WHS Research

Centre for Construction
Work Health and Safety

Safety Leadership Summary Report

An examination of the safety climate and leadership of workgroups in the construction industry.

The Research Project

The research was undertaken in collaboration with three construction industry partners. The "drivers" of work health and safety culture and performance in construction workgroups were examined. The research explored the pivotal role played by supervisors in shaping the safety performance of workgroups. The research investigated:

- the way in which workgroups develop unique safety "climates" in the Australian construction industry
- how supervisors and group members shape workgroup safety climate and performance
- whether organizational safety management activities "filter down" to influence workgroup safety climate, especially in conditions of subcontracting, and
- the extent to which different aspects of safety climate (i.e, strength and level) influence the safety performance of workgroups.

Previous Safety Climate Research

The earliest efforts to improve WHS performance in construction focused on the provision of a safe physical environment and addressed issues such as the provision of machinery guarding and safe mechanical equipment. Following this, the focus shifted to the implementation of robust WHS management systems. These traditional approaches led to enormous improvements in WHS performance. However, it is now acknowledged it is essential to win 'hearts and minds' to elicit a common commitment to improving WHS in organizations.

The importance of managerial leadership in communicating the importance of WHS and in ensuring that WHS practices are consistently followed is recognised. A large amount of research has shown that managers' behaviour and the quality of WHS communication distinguishes workplaces with high levels from those with low levels of WHS performance. The increased emphasis on cultural drivers has been referred to as the 'third age' of safety. In-keeping with this focus on workplace cultures, the measurement of safety climate has become prevalent.

Safety climate was first defined by Zohar (1980) as 'a summary of molar perceptions that employees share about their work environments…a frame of reference for guiding appropriate and adaptive task behaviors' (p.96). Safety climate is distinguished from safety culture in that the latter refers to underlying core organizational beliefs, while the former represents employees' attitudes and perceptions of WHS at a given point in time. Given this interpretation, an organization's

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safety culture is expressed through its safety climate. If this interpretation is accepted, then the development of a positive safety culture should be the most important aim for those who wish to improve WHS performance, while the measurement of the safety climate can be viewed as a useful diagnostic tool for measuring safety culture at any point in time. Safety climate surveys are frequently used to provide a 'snapshot assessment' of the state of an organization's safety culture.

The concept of safety climate is important insofar as it predicts WHS performance within organizations. Researchers have empirically investigated the relationship between safety climate and various aspects of safety-related performance. The results have generally (but not always) supported a link between safety climate and performance. Generally, the more positive the safety climate, the better the safety performance.

Multi-Level Safety Climates

Most safety climate studies have focused on workers' perceptions of organizational issues, for example the status of specialist safety staff, resources allocated to safety, top management commitment and the quantity and usefulness of safety training. However, modern organizations are large and complex and the notion of a single uniform safety climate seems overly simplistic. Differences in safety climate among groups of employees within the same organization have been identified in a number of industries.

Zohar (2000) proposed two levels of safety climate: (i) that arising from the formal organization-wide policies and procedures established by top management, and (ii) that arising from the safety practices associated with the implementation of company policies and procedures within workgroups. Within this framework, group-level safety climate relates to patterns of supervisory safety practices, or ways in which organizational WHS policies are implemented at the local workgroup level.

The Importance of Co-Workers

Safety climate researchers have usually focused on people who have defined responsibility for others within an organization (such as senior managers and supervisors). However, those without formal power can also substantially influence the local safety climate. In construction there is likely to be a particularly weak connection between people with formal power and the workforce due to the multi-tiered subcontracting system and prevalence of semi-autonomous workgroups. In this context, the influence of co-workers is likely to be strong.

Arguably, it is through exchanges with co-workers that individuals develop beliefs about what is expected of them, i.e. what they should and should not do in their work role. Co-workers are an important source of influence, providing feedback and advice about appropriate behaviour. This might be particularly influential when there is tension between different job-role requirements, such as productivity and safety.

There is considerable empirical evidence to suggest that co-workers influence WHS within workgroups. Thus, co-workers' safety actions were examined as a possible facet of group safety climate in the construction context.

Data Collection

Data were collected within three organizations operating in the Australian construction industry (see Table 1).

Study one was undertaken within the regional construction and maintenance works district of a state-based road construction and maintenance organization in the Southeast of Australia.

Study two was undertaken at a hospital construction project in Melbourne.

Study three was undertaken at the Melbourne operation of a national steel reinforcement manufacturing organization.

ORGANIZATION	NO. OF RESPONSES	NO. OF WORKGROUPS
Road construction and maintenance organization	71	15
Hospital construction project	99	9
National steel reinforcement manufacturing organization	137	16

Table 1: Responses and workgroups by organization.

Data were collected using a questionnaire specially developed to measure workers' perceptions of the: (i) Organizational Safety Response; (ii) their immediate Supervisors' Safety Response; and (iii) their Co-workers' Safety Response.

Survey items were adopted from previously used and validated safety climate survey instruments and the reliability of the survey tool was assessed in the Australian context.

Between-Group Difference and Within-Group Similarity

Analysis of the data revealed three group-level safety climate dimensions. These were perceptions of supervisors' safety response, perceptions of co-workers' 'ideal' safety response and perceptions of co-workers' 'actual' safety response. All three group level safety climate dimensions demonstrated high levels of within-group agreement, indicating that members of the same work group shared consistent perceptions of supervisors' safety response, their co-workers' 'actual' safety response' and their co-workers' 'ideal' safety response.

An analyses of variance revealed significant between-group differences in perceptions of supervisors' safety response (See Figure 1).

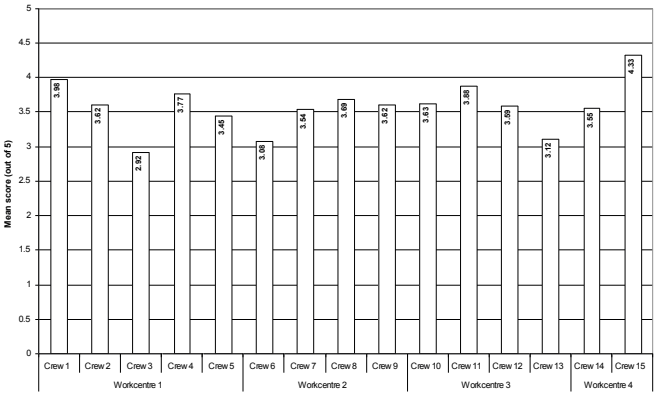


Figure 1: Between-group variation in perceptions of supervisors' safety response at the road administration agency.

Members of different workgroups shared a consistent view about the ideal safety behaviours of co-workers, i.e. what co-workers *should* do to support the safety of others in their workgroup. However, significant between-group differences were obseved in perceptions of the actual safety behaviours demonstrated by co-workers. In all instances, perceptions of co-workers' ideal WHS behaviour were higher than perceptions of co-workers' perceptions of actual WHS behaviour. In some groups the gap between ideal and actual was more exaggerated than in others.

The implications of these findings for WHS management relate to the importance of group-level drivers of safety climates. The quality (i.e. supportive or unsupportive of safety) of group level climates is reported to influence workgroups' safety performance through shaping members' safety behaviour. The existence of variation between workgroup safety climate (driven by supervisor and co-workers' safety-related actions) can therefore support or undermine organizational safety management efforts.

Strategies to develop supervisors' and co-workers' safety leadership capability, to foster strong and supportive group safety climates and promote consistency between workgroups within an organization could contribute to better organizational WHS outcomes.

The size of the workgroup was also found to have an impact on the perceptions of co-workers' actual safety responses. The bigger the group, the less positive were co-workers' safety responses.

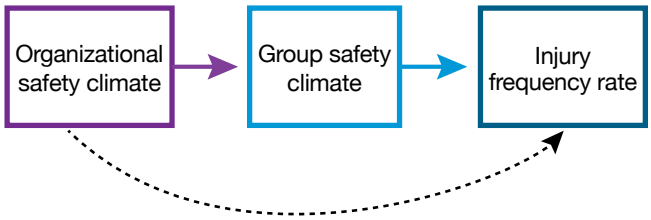
Previous studies indicate that the development of friendships and social relationships between members of a workgroup will increase members willingness to assist co-workers. This is attributed to the 'bystander apathy effect', which describes a tendency to help those we know but not to help strangers in difficulty.

The construction context is particularly challenging as there is a high degree of turnover and 'churn' among group members. This increases the potential for latent errors which, in turn, elevates the likelihood of injury to new or existing workgroup members. The development of programs designed to increase knowledge of co-workers and build social relationships within workgroups may be a useful strategy to strengthen group safety climates.

Cascading Management Influence

The research also examined whether group safety climate is the mechanism through which the organizational climate influences injury frequency rates in the construction context (See Figure 2).

Analysis of the data confirmed that the relationship between the organizational safety climate and workgroup injury frequency rate were fully mediated by perceptions of supervisors' safety response (a group-level climate variable).



Note: Unbroken line denotes full influential pathway
Dashed line denotes partial influencial pathway

Figure 2: Proposition that group safety climate mediates the relationship between the organizational safety climate and injury frequency rate.

The results suggest that the actions of managers in the corporate/head offices of construction organizations have a significant influence on WHS, but that this influence is indirect rather than direct. That is, it is through their influence on supervisors' safety responses that senior managers' actions shape WHS performance within construction workgroups. This suggests a 'cascading' managerial influence by which management commitment to safety filters down through organizational hierarchies.

The results also confirm the importance of the role of first-level supervisors in influencing group-level safety climates and WHS performance. The pathway by which management commitment to safety influences workgroup injury performance is through the development of strong supervisory safety leadership. Supervisors act as a "conduit" through which organizational safety priorities are communicated and provide important feedback to front-line workers concerning the appropriateness of their behaviour.

The influence of supervisors on safety performance is likely to be increased in the construction context because construction work is highly decentralized, with productive work undertaken at sites remote from the corporate office. This geographical dispersion is likely to increase the behavioural influence of supervisors relative to senior management. Construction work is also largely non-routine, necessitating the exercise of supervisory discretion in the interpretation of formal safety policies and procedures. In this context, the role of supervisors in shaping subordinates' safety behaviour is likely to be considerably greater than in stable work contexts, characterized by routine production processes.

This finding highlights the importance of first level supervisors in translating organizational safety policies and procedures into workgroup safety practices. In order to develop safety-supportive climates within workgroups, it is critical that supervisors are consistent in the way that they emphasize safety in their interactions with employees. Climates are formed on the basis of the day-to-day interactions and observations of supervisors' behaviour. Over time, supervisors' behaviour is observed to form a pattern. Positive and strong safety climates will develop only to the extent that supervisors are consistent in what they say and do in relation to safety.

There is potential to provide formal training to specifically develop WHS leadership capability in first-level supervisors. The results suggest that this could yield significant dividends for construction organizations in terms of reduced injuries.

Safety Climate in Conditions of Subcontracting

Subcontracting is a key feature of the construction industry, which is known to present significant challenges in the management of WHS. Time pressures, confusion over responsibility for WHS, and a dominant culture of risk transfer create challenges for the management of WHS in conditions of subcontracting. Further, a 'payment-by-results' system can push subcontractors to work excessive hours and 'cut corners' with respect to WHS.

Subcontractor involvement is a core aspect of a construction organizations' safety culture and a feature of effective WHS management in construction. Construction subcontractors are often engaged in complex relationships both horizontally (i.e. when multiple subcontractors are engaged by a principal contractor) and vertically (i.e. in the case of multi-layered subcontracting).

In this context, workers involved in subcontracted companies are only loosely connected with the principal contractor and may also be relatively isolated from their own company. The implication of subcontracting for the development and impact of safety climates within the construction industry was previously not well understood and a principal aim of the research was to examine the development of safety climate perceptions in conditions of subcontracting.

Specifically, the research sought: (1) to examine the extent to which distinct group-level safety climates exist within subcontractors engaged by a single principal contractor; (2) to test whether subcontracted workers discriminate between perceptions of the safety climate within their own organization (i.e. the subcontractor) and the principal contractor; and (3) to test the ability of a multi-level safety climate model to predict subcontractors' WHS performance.

The results of this analysis are depicted in Figure 3.

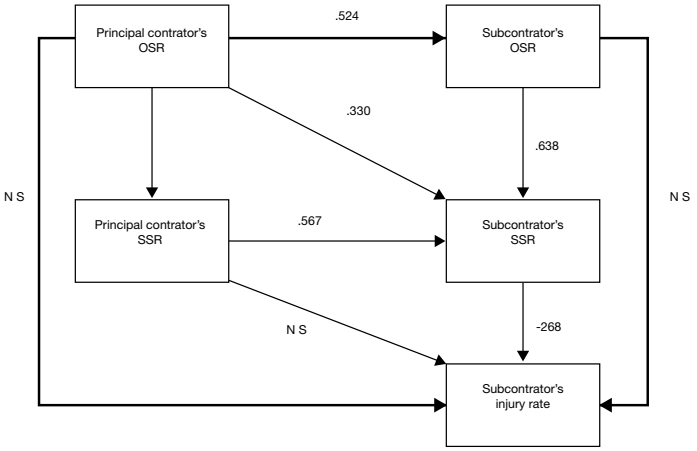


Figure 3: Multi-level safety climate model for construction subcontracting (hospital construction project only, N=114)

The principal contractors' organizational safety response positively and significantly predicted subcontractors' organizational safety response and supervisors' safety responses. Thus, when top managers in principal contractors are highly committed to WHS, subcontractors' management and supervisory commitment to WHS are also likely to be favourable. The results highlight the importance of principal contractors' managers strongly demonstrating their WHS commitment, thereby helping to engender positive safety climates within subcontractors engaged in the projects they manage.

The nine subcontractors differed significantly in the extent to which their members perceived their immediate supervisors and their organizations to be committed to safety. Further, subcontracted workers discriminated between the safety climate of their own organization and that of the principal contractor. In general, the subcontracted workers perceived the principal contractor's organizational safety response to be more positive than that of their own company. However, subcontractors' supervisors' safety response was viewed more favourably than that of the principal contractor's foreman.

The results indicate a high degree of alignment between group and organizational safety climates within each organization. Supervisors' safety response was positively predicted by the organizational safety response in both the principal contractor and within each subcontractor. This supports the notion of cascading management influence, as the WHS attitudes and behaviours of senior managers shape the WHS attitudes and behaviours of supervisory personnel. This alignment is important because supervisors operate at the interface between management and the workforce. They are a critical conduit through which senior managers' commitment to WHS is communicated. Supervisory personnel are particularly influential because they "filter" organizational WHS messages and shape employees' beliefs about how committed managers are to WHS. Put simply, supervisors communicate what "management really wants."

The significant inverse relationship between the subcontractors' supervisors' safety response and subcontractors' incident frequency rate supports the important role played by supervisory personnel in shaping WHS performance in the construction industry. These results reinforce the importance of developing safety supportive supervision within construction organizations.

The results also suggest that the principal contractor's safety climate influences subcontractors' WHS performance indirectly to the extent that it shapes their own (i.e. the subcontractor's) supervisors' safety response. Notwithstanding, the indirect nature of this influence, principal contractors supervisors' are an important link in the WHS chain of influence.

Properties of Safety Climate

Safety climates can be described in terms of two properties: (i) their strength; and (ii) their level. Safety climate strength refers to the degree of consensus concerning climate perceptions within members of a group and can range from weak to strong. A strong safety climate is one in which there is very high consensus between members about the priority placed upon safety, while a weak safety climate is where there is a low level of consensus. The level of safety climate refers to the relative priority placed upon safety within a workgroup as perceived by members of that group. The level of the safety climate can be expressed as either high (i.e., a high level of safety commitment) or low (i.e. a low level of low safety commitment). Thus, it is possible for a safety climate that is supportive of safety (i.e., high in level) to be either weak or strong depending upon the degree of 'sharedness' of this perception among group members.

Figure 4 depicts four distinct types of safety climate according to their strength and level. These are:

(i) an indifferent climate (weak strength and low level)

(ii) an obstructive climate (strong strength and low level)

(iii) a contradictory climate (weak strength and high level), or

(iv) a strongly supportive climate (strong strength and high level).

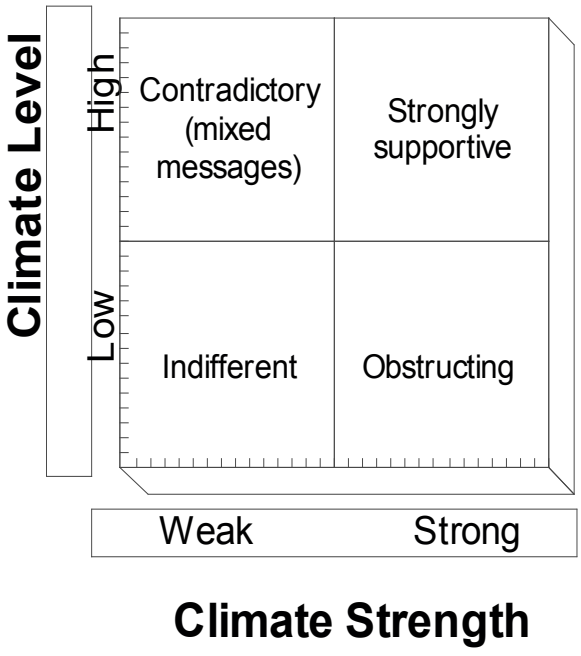


Figure 4: Safety climate 'types'

In an 'indifferent' safety climate, group members (including supervisors) are low in commitment to and ambivalent towards safety. A characteristic of this type of safety climate is a low level of consensus as to the relative priority placed upon safety within the workgroup. An 'obstructive' safety climate is characterised by a strong consensus that safety is of secondary importance to other facets of work performance, such as production. A 'contradictory' safety climate can develop when mixed messages concerning the importance of safety are communicated and/or where group members' (including supervisors') actions are inconsistent with their rhetoric regarding the importance of safety. In these circumstances, weak consensus about the relative priority of safety exists, despite a perception that group members pay 'lip service' to safety. Finally, in a 'strongly supportive' safety climate, group members (including supervisors) consistently treat safety as being of high priority and demonstrate a high level of commitment to safety, which does not vary according to circumstances.

A series of quadrant charts were plotted to position workgroups in the two dimensional model.

The diagrams are divided into four quadrants according to the median values for strength and level of safety climate (solid lines). Each workgroup is plotted based on their safety climate strength and level scores. Figure 5 shows the quadrant plot relating to perceptions of the Supervisors' Safety Response.

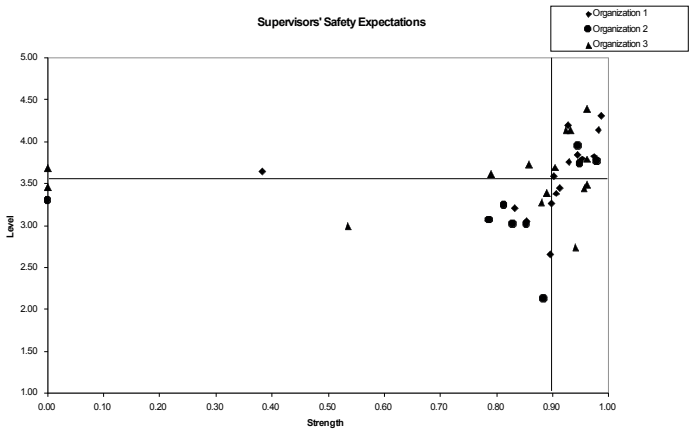


Figure 5: Quadrant plot for supervisors' safety response (N=40 workgroups)

Safety Climate Type and Injury Frequency

Injury frequency rates for workgroups in each of the quadrants were compared.

The research revealed that workgroups with a 'strongly supportive' group safety climate experienced injury frequency rates that were approximately two thirds the magnitude of workgroups with 'indifferent,' 'contradictory – mixed messages' or 'obstructive' group safety climates. These findings provide preliminary evidence supporting the importance of developing strongly supportive group safety climates within the construction industry.

Published Outcomes

The following is a list of published outcomes from this research that are available upon request.

Lingard, H., Cooke, T. & Blismas, N., (2012), Do perceptions of supervisors' safety responses mediate the relationship between perceptions of the organizational safety climate and incident rates in construction? ASCE Journal of Construction Engineering and Management, 138 (2), 234–241

Lingard, H., Cooke, T. & Blismas, N., (2011) Co-workers' response to occupational health and safety: An overlooked dimension of group-level safety climate in the construction industry? Engineering, Construction and Architectural Management, 18, 159–175.

Lingard, H., Cooke, T. & Blismas, N., (2010), Properties of group safety climate in construction: The development and evaluation of a typology. Construction Management and Economics, 28 (10), 1099–1112.

Lingard, H., Cooke, T. & Blismas, N., (2010), Safety climate in conditions of construction subcontracting: A multi-level analysis. Construction Management and Economics, 28, 313–825.

Lingard, H., Cooke, T. & Blismas, N., (2009) Group-level safety climate in the Australian construction industry: Within-group homogeneity and between-group differences in road construction and maintenance. Construction Management and Economics, 27, 419–432.

Lingard, H., Cooke, T. & Blismas, N., (2009), Group safety climate in the construction industry: An analysis of strength and level, in Proceedings of the CIB W099 International Conference 'Working Together: Planning, Designing and Building a Healthy and Safe Industry,' Melbourne, 21–23rd October 2009.

Cooke, T., Lingard, H. & Blismas, N., (2008), Multi-level safety climates: An investigation into the health and safety of workgroups in road construction, in Proceedings of the CIB W99 International Conference: Evolution of and Directions in Construction Safety and Health, J. Hinze, S. Bohner & J. Lew (eds), Gainesville, Florida, 349–362.