GROUP SAFETY CLIMATE IN THE CONSTRUCTION INDUSTRY: AN ANALYSIS OF STRENGTH AND LEVEL

Lingard, Helen, School of Property, Construction and Project Management, RMIT University, Australia

Cooke, Tracy, School of Property, Construction and Project Management, RMIT University, Australia

Blismas, Nick, School of Property, Construction and Project Management, RMIT University, Australia

ABSTRACT
Much safety climate research has focused on the organization as the unit of analysis. However, using the organization as the level of analysis can mask important sub-unit differences. Workgroups in the Australian construction industry have been found to demonstrate significant within group homogeneity and between-group variation in safety climate. In particular, subcontracted work groups are reported to develop unique and variable safety climates. A typology of group-level safety climates is developed, based on the combination of climate level and climate strength. The safety climate of nine subcontracted workgroups engaged at a large hospital construction project are analysed according to this typology. Most subcontractors demonstrated ‘strongly supportive’ perceptions of their company’s organizational safety response and supervisors’ safety response (i.e. demonstrating high level and high strength). However, in some instances, the organizational safety response (OSR) and supervisors’ safety response (SSR) were perceived to be low in level but high in strength. These groups were classified as possessing an ‘obstructing’ safety climate for these dimensions. The level of subcontractors’ OSR and SSR were significantly inversely correlated with the subcontractors’ injury rates. Safety climate strength was not significantly related to injury rates.

Keywords
Group level safety climate, subcontracted workgroups, Supervisors’ safety response, Climate strength, Climate level

GROUP SAFETY CLIMATE IN THE CONSTRUCTION INDUSTRY: AN ANALYSIS OF STRENGTH AND LEVEL

Introduction

The construction industry’s poor OHS performance
Construction is one of Australia’s highest risk industries. In 2002 – 2003 construction workers were more than twice as likely to be killed at work compared to the average worker in all Australian industries. Further, 2006 figures indicate that construction has consistently been Australia’s third most dangerous industry, surpassed only by transport and storage and agriculture for the past three years, with a rise of 9% in the number of recorded fatalities in 2006-07 (ASCC, 2008). Data from the National Online Statistics Interactive (NOSI) system show that in the financial year period 2003-2007, there were 184 compensated fatalities in the construction industry (an average of 46 compensated fatalities per year). Preliminary data show that, in the 2006-2007 financial year, the incidence rate for fatal injuries in the Australian construction industry was 7.8 per 100,000 employees. This rate was only surpassed by the transport and storage industry (10.8). In 2006–07 there were 14,120 serious workers’ compensation claims in the construction industry, representing 11% of these claims across all industries. This equates to 39 employees a day sustaining a serious
work-related injury or disease requiring one week or more off work (ASCC, 2008). Despite technological developments and the implementation of robust occupational health and safety (OHS) management systems, the construction industry’s chronic level of fatalities, serious injury and ill-health appears resistant to change. This has led researchers and practitioners to focus on organizational and social factors, such as safety climate, to induce positive change to the industry’s poor OHS performance.

Safety climate

There is some debate about the distinction between safety culture and climate. Shannon & Norman (2009) suggest culture consists of the underlying values, beliefs and assumptions concerning OHS which shape ‘the way we do things around here’ (p.327). Safety climate, on the other hand refers to perceptions of what is actually done, thus it is the check of whether the behaviour of people in the organization matches the rhetoric. Neal and Griffin (2006: pp 946-947) define safety climate as ‘individual perceptions of the policies, procedures and practices relating to safety in the workplace.’ The development of shared perceptions about the priority placed upon safety within the work environment is believed to inform workers’ role behaviour through expectations they form about how certain behaviours will be rewarded and supported in an organization (Zohar & Luria, 2005).

Cooper and Phillips (2004) comment upon the importance of examining the ability of safety climate to predict OHS outcomes. Griffin and Neal (2000) and Neal and Griffin (2002) report safety climate to be positively related to both self-reported compliance with safety procedures and self-reported voluntary participation in safety-related activities. In the offshore oil industry, Tharaldsen, Olsen and Rundmo (2008) report a significant inverse correlation between safety climate perceptions and accident rates while Mearns, Whitaker and Flin (2003) likewise show favourable safety climate scores are associated with offshore installations returning a lower proportion of self-reported accidents. Varonen and Mattila (2000) similarly report that perceptions of the prevailing attitude towards OHS within an organization were inversely correlated with the accident rate in wood processing companies. Another Australian study in the health sector reported that safety climate levels measured at one point in time predicted higher levels of OHS motivation and self-reported OHS-related behaviour at a future point in time (Neal and Griffin, 2006). In a recent meta-analysis of safety climate studies, Clarke (2006) identified a consistent relationship between safety climate and performance in prospective studies (i.e. those in which safety performance is monitored some time after the prevailing safety climate is measured), concluding that this ‘effect’ is generalizable across occupational settings (Clarke, 2006).

Safety climate in construction

Early studies of safety climate in construction combined perceptions of management commitment and workers’ involvement in OHS (Dedobbeleer & Beland, 1991). Research has revealed a significant positive association between safety climate and various aspects of OHS performance in the construction industry (Gillen, Baltz, Gassel, Kirsch & Vaccaro, 2002). Siu, Phillips & Leung (2004) tested a Safety Attitude Survey, which combined items about workers’ perceptions of themselves, their colleagues, management, company safety officers and supervisors. Their analysis revealed that aggregated safety attitude scores were directly related to self-reported occupational injury rates and indirectly related to self-reported accident rates via reported levels of psychological distress. Zhou, Fang & Wang (2008) report that two climate dimensions (management commitment and workmates’ influence) exert significantly greater influence on self-reported safety behaviour than workers’ personal experiences of training and safety. In a lagged, two-wave study of Swedish construction workers, Poussette, Larsson, and Törner (2008) report that safety climate scores at one point in time (time 1) significantly predicted self-reported safety behaviours seven months later (after controlling for safety behaviour at time 1).

Multi-level safety climates

Most researchers have measured safety climate at the level of the organization. However, Zohar (2000) proposes 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. Zohar tested this proposition in a manufacturing context and confirmed that workgroup members develop a shared set of perceptions of supervisory safety practices, and discriminate between perceptions of the organization's safety climate and the workgroup safety climate. Zohar suggests that group-level safety climates relate to patterns of supervisory safety practices, or ways in which organization level policies are implemented within each workgroup or sub-unit.

Zohar and Tenne-Gazit (2008) describe how, in the measurement of safety climate, individual climate scores are aggregated to the unit of analysis of theoretical interest. This can be the entire organization or organizational sub-units, such as workgroups. The findings highlight the importance of clearly specifying the unit of analysis of theoretical interest in safety climate research. Safety climate researchers have often incorporated co-worker safety stewardship and supervisory safety leadership in their survey design. For example, Lu and Shang (2005) incorporate both perceptions of co-worker safety and perceptions of supervisors' safety leadership in a safety climate survey of container terminal operators in Taiwan. However, these researchers have aggregated these scores to the level of the entire organization. With regard to supervisory and co-worker facets of safety climate, the workgroup is a more appropriate unit of analysis. Attempts to aggregate scores for these dimensions at the organization level are likely to mask important between-group differences (Tharaldsen, J. E., Olsen, E. and Rundmo, T., 2008; Glendon & Litherland, 2001; Findley, M., Smith, S., Gorski, J. & O'Neil, M., 2007).

Safety climate in the context of subcontracting
Recent research by Lingard, Cooke and Blismas (2009) has demonstrated that workgroups develop unique and distinct group safety climates in an Australian public sector road construction and maintenance organization. However, the employees in this organization were all directly employed. Subcontracting is a key feature of the Australian construction industry, which is known to present significant challenges in the management of OHS. 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 pyramid of multi-layered subcontracting). In this context, workers involved in subcontracted companies are only loosely connected with the principal contractor and relatively isolated from their own company, which could impact upon the development and impact of safety climate (Melia, Mearns, Silva & Lima, 2008). Facets of group safety climate have been linked to subcontractors’ safety behaviour. For example, Choudhry and Fang (2008) report that when co-workers’ and supervisors’ are perceived to be unsupportive of safe behaviour, subcontracted construction workers are more likely to adopt unsafe work practices. The implication of subcontracting for the development and impact of safety climates within the construction industry is not well understood. The research reported in this paper examines the extent to which subcontracted workgroups in the Australian construction industry exhibit distinct and unique safety climates.

Safety climate properties
Zohar and Luria (2004) suggest climate can be described in terms of two parameters: (i) its strength; and (ii) its 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 by management, while a weak safety climate is where there is a low level of consensus concerning management commitment to safety. The level of safety climate refers to the relative priority placed upon safety within a work group as perceived by members of that group. The level of the safety climate can be expressed as either high (i.e., perceptions of a highly level of managerial support for safety) or low (i.e. perceptions of low managerial support for safety). Thus, it is possible for a safety climate that is supportive of safety to be either weak or strong depending upon the degree of ’sharedness’ of this perception among workers in the same organization or workgroup.
Figure 1 suggests four theoretically distinct types of safety climate positioned according to their strength and level. These are:

(i) An indifferent safety climate (weak strength and low level);
(ii) An obstructive safety climate (strong strength and low level);
(iii) A contradictory climate (weak strength and high level); and
(iv) A strongly supportive climate (strong strength and high level).

In an indifferent climate, management are perceived to be low in commitment to and ambivalent towards OHS. A characteristic of this type of safety climate is a low level of consensus as to the relative priority placed upon OHS, as managers do not actively communicate their OHS expectations. By contrast, an obstructive climate is characterised by a high level of consensus that management prioritises other facets of work performance, such as production above OHS. The theory suggests that contradictory climates develop when mixed messages concerning the importance of OHS are delivered by managers or when managers’ actions are inconsistent with rhetoric regarding OHS. In these circumstances, a low level of consensus about the relative priority of OHS exists, despite a perception that managers at least, pay ‘lip service’ to OHS. Finally, in strongly supportive safety climate, managers are perceived to consistently prioritise OHS and demonstrate a high level of commitment to OHS, which does not vary according to circumstances.

**Aims and objectives**

This paper presents an argument for the analysis of safety climate in the construction industry at the level of the subcontracted workgroup (as opposed to the principal contractor organization). Data supporting the validity of group-level climates in the construction industry is presented. The paper also examines two distinct properties of safety climate: (i) the level; and (ii) the strength of the safety climate. A framework for positioning group-level safety climates in a two-dimensional grid representing these two properties is described. Data collected from subcontractors working at a large construction project is plotted on these two-dimensional safety climate grids.

![Safety Climate Types](image)

Figure 1: Safety climate types

**RESEARCH METHODS**

**Data collection**

Data were collected from directly employed and subcontracted workers at a hospital construction project in Melbourne. The surveys were administered using the ‘TurningPoint’ automated response system with ‘KeyPad’ handheld devices. The advantages of this system over paper based survey administration include the completeness of data and minimisation of human error in data entry. Participants were invited into the site office during normal work hours to participate in the survey. Participation was voluntary and participants were advised that their responses would be anonymous.
Subcontractors' Organizational Safety Response (OSR) was measured using items were taken from the HSE's Safety Climate Tool (2002). Consistent with Zohar and Luria (2005), the survey measured perceptions of management commitment to OHS as the core meaning of safety climate. Example items are “I feel that at [company name] management are concerned about my health and safety” and “[Company name’s] management only bother to look at health and safety after there has been an accident” (reversed score). Supervisors’ Safety Response (SSR) was measured using an eleven-item group safety climate scale developed by Zohar (2000). Example items are “Whenever pressure builds up, my supervisor wants us to work faster, rather than by the safe work procedures” (reverse scored), and “My immediate supervisor often talks to me about health and safety.” Co-workers’ Safety Response (CSR) was measured using items from the UK Health and Safety Executive (HSE) safety climate survey (HSE 2002). Example items are “My workmates encourage others to be safe” and “Workmates in my crew sometimes pressure me to work unsafely” (reverse scored) (HSE 2002). Participants were asked to rate all of the statements in the survey on a five point scale, ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (5).

Data analysis
The internal consistency reliability of the safety climate components was assessed using Cronbach’s alpha. Consistent with Zohar (2000), between-group differences in safety climate were explored by conducting a one way analysis of variance (ANOVA). Within-group homogeneity of safety climate perceptions was examined by calculating the inter-rater agreement (IRA). The IRA is used to measure the interchangeability or the absolute consensus in scores between group members. It estimates whether responses from one participant are ‘similar’ to the responses provided by others in the same workgroup, thus reflecting the degree of ‘sharedness’ in group climate scores (James, Demaree and Wolf. 1993). According to this test, within-group consensus (i.e. an acceptable level of consistency between the safety climate perceptions of different workers within the same group, in this case the subcontractor) is deemed to exist if $r_{wg(j)}$, the variance of random response ratings from multiply participants is 70% or greater. A value of 0.70 is representative of this figure. To adequately reflect team dynamics and protect participants’ anonymity, subcontractors with less than three workers at the project were excluded from the analysis.

RESULTS

The sample
One hundred and thirty six surveys were completed. Table 1 shows the characteristics of the sample. The majority of respondents (N=114, 83.3%) were employed by nine different subcontractors working at the construction project. These subcontractors varied in the numbers of workers engaged at the project and thus the numbers of respondents also varied considerably by subcontractor, ranging from thirty three respondents employed by subcontractor 6 to four respondents employed by subcontractors 2 and 5.

<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal contractor</td>
<td>22</td>
<td>16.2</td>
</tr>
<tr>
<td>Subcontractor</td>
<td>114</td>
<td>83.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Construction worker</td>
<td>98</td>
<td>72.1</td>
</tr>
<tr>
<td>Foremen</td>
<td>10</td>
<td>7.4</td>
</tr>
<tr>
<td>Graduate engineer</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Leading hand</td>
<td>13</td>
<td>9.6</td>
</tr>
<tr>
<td>Manager</td>
<td>5</td>
<td>3.5</td>
</tr>
<tr>
<td>Safety</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Missing data</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Table 1: Characteristics of the sample

<table>
<thead>
<tr>
<th>Employer</th>
<th>Subcontractor 1 (SC 1)</th>
<th>Subcontractor 2 (SC 2)</th>
<th>Subcontractor 3 (SC 3)</th>
<th>Subcontractor 4 (SC 4)</th>
<th>Subcontractor 5 (SC 5)</th>
<th>Subcontractor 6 (SC 6)</th>
<th>Subcontractor 7 (SC 7)</th>
<th>Subcontractor 8 (SC 8)</th>
<th>Subcontractor 9 (SC 9)</th>
<th>Principal contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>33</td>
<td>20</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td>2.9</td>
<td>5.1</td>
<td>5.1</td>
<td>2.9</td>
<td>24.3</td>
<td>14.7</td>
<td>8.1</td>
<td>8.1</td>
<td>16.2</td>
</tr>
</tbody>
</table>

Table 2 shows descriptive statistics for the three variables included in the analysis. Cronbach’s alpha coefficients were > 0.7 for all three variables, indicating acceptable internal consistency reliability.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcontractors’ OSR</td>
<td>3.2</td>
<td>0.71</td>
<td>0.89</td>
</tr>
<tr>
<td>Subcontractors’ SSR</td>
<td>3.1</td>
<td>0.77</td>
<td>0.90</td>
</tr>
<tr>
<td>Subcontractors’ CSR</td>
<td>3.6</td>
<td>0.79</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Table 2: Descriptive statistics for subcontractor safety climate dimensions

Subcontractors’ safety climate

The existence of unique subcontractor safety climates engaged at the construction project was determined on the basis of two criteria established by Zohar (2000). These are:

(ii) Between-group variance (i.e. whether safety climates differ significantly between subcontractors working at the same construction project); and

(ii) Within-group homogeneity (i.e. whether workers employed by a single subcontractor share similar perceptions of the safety climate).

One way analyses of variance were conducted to test for significant variation in mean safety climate scores between subcontractors engaged at the projects. Significant between-group variance was found for both perceptions of the subcontractors’ OSR and SSR. No significant between-group variance was found for perceptions of subcontractors’ CSR.

Table 3 shows the inter-rater agreement scores for each subcontractor for the three aspects of subcontractors’ safety climate. With the exception of one subcontractor (SC 5), there was a high level of inter-rater agreement concerning safety climate in subcontracted work groups.

<table>
<thead>
<tr>
<th>Subcontractor</th>
<th>Subcontractors’ OSR</th>
<th>Subcontractors’ SSR</th>
<th>Subcontractor’s CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC 1</td>
<td>0.82</td>
<td>0.82</td>
<td>0.86</td>
</tr>
<tr>
<td>SC 2</td>
<td>0.93</td>
<td>0.93</td>
<td>0.97</td>
</tr>
<tr>
<td>SC 3</td>
<td>0.97</td>
<td>0.97</td>
<td>0.93</td>
</tr>
<tr>
<td>SC 4</td>
<td>0.96</td>
<td>0.96</td>
<td>0.95</td>
</tr>
<tr>
<td>SC 5</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>SC 6</td>
<td>0.83</td>
<td>0.83</td>
<td>0.86</td>
</tr>
<tr>
<td>SC 7</td>
<td>0.95</td>
<td>0.95</td>
<td>0.91</td>
</tr>
<tr>
<td>SC 8</td>
<td>0.77</td>
<td>0.77</td>
<td>0.79</td>
</tr>
<tr>
<td>SC 9</td>
<td>0.84</td>
<td>0.84</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Table 3: Inter-rater agreement scores for group-level safety climate dimensions
Strength and level of subcontractors’ safety climate perceptions

A series of quadrant charts was plotted to position subcontractors’ safety climate in the two dimensional schema described above. For the purposes of these plots, the safety climate level (the mean score for each subcontractor) was plotted against the vertical axis whereas safety climate strength (the inter-group agreement score for each subcontractor) was plotted against the horizontal axis. The midpoint on the vertical axis was the midpoint in the survey scale (i.e., 3). The midpoint on the horizontal axis was 0.5 as climate strength can vary between 0 and 1.0. The results are shown in Figures 2 to 4.

Figure 2 shows the quadrant plot for subcontracted workers’ perceptions of their own organization’s Organizational Safety Response. Five of the nine subcontractors working at the hospital construction project were located within the ‘Strongly Supportive’ quadrant, indicating a high degree of consensus among workers of those subcontracting organizations that their respective organizations are strongly committed to OHS. One subcontractor was positioned at the border between the ‘Strongly Supportive’ and the ‘Obstructing’ quadrants, indicating high within-group consensus concerning an organizational ambivalence to OHS within this subcontractor. Two of the subcontractors fell into the ‘Obstructing’ quadrant, indicating that there was a high degree of consensus that OHS is not always a high priority for the management of these subcontractors. Finally, one subcontractor was located in the ‘Contradictory’ quadrant, indicating that workers, on average, perceived their organization to be committed to OHS but that there was very low group consensus within this subcontractor, that is, workers engaged by this subcontractor did not share similar perceptions of their own company’s safety management.

Figure 2: Strength and level of subcontractors’ OSR
Figure 3 shows the quadrant plot for subcontracted workers’ perceptions of their own organization’s *Supervisory Safety Response*. Most subcontractors at the hospital construction project fell into the ‘Strongly Supportive’ quadrant for this aspect of safety climate, indicating a high level of agreement within subcontractors that workers perceived their company supervisor to prioritise OHS highly relative to other objectives. However, one subcontractor clearly fell into the ‘Obstructing’ quadrant, indicating that there was a high degree of consensus about this supervisor’s safety-related behaviour but that the supervisor was perceived to be somewhat lacking in support for OHS. Two subcontractors were positioned at the border between the ‘Strongly Supportive’ and the ‘Obstructing’ quadrants, indicating high within-group consensus that the supervisor was ambivalent in his commitment in relation to OHS. Finally, one subcontractor was located in the ‘Indifferent’ quadrant, indicating that workers, on average, perceived their supervisor as being relatively low in commitment to OHS but that group consensus within this subcontractor was low, that is, workers engaged by this subcontractor did not share similar perceptions of their own company *Supervisor’s Safety Response*.

Figure 4 shows the quadrant plot for subcontracted workers’ perceptions of their *Co-workers’ Safety Response*. All but one subcontractor fell into the ‘Strongly Supportive’ quadrant, indicating that workers considered that their co-workers to be concerned about OHS and also indicating a high level of within group agreement about this concern (See Figure 22). One subcontractor fell into the ‘Contradictory’ quadrant, indicating that workers, on average, perceived their co-workers to be concerned about OHS but having a low level of consensus about this concern, that is, workers engaged by this subcontractor did not share similar perceptions of their co-workers’ level of concern for OHS.
DISCUSSION

Group-level climates

All three safety climate dimensions indicated high levels of within-group homogeneity, indicating that workers employed by a single subcontractor share consistent perceptions of their own OSR, SSR and CSR. The analyses of variance revealed significant between-subcontractor differences in perceptions of the OSR and SSR. However, no significant between-subcontractor difference was found for perceptions of CSR. The conditions established by Zohar for group-level safety climate were satisfied for two of the three safety climate dimensions measured (i.e., subcontractors’ OSR and SSR). This lends further validity to the concept of group-level safety climate in the construction industry and also extends previous analysis by examining the extent to which distinct and unique safety climates exist within subcontracted workgroups. Group-level safety climates are likely to be particularly significant when work teams enjoy a high level of autonomy and work is de-centralised and non-routine, as in the construction industry. Given the characteristics of construction work, which is undertaken within small workgroups, and in which members exercise considerable discretion in the interpretation of organizational safety policy and procedures, the safety climate of subcontracted workgroups is likely to exert greater influence on OHS performance than in other organizational contexts.

In the construction context, the variation in subcontractors’ safety climates revealed in this analysis raise important questions for principal contractors concerning the alignment of subcontractors’ safety climates with the principal contractor’s organizational commitment to OHS. In revealing significant variance in workers perceptions of subcontractors’ ORS and SSR, the results raise the possibility that some subcontractors will be perceived by their workers as being significantly different in their commitment to OHS than the principal contractor. As perceptions of the subcontractors’ safety climate are likely to be the more proximal, direct influence on workers’ OHS behaviour, this could undermine the principal contractors’ OHS management efforts and impact upon the attainment of project OHS goals.

In the present research, group perceptions of subcontractors’ OSR and SSR were both inversely significantly correlated with the subcontractors’ lost time injury (LTI) and medical treatment injury (MTI) rate for the twelve months prior to administration of the survey, providing preliminary evidence of a link between safety climate (level) and subcontractors’ OHS performance. The correlation between subcontractors’ mean OSR score and the LTI/MTI rate was $r=-.578$, ($p=.000$) and the correlation between subcontractors’ mean SSR was $r=-.313$ ($p=.001$).
The results also have important implications for safety climate research. The existence of distinct
and unique safety climates within subcontracted workgroups highlights the need to carefully
specify the unit of analysis in safety climate research in the construction industry. Attempts to link
perceptions of the principal contractors’ organizational safety climate with on-site OHS
performance might mask significant differences between subcontractors.

The theoretical model for positioning workgroup safety climate in a two dimensional grid
recognises that both safety climate level and safety climate strength are likely to be important in
shaping safety-related behaviours (Zohar 2002). Strategies to promote ‘strongly supportive’ safety
climates within subcontracted workgroups are recommended.

CONCLUSIONS
The results of the research lend further support to the existence of group-level safety climates
within the Australian construction industry. First, the results have shown that workgroup members
develop uniform perceptions concerning safety within their subcontracted workgroups; and second,
perceptions of subcontractors’ OSR and SSR vary between workgroups, resulting in significantly
different safety climate perceptions between members of different subcontracted workgroups (i.e.
between group variance).

Limitations and future research
Owing to the small number of subcontracted workgroups in the analysis (n=9), it was not possible
to investigate whether the position of a workgroup’s safety climate in the four quadrant model was
related to OHS performance. Future research should investigate the two-dimensional models’
ability to predict subcontracted workgroups’ OHS performance in the construction industry. It is
recommended that prospective research designs be employed in future research. It is hoped that
the current study will encourage researchers to conduct further studies of a similar design in order
to replicate and extend the results.

Acknowledgement
This research was funded by the Australian Research Council under Linkage Project Grant
LP0668012.

REFERENCES
ASCC, (2008), Information Sheet, Construction, Australian Safety and Compensation Council,
Canberra.
Choudhry, R. M. & Fang, D., (2008), Why operatives engage in unsafe work behavior:
Investigating factors on construction sites, Safety Science, 566–584

Clarke, S., (2006b), The relationship between safety climate and safety performance: A meta-


Dedobbeleer, N. and Béland, F. (1991), A safety climate measure for construction sites, Journal of
Safety Research, 22, 97-103.

positions in a nuclear decommissioning and demolition industry: Employees’ self-reported safety
attitudes and perceptions, Safety Science, 45, 875-889.

Flin, R., Mearns, K., O’Connor, P. and Bryden, R., (2000), Measuring safety climate: identifying the
common features, Safety Science, 34, 177-192.


