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Outcomes from a stakeholder  
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## **HOW CAN WE PREVENT CONSTRUCTION ACCIDENTS? OUTCOMES FROM A STAKEHOLDER CONSULTATION: SOCIETAL AND INDUSTRY-WIDE INFLUENCES**

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This paper presents some of the findings from a time-limited, independent research project that reviewed evidence about underlying causes of construction accidents and levers within and beyond health & safety systems to make further improvements. The triangulated method incorporated national and international expert consultations with a total of 72 participants from across the industry, plus a literature review. An initial 'sounding out' exercise was also undertaken to gather feedback on the practical strategies developed during the consultation process. Perspectives on the underlying causes identified: broader societal and industry-wide influences (macro); project and process factors (mezzo); and worker/supervisor/workplace causes (micro). A number of improvement strategies were suggested, some of which have been summarised in this paper.

### **Introduction**

The UK has a large and exciting construction industry, which contributes over £100 billion annually to the gross domestic product (HSE, 2009). The construction industry has been recognised internationally as one of the most dangerous industries in which to work, with the statistics often explained in terms of the industry's inherently hazardous nature (Lingard & Rowlinson, 2005). There have been considerable efforts over many years directed at understanding accident causes (e.g. Haslam et al 2005) reducing the numbers of accidents and injuries through prevention. However, there is recognition that construction still has one of the highest rates of fatal and major injuries of all industries in the UK (HSE, 2009) and further improvement needs to be sought. In late 2008, the Secretary of State (SoS) at the Department for Work and Pensions (DWP) commissioned an inquiry into the underlying causes of construction fatal accidents. (The full findings of the inquiry can be found at: [www.dwp.gov.uk/publications/policy-publications/fatal-accidents-inquiry.shtml](http://www.dwp.gov.uk/publications/policy-publications/fatal-accidents-inquiry.shtml) and the details of the work presented in this paper can be found in Brace et al 2009). This paper presents findings from a time-limited, independent research project reviewing non-HSE (Health and Safety Executive) evidence about underlying causes of construction accidents and levers within and beyond health & safety systems that could be applied to make further improvements. The aims of this research were to explore the extent of complementary evidence about underlying or root causes of construction (fatal) accidents generated by parties outside HSE and to determine some practical strategies (levers) that might be adopted for accident reduction.

## **Approach**

The triangulated method incorporated a literature review plus national and international expert consultations with a total of 72 participants from across the industry to gather: stakeholder opinion on underlying causes of accidents and strategies for prevention based on their experience of fatal and serious construction accidents; detail about existing accident investigation processes and approaches to learning from accidents; and case study examples of good practice regarding accident investigation and prevention from the UK as well as a range of different countries. The stakeholders consulted included: 27 UK senior construction industry expert stakeholders; 15 practitioners from the UK construction industry; 15 workers representing the UK's very small, hard to reach organisations/sole-traders, and; 15 overseas construction industry expert stakeholders. The consultation combined face to face and telephone interviews, plus email correspondence. Consequently, the research team created a prioritized 'list' of possible strategies that arose during the preceding research process. These were organised into main topic groupings and feedback on the potential improvement strategies was gathered from 14 industry stakeholders (who were separate individuals to those already involved in the research) via two focus groups. Upon completion of data gathering and feedback, based on researcher/stakeholder perceptions, the potential improvement strategies were given a rating of high, low or medium priority based on perceived impact, implementation and dependency. This paper focuses on summarizing some of the proposed intervention strategies that resulted from the research process.

## **Findings - Causes of Construction (Fatal) Accidents**

There have been very few comprehensive studies reported in the literature on why or how construction accidents happen. Most studies on construction accidents focus on immediate causes, characteristics of accident victims or accident sequence. It is clear from the review that of the few studies examining the underlying causes and contributing factors to construction accidents, those that do have limitations. The underlying factors that have been documented in these studies (e.g. Arboleda & Abraham 2004; Behm 2005; Chi et al 2005) include: workplace management and culture; worker training and competency; worker attitude and behaviour; equipment factors; inappropriate/non-compliant procedures; lack of safety regulations and legislation; environmental factors; industry structure and set up. It is not possible to quantify the extent to which each factor plays a role in accidents due to the discrepancies in reporting and in data collection itself. As would be expected, based on the accident hierarchy, there do not appear to be any major differences between the causal/underlying factors reported to be contributing to fatal accidents, compared to those for all accident injury outcomes. The underlying factors reported were complex and inter-related and for the purposes of this work they were grouped into the themes of macro, mezzo, and micro (it is important not to confuse this use of 'micro' to refer to worker, workplace and supervisor issues with the use of the term 'micro' to refer to very small organisations). Perspectives on the underlying causes gathered via the stakeholder consultation exercises identified similar and broader: societal and industry-wide influences (macro factors); project and process factors (mezzo factors); and worker/supervisor/workplace causes (micro factors). These influences can be viewed as potential defences against accidents, in line with approaches by Reason (1990) and applications to construction accidents by Gibb and colleagues (Gibb et al 2006). When active or latent failures at each level create holes in the defensive plates, accidents can occur, with the 'chance' element being represented by the

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chance of the holes in the various plates lining up to provide an opportunity for ‘accident trajectory’. Amongst the stakeholder cohort, underlying causes of construction fatal accidents are documented in Table 1.

**Table 1. A summary of the underlying causes under each of the classification groupings**

<b>Macro Factors</b>	<b>Mezzo Factors</b>	<b>Micro Factors*</b>
Immature corporate systems; Inappropriate enforcement; Lack of proper accident data; Lack of leadership from ‘Government’ as a key client; Lack of influence of trades unions in practice on most sites, especially for smaller projects.	Immature project systems and processes; Inappropriate procurement and supply chain arrangements; Lack of understanding and engagement by some of the design community; Lack of proper accident investigation / data and consequently, a lack of organisational learning.	A shortage of competent supervisors; A lack of individual competency and understanding of workers and supervisors; The ineffectiveness or lack of training and certification of competence; A lack of ownership, engagement and empowerment of, communication with and responsibility for workers and supervisors.

\* These factors were also exacerbated by poor behaviour, cost pressures; poor equipment or misuse of equipment, including personal protective equipment; site hazards; poor employment practices; an itinerant workforce and inadequate management of and provision for vulnerable workers such as younger, older or migrant workers.

### **Findings - Strategies for Accident Prevention**

Within the literature, a number of strategies have been proposed for preventing construction fatal accidents, including those focused on the technical, organisational and human factors, with many prevention strategies focused on particular accident mechanisms, such as falls from height. The expert stakeholder cohort were surveyed to find out what interventions they had found successful in reducing accident rates and other more ‘futuristic’, ideal world methods that they felt could be adopted to reduce accidents and increase safety within the industry based on their experience and understanding. Due to the relatively small number of fatal accidents that occur in the industry compared to serious and slight injury outcome accidents, stakeholders were asked to consider methods for preventing all accident outcomes. After reviewing the findings from the literature and stakeholder consultation exercises, a number of potential improvement strategies for reducing fatal and serious accidents at the macro, mezzo and micro level were proposed. Table 2 presents the full set of potential improvement strategies proposed but this paper focuses solely on the potential macro level improvement strategies. Another paper discusses the mezzo and micro level improvement strategies (Gibb et al, forthcoming 2010).

**Table 2. A summary of the strategies under each of the classification groupings**

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**and cross cutting themes)**

<b>Macro Factors</b>	<b>Mezzo Factors</b>	<b>Micro Factors</b>
<b>Theme 1: Enforcement and Compliance</b>		
Enhance enforcement activities; Ensure Government is an exemplar client; Certify all construction organisations; Link Building Control approval to health and safety; Focus on overall effective management systems; Divide HSE; Consider the creation of a Government construction body.	Enhance any connection between employment type and safety.	Increase the number of supervisors; Organisations to implement licensing requirements.
<b>Theme 2: Competency and Training</b>		
Provide free advice and training Conduct finer analysis of accident data; Consider advice/legislation for accident investigation and learning; Conduct evaluations of interventions; Implement competency standards; Develop training and competency in the design community.	Develop strong organisational competency and maturity; Conduct enhanced examination of accident and high potential incident data; Conduct in-house evaluations of interventions.	Develop individual competency and understanding.
<b>Theme 3: Culture and Mindset</b>		
Tackle safety from a consumer protection perspective; Outlaw inappropriate tools and equipment; Insurers to demand greater safety provision by organisations; Change HSE approach; Consider implementing an independent accident investigation board; Reduce poor employment practices.	Create a minimum time period before site work starts.	Make subcontractors part of the team; Remove the 'bonus payment'; Encourage and manage diversity in the industry.

These potential improvement strategies were themed under three categories: enforcement and compliance; competency and training; and culture and mindset, and are summarised in the following sub-sections, along with a rating of high, low or medium priority based on perceived impact, implementation and dependency (based on researcher/stakeholder perceptions). It should be noted that it is very unusual for (existing or former) interventions to be evaluated for their impact, which causes difficulty in determining their efficacy for reducing accidents

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improving safety.

*Theme 1: Enforcement and compliance*

**Enhance enforcement activities (High Priority)** It was widely suggested that enforcement by the regulator is the key improvement facilitator for the 'rogue' element of the industry. Based on finer analysis of the accident data, it was suggested that enforcement activities amongst target groups should be enhanced to raise awareness and priority of safety amongst the 'problem' areas of the industry (fairly but visibly). It was suggested that increasing the number of enforcement notices and subsequent prosecutions would create a higher profile and priority for safety, particularly amongst target groups, although we should be aware of promulgating a blanket 'stick' approach. However, as well as the 'stick' approach being appropriate on many occasions, the consensus was that 'one size does not fit all', and subsequently the 'carrot' is seen as being very important for many other circumstances, i.e. HSE to enhance positive enforcement.

**Ensure Government is an exemplar client (High Priority)** Government works encompass a significant proportion of the activities of the UK construction industry. Therefore, it was proposed that all UK Government departments follow the lead of some current departments in being exemplar clients in terms of health and safety.

**Certify all construction organisations (Medium Priority)** Within the industry, there are a large number of 'unengaged' small and medium enterprises (SMEs) resulting in unsafe behaviour and poor culture. To address the challenges of the small organisation sector and to engage SMEs especially those working on domestic projects, it was suggested by stakeholders that we (the UK construction industry and stakeholders) should consider requiring certification of all construction organisations.

**Link Building Control approval to health and safety (Medium Priority)** Stakeholders suggested that there are many bad practices being followed in industry, partly because there is a limit as to the amount of enforcement and 'checks' that can be conducted by the regulator. Therefore, the idea of making Building Control approval conditional on health and safety planning should be considered, e.g. organisations have to talk through their H&S plan with an H&S expert to ensure they are fully anticipating risk (similar to CDM: Construction (Design & Management) Regulations). The main function of Building Control is to ensure compliance with the Building Regulations under the Building Act 1984. The purpose of which is to ensure that building standards meet the requirements necessary to protect the health, safety of people in and around buildings. In the first instance, it was proposed that a review of how this could be practically implemented should be conducted.

**Focus on overall effective management systems (Medium Priority)** Good safety systems depend on good overall management systems. Therefore, it was considered that more focus by the regulator should be given to the overall effective management systems rather than solely on safety systems, hence consider appropriate training for HSE Inspectors to provide them with a better understanding of the commercial contractual complexities of the industry.

**Divide HSE (potentially Medium Priority)** Numerous issues were raised about the HSE and the challenges HSE faces in being both the regulator and the advisor. It was therefore suggested that the UK should consider dividing HSE in two (similar structure to OSHA and NIOSH or OSHA enforcement and OSHA consultation in the USA) to enable an arm for enforcement and another for assistance and to consider the outworking of the 'assistance' arm being assigned to the local authorities and building control at a local level.

**Consider the creation of a Government construction body (potentially Medium Priority)** The creation of a single Government body to manage the construction industry

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might be beneficial for safety. This body would be able to run a high level panel to which CEOs of companies who have had a fatality must give account (similar to the model adopted in Hong Kong). It was proposed that a review should be conducted on this suggestion.

### *Theme 2: Competency and training*

**Provide free advice and training (High Priority)** It was frequently noted that health and safety awareness and competency across the industry are low, particularly within smaller organisations. Therefore, free information and training should be provided to the industry (focusing on SMEs) on key construction management issues (incorporating OHS).

**Conduct finer analysis of accident data (High Priority)** A better, more detailed understanding of the 'problem' (target) organisation types or sectors of the industry is required in order to target interventions better. Therefore, a finer analysis of accident data and investigations are required and findings publicised amongst the industry to raise awareness and understanding.

**Consider advice/legislation for accident investigation and learning (High Priority)** There can be scenarios arising within construction organisations when there is 'data overload' due to the large volume of accident data that is being collected. Therefore it was proposed that HSE/industry bodies provide guidance materials on best practice approaches to data collection and review to avoid 'data overload'. In order to place pressure on management to lead strong safety processes, legislation could be implemented for accident investigation/learning to ensure good practice is followed, led by the leaders of an organisation (e.g. as per Sweden, Hong Kong).

**Conduct evaluations of interventions (High Priority)** Typically, when interventions have been implemented in industry, there is limited evaluation of their efficacy. Therefore, (simple) evaluations of interventions should be arranged to determine whether or not changes are having the desired effect and to better inform the organisation and the industry. Additionally, it was noted that assistance should be provided to industry organisations on how to conduct worthwhile evaluations, e.g. including field workers to work with industry to ensure uptake and evaluation.

**Implement competency standards (High Priority)** It was suggested that if we're serious about making the construction industry effective, safe and well run, we need (competency and therefore) a licensing system. Therefore, the industry and Government should consider the implementation of competency standards for individuals' task and safety knowledge to standardise competency and aid awareness of what criteria need to be met.

**Develop training and competency in the design community (High Priority)** A key issue for improving safety in the build process was the need to improve competency and understanding amongst the design community. Examples of what could be developed included: following through on previous initiatives to regulate and accredit higher education courses to ensure there is enhanced and appropriate coverage of health and safety; put improved continuous professional development (CPD) and professional practice strategies in place so that there is improved understanding and engagement; place more emphasis on health and safety issues during initial professional development (IPD) and stress the essential role that designers and pre-construction planners can play in reducing health and safety risks.

### *Theme 3: Culture and mindset*

**Tackle safety from a consumer protection perspective (High Priority)** It was suggested that, if awareness was raised amongst consumers, they would be more likely to only employ



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licensed professionals. Therefore, safety could be tackled from a consumer protection perspective, i.e. similar to systems operating in other industry sectors, e.g. CORGI (now the Gas Safe Register). Aimed at householders, emotive campaigns could be used to raise awareness about construction accidents and safety to make small-scale clients consider what is at stake by employing someone who is not competent.

**Outlaw inappropriate tools and equipment (Low Priority)** Strategies could be developed to encourage/force equipment suppliers and builders' merchants to outlaw inappropriate tools and equipment and to ensure that adequate safety directions and training is provided for all users, including do-it-yourself (DIY) enthusiasts and SMEs.

**Insurers to demand greater safety provision by organisations (potentially High Priority)** Insurers could demand greater safety provision by organisations in order to increase the emphasis on health and safety quality systems within an organisation. In the first instance it was suggested that the value of this idea is explored through consultation with the insurance sector.

**Change HSE approach (Medium Priority)** The challenge for HSE resources to pick up the rogue element and at the same time encourage the 'better end' of industry was acknowledged. However, a more positive and proactive approach by the HSE would assist industry in moving forwards. Therefore, it was proposed that the mindset of the regulator needs to change to enable them to more readily give credit for those organisations who are doing 'more right than wrong', in order to remove obstructive fear from the system.

**Consider implementing an independent accident investigation board (Low Priority)** It may be useful to consider the implementation of an independent accident investigation body.

It was felt that such a body (similar to those currently operating for rail, aviation and maritime environments), which has the objective of learning and preventing accidents rather than apportioning blame, would enable more detail on the underlying causes of accidents to be investigated.

**Reduce poor employment practices (Low Priority)** It was recognised that many employment practices impact on health and safety in the workplace. Therefore, it was proposed that the Government should consider amending legislation (and subsequently enhancing enforcement) and systems to reduce the black market in undocumented workers and to eliminate/reduce the workers operating on a false self employed status.

## Conclusions

This work has provided an insight into current industry practices and thinking about the causes of accidents and levers and strategies that could be adopted to improve health and safety and reduced accidents in the construction industry. A number of strategies have been proposed in this paper and these have been attributed a priority rating based on perceived impact, implementation and dependency. It is important to note that the responsibility of industry leaders and corporate managers extends beyond the macro to the mezzo and micro areas – actions of such leaders have a very significant impact on projects and on workers. There is an urgent need to evaluate interventions to establish their value in making the construction industry safer. The rich data gathered during this work was largely subjective opinion as there are only very limited numbers of 'hard facts' concerning the underlying causes of accidents and the efficacy of interventions in the construction industry, in the UK or internationally. The tight time constraints (6 weeks for the data collection phase caused by the SoS deadline) meant that the work was very intense but focused and the research team were unable to explore in depth all avenues that were captured during the research process.

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Despite its limitations, this work provides a picture of the current practice of construction health and safety and evaluates opinion on the challenges and opportunities facing the construction industry in this regard.

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