

University of Wales Trinity Saint David. CertHE Applied Leadership and Management Outreach

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Construction Site Safety

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BMSK 4014: Problem Solving and Decision Making - Construction Site Safety

1 - Introduction

In the construction industry, ensuring a safe working culture on busy construction sites remains a constant challenge. A complex problem identified is frequent near-miss incidents stemming from non-adherence to safety protocols, such as failing to wear personal protective equipment (PPE) or disregarding safety barriers around hazardous areas (Health and Safety Executive [HSE], 2023). This problem is critical as it heightens the risk of serious injuries or fatalities, disrupts project timelines, and raises concerns about regulatory compliance with bodies like the HSE in the UK. The issue impacts workers, who face immediate physical dangers and psychological stress; supervisors and managers, who must divert time from productivity to address safety breaches; and the organisation, which risks penalties, reputational damage, and increased insurance premiums. External stakeholders, including clients and regulators, may also suffer from delays in project delivery and loss of confidence in the industry's standards.

Such breaches may result from factors like inadequate training, a weak safe working culture, fatigue, or conflicts between productivity demands and safety measures (Umar, 2021). For example, in the UK, the construction industry accounts for a high proportion of workplace fatalities, with 45 deaths reported in 2022/23, often linked to falls from height or being struck by moving vehicles (Health and Safety Executive, 2023). Addressing this requires a comprehensive approach, as unresolved issues lead to operational inefficiencies, financial losses, and long-term harm to staff morale. This report analyses the problem using various tools, proposes solutions, evaluates them, and outlines implementation and communication plans to foster a safer construction environment. By prioritising safety, organisations can meet legal obligations under the Health and Safety at Work etc. Act 1974 while enhancing overall project efficiency and sustainability (Carter, 2023).

2 - Problem Analysis

Before we take a look into specific analytical tools, it is essential to outline the broader context of construction site safety issues. The construction sector in the UK is one of the most hazardous industries, with statistics indicating that workers are four times more likely to be killed at work compared to the average across all sectors (HSE, 2023). Common problems include falls from height, slips and trips, exposure to harmful substances, and machinery accidents, often exacerbated by poor adherence to protocols. These issues are compounded by factors such as tight deadlines, subcontractor involvement, and varying levels of worker experience. Analysing this problem requires creative and structured

methods to uncover root causes and potential solutions, ensuring a holistic understanding that informs effective interventions.

3 - Brainstorming

To understand effective idea generation, it's useful to first define what it entails.

Brainstorming is a group creativity technique designed to generate a large number of ideas for solving a problem (Atlassian, 2024). Employing this for issues like construction site safety is beneficial as it yields diverse ideas, solutions, and perspectives not immediately obvious. Since it fosters inventive thinking and idea creation, it's key for tackling complex challenges without clear answers, such as ignoring safety protocols. This process gathers varied input from team members, including site managers, workers, health and safety officers, and subcontractors, resulting in stronger outcomes. Rather than focusing on one remedy, it allows the exploration of multiple options, from enhanced training to technological additions like wearable alert systems. Moreover, it helps identify underlying issues initially overlooked, such as attitudes hindering safety adoption or limited resources. Collaboration ensures everyone is invested in resolution, producing more detailed and robust ideas.

Potential Causes:

- Lack of adequate training on safety protocols
- Weak safety culture and management commitment
- Fatigue from long working hours
- Inadequate PPE availability or poor quality
- Poor site layout and signage
- Pressure to meet deadlines overriding safety concerns

Possible Solutions:

- Implementing mandatory interactive safety training sessions
 - Introducing incentives for safe behaviour
 - Enhancing site signage and PPE distribution
 - Using technology like drones for site monitoring
 - Strengthening enforcement through regular audits
 - Fostering a positive safety culture via leadership workshops
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4 - Mind Mapping

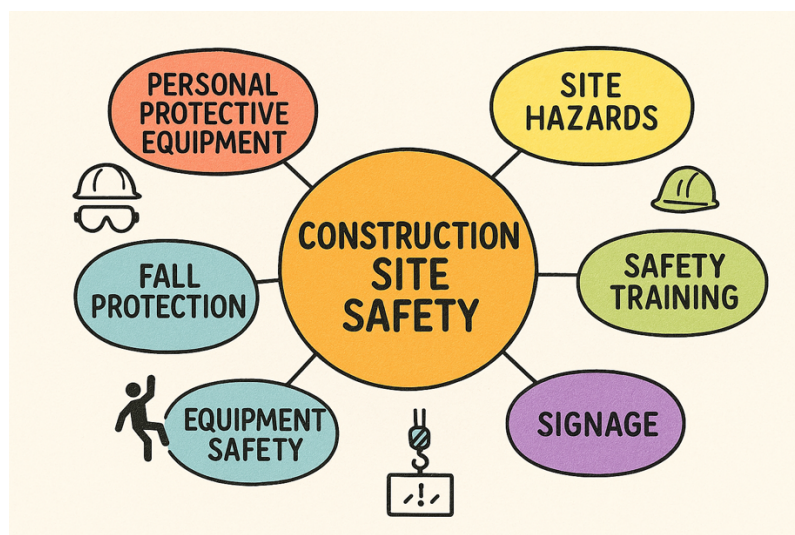
We use mind mapping because it organises and visually analyses various aspects of the issue and potential solutions for construction site safety breaches. Mind maps provide a pictorial method to sort ideas centred on a main theme, incorporating words, colours, images, and numbers to highlight concepts and link them (Colman, 2016).

Reasons why we Mind Map:

Visual Clarity: A mind map delivers a clear pictorial view of complex matters tied to construction site safety breaches. It simplifies spotting links among elements like staff actions, company policies, site hazards, and legal requirements, consolidated in one place.

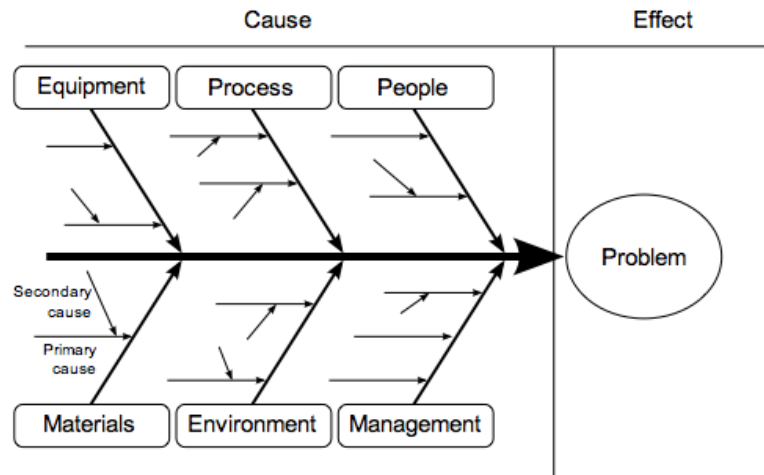
Holistic Overview: By mapping all primary aspects, a mind map grants a full insight into site safety challenges. This boosts understanding of connections between issues and how improvements in one area might influence others, for instance, how better training could reduce errors from fatigue.

Systematic Problem-Solving: With a mind map, a broad challenge can be segmented into smaller, more manageable parts, organising ideas systematically. This structured approach ensures each part is handled appropriately, such as branching out from “root causes” to sub-sections like “human factors” and “site risks.”



5 - Ishikawa (Fishbone) Diagram

The Ishikawa diagram, also known as cause-and-effect charts or fishbone diagrams. These are typically used to identify likely origins of a specific challenge or outcome (Thompson, 2019). The illustration would group possible triggers for construction site safety breaches into categories like people, process, equipment, environment, management, and materials.



1. People

- a. Lack of Training: Workers may not be adequately trained on safety protocols.
- b. Resistance to Change: Employees may resist adopting strict safety measures.
- c. Human Error: Fatigue or complacency leading to mistakes.
- d. Fatigue from Long Shifts: Extended hours reducing alertness.

2. Process

- a. Inconsistent Enforcement: Safety rules not uniformly applied.
- b. Unclear Procedures: Ambiguous guidelines on PPE usage.
- c. Inefficient Workflow: Rushed processes prioritising speed over safety.
- d. Poor Communication: Lack of daily safety briefings.

3. Equipment

- a. Outdated Equipment: Faulty PPE or signage.
- b. Lack of Integration: No digital tools for real-time hazard alerts.
- c. Poor User Experience: Complicated safety checklists.
- d. Insufficient PPE Availability: Shortages leading to non-use.

4. Materials

- a. Substandard PPE: Low-quality gear that is uncomfortable.

- b. Limited Access: PPE not readily available at entry points.
- c. Insufficient Documentation: Lack of updated safety manuals.
- d. Poor Quality Signage: Faded or unclear warnings.

5. Environment

- a. Crowded Site Layout: Overlapping work zones increasing risks.
- b. Poor Visibility: Inadequate lighting in high-risk areas.
- c. Weather Conditions: Slippery surfaces from rain ignored.
- d. Remote Locations: Difficulty in enforcing rules off-site.

6. Management

- a. Lack of Investment: Insufficient funds for safety upgrades.
- b. Poor Planning: Inadequate risk assessments.
- c. Weak Safety Culture: Limited leadership emphasis on safety.
- d. Competing Priorities: Deadlines overriding safety concerns.

6 - 5 Whys Analysis

The Five Whys technique is a structured problem solving method designed to uncover the root cause of an issue through iterative questioning (Liker, 2004). By asking "Why?" successively - typically five times - investigators can move beyond surface-level symptoms to identify deeper systemic causes. The process begins with a clear statement of the problem, followed by the first "Why?" question to explore the reason for its occurrence. Each subsequent "Why?" builds upon the previous answer until the fundamental cause is identified, enabling the development of more effective and lasting corrective actions.

Example – Construction Site Safety Breach

Safety Breach: A construction worker used an angle grinder without wearing eye protection.

1. **Why** was the worker not wearing safety goggles?
→ Because none were available at the workstation.
2. **Why** were there no goggles at the workstation?
→ Because the last pair had broken earlier that day.
3. **Why** was the broken pair not replaced immediately?
→ Because the replacement PPE stockroom was locked, and only a supervisor had access.
4. **Why** was the supervisor not available to unlock the stockroom?
→ Because they were attending an off-site meeting during work hours.
5. **Why** was there no backup process for PPE access when the supervisor is away?
→ Because the site's safety procedures do not include contingency measures for PPE distribution.

Findings: The worker's failure to wear eye protection was caused by unavailable PPE, but the root issue is the lack of a backup process for PPE access when supervisors are absent. Implementing a contingency system and ensuring sufficient stock at workstations will prevent similar incidents and improve overall site safety.

7 - Root Cause Analysis

The main cause of non-compliance is a weak safety culture that does not prioritise training and enforcement, leading to habitual disregard for safety protocols. Secondary root causes include inadequate resources for PPE and signage, as well as environmental factors like site overcrowding, supported by incident logs showing 15 near-misses in the past month (HSE, 2023; Umar, 2021).

8 - Possible Solutions to remedy Construction Site Safety Breaches

Enhanced Safety Training Programme:

Implement regular, interactive safety training sessions, including simulations, practical exercises, and virtual reality modules to engage workers effectively. This would cover PPE usage, hazard recognition, and emergency responses, with sessions tailored to different worker groups such as subcontractors.

Advantages: Highly effective at building awareness and reducing incidents. Improves long-term safety culture. Scalable for large sites.

Disadvantages: High initial costs for trainers and materials. Time-consuming, potentially disrupting work schedules. Requires ongoing commitment.

Improved Site Signage and PPE Accessibility

Install clear, multilingual safety signs and ensure PPE is readily available at all site entrances, with automated dispensers and regular stock checks. Integrate digital signage for dynamic hazard updates.

Advantages: Low-cost, quick implementation. Immediate impact on visibility and compliance. Minimal training needed.

Disadvantages: Ongoing maintenance required. Potential for vandalism or wear. Does not address behavioural root causes.

Stricter Enforcement with Incentives

Enforce protocols through regular inspections, coupled with rewards like bonuses or recognition for compliant workers, and penalties for violations. Use apps for real-time reporting.

Advantages: Encourages positive behaviour change. Balances enforcement with motivation. Can integrate with existing processes.

Disadvantages: May create resentment if seen as punitive. Ongoing costs for incentives. Risk of short-term compliance only.

These solutions link directly to root causes: training addresses people and process factors, signage tackles equipment and environment, and enforcement strengthens management (Smith & Brown, 2021; Chan et al., 2023).

9 - Decision-Making Technique: Evaluating Solutions for Construction Site Safety Issues

This weighted grid analysis is a tool used to evaluate the three possible solutions for remedying construction site safety breaches: Enhanced Safety Training Programme, Improved Site Signage and PPE Accessibility, and Stricter Enforcement with Incentives. The data collected can be reviewed via cost-benefit analysis, grid evaluation, and ratio analysis. The aim isn't merely selecting the cheapest but pinpointing the most fitting, offering optimal balance among cost, impact, and long-term gains. The analysis assigns weights to key factors (Cost, Speed of Implementation, Complexity, and Effectiveness) based on their importance, scores each solution against these factors, and calculates a total to identify a possible best option.

Factors	Weights	Enhanced Safety Training Programme	Improved Site Signage and PPE Accessibility	Stricter Enforcement with Incentives
Cost	25% (25)	3 (15)	4 (20)	3 (15)
Speed of Implementation	20% (20)	2 (10)	5 (20)	4 (16)
Complexity	20% (20)	3 (12)	5 (20)	3 (12)
Effectiveness	35% (35)	5 (35)	3 (21)	4 (28)
Total		72	81	71

Explanation of Scores and Weights:

- **Cost (25%):** Reflects initial and ongoing financial investment. Improved Site Signage and PPE Accessibility scores highest (4) due to its affordability and quick setup, while Enhanced Safety Training Programme (3) and Stricter Enforcement with Incentives (3) involve higher costs for trainers/incentives.
- **Speed of Implementation (20%):** Measures how quickly the solution can be rolled out. Improved Site Signage and PPE Accessibility leads (5) with its immediate deployment potential, followed by Stricter Enforcement with Incentives (4), and Enhanced Safety Training Programme (2) due to time needed for planning and sessions.
- **Complexity (20%):** Assesses ease of implementation. Improved Site Signage and PPE Accessibility scores highest (5) with minimal training required, while Enhanced Safety Training Programme (3) and Stricter Enforcement with Incentives (3) involve more coordination and effort.
- **Effectiveness (35%):** The most weighted factor, reflecting long-term impact on safety. Enhanced Safety Training Programme scores highest (5) for addressing root causes and building culture, followed by Stricter Enforcement with Incentives (4), and Improved Site Signage and PPE Accessibility (3) for its limited behavioural influence.

Conclusion:

The Improved Site Signage and PPE Accessibility solution, with a total score of 81, emerges as the top choice. Its quick implementation, low complexity, and cost-effectiveness make it an immediate and practical option to enhance visibility and compliance. However, to address behavioural root causes more comprehensively, combining it with elements of the Enhanced Safety Training Programme (score 72) could optimise long-term safety outcomes, despite its higher cost and complexity. Stricter Enforcement with Incentives (score 71) is a viable alternative but risks resentment and short-term gains. This method provides a cost-effective means of fixing present issues and future-proofing safety practices to meet evolving regulatory demands (Johnson, 2020; Lee & Patel, 2022).

10 - Implementation: Enhanced Safety Training Programme

To establish an Enhanced Safety Training Programme that reduces near-miss incidents, boosts compliance, elevates staff morale, and ensures legal alignment.

Project Overview

Project Name: Enhanced Construction Site Safety Programme

Project Leader: Ross Davies

Project Commencement: 18th August 2025

Projected Completion: 13th February 2026

Gantt Chart

This Gantt diagram segments the execution strategy into focused segments to ensure all essential duties conclude on time.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Develop Materials	xxxxxxx					
Hire Trainers	xxxxxxx					
Schedule Sessions		xxxxxxx				
Conduct Batch 1			xxxxxxx			
Conduct Batch 2				xxxxxxx		
Evaluate Effectiveness					xxxxxxx	
Follow-Up Sessions						xxxxxxx

Month 1: Concentrate on developing training resources and recruiting training instructors.

Month 2: Organise sessions and prepare site arrangements.

Month 3: Deliver training to the initial workforce.

Month 4: Train the next group, including external contractors.

Month 5: Assess via questionnaires and incident monitoring.

Month 6: Conduct refresher sessions and evaluate total impact.

11 - Communication Plan

To guarantee full involvement of stakeholders, the approach includes a smart combination of procedures and time to successfully explain the enhanced safety training programme. The main goal is to ensure that all important parties—workers, supervisors, management, clients, and regulators—are informed and ready for the changeover. Internally, the plan calls for early starting meetings, email reports on progress every week, and focused training sessions to make sure employees are prepared. Workers will receive accurate and clear messages regarding the benefits of the training and any changes to procedures, while clients and regulators will receive updates on compliance improvements. From the planning stage to implementation and after the introduction testing, this planned communication

timetable attempts to promote smooth changes, identify issues, and guarantee that all stakeholders are supported and updated on the enhanced process (Davis & Green, 2020).

12 - Monitoring Plan

The enhanced safety training programme must be implemented effectively, requiring a robust set of monitoring and review procedures. These measures will help ensure that the project progresses as planned, all tasks are completed on schedule, and deadlines are consistently met.

Progress Tracking and Reporting

Weekly Status Reports: Create a procedure for assessing finished tasks, upcoming deadlines, and any problems in weekly progress reports. Everyone involved, including the project manager, team members, and important stakeholders, should receive these reports.

Project Management Software

To keep track of developments in real time, use project management software such as Microsoft Project. With the help of this technology, tasks, due dates, and responsibilities can be visually tracked, promoting responsibility (Wilson, 2021).

Reviews

Planned Reviews: After every important stage, schedule frequent review sessions (e.g., material development, training delivery, evaluation). Assess the quality of the work achieved, determine whether the targets have been met, and discuss what has changed from the plan during these meetings.

Measures of Performance: Establish and track outcomes for every stage. Metrics could include participation rates, reduction in near-misses (target: 50% within 6 months), and worker feedback scores.

Testing and Quality Control

Quality control involves testing units and determining if they are within the specifications for the final product (Oakley, 2024).

System Testing: To make sure the training programme performs as expected, conduct pilot sessions, gather feedback, and adjust content for effectiveness.

Review Cycle: Create a feedback cycle where workers and supervisors report issues or suggest improvements. Use this input to refine the programme before full rollout.

Effective risk management and feedback systems must be in place along with effective oversight and performance monitoring to guarantee the programme's successful adoption. Project management tools should track progress, with clear task assignments and deadlines. Regular check-ins address issues, and post-implementation surveys provide data on performance. Stakeholder meetings allow for adjustments, issue tracking systems log problems, and contingency plans handle risks. Lastly, a thorough post-implementation evaluation report assesses outcomes and identifies improvements (Lee & Patel, 2022; Dörner & Funke, 2017).

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