires et al. (2016) stated

that very few studies investigated the implementation of PtD regulations. In an earlier study, Martínez Aires et al. (2010) stated that even though PtD regulation is a significant driving force of the concept, there is a paucity of research about it. Study shows that publications related to PtD have been actively published since 2008 and especially doubled since 2020. However, studies that explored the topics of PtD regulations and legislation remained isolated. No study has been conducted to compare the differences in the policies and practices of different countries (Jin et al., 2023). Thus, to address the study gap, this paper is to provide an overview of the legal framework component and compare it with Malaysia's newly established Occupational Safety and Health (Construction Work) (Design and Management) Regulations 2024.

RESEARCH METHODOLOGY

This study adopts a doctrinal legal research methodology, a well-established qualitative approach in legal study focused on analyzing and interpreting legal texts, such as statutes, regulations, case law, and related official materials (Hutchinson & Duncan, 2012; McConville & Chui, 2017). Doctrinal research systematically examines the “black letter” law to clarify legal rules, principles, and institutional frameworks, enabling a rigorous comparison of legislative instruments across jurisdictions (Hutchinson & Duncan, 2012). The methodological steps for this research included the following:

Identification and Collection of Primary Legal Sources

The primary data consist of official legislation documents which are the Occupational Safety and Health (Construction Work) (Design and Management) Regulations 2024 (Malaysia), Construction (Design and Management) Regulations 2015 (UK), Health and Safety at Work Act 2015 (New Zealand), Work Health and Safety Act 2011 (Australia), and Workplace Safety and Health (Design for Safety) Regulations 2015 (Singapore). These documents were sourced from official government websites and legal databases to ensure their authenticity and currency (McConville, 2017).

Thematic Legal Analysis

The legal texts were analyzed according to key thematic categories relevant to construction safety legislation: scope, duty holders, risk management, worker participation, enforcement, and penalties (Hames & Ekern, 2017). This thematic framework allows for systematic comparisons, while capturing the substantive regulatory features that influence occupational safety outcomes

Comparative Legal Framework

Employing the comparative method within doctrinal research, the study juxtaposes statutory provisions to identify convergences and divergences in legal approaches and regulatory design (Zweigert & Kötz, 1998). The findings from textual analysis and contextual interpretation were synthesized to assess the adequacy of Malaysia's recent legislative reforms against international best practices. This step aims to identify gaps and potential improvements informed by doctrinal insights and existing literature (Gardiner & Hutchinson, 1989). This doctrinal approach is appropriate for legal studies aiming to clarify legal standards and compare regulatory frameworks without empirical field data, ensuring a rigorous and systematic legal evaluation. This doctrinal approach also allows for both a comprehensive understanding of the regulatory frameworks, and their potential impact on construction occupational safety.

ANALYSIS AND DISCUSSION

Result

Through doctrinal research methodology, the research is compared and analyzed in terms of six elements, namely legal structures, scope and coverage, duty holders and responsibilities, risk management and safety planning, worker engagement and consultation, and finally enforcement mechanisms and penalties, as summarized in Figure 2.

Element	Malaysia OSH (Construction Work) (Design and Management) Regulations 2024	United Kingdom CDM Regulations 2015	Singapore WSH (Design for Safety) Regulations 2015	New Zealand Health and Safety at Work Act 2015	Australia WHS Act 2011
Legal Structure	5 Parts (Reg. 1–39)	5 Parts (Reg. 1–39)	5 Parts (Reg. 1–13)	5 Parts (Sec. 3–232)	14 Parts (Sec. 1–276)

Mashitah Mohamad Hanafiah, Mazlina Zaira Mohammad, Nor Syamimi Samsudin, Natasha Khalil, Siti Azira Abd Rahim

AN EXAMINATION OF DESIGN FOR SAFETY LEGISLATION IN CONSTRUCTION ACROSS MALAYSIA, UNITED KINGDOM, NEW ZEALAND, AUSTRALIA, AND SINGAPORE: A DOCTRINAL ANALYSIS APPROACH

Element	Malaysia OSH (Construction Work) (Design and Management) Regulations 2024	United Kingdom CDM Regulations 2015	Singapore WSH (Design for Safety) Regulations 2015	New Zealand Health and Safety at Work Act 2015	Australia WHS Act 2011
Scope & Coverage	Applies to all construction projects; focuses on design & management safety (Reg. 2)	Covers construction projects from inception to completion; excludes mineral extraction (Reg. 2)	Specific to construction safety, focuses on design hazard elimination (Reg. 3)	Broad coverage of all workplaces; applies to construction ; excludes army, volunteers, prisoners (Sec. 15–18)	Broad workplace law: construction included exclusions like NZ (Sec. 20–26)
Duty Holders & Responsibilities	Principal Designer (Reg. 7), Client, Contractors	Principal Designer (Reg. 13), Client, Contractors	Developer, Designer, Contractor (Reg. 4–10)	PCBU (Sec. 17), Officers (due diligence)	PCBU (Sec. 27), Officers (due diligence)
Risk Management & Safety Planning	Safety & Health Plan pre-construction (Reg. 11)	Pre-construction risk assessments & ongoing reviews (Reg. 13)	Eliminate/reduce design risks at source (Reg. 9–10)	Continuous risk identification and control (Sec. 30)	Hazard ID, control & consultation throughout (Sec. 27)
Worker Engagement & Consultation	Workers involved via principal contractor (Reg. 17)	Strong emphasis on worker involvement (Reg. 15)	Developer ensures safety via collective measures (Reg. 4)	Worker participation legally required (Sec. 58)	Worker consultation & representation (Sec. 47)
Enforcement & Penalties	Fine ≤ RM500,000 &/or imprisonment ≤ 1 year	No fixed fine or prison term specified in regulations	Fine SGD 10,000–20,000 &/or imprisonment ≤ 12 months	Fine ≤ NZD 3 million &/or imprisonment ≤ 5 years	Fine ≤ AUD 3 million &/or imprisonment ≤ 5 years

Figure 6: A comparative summary table of PtD legal frameworks across countries.

Legal Structures

Occupational Safety and Health (Construction Work) (Design and Management) Regulation 2024 is divided into 5 parts namely preliminary regulations 1 to 3, client duties regulations 4 to 9, duties relation to safety and health regulations 10 to 17, general requirements for all construction sites detailed in regulation 18 to 37 and miscellaneous regulation 38 to 39. The Construction (Design and Management) Regulations 2015 is a United Kingdom legal framework related to safety for design and construction work.

The regulation is structured into five parts, with Regulations 1 to 3 as the introduction of the regulation; regulations 4 to 7 about client duties; and regulations 8 to 15 stipulate health and safety duties and roles. General requirements for all construction sites are codified under Part 4 from Regulation 16 to 35. Lastly, Regulations 36 until 39 describe the general application of the legal book. Workplace Safety and Health (Design for Safety) Regulations 2015 under Singapore jurisdiction is divided into 5 parts, namely Preliminary from Regulation 1 to 3; duties of Developer Regulation from 4 to 8; duties of Designer and Contractor Regulation from 9 to 10; and lastly miscellaneous from 11 to 13. The Health and Safety at Work Act 2015 regulates occupational safety and health practices in New Zealand. The act is divided into five parts, including health and safety at work from Section 3 until 29; part 2 regarding health and safety duties stipulated under Sections 30 to 57; and Section 58 to 99 codified under Part 3 regarding worker engagement, participation, and representation. Enforcement and other matters in part 4 include Sections 100 to 188.

Lastly, miscellaneous matters are under part 5 from Section 189 under 232. In the context of Australia for occupational safety and health, the Work Health and Safety Act 2011 is relevant. The act is divided into 14 parts, namely preliminary from Section 1 until 12A, part 2 health and safety duties which are stipulated in Section 13 until 34. Notification in Part 3 is from Section 35 until 39, and Part 4 of the Act from Section 40 until 45 is regarding authorization. Part 5 is consultation, representation, and participation from Sections 46 to 103. Part 6 codifies matters of discriminatory, coercive, and misleading conduct under Section 104 until 115. Part 7 includes Sections 116 to 151 regarding workplace entry by WHS entry permit holders. Sections 152 to 155 in part 8 are about the regulator. Part 9 from Section 156 until 190 stipulates securing compliance, Part 10 of enforcement measures is in Sections 191 to 215, and Part 11 is enforcement undertaking in Sections 216 to 222. Part 12 is a review of the decision from Section 223 to 229 and part 13 is a legal proceeding from Section 229A until 267. Lastly, part 14 is a general requirement of the act stipulated under Section 268 until 276.

Scope and Coverage

Malaysia's OSH (Construction Work) (Design and Management) Regulations 2024 comprehensively apply to all construction projects, emphasizing the integration of safety measures at the design and management stages as stated in Regulation 2 (Government of Malaysia, 2024). This aligns closely with the UK's CDM Regulations 2015, which govern construction health and safety from project inception to completion, emphasizing coordination among duty holders referring to Regulation 2(1)(a) until 2(1)(e) however not included exploration or extraction of mineral resources (Instruments, 2015).

Similarly, Singapore's Design for Safety Regulations 2015 focuses specifically on construction safety, mandating hazard elimination during design as stated in Regulation 3(1) (Minister of Manpower, 2015). New Zealand's HSWA 2015 takes a broader approach, regulating all workplaces, with specific duties for construction projects detailed within this general framework, however disapplication to the army, volunteer workers, and prisoners as in Section 15 to Section 18 (Act, 2015). The same applies to Australia's WHS Act 2011 which is detailed under Division 3, Section 20 to Section 26 (New South Wales Government, 2011).

Duty Holders and Responsibilities

A clear delineation of duty holders is central to these frameworks. Regulation 7 of the Malaysian legal framework and Regulation 13 of the United Kingdom's legal framework each designate a Principal Designer role, responsible for coordinating design-stage safety, supported by clients, contractors, and workers. Likewise, in Part 3 of the Singapore Act, specifically Section 9 and Section 10, Singapore mandates designers and contractors to eliminate hazards early, promoting collaboration with clients and contractors to ensure safety is embedded throughout the design and construction phases (Minister of Manpower, 2015).

In contrast, New Zealand and Australia employ a principle-based approach emphasizing the duty of officers to exercise due diligence to ensure compliance (Act, 2015) (New South Wales Government, 2011). This imposes active leadership accountability beyond prescriptive roles. In New Zealand, PCBU or a person conducting business or undertaking is outlined in Regulation 17, and there are similar highlights in Australia's act under Section 27 of Division 4.

Risk Management and Safety Planning

All jurisdictions prioritize risk management but differ in focus and timing. Malaysia requires detailed safety and health plans prior to construction commencement, emphasizing early-stage risk assessment. As stated under

Regulation 11(2), the construction work designer must consider preventing and eliminating any risk to the safety and health of a person during pre-construction as far as practicable.

A similar principle applies under Regulation 13 of the UK's CDM framework, which mandates detailed pre-construction information sharing and ongoing risk assessments to enable dynamic safety management. Singapore uniquely prioritizes design risk elimination or reduction at its sources as the duty of designers and contractors in Regulation 9 and Regulation 10, reflecting a proactive approach to preventing construction accidents. Section 30 of New Zealand imposed a duty to a person under this act, while Section 27 of Division 4 in Australia's legal framework focuses on continuous hazard identification, control, and worker consultation throughout a project's lifecycle.

Worker Engagement and Consultation

Effective worker engagement is a statutory requirement across all jurisdictions. Malaysia's regulations require principal construction work contractors to engage with workers and establish clear communication channels for workers and contractors during safety planning as stipulated in Regulation 17. The UK's CDM 2015 strongly emphasizes worker involvement to enhance hazard awareness and compliance and applies a similar practice to Malaysia as stipulated under Regulation 15. Part 3 and Section 58 of New Zealand's act and Part 5, Division 2 Section 47 of Australia codify that the person conducting business is to provide workers with consultation, as this is a core element of workplace health and safety, fostering participatory safety cultures.

Differing from this, Singapore requires the developer to ensure safety and eliminate all foreseeable risks through collective protective measures rather than personal collective measures and encourages ongoing collaboration between designers, contractors, and workers, aiming to integrate safety considerations at all project stages, as stipulated under Part 2 Regulation 4.

Enforcement Mechanisms and Penalties

Enforcement authorities vary between Malaysia, the United Kingdom, New Zealand, Australia, and Singapore, but each are empowered to monitor compliance and prosecute violations. Penalties commonly include financial fines and imprisonment for serious breaches, with recent Malaysian regulations adopting stricter sanctions to align with international standards with not more than RM500,000 fines and not more than 1 year of imprisonment or both.

The fines vary to not more than 3 million or imprisonment of not more than 5 years for New Zealand and Australia, emphasizing criminal liability for officers, encouraging proactive leadership accountability. Under Singaporean

Mashitah Mohamad Hanafiah, Mazlina Zaira Mohammad, Nor Syamimi Samsudin, Natasha Khalil, Siti Azira Abd Rahim

AN EXAMINATION OF DESIGN FOR SAFETY LEGISLATION IN CONSTRUCTION ACROSS MALAYSIA, UNITED KINGDOM, NEW ZEALAND, AUSTRALIA, AND SINGAPORE: A DOCTRINAL ANALYSIS APPROACH

regulations, fines for non-compliance range from 10,000 to 20,000 with not more than 12 months imprisonment. Differing from under the United Kingdom's legal framework, in the event of non-compliance, there is no stipulated fine value or imprisonment year.

Comparative Regulatory Approaches

While all jurisdictions incorporated key elements in their DfS framework, the application and implementation are different. Malaysia, United Kingdom and Singapore adopt role-based approach by designing clear responsibilities among design principles, contractor and client (Hussain et al., 2025). In contrast, New Zealand and Australia a principle-based framework focusing on Person Conducting Business or Undertaking (PCBU) which requires broader organizational accountability and due diligence (Burgemeestre et al., 2009). These differences highlight how regulatory philosophy influences the effectiveness of Design for Safety implementation across jurisdictions.

CONCLUSION

This doctrinal analysis demonstrates that Design for Safety (DfS) legislation across Malaysia, the United Kingdom, New Zealand, Australia, and Singapore share a foundational commitment to early hazard identification and elimination during the design phase of construction projects. All jurisdictions establish clear statutory duties for key factors such as designers, clients, contractors, and workers, and emphasize the importance of risk management, worker engagement, and proactive safety planning throughout the construction lifecycle. Malaysia's recently enacted Occupational Safety and Health (Construction Work) (Design and Management) Regulations 2024 notably align with international best practices, reflecting a progressive shift towards embedding DfS principles within national law.

While the legislative frameworks bear strong similarities in scope and intent, differences emerge in enforcement mechanisms and the delineation of responsibilities. For example, New Zealand and Australia's principle-based due diligence requirements for officers foster high accountability levels, while Singapore's regulations emphasize collective protective measures and collaboration among stakeholders. The United Kingdom's CDM Regulations maintain a structured approach with defined roles but lack specified penalties within the regulations themselves. Malaysia's new regulations introduce clearer punitive sanctions, potentially enhancing compliance and safety outcomes. The comparative analysis of construction accident data for 2023 has corroborated positive correlations between rigorous DfS legislation, enforcement, and improved safety performance. Jurisdictions with comprehensive and enforced

DfS laws, such as Singapore and Australia, report lower fatality and injury rates, underscoring the critical role of proactive legal frameworks in mitigating occupational hazards. In sum, this study affirms that embedding DfS into statutory frameworks is essential for advancing construction safety and reducing preventable accidents. Malaysia's 2024 regulations represent a significant step toward closing regulatory gaps and fostering a safety culture aligned with global standards. Future research should offer empirical evaluations of the regulations' practical implementation and their impact on industry behavior, thus bridging the current gap between legal theory and practice noted in existing literature (Jin et al., 2023) (J. A. Gambatese et al., 2017).

ACKNOWLEDGEMENT AND DISCLOSURE STATEMENT

The authors would like to credit University Technology MARA and INTI International University for its continuous support to complete this study. The authors also declared that there is no conflict of interest related to the work presented in this paper.

REFERENCES

- Asmone, A. S., Goh, Y. M., & Lim, M. S. H. (2022). Prioritization of industry level interventions to improve implementation of design for safety regulations. *Journal of Safety Research*, 82, 352–366. <https://doi.org/10.1016/j.jsr.2022.06.011>
- Australia, Safe Work. (2024). Key work health and safety statistics Australia 2024. September.
- Burgemeestre, B., Hulstijn, J., & Tan, Y. H. (2009). Rule-based versus principle-based regulatory compliance. *Frontiers in Artificial Intelligence and Applications*, 205, 37–46. <https://doi.org/10.3233/978-1-60750-082-7-37>
- Christermaller, F., Che Ibrahim, C. K. I., Manu, P., Belayutham, S., Mahamadu, A. M., & Yunusa-Kaltungo, A. (2022). Implementation of design for safety (DfS) in construction in developing countries: A study of designers in Malaysia. *Construction Economics and Building*, 22(2), 1–26. <https://doi.org/10.5130/AJCEB.v22i2.8105>
- Department of Statistics Malaysia. (2024). National occupational injury and disease statistics 2023.
- Gambatese, J. A., Behm, M., & Hinze, J. W. (2005). Viability of designing for construction worker safety. *Journal of Construction Engineering and Management*. <https://doi.org/10.1061/ASCE0733-93642005131:91029>
- Gambatese, J. A., Behm, M., & Rajendran, S. (2008). Design's role in construction accident causality and prevention: Perspectives from an expert panel. *Safety Science*, 46(4), 675–691. <https://doi.org/10.1016/j.ssci.2007.06.010>
- Gambatese, J. A., Pestana, C., & Lee, H. W. (2017). Alignment between lean principles and practices and worker safety behavior. *Journal of Construction Engineering and Management*, 143(1). [https://doi.org/10.1061/\(ASCE\)CO.1943-](https://doi.org/10.1061/(ASCE)CO.1943-)

[7862.0001209](https://doi.org/10.5204/qutlr.v5i0.321)

- Gardiner, D. G., & Hutchinson, T. (1989). Legal research materials and methods (Review of the book Legal research materials and methods, by E. Campbell). *QUT Law Review*, 5, 141–143. <https://doi.org/10.5204/qutlr.v5i0.321>
- Government of Malaysia. (2024). Occupational safety and health (construction work) (design and management) regulations 2024. May.
- Gunningham, N. (2010). Enforcement and compliance strategies. In R. Baldwin, M. Cave, & M. Lodge (Eds.), *The Oxford handbook of regulation*. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780199560219.003.0007>
- Haslam, R. A., Hide, S. A., Gibb, A. G. F., Gyi, D. E., Pavitt, T., Atkinson, S., & Duff, A. R. (2005). Contributing factors in construction accidents. *Applied Ergonomics*, 36(4), 401–415. <https://doi.org/10.1016/j.apergo.2004.12.002>
- Hinze, J., & Wiegand, F. (1992). Role of designers in construction worker safety. *Journal of Construction Engineering and Management*, 118(4), 677–684. [https://doi.org/10.1061/\(ASCE\)0733-9364\(1992\)118:4\(677\)](https://doi.org/10.1061/(ASCE)0733-9364(1992)118:4(677))
- Hocke Van. (2010). Methodology of legal research. *Methodologies of Legal Research. Which Kind of Method for What Kind of Discipline*, 111–121.
- Hussain, A., Che Ibrahim, C. K. I., Belayutham, S., Manu, P., & Cheung, C. (2025). Exploring regulatory capabilities for design for safety in construction: The case of Malaysia. *Built Environment Project and Asset Management*, 1–21. <https://doi.org/10.1108/BEPAM-03-2025-0077>
- Hutchinson, T., & Duncan, N. (2012). Defining and describing what we do: Doctrinal legal research. *Deakin Law Review*, 17(1), 83–119. <https://doi.org/10.21153/dlr2012vol17no1art70>
- Jin, Z., Gambatese, J., Karakhan, A., & Nnaji, C. (2023). Analysis of prevention through design studies in construction: A subject review. *Journal of Safety Research*, 84, 138–154. <https://doi.org/10.1016/j.jsr.2022.10.015>
- Lingard, H., & Rowlinson, S. (2004). *Occupational health and safety in construction project management* (1st ed.). Routledge. <https://doi.org/10.4324/9780203507919>
- Loosemore, M., & Andonakis, N. (2007). Barriers to implementing OHS reforms: The experiences of small subcontractors in the Australian construction industry. *International Journal of Project Management*, 25(6), 579–588. <https://doi.org/10.1016/j.ijproman.2007.01.015>
- Martínez-Aires, M. D., Rubio Gámez, M. C., & Gibb, A. (2010). Prevention through design: The effect of European directives on construction workplace accidents. *Safety Science*, 48(2), 248–258. <https://doi.org/10.1016/j.ssci.2009.09.004>
- Martínez-Aires, M. D., Rubio Gámez, M. C., & Gibb, A. (2016). The impact of occupational health and safety regulations on prevention through design in construction projects: Perspectives from Spain and the United Kingdom. *Work*, 53(1), 181–191. <https://doi.org/10.3233/WOR-152148>
- McConville, M., & Chui, W. H. (Eds.). (2017). *Research methods for law* (3rd ed.). Edinburgh University Press.
- Ministry of Manpower. (2015). Workplace safety and health (design for safety) regulations 2015.

- Ministry of Manpower. (2023). Singapore workplace safety and health report 2023.
- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research. *International Journal of Qualitative Methods*, 22, 1–18. <https://doi.org/10.1177/16094069231205789>
- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research. *International Journal of Qualitative Methods*, 22, 1–18. <https://doi.org/10.1177/16094069231205789>
- New South Wales Government. (2011). Work Health and Safety Act 2011.
- New Zealand Government. (2015). Health and safety at work act 2015 no 70 (as at 28 October 2021), public act contents – New Zealand legislation. <https://www.legislation.govt.nz/act/public/2015/0070/latest/DLM5976660.html>
- Office for National Statistics. (2024). Construction statistics in Great Britain, 2024.
- Poghosyan, A., Manu, P., Mahdjoubi, L., Gibb, A. G. F., Behm, M., & Mahamadu, A. M. (2018). Design for safety implementation factors: A literature review. *Journal of Engineering, Design and Technology*, 16(5), 783–797. <https://doi.org/10.1108/JEDT-09-2017-0088>
- Smallwood, J., & Haupt, T. (2005). The need for construction health and safety (H&S) and the construction regulations: Engineers' perceptions. *Journal of the South African Institution of Civil Engineering*, 47(2), 2–8.
- UK Government. (2015). Health and safety the construction (design and management) regulations 2015. 1975(51), 1–32.
- Worksafe New Zealand. (2024). Work health and safety: An overview of harm and risk in Aotearoa New Zealand 2024.

Received: 11th November 2025. Accepted: 13th January 2026