SafeWork NSW

NSW GOVERNMENT

Work Health and Safety (WHS) in Construction Subcontracting

Survey Report
January 2025

Acknowledgement of Country

SafeWork NSW acknowledges the Traditional Custodians of the lands where we work and live. We celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of NSW.

We pay our respects to Elders past and present and acknowledge the Aboriginal and Torres Strait Islander people that contributed to the development of this.

We advise this resource may contain images, or names of deceased persons in photographs or historical content.

Work Health and Safety (WHS) in Construction Subcontracting

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Executive Summary

Background

The project "Subcontractor Management in Construction" has been funded by SafeWork New South Wales (NSW) to understand the challenges and drivers for work health and safety (WHS) compliance in conditions of subcontracting and identify effective solutions to achieve subcontractor WHS compliance. The first stage of the project involved a comprehensive literature review, which identified a total of 38 factors that have the potential to influence subcontractor WHS compliance in the construction industry. These factors reflect five levels of influence, including:

- regulatory effectiveness
- industry context and supply chain environment
- subcontractor management practices by principal contractors
- workplace environment, and
- subcontractor knowledge, capability and attitude.

Building on the literature review findings, the current second stage of the project involved conducting a survey to:

- assess the extent to which these factors with the potential to influence subcontractor WHS compliance are currently being effectively addressed in the NSW construction industry
- highlight areas that need to be focused on for improvement, and
- identify aspects that warrant further exploration in the subsequent project stage of conducting interviews.

The survey instrument consisted of four sections, including:

- section 1 capturing participants' demographic information
- section 2 exploring participants' general perceptions of subcontractor WHS compliance in the NSW construction industry
- section 3 examining participants' perceptions of how well each of the 38 identified factors is currently being addressed in the NSW construction industry, and
- section 4 using one open-ended question to explore participants' opinions on additional considerations for ensuring subcontractor WHS compliance in the NSW construction industry.

The survey was administered using the Qualtrics online survey platform. The target participants for this survey were principal contractors and subcontractors working in the NSW construction industry. Participant recruitment was facilitated through the collaborative efforts of the project funder (i.e. SafeWork NSW), the project partner (i.e. Advanced Buildings) and members of the project's Industry Advisory Group (IAG). Participants were requested to indicate how well they believe each factor with the potential to impact subcontractor WHS compliance is currently being addressed in the NSW construction industry.

The survey was conducted between 9 September and 18 November 2024. By the end of the survey period, a total of 268 survey responses were received. After data screening, 65

invalid responses were excluded, resulting in a final dataset of 203 valid responses for data analysis.

Method

The survey data were analysed using both descriptive and inferential statistical methods. Descriptive analysis, mainly frequency counts and percentages, was used to examine the demographic data and the general perceptions of subcontractor WHS compliance. Mean scores were calculated for each of the factors with the potential to influence subcontractor WHS compliance.

The Kruskal-Wallis one-way ANOVA test was used to identify significant differences in the responses of different respondent groups in relation to the demographic variables of organisation type, construction sector, and company size. Post hoc tests were conducted to determine specific pairwise differences. An independent t-test was performed to determine any significant differences in responses of those who rated general subcontractor WHS compliance in the NSW construction industry as currently good and those who rated it as currently poor.

Findings

Among the five factors related to regulatory effectiveness, survey respondents perceived the following two factors as being the least effectively addressed in the NSW construction industry:

- adequate regulatory oversight to ensure subcontractors' WHS compliance, and
- SafeWork NSW's direct engagement with subcontractors regarding WHS.

Survey respondents perceived the NSW construction industry as performing relatively poorly in addressing factors related to industry context and the supply chain environment. This is reflected in 9 out of 10 factors being rated lower than 4 (i.e. the rating of 'good'). Specifically, respondents were most concerned about the following factors:

- adequate supply of skilled workers in the industry to undertake required work
- preventing aggressive tendering practices (e.g. bid shopping) by principal contractors
- considering the cost of subcontractor WHS compliance in head contract procurement
- sufficient financial allocation for meeting WHS requirements in subcontract procurement, and
- consistent subcontractor pre-qualification processes across principal contractors in the industry.

Survey responses indicated a need for principal contractors to improve their performance in managing subcontractors to ensure subcontractor WHS compliance. This is indicated by 10 out of 13 factors receiving a mean score lower than 4 (i.e. the rating of 'good'). The factors that were identified as being of most concern were:

- use of reward systems to incentivise subcontractor WHS compliance
- alignment between principal contractors' WHS management systems and those of subcontractors
- robust competence assessments of subcontractors before engagement
- limiting subcontractor tiers on projects to ensure effective WHS control, and
- active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs).

Among the five factors related to the local workplace environment, respondents perceived the following two factors to be the least effectively addressed in the NSW construction industry:

- subcontractors' effective coordination of activities to avoid creating WHS risks for each other, and
- fostering a shared understanding of the importance of WHS among subcontractors by principal contractors.

— Regarding subcontractor knowledge, capability and attitude, respondents perceived the factors being the least effectively addressed in the NSW construction industry as:

- subcontractors following WHS requirements, even under production pressure
- subcontractors having positive attitudes about WHS, and
- subcontractors having the resources to perform their WHS duties.

Responses were compared between respondents who indicated they work in organisations that act as principal contractors, subcontractors, or both principal contractors and subcontractors. For the factors that showed significant differences between respondent groups, the results indicate the following overall patterns:

- respondents who work primarily for principal contractors had the least positive perceptions of how well these factors are currently being addressed in the NSW construction industry, and
- respondents who work for organisations operating as both principal contractors and subcontractors had the most positive perceptions of how well these factors are currently being addressed in the NSW construction industry.

Responses were similarly compared between people working for organisations operating in the residential construction, non-residential construction and civil and heavy engineering construction sectors. For the factors that exhibited significant differences between respondent groups, the following overall pattern was observed:

- respondents from the non-residential construction sector had the least positive perceptions of how well these factors are currently being addressed in the NSW construction industry compared to those from the residential construction sector or the heavy and civil engineering construction sector.

Comparison between responses from individuals representing different company sizes did not reveal noticeable differences, except for the factor of "ensuring subcontractors are paid on time". Respondents from companies with 1-19 employees had significantly less

positive perceptions of how well this factor is currently being addressed in the NSW construction industry compared to those from companies with 20-199 employees.

Respondents who rated general subcontractor WHS compliance performance as good also had significantly more positive perceptions of how well the factors with the potential to impact subcontractor WHS compliance are currently being addressed in the NSW construction industry, compared to those who rated the subcontractor WHS compliance performance as poor. Notably, the factors that displayed the largest differences in mean scores between these two groups were similar to those rated the lowest by all respondents. It appears that these factors not only highlight areas requiring focused attention within the NSW construction industry but also reflect areas of divergent views among industry stakeholders.

1 Introduction

1.1 Background

The project "Subcontractor Management in Construction" funded by SafeWork New South Wales (NSW) aims to contribute to the prevention of workplace harm and safety incidents through improved subcontracting arrangements and management in the NSW construction industry. Specifically, the project seeks to understand the challenges and drivers of work health and safety (WHS) compliance in conditions of subcontracting, and identify effective solutions to achieve subcontractor WHS compliance.

The first stage of the project involved a comprehensive review of academic and grey literature. Drawing on the constraint-response model (Suraji et al., 2001) and the Pressure, Disorganisation, Regulatory failure (PDR) model (Quinlan, 2023), the literature review identified three major categories of constraints that are reported to affect WHS compliance in subcontracting arrangements in the construction industry, including:

- economic pressure - created by the industry conditions and the supply chain operating environment
- project disorganisation -ineffective processes and procedures and deficiencies in WHS management activities, and
- regulation - limitations in the coverage or enforcement of WHS-related legislation.

The literature review identified a range of factors that have previously been reported to influence subcontractor WHS compliance in the construction industry. Building on the literature review findings, the current second stage of the project involved conducting a survey to:

- assess the extent to which these factors of potential influence on subcontractor WHS compliance are currently being effectively addressed in the NSW construction industry
- highlight areas that need to be focused on for improvement, and
- identify aspects that warrant further exploration in the subsequent project stage of conducting interviews.

This report presents key findings from the survey.

1.2 Multilevel influences for subcontractor WHS compliance

The literature review indicates that subcontractor WHS compliance can be shaped by complex structural, systemic and management factors, with the influences operating across multiple levels of the construction industry, including the institutional, inter-organisational and organisational levels.

These multilevel influences are consistent with the theoretical models developed in the health promotion area, including the social-ecological model (McLeroy et al., 1988) and the ecology of human development (Bronfenbrenner, 1997), both of which suggest that WHS behaviour is shaped by influences arising from multiple levels in a social system.

Specifically, the social-ecological model would suggest that WHS behaviour is affected by different levels of influence embedded in a network of nested systems, including:

- intrapersonal factors, - individual characteristics such as knowledge, attitudes, behaviour and skills
- interpersonal processes and primary groups - formal and informal social networks and social support systems
- institutional factors - social institutions with organisational characteristics and formal (and informal) rules and regulations for operation
- community factors - relationships among organisations, institutions, and informal networks within defined boundaries, and
- public policy - local, state and national laws and policies (McLeroy et al., 1988).

Similarly, the ecology of human development theory argues that human development is affected by an ecological environment comprising a multilevel nesting arrangement of social structures and systems, including:

- a microsystem - the complex relations between an individual and their immediate environment setting (e.g. the workplace)
- a mesosystem - the interrelations among major immediate settings in which the person lives and works
- an exosystem - social structures (both formal and informal) that influence the immediate settings, and
- a macrosystem - the overarching institutional patterns of culture or subculture, such as the economic, social, legal and political systems that shape the micro-, meso-, and exosystems (Bronfenbrenner, 1977).

These two theoretical models were adapted to construct a conceptual model (shown in Figure 1), depicting multilevel influences for subcontractor WHS compliance in the construction industry. The conceptual model was used to guide the survey design and to structure the survey questions.

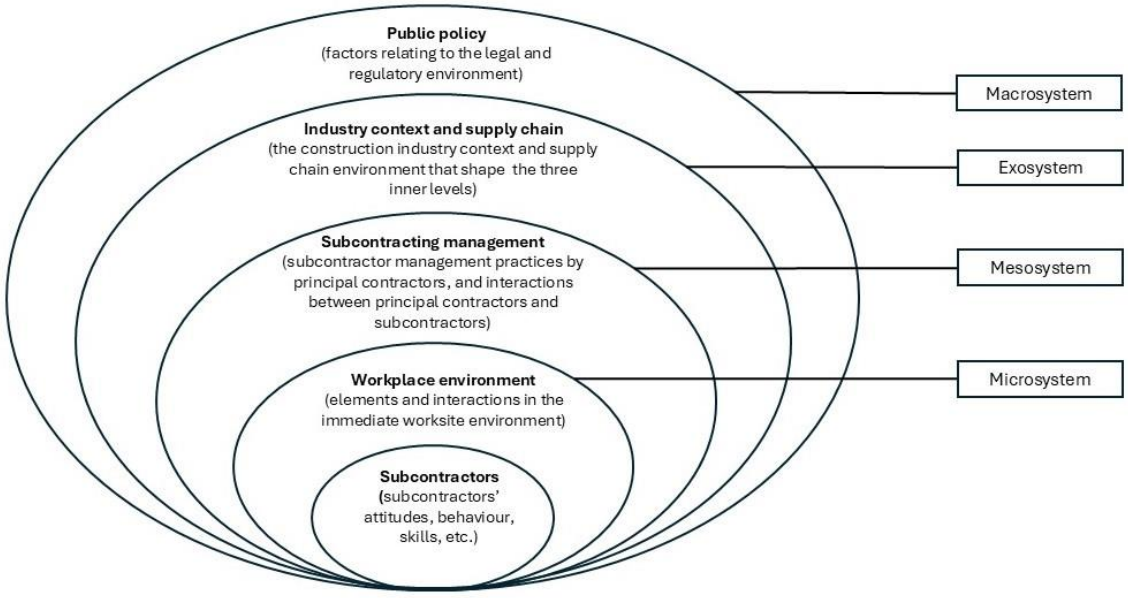

Figure 1: A conceptual model of multilevel influences for subcontractor WHS compliance

1.3 Structure of the report

The remainder of this report is structured as follows:

- Part 2 – Describes the research methods, including survey design, sampling, survey administration and data analysis techniques
- Part 3 – Reports the data analysis results and key survey findings, and
- Part 4 – Discusses the survey findings and suggests next steps.

2 Research Methods

2.2 Survey instrument development

The survey instrument was developed following a comprehensive literature review of work health and safety (WHS) in subcontracting arrangements in the construction industry. Factors with the potential to influence subcontractor WHS compliance identified from the review served as the foundation for the development of the survey instrument. These factors correspond to the different levels of influence depicted in Figure 1.

To ensure its relevance and clarity, the initial survey instrument was reviewed by members of the Industry Advisory Group (IAG) established to oversee this project, with revisions made to incorporate their feedback. Then, the instrument was pretested with Master Electricians

Australian (MEA) to evaluate its effectiveness and further refinements were made to ensure that the survey length was appropriate.

The final survey instrument consisted of 46 questions in four sections.

Section 1 captured participants' demographic information, including:

- company size
- organisation type
- sector within the construction industry, and
- job role.

Section 2 explored participants' general perceptions of subcontractor WHS compliance in the NSW construction industry.

Section 3 examined participants' perceptions of how well the identified factors of potential influence are currently being addressed in the NSW construction industry. A total of 38 factors were organised into five sub-sections, including:

- regulatory effectiveness
- industry context and supply chain environment
- subcontractor management practices by principal contractors
- workplace environment, and
- subcontractor knowledge, capability and attitude.

Section 4 used one open-ended question to explore participants' opinions about additional considerations for ensuring subcontractor WHS compliance in the NSW construction industry.

Participants were requested to answer the survey questions in sections 2 and 3 against a 6-point Likert scale ranging from "1 = extremely poor" to "6 = excellent". An even-point scale was employed to eliminate the neutral option bias in odd-point Likert scales, where respondents tend to choose the middle point (such as "neither agree nor disagree"), either due to indecision or out of convenience (Chyung et al., 2017). With an even-point scale, respondents are forced to take a clear stance, which can improve the quality of the data collected as the likelihood of central tendency bias is reduced.

2.3 Sampling

The study employed a convenience sampling strategy, which involves conducting a survey among a non-randomly selected group of participants who are conveniently accessible to the researchers, allowing the participants to self-select and participate voluntarily (Andrade, 2020; Stratton, 2021). Given that the project focuses on the NSW construction industry while the research team is based in the state of Victoria, convenience sampling was deemed the most appropriate approach for this study as the project team relied on the IAG members, the project funder (i.e., SafeWork NSW) and the project partner (i.e., Advanced Buildings) to recruit participants through their networks and social media platforms in NSW. The approach ensured access to relevant participants within the constraints of the project.

The NSW construction industry is made up of approximately 149,382 construction businesses (ABS, 2023). With this population size, a confidence level of 95%, a margin of

error of 7%, and a population proportion of 50%, the minimum required sample size was deemed to be 196 (Cochran, 1977).

2.4 Survey administration

The survey was administered using the Qualtrics online survey platform, which is the data collection tool recommended by the RMIT University Human Research Ethics Committee. Participants could access the survey using electronic devices (e.g. a computer or a smartphone) via an anonymous weblink or via a QR code.

The target participants for the study were principal contractors and subcontractors working in the NSW construction industry. Participant recruitment was facilitated through the collaborative efforts of SafeWork NSW, Advanced Buildings and members of the IAG. Recruitment activities included:

- SafeWork NSW publishing the survey invitation in their newsletter
- Advanced Buildings distributing the survey invitation to their network of subcontractors across NSW, and
- IAG members sharing the survey invitation within their professional networks.

The survey was conducted between 9 September and 18 November 2024. By the end of the survey period, 268 survey responses were received, out of which the majority of participants, 253 (94.4%), accessed the survey via the anonymous link, and 15 (5.6%) used the QR code.

2.5 Data analysis methods

The quantitative data collected through the survey were analysed using both descriptive and inferential statistical techniques in the Statistical Software Package for the Social Sciences (SPSS). Descriptive analysis, mainly frequency counts and percentages, was used to examine the demographic data and the general perceptions of subcontractor WHS compliance. Mean scores were calculated for each factor identified as having a potential influence on subcontractor WHS compliance.

A Kruskal-Wallis one-way ANOVA test was used to identify significant differences in responses between respondent groups in relation to:

- type of organisation
- construction sector, and
- company size.

Post hoc tests were performed to determine specific pairwise differences. To prevent a Type 1 error (i.e. incorrectly concluding that a statistically significant difference exists between groups when it does not), pairwise comparisons results are typically adjusted using the Bonferroni correction, which helps minimize false positives (von der Malsburg & Angele, 2017). Therefore, only pairwise comparisons with a p-value less than 0.05 after the application of the Bonferroni correction were considered to be significant and reported.

An independent samples t-test was performed to determine any significant differences between the perceptions of those who deemed current levels of subcontractor WHS compliance to be good and those rating it as poor.

Please see Appendix A for detailed descriptions of these statistical procedures.

3. Research Methods

3.1 Data cleaning

A data screening process revealed that 65 respondents (of the 268 responses received) answered fewer than half (50%) of the survey questions, 13 respondents completed at least half of survey questions, and 190 fully completed the survey.

To ensure the reliability and validity of data, responses from people who failed to answer at least 50 per cent of the survey questions were excluded from the subsequent data analysis. A total of 203 valid responses were retained in the sample, exceeding the targeted sample size of 196 responses.

3.2 Sample demographic information

3.2.1 Job role

Respondents were asked to specify their job roles. Table 1 shows that a total of 160 (78.8%) of the respondents indicated their job titles, out of which the majority (n=71, 35.0%) held senior management or executive roles, followed by 21.7% (n=44) in work health and safety (WHS) professional roles. Administrative and business support roles accounted for 7.9% (n=16) of responses, followed by project and site management roles (5.4%, n=11), and engineering and technical roles (4.4%, n=9). Additionally, nine (9) respondents (4.4%) reported job roles grouped as 'others'.

Table 1: Job roles of respondents

Job role	*N*	*%*
Senior management/Executives Owner • *Director/General Director* • *Manager/General Manager* • *Deputy Manager*	*71*	*35.0*
WHS professionals • *WHS/WSHE/HSE/HSEQ/WHSEQ Manager* • *WHS Adviser/Officer* • *Compliance Inspector* • *Risk Manager*	*44*	*21.7*
Project and site management • *Construction/Project Manager/Project Coordinator* • *Site Manager/ Supervisor*	*11*	*5.4*
Engineering and technical roles • *Construction/Project Engineer* • *Mechanical Engineer* • *Structural Engineer* • *IES (integrated environmental solutions) Manager*	*9*	*4.4*
Administrative and business support • *Administrator* • *Budget/Finance Manager* • *Sales Manager* • *Assessing Manager/Asset Manager*	*16*	*7.9*
Others	*9*	*4.4*
Not indicated	*43*	*21.2*
Total	*203*	*100.0*

3.2.2 Type of organisation

Respondents were asked to specify whether their organisation works primarily as a principal contractor, a subcontractor or both. Figure 2 shows that the largest proportion of the respondents (n=72, 35.5%) reported that their company operates as both a principal contractor and a subcontractor. This is followed by respondents whose companies operate solely as subcontractors (n = 71, 35.0%). Approximately a quarter of the respondents (n = 49, 24.1%) reported their company operates solely as a principal contractor. Additionally, 11 respondents (5.4%) reported their company's operation to fall outside the listed categories.

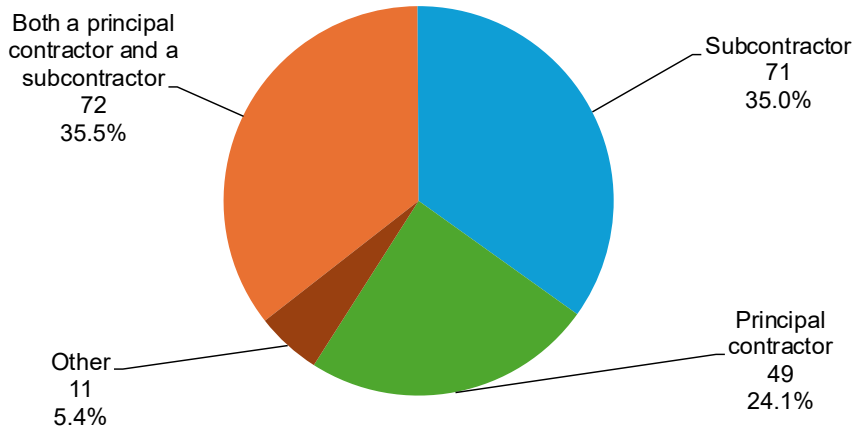

Figure 2: Type of organisation

Respondents who indicated that their company operates as a principal contractor or both a principal contractor and a subcontractor (n = 121) were asked to specify the tier of operation using four options, i.e. 'Tier 1 contractor', 'Tier 2 contractor', 'Tier 3 contractor', and 'not applicable'. Only 92 of the respondents indicated their tier of operation.

As shown in Figure 3, the largest proportion of respondents (n = 38, 41.3%) reported their company operating as a Tier 2 contractor, followed by 37 (40.2%) identifying their company as a Tier 3 contractor, while 17 respondents (18.5%) indicated that their company operates as a Tier 1 contractor.

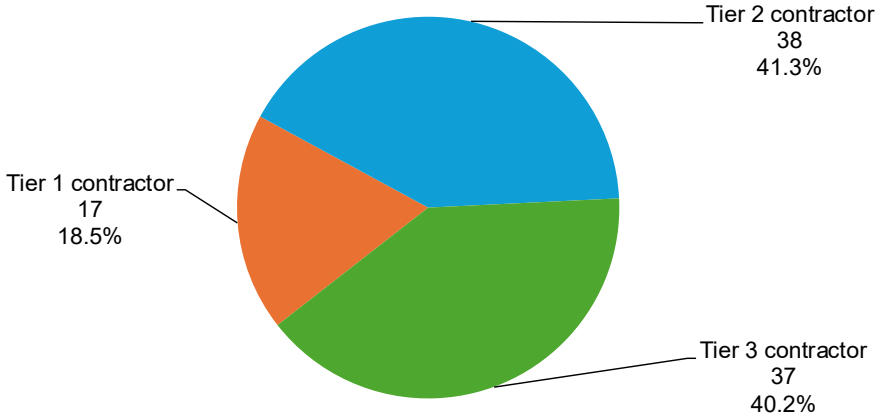

Figure 3: Principal contractor tiers

Respondents who indicated that their company operates as a subcontractor were asked to specify the primary trade in which their company is involved. Table 2 provides a summary of the subcontractors' trades. Trades specified that did not align with the Australian and New Zealand Standard Classification of Occupations (ANZSCO) groups were categorised as 'others'.

Of the 71 respondents who reported that their company operates as a subcontractor, only 65 provided information about their trade. As shown in Table 2, of the trades specified, the most frequently reported trade was bricklaying, carpentry and joinery (n = 20, 30.8%), followed by building maintenance and facilities management (n = 11, 16.9%).

Table 2: Subcontractor trade

Subcontractor trades	*N*	*%*
Bricklaying, carpentry or joinery	*20*	*30.8*
Building maintenance and facilities management	*11*	*16.9*
Floor finishing or painting	*6*	*9.2*
Steel fixing, scaffolding, construction rigging	*5*	*7.7*
Glazing, plastering or tiling	*3*	*4.6*
Plumbing	*3*	*4.6*
Electrical	*1*	*1.5*
Others	*16*	*24.6*
Total	*65*	*100.0*

3.2.3 Company size

Respondents were asked to indicate the size of their company. As illustrated in Figure 4, companies with 20-199 employees comprised the largest proportion of responses (n = 64, 31.5%). Companies employing 5-19 people comprised the second largest proportion (n = 59, 29.1%), followed by those employing 1-4 people (n = 36, 17.7%). Large businesses employing over 200 employees made up 15.8% (n = 32) of the sample, while sole traders (non-employing businesses) accounted for the smallest proportion at 5.9% of the sample (n = 12).

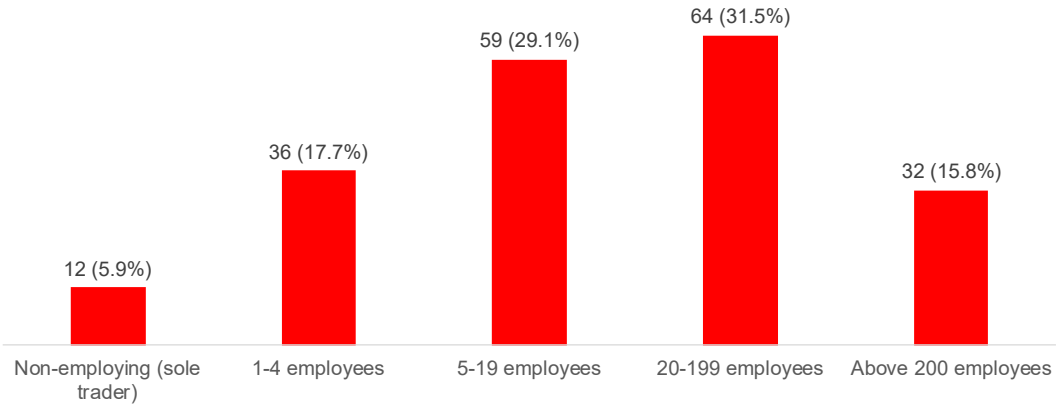

Figure 4: Company size

3.2.4 Construction sector

Respondents were asked to indicate the construction sector(s) in which their company primarily operates. **They could choose more than one sector** from four options, i.e. 'residential construction', 'non-residential construction', 'heavy and civil engineering

construction' and 'others'. Figure 5 provides a summary of construction sectors reported by respondents.

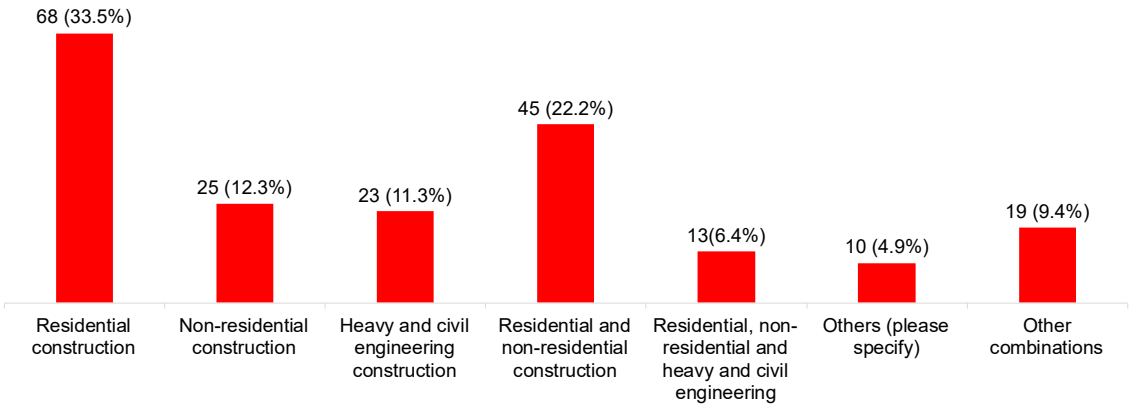

Figure 5: Sector of operation

Figure 5 shows that most respondents reported that their company operates in the residential construction sector only (n = 68, 33.5%), followed by companies operating in both residential and non-residential construction sectors (n = 45, 22.2%). Another 25 respondents (12.3%) indicated that their company operates solely in the non-residential construction sector, while 23 (11.3%) indicated that their company operates only in the heavy and civil engineering sector. In addition, 13 respondents (6.4%) indicated that their company operates across all three sectors. Due to small numbers, respondents reporting other combinations were grouped into "other combinations" (n = 19, 9.4%).

3.3 Description analysis

3.3.1 General perception of subcontractors WHS compliance performance

Respondents were asked to rate subcontractors' current levels of WHS compliance performance based on their experience in the NSW construction industry. Figure 6 illustrates that the majority of respondents had positive perceptions of subcontractor WHS compliance performance in NSW. Specifically, 76 respondents (38%) rated it as 'good', 45(22%) as 'very good' and 31 (15%) as 'excellent'.

Figure 6 also reveals that approximately a quarter of respondents held negative perceptions, among which 35 respondents (17%) rated current subcontractor WHS compliance performance as 'poor', 11 (5%) as 'very poor', and 5 (3%) as 'extremely poor'.

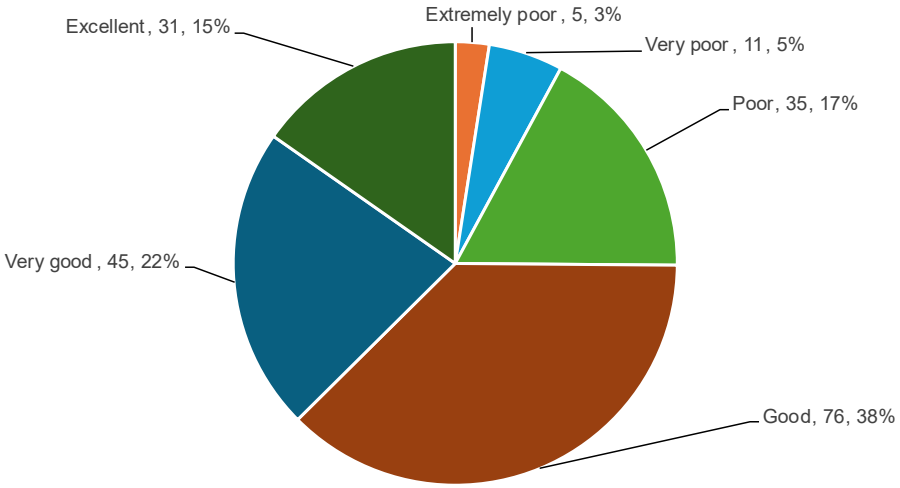

Figure 6: Overall perceptions of subcontractors' WHS compliance performance

3.3.2 Factor of potential influence on subcontractor WHS compliance

Regulatory effectiveness

Five factors related to regulatory effectiveness were identified through the literature review as being determinants of subcontractors' WHS compliance. Respondents were asked to indicate how well they believe each of these factors is being currently addressed in the NSW construction industry, using a Likert-scale ranging from 1 (extremely poor) to 6 (excellent).

Figure 7 shows the mean scores for each factor in descending order.

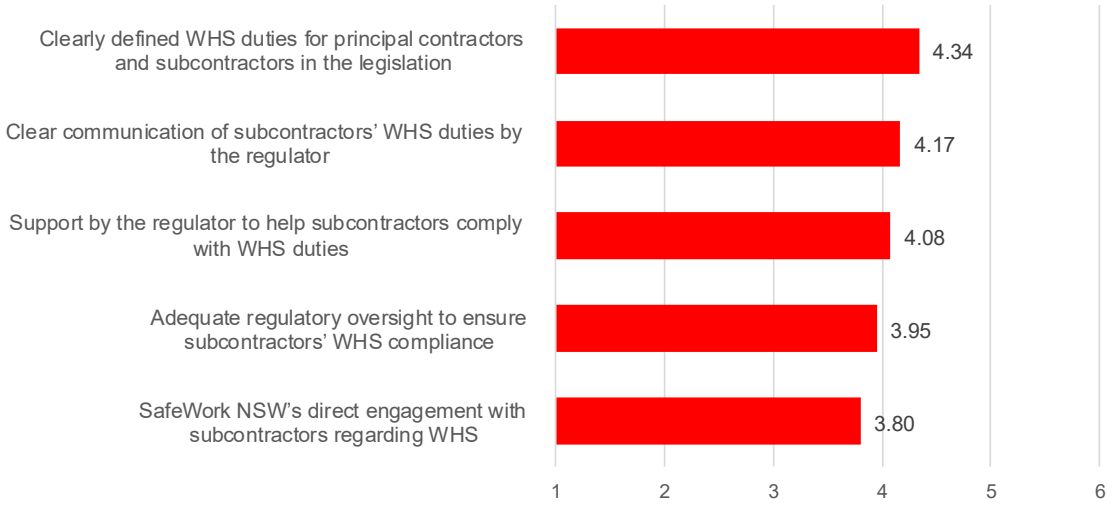

Figure 7: Mean scores for factors related to regulatory effectiveness

Out of the five factors, two were rated on average below 4 (i.e. the rating of 'good'). These two factors were related to aspects of:

the regulator's direct engagement with subcontractors (i.e. 'SafeWork NSW's direct engagement with subcontractors regarding WHS'), and

regulatory oversight (i.e. 'Adequate regulatory oversight to ensure subcontractors' WHS compliance').

Industry context and supply chain environment

A total of 10 factors related to the industry context and supply chain environment were identified from the literature as influencing subcontractors' WHS compliance. Respondents were asked to indicate how well each of these factors is being currently addressed in the NSW construction industry using a Likert-scale ranging from 1 (extremely poor) to 6 (excellent).

Figure 8 shows the mean scores for each factor in descending order.

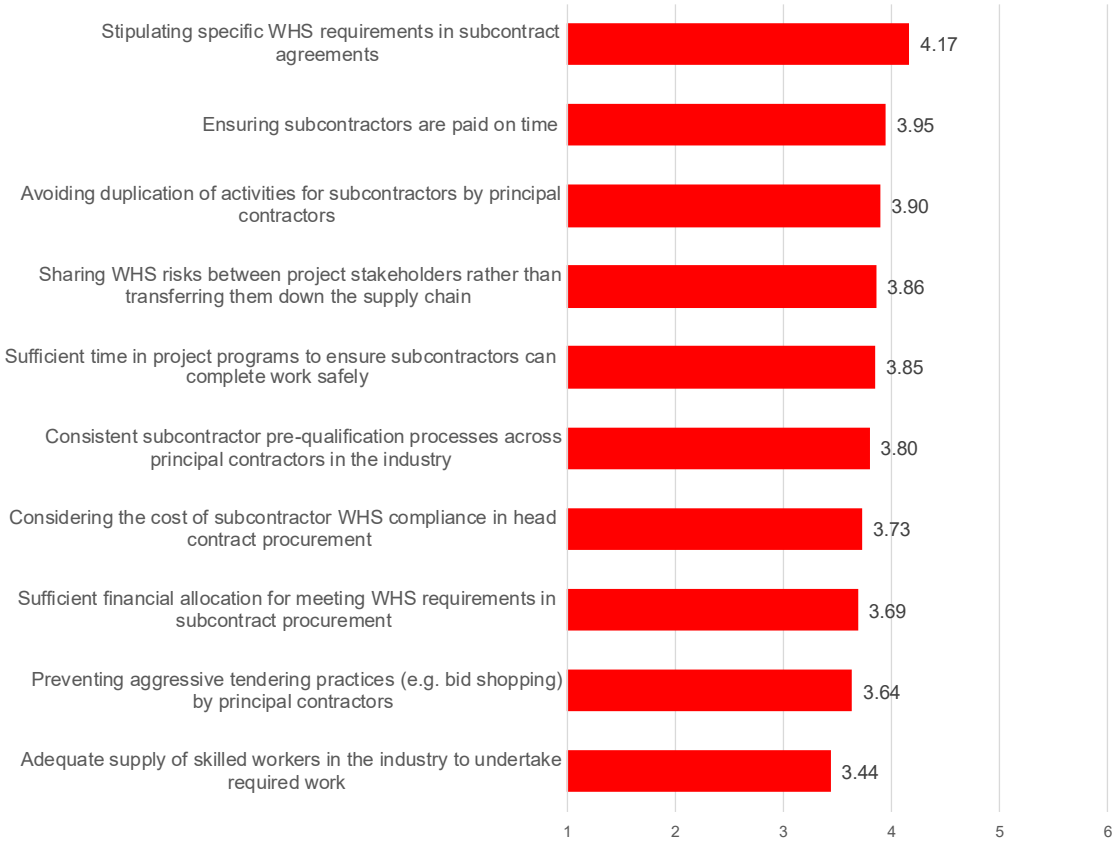

Figure 8: Mean scores for factors related to industry context and supply chain environment

The mean scores for all factors, except one, are lower than 4 (i.e. the rating of 'good'). This suggests that respondents held relatively low perceptions of the NSW construction industry's performance in effectively addressing these factors.

The factors that received the lowest mean scores are related to the following aspects:

the supply of skilled workforce in the NSW construction industry (i.e. 'Adequate supply of skilled workers in the industry to undertake required work')

tendering practices in the NSW construction industry (i.e. 'Preventing aggressive tendering practices (e.g. bid shopping) by principal contractors')

cost allocations for subcontractor WHS compliance in procurement (i.e. 'Sufficient financial allocation for meeting WHS requirements in subcontract procurement', and 'Considering the cost of subcontractor WHS compliance in head contract procurement'), and

subcontractor pre-qualification processes (i.e. 'Consistent subcontractor pre-qualification processes across principal contractors in the industry').

Subcontractor management practices by principal contractors

A total of 13 factors related to subcontractor management practices by principal contractors were identified from the literature as impacting subcontractor WHS compliance. Respondents were asked to indicate how well each of these factors is being currently addressed in the NSW construction industry using a Likert-scale ranging from 1 (extremely poor) to 6 (excellent).

Figure 9 shows the mean scores for each factor in descending order.

The mean scores for 10 out of 13 factors are lower than 4 (i.e. the rating of 'good').

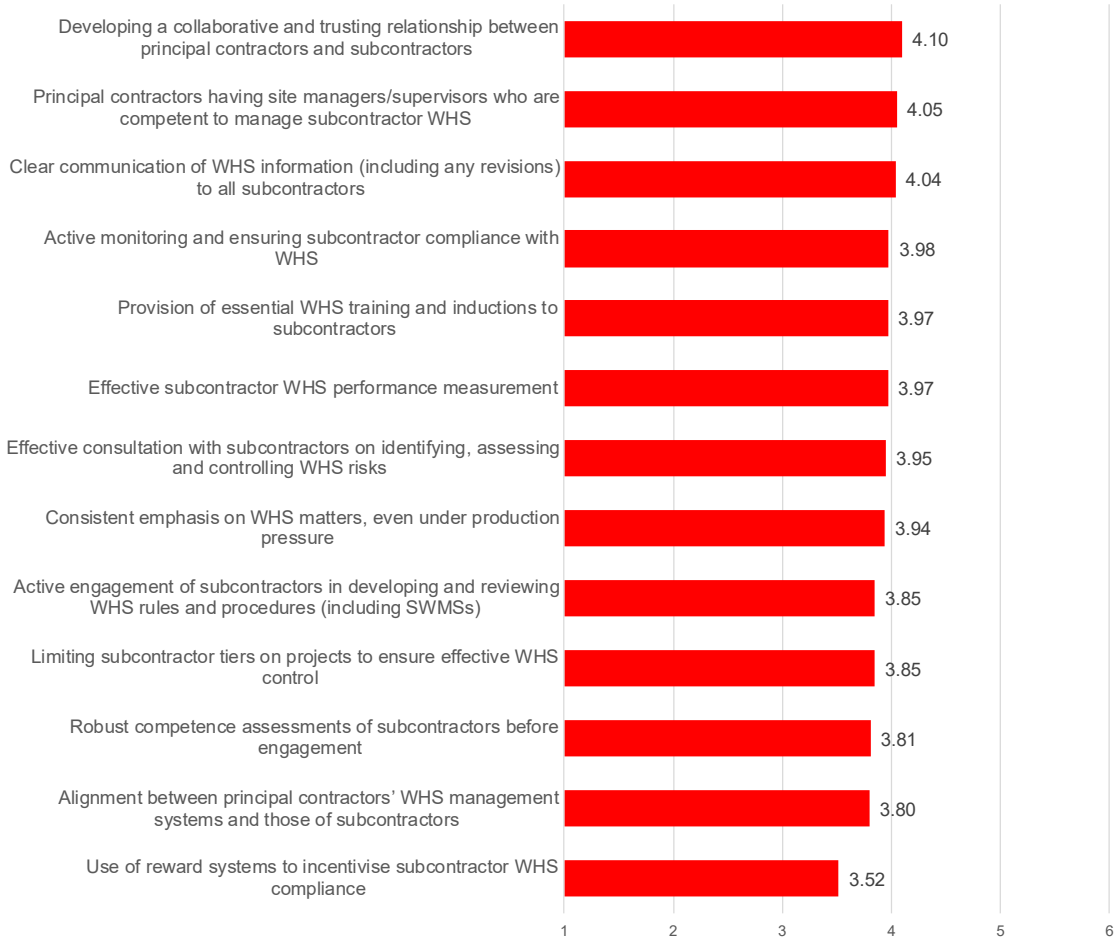

Figure 9: Mean scores for factors related to subcontractor management practices by principal contractors

Specifically, the factors that received the lowest mean scores are related to the following aspects:

- **subcontractor incentives** (i.e. 'Use of reward systems to incentivise subcontractor WHS compliance')
- **WHS management systems** (i.e. 'Alignment between principal contractors' WHS management systems and those of subcontractors')
- **subcontractor competence assessment** (i.e. **'**Robust competence assessments of subcontractors before engagement')
- **tiers of subcontracting** (i.e. 'Limiting subcontractor tiers on projects to ensure effective WHS control'), and
- **subcontractor engagement and consultation** (i.e. 'Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)').

Workplace environment

Five factors related to the local construction workplace environment were identified from literature as determinants of subcontractor WHS compliance. Respondents were asked to indicate how well each of these factors is being currently addressed in the NSW construction industry using a Likert-scale ranging from 1 (extremely poor) to 6 (excellent).

Figure 10 shows the mean scores for each factor in descending order.

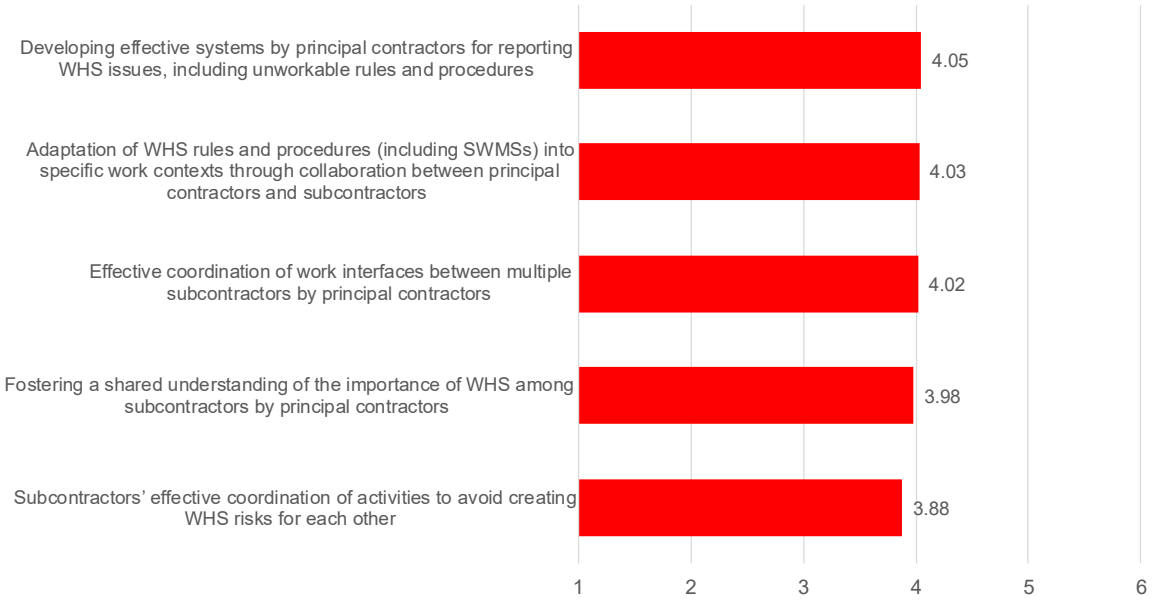

Figure 10: Mean scores for factors related to workplace environment

Two of the five factors received a mean score lower than 4 (i.e., the rating of 'good'). These two factors were related to the aspects of:

- **activity coordination among subcontractors** (i.e. 'Subcontractors' effective coordination of activities to avoid creating WHS risks for each other'), and

shared WHS understanding among subcontractors (i.e. 'Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors').

Subcontractor knowledge, capability, and attitude

Five factors related to subcontractor knowledge, capability and attitude were identified from literature as affecting subcontractor WHS compliance. Respondents were asked to indicate how well each of these factors is being currently addressed in the NSW construction industry using a Likert-scale ranging from 1 (extremely poor) to 6 (excellent).

Figure 11 shows the mean scores for each factor in descending order.

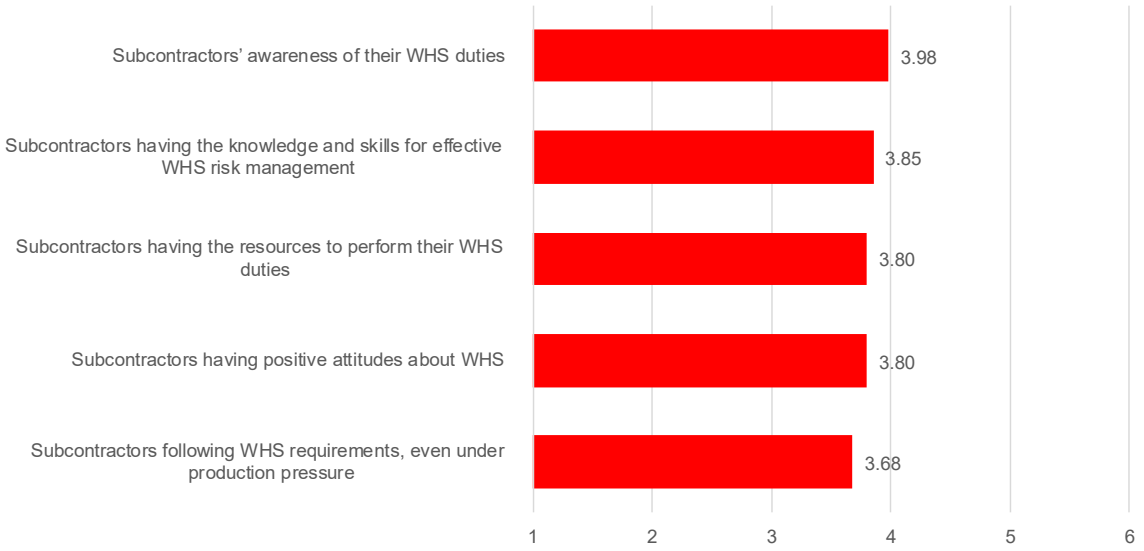

Figure 11: Mean scores for factors related to subcontractor knowledge, capability, and attitude

The mean scores for all factors are lower than 4 (i.e. the rating of 'good'), suggesting the need to improve subcontractors' WHS-related knowledge, capabilities and attitudes to enhance subcontractor WHS compliance in NSW.

The factors that received the lowest mean scores are related to the following aspects:

subcontractors' commitment and attitudes toward WHS (i.e. 'Subcontractors following WHS requirements, even under production pressure', and 'Subcontractors having positive attitudes about WHS'), and

subcontractors' WHS resources (i.e. 'Subcontractors having the resources to perform their WHS duties').

3.3.3 Comparison of survey responses between respondent group

Kruskal-Wallis ANOVA tests were performed to determine whether there were significant differences in respondents' responses to the survey questions in relation to the demographic variables of:

type of organisation

construction sector, and

company size.

3.3.4 Comparison of responses by type of organisation

Mean scores were compared to ascertain any significant differences in respondents' perceptions of how well the factors identified as having the potential to influence subcontractor WHS compliance are currently being addressed in the NSW construction industry across three types of organisations, i.e. those that operate as:

a principal contractor

a subcontractor, or

both a principal contractor and a subcontractor.

Regulatory effectiveness

Table 3 presents the mean 'regulatory effectiveness' scores for each organisation type. Kruskal-Wallis tests (presented in Table 18 in Appendix B) identified significant differences in the mean scores across the three types of organisations for the following factors:

clear communication of subcontractors' WHS duties by the regulator

support by the regulator to help subcontractors comply with WHS duties

adequate regulatory oversight to ensure subcontractors' WHS compliance, and

SafeWork NSW's direct engagement with subcontractors regarding WHS.

Table 3: Mean scores for factors related to regulatory effectiveness across the types of organisations

Regulatory effectiveness	*Principal contractor*		*Subcontractor*		*Both a principal contractor and a subcontractor*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Clearly defined WHS duties for principal contractors and subcontractors in the legislation	*4.27*	*0.79*	*4.20*	*1.09*	*4.50*	*1.02*
** Clear communication of subcontractors' WHS duties by the regulator*	*3.65*	*0.99*	*4.20*	*1.24*	*4.43*	*1.15*
** Support by the regulator to help subcontractors comply with WHS duties*	*3.82*	*0.93*	*3.99*	*1.23*	*4.38*	*1.19*
** Adequate regulatory oversight to ensure subcontractors' WHS compliance*	*3.47*	*1.19*	*4.03*	*1.27*	*4.21*	*1.17*
** SafeWork NSW's direct engagement with subcontractors regarding WHS*	*3.39*	*1.08*	*3.79*	*1.31*	*4.11*	*1.26*

**. There is a significant difference across the types of organisations (i.e. principal contractor, subcontractor, and both a principal contractor and a subcontractor); SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 12 shows the mean scores for the four factors that exhibited significant differences across respondent groups. The *post hoc* analysis (presented in Table 18 in Appendix B) indicates that:

respondents from principal contractors perceived two of the four factors, i.e. '*clear communication of subcontractors' WHS duties by the regulator*', and '*adequate regulatory oversight to ensure subcontractors' WHS compliance*', as currently being addressed significantly less effectively in the NSW construction industry compared to respondents from subcontractors, and

respondents from principal contractors perceived all four factors as currently being addressed significantly less effectively in the NSW construction industry compared to respondents from companies operating as both principal contractors and subcontractors.

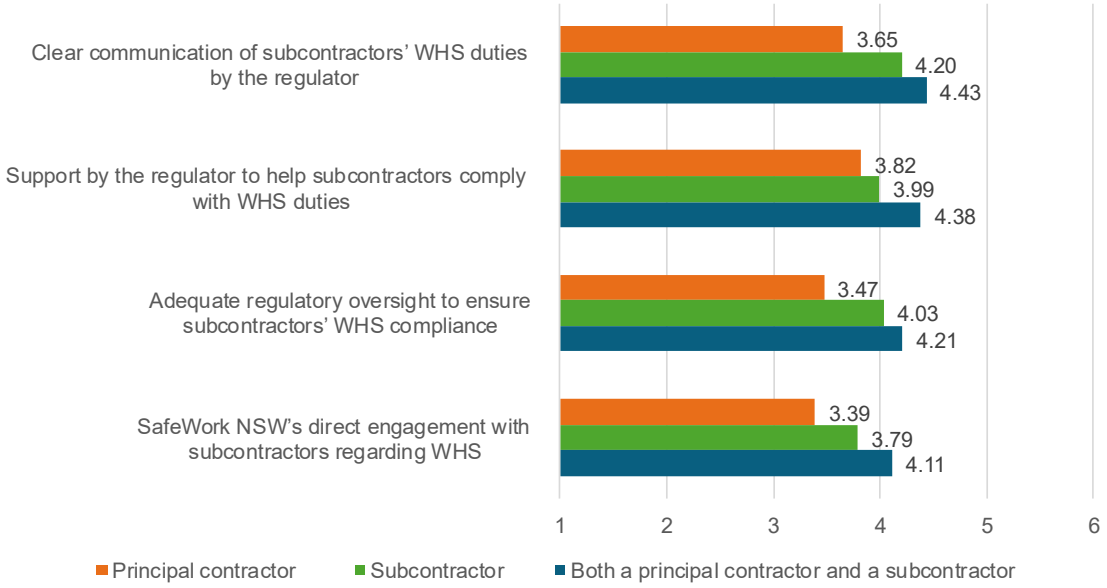

Figure 12: 'Regulatory effectiveness' mean scores across organisation types

Industry context and supply chain environment

Table 4 presents the mean scores for factors related to industry context and supply chain environment for each organisation type. Kruskal-Wallis tests (presented in Table 19 in Appendix B) identified significant differences in the mean scores across the three types of organisations for the following factors:

consistent subcontractor pre-qualification processes across principal contractors in the industry, and

adequate supply of skilled workers in the industry to undertake required work.

Table 4: Mean scores for factors related to industry context and supply chain environment across the types of organisations

Industry context and supply chain	*Principal contractor*		*Subcontractor*		*Both a principal contractor and a subcontractor*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Stipulating specific WHS requirements in subcontract agreements	*4.16*	*1.05*	*4.21*	*1.15*	*4.18*	*1.18*

Ensuring subcontractors are paid on time	*3.98*	*1.11*	*3.87*	*1.34*	*3.97*	*1.43*
Sharing WHS risks between project stakeholders rather than transferring them down the supply chain	*3.80*	*1.17*	*3.80*	*1.26*	*4.01*	*1.38*
Avoiding duplication of activities for subcontractors by principal contractors	*3.67*	*0.92*	*4.04*	*1.13*	*4.00*	*1.22*
Sufficient time in project programs to ensure subcontractors can complete work safely	*3.65*	*1.20*	*3.89*	*1.18*	*3.97*	*1.34*
Preventing aggressive tendering practices (e.g. bid shopping) by principal contractors	*3.63*	*1.22*	*3.59*	*1.44*	*3.83*	*1.52*
Considering the cost of subcontractor WHS compliance in head contract procurement	*3.59*	*1.04*	*3.69*	*1.35*	*3.89*	*1.30*
Sufficient financial allocation for meeting WHS requirements in subcontract procurement	*3.47*	*1.08*	*3.65*	*1.26*	*3.90*	*1.30*
** Consistent subcontractor pre-qualification processes across principal contractors in the industry*	*3.20*	*1.19*	*3.94*	*1.36*	*4.13*	*1.24*
** Adequate supply of skilled workers in the industry to undertake required work*	*2.86*	*1.32*	*3.48*	*1.45*	*3.93*	*1.50*

**. There is a significant difference across the types of organisations (i.e., principal contractor, subcontractor, and both a principal and a subcontractor); SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 13 shows the mean scores for the two factors that displayed significant differences across respondent groups. The *post hoc* analysis (presented in Table 19 in the Appendix B) indicates that:

respondents from principal contractors perceived the factor '*consistent subcontractor pre-qualification processes across principal contractors in the industry*' as currently being addressed significantly less effectively in the NSW construction industry compared to respondents from subcontractors, and
respondents from principal contractors perceived both factors as currently being addressed significantly less effectively in the NSW construction industry compared to respondents from companies operating as both principal contractors and subcontractors.

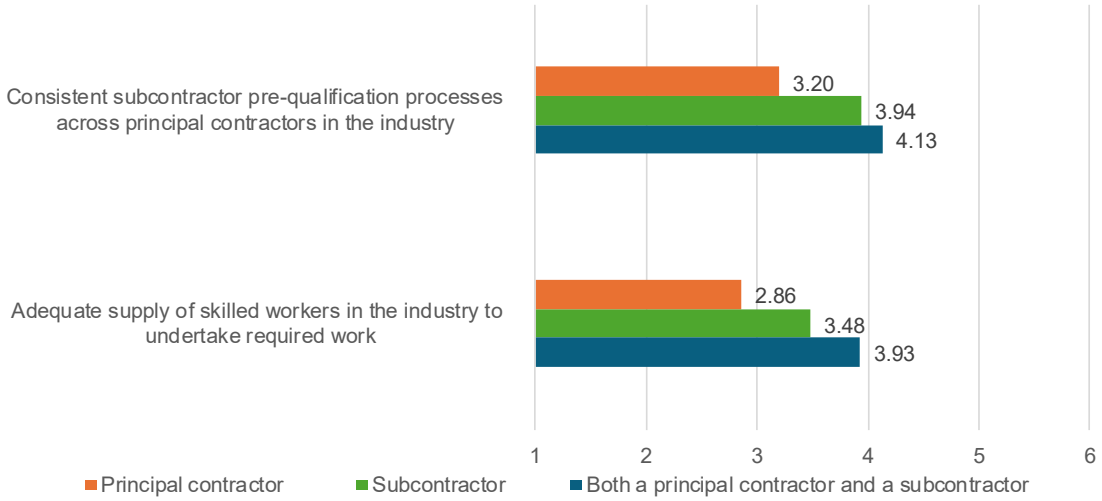

Figure 13: 'Industry context and supply chain environment' mean scores across organisation types

Subcontractor management practices by principal contractors

Table 5 presents the mean scores for factors related to subcontractor management practices by principal contractors for each organisation type. Kruskal-Wallis tests (presented in Table 20 in Appendix B) revealed significant differences in the mean scores across the three types of organisations for the factors of:

- principal contractors having site managers/supervisors who are competent to manage subcontractor WHS
- effective consultation with subcontractors on identifying, assessing and controlling WHS risks
- effective subcontractor WHS performance measurement
- alignment between principal contractors' WHS management systems and those of subcontractors
- robust competence assessments of subcontractors before engagement, and
- use of reward systems to incentivise subcontractor WHS compliance.

Table 5: Mean scores for factors related to subcontractor management practices by principal contractors across the types of organisations

Subcontractor management practices by principal contractors	*Principal contractor*		*Subcontractor*		*Both a principal contractor and a subcontractor*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Consistent emphasis on WHS matters, even under production pressure	*4.07*	*0.95*	*3.88*	*1.13*	*3.95*	*1.35*
Clear communication of WHS information (including any revisions) to all subcontractors	*3.96*	*1.03*	*4.06*	*1.16*	*4.12*	*1.40*
Active monitoring and ensuring subcontractor compliance with WHS	*3.96*	*1.03*	*4.06*	*1.17*	*4.03*	*1.37*
Provision of essential WHS training and inductions to subcontractors	*3.83*	*1.29*	*4.07*	*1.20*	*4.05*	*1.27*
Developing a collaborative and trusting relationship between principal contractors and subcontractors	*3.83*	*1.06*	*4.14*	*1.18*	*4.33*	*1.28*
**Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS*	*3.80*	*1.00*	*4.00*	*1.22*	*4.29*	*1.27*
**Effective consultation with subcontractors on identifying, assessing and controlling WHS risks*	*3.70*	*1.03*	*4.01*	*1.13*	*4.15*	*1.26*
**Effective subcontractor WHS performance measurement*	*3.65*	*1.04*	*4.00*	*1.19*	*4.26*	*1.33*
Limiting subcontractor tiers on projects to ensure effective WHS control	*3.63*	*1.04*	*3.85*	*1.23*	*4.11*	*1.25*
**Alignment between principal contractors' WHS management systems and those of subcontractors*	*3.36*	*1.11*	*3.87*	*1.15*	*4.05*	*1.40*
**Robust competence assessments of subcontractors before engagement*	*3.20*	*1.13*	*4.06*	*1.33*	*4.05*	*1.38*
**Use of reward systems to incentivise subcontractor WHS compliance*	*3.09*	*1.19*	*3.71*	*1.42*	*3.76*	*1.68*
Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)	*3.05*	*1.21*	*4.09*	*1.11*	*3.98*	*1.33*

**. There is a significant difference across the types of organisations (i.e., principal contractor, subcontractor, and both a principal contractor and a subcontractor); SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 14 shows the mean scores for the six factors that exhibited significant differences across respondent groups. The *post hoc* analysis (presented in Table 20 in Appendix B) indicates that:

- respondents from principal contractors perceived the factor of '*robust competence assessments of subcontractors before engagement*' as being addressed significantly less effectively in the NSW construction industry compared to respondents from subcontractors, and
- respondents from principal contractors perceived all six factors as currently being addressed significantly less effectively in the NSW construction industry compared to respondents from companies operating as both principal contractors and subcontractors.

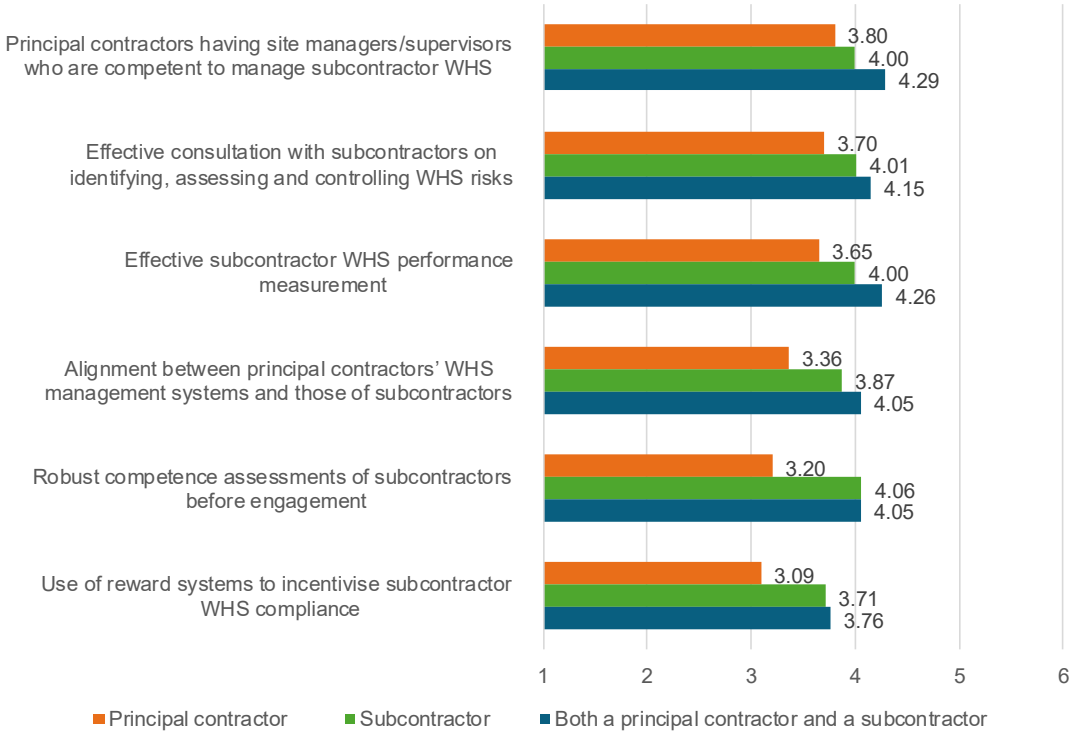

Figure 14: 'Subcontractor management practices by principal contractors' mean scores across organisation types

Workplace environment

Table 6 presents the mean scores for factors related to workplace environment for each organisation type. Kruskal-Wallis tests (presented in Table 21 in Appendix B) identified significant differences in the mean scores across the three types of organisations for the following factors:

fostering a shared understanding of the importance of WHS among subcontractors by principal contractors, and

subcontractors' effective coordination of activities to avoid creating WHS risks for each other.

Table 6: Mean scores for factors related to workplace environment across the types of organisations

Workplace environment	*Principal contractor*		*Subcontractor*		*Both a principal contractor and a subcontractor*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Developing effective systems by principal contractors for reporting WHS issues, including unworkable rules and procedures	*4.04*	*0.89*	*3.89*	*1.29*	*4.24*	*1.16*
Adaptation of WHS rules and procedures (e.g., SWMSs) into specific work contexts through collaboration between principal contractors and subcontractors	*3.83*	*0.95*	*4.08*	*1.14*	*4.21*	*1.18*
Effective coordination of work interfaces between multiple subcontractors by principal contractors	*3.87*	*0.96*	*4.06*	*1.18*	*4.17*	*1.09*
**Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors*	*3.65*	*0.99*	*4.03*	*1.11*	*4.23*	*1.28*
**Subcontractors' effective coordination of activities to avoid creating WHS risks for each other*	*3.33*	*1.12*	*4.00*	*1.19*	*4.24*	*1.33*

**. There is a significant difference across the types of organisations (i.e. principal contractor, subcontractor, and both a principal contractor and a subcontractor); SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 15 shows the mean scores for the two factors that exhibited significant differences across respondent groups. The *post hoc* analysis (presented in Table 21 in Appendix B) indicates that:

- respondents from principal contractors perceived the factor '*subcontractors' effective coordination of activities to avoid creating WHS risks for each other*' as being currently addressed significantly less effectively in the NSW construction industry compared to respondents from subcontractors, and
- respondents from principal contractors perceived both factors as being addressed significantly less effectively in the NSW construction industry compared to respondents from companies operating as both principal contractors and subcontractors.

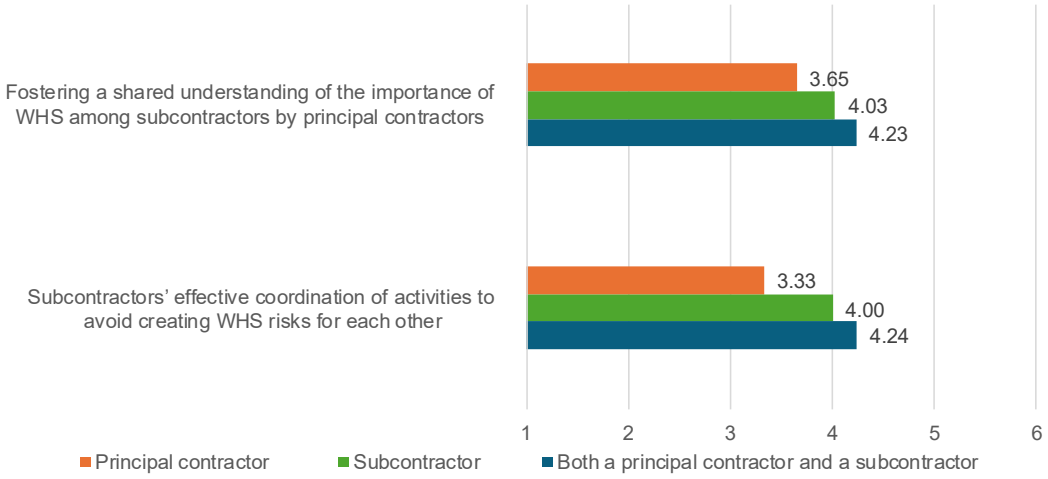

Figure 15: 'Workplace environment' mean scores across organisation types

Subcontractor knowledge, capability, and attitude

Table 7 presents the mean scores for factors related to subcontractor knowledge, capability and attitude for each organisation type. Kruskal-Wallis tests (presented in Table 22 in Appendix B) identified significant differences in the mean scores across the three types of organisations for all the factors, namely:

- subcontractors' awareness of their WHS duties
- subcontractors having the knowledge and skills for effective WHS risk management
- subcontractors having the resources to perform their WHS duties
- subcontractors having positive attitudes about WHS, and
- subcontractors following WHS requirements, even under production pressure.

Table 7: Mean scores for factors related to subcontractor knowledge, capability, and attitude across the types of organisations

Subcontractor knowledge, capability, and attitude	*Principal contractor*		*Subcontractor*		*Both a principal contractor and a subcontractor*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
**Subcontractors' awareness of their WHS duties*	*3.40*	*1.27*	*4.11*	*1.16*	*4.27*	*1.54*
**Subcontractors having the knowledge and skills for effective WHS risk management*	*3.27*	*1.27*	*3.98*	*1.15*	*4.23*	*1.41*
**Subcontractors having the resources to perform their WHS duties*	*3.18*	*1.44*	*3.92*	*1.20*	*4.17*	*1.34*
**Subcontractors having positive attitudes about WHS*	*3.27*	*1.45*	*3.98*	*1.19*	*4.06*	*1.56*
**Subcontractors following WHS requirements, even under production pressure*	*3.02*	*1.52*	*3.94*	*1.30*	*3.98*	*1.46*

**. There is a significant difference across the type of organisation (i.e., principal, subcontractor, and both a principal contractor and a subcontractor); SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 16 presents the mean scores for the five factors that displayed significant differences across respondent groups. The *post hoc* analysis (presented in Table 22 in Appendix B) indicates that:

respondents from principal contractors perceived all five factors, except '*subcontractors having positive attitudes about WHS*', as being addressed significantly less effectively in the NSW construction industry compared to respondents from subcontractors, and
respondents from principal contractors perceived all five factors as being addressed significantly less effectively in the NSW construction industry compared to respondents from companies operating as both principal contractors and subcontractors.

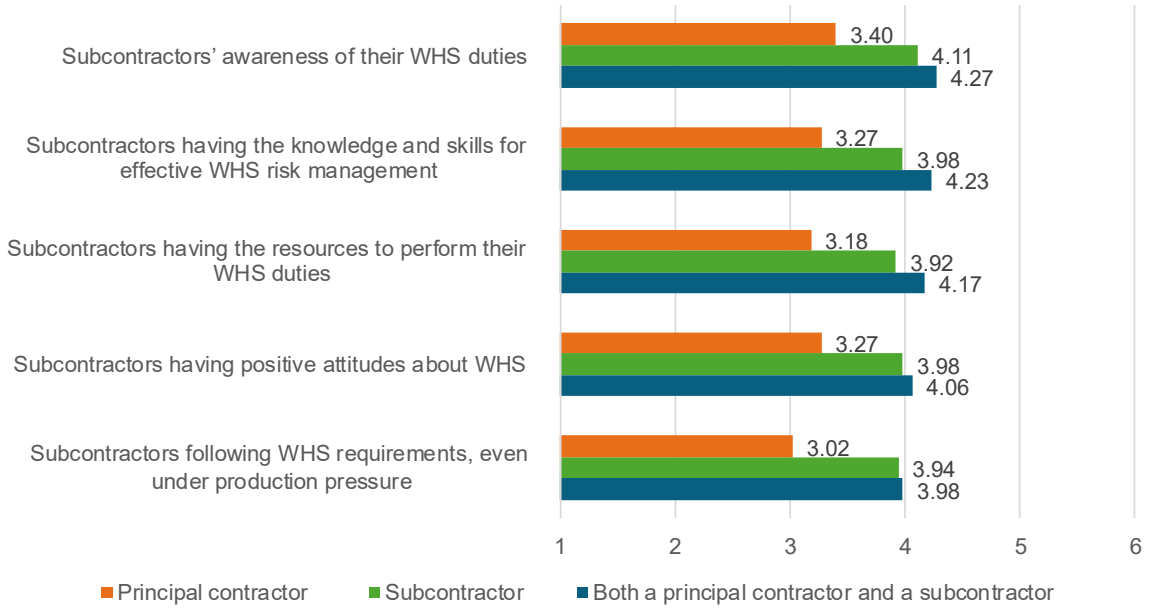

Figure 16: 'Subcontractor knowledge, capability, and attitude' mean scores across organisation types

3.4.2 Comparison of responses by construction sector

Mean scores were compared to determine any significant differences in respondents' perceptions of how well the factors of potential influence on subcontractor WHS compliance are currently being addressed in the NSW construction industry across organisations operating in the following sectors:

residential building construction

non-residential building construction

heavy and civil engineering construction

both residential and non-residential building construction, and

all three sectors, i.e. residential building, non-residential building and heavy and civil engineering construction.

Regulatory effectiveness

Table 8 presents the mean scores for factors related to regulatory effectiveness for each construction sector. Kruskal-Wallis tests (presented in Table 23 in Appendix B) identified significant differences in the mean scores across the sectors for two factors, namely:

clear communication of subcontractors' WHS duties by the regulator, and

SafeWork NSW's direct engagement with subcontractors regarding WHS.

Table 8: Mean scores for factors related to regulatory effectiveness across sectors

Regulatory effectiveness	*Residential*		*Non-residential*		*Heavy and civil engineering*		*R & NR*		*R & NR & HCE*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Clearly defined WHS duties for principal contractors and subcontractors in the legislation	*4.28*	*1.24*	*4.28*	*0.68*	*4.39*	*1.03*	*4.44*	*0.76*	*4.46*	*0.78*
**Clear communication of subcontractors' WHS duties by the regulator*	*4.37*	*1.26*	*3.56*	*1.12*	*4.35*	*1.07*	*4.29*	*1.04*	*4.15*	*1.07*
Support by the regulator to help subcontractors comply with WHS duties	*4.31*	*1.08*	*3.72*	*1.17*	*4.43*	*1.20*	*4.04*	*1.17*	*3.69*	*1.38*
Adequate regulatory oversight to ensure subcontractors' WHS compliance	*4.22*	*1.14*	*3.52*	*1.48*	*4.17*	*1.37*	*4.02*	*1.20*	*3.62*	*1.04*
**SafeWork NSW's direct engagement with subcontractors regarding WHS*	*4.10*	*1.25*	*3.28*	*1.21*	*4.17*	*1.11*	*3.82*	*1.25*	*3.08*	*1.44*

**. There is a significant difference across the sectors; R&NR = Residential and non-residential construction sectors; R&NR&HCE = Residential, non-residential and heavy and civil engineering construction sectors; SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 17 shows the mean scores for the two factors that displayed significant differences across respondent groups. The *post hoc* analysis (presented in Table 23 in Appendix B) indicates that:

respondents from the non-residential building construction sector perceived both factors as being addressed significantly less effectively in the NSW construction industry compared to those from the residential building construction sector.

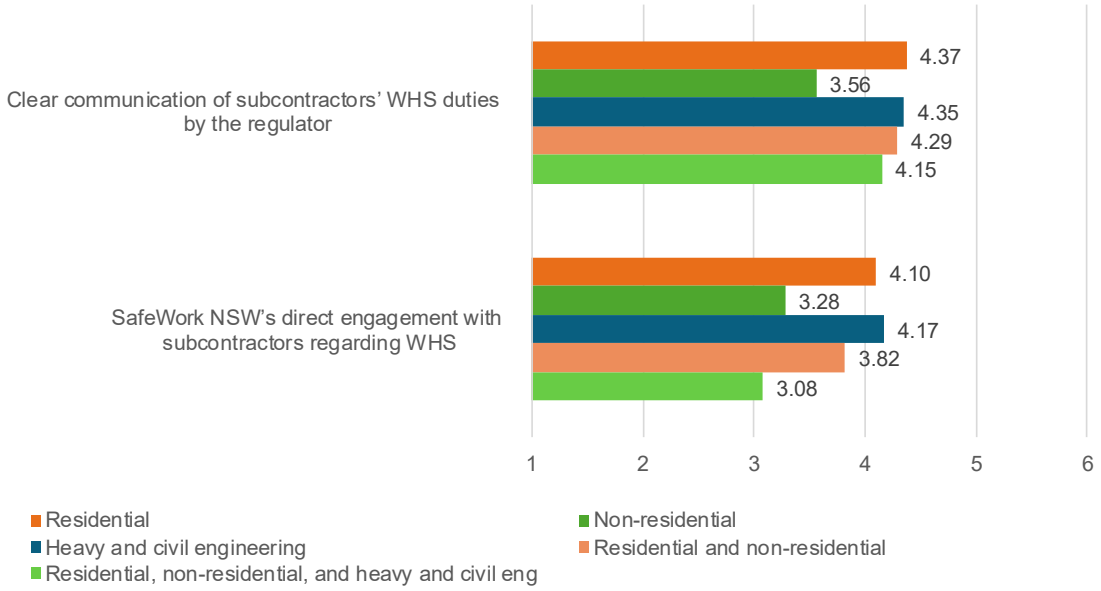

Figure 17: 'Regulatory effectiveness' mean scores across construction sectors

Industry context and supply chain environment

Table 9 presents the mean scores for factors related to industry context and supply chain environment for each construction sector. Kruskal-Wallis tests (presented in Table 24 in Appendix B) identified significant differences in the mean scores across the sectors for four factors, namely:

sufficient time in project programs to ensure subcontractors can complete work safely
sharing WHS risks between project stakeholders rather than transferring them down the supply chain
consistent subcontractor pre-qualification processes across principal contractors in the industry, and
adequate supply of skilled workers in the industry to undertake required work.

Table 9: Mean scores for factors related to industry context and supply chain environment across sectors

Regulatory effectiveness	*Residential*		*Non-residential*		*Heavy and civil engineering*		*R & NR*		*R & NR & HCE*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Stipulating specific WHS requirements in subcontract agreements	*4.37*	*1.17*	*3.80*	*1.16*	*4.30*	*1.15*	*4.16*	*1.07*	*4.15*	*0.99*
**Sufficient time in project programs to ensure subcontractors can complete work safely*	*4.26*	*1.12*	*3.20*	*1.29*	*4.22*	*1.48*	*3.64*	*1.19*	*3.77*	*1.17*
Avoiding duplication of activities for subcontractors by principal contractors	*4.24*	*1.19*	*3.68*	*1.03*	*4.04*	*1.07*	*3.82*	*1.09*	*3.46*	*1.20*
**Sharing WHS risks between project stakeholders rather than*	*4.22*	*1.33*	*3.40*	*1.00*	*4.13*	*1.36*	*3.73*	*1.20*	*3.54*	*1.13*

transferring them down the supply chain										
**Consistent subcontractor pre-qualification processes across principal contractors in the industry*	*4.16*	*1.35*	*3.04*	*1.21*	*4.26*	*1.25*	*3.93*	*1.14*	*3.23*	*1.36*
Ensuring subcontractors are paid on time	*4.12*	*1.35*	*3.92*	*1.26*	*4.52*	*1.04*	*3.73*	*1.23*	*3.85*	*1.07*
Preventing aggressive tendering practices (e.g. bid shopping) by principal contractors	*4.07*	*1.46*	*3.24*	*1.39*	*4.17*	*1.27*	*3.47*	*1.29*	*2.92*	*1.38*
Sufficient financial allocation for meeting WHS requirements in subcontract procurement	*3.99*	*1.37*	*3.40*	*1.19*	*3.78*	*1.45*	*3.64*	*1.07*	*3.31*	*1.18*
Considering the cost of subcontractor WHS compliance in head contract procurement	*3.97*	*1.34*	*3.36*	*1.08*	*4.00*	*1.24*	*3.76*	*1.23*	*3.31*	*1.38*
**Adequate supply of skilled workers in the industry to undertake required work*	*3.93*	*1.43*	*2.68*	*1.49*	*4.00*	*1.28*	*3.24*	*1.43*	*3.15*	*1.41*

**. There is a significant difference across the sectors; R&NR = Residential and non-residential construction sectors; R&NR&HCE = Residential, non-residential and heavy and civil engineering construction sectors; SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 18 shows the mean scores for the four factors that displayed significant differences across respondent groups. The *post hoc* analysis (presented in Table 24 in Appendix B) indicates that:

- respondents from the non-residential building construction sector perceived all four factors as being addressed significantly less effectively in the NSW construction industry compared to those from the residential building construction sector
- respondents from the non-residential building construction sector perceived all four factors, except for '*sharing WHS risks between project stakeholders rather than transferring them down the supply chain*', as being addressed significantly less effectively in the NSW construction industry compared to those from the heavy and civil engineering construction sector, and
- respondents from the non-residential building construction sector perceived the factor '*consistent subcontractor pre-qualification processes across principal contractors in the industry*' as being addressed significantly less effectively in the NSW construction industry compared to those working in both the residential and non-residential building construction sectors.

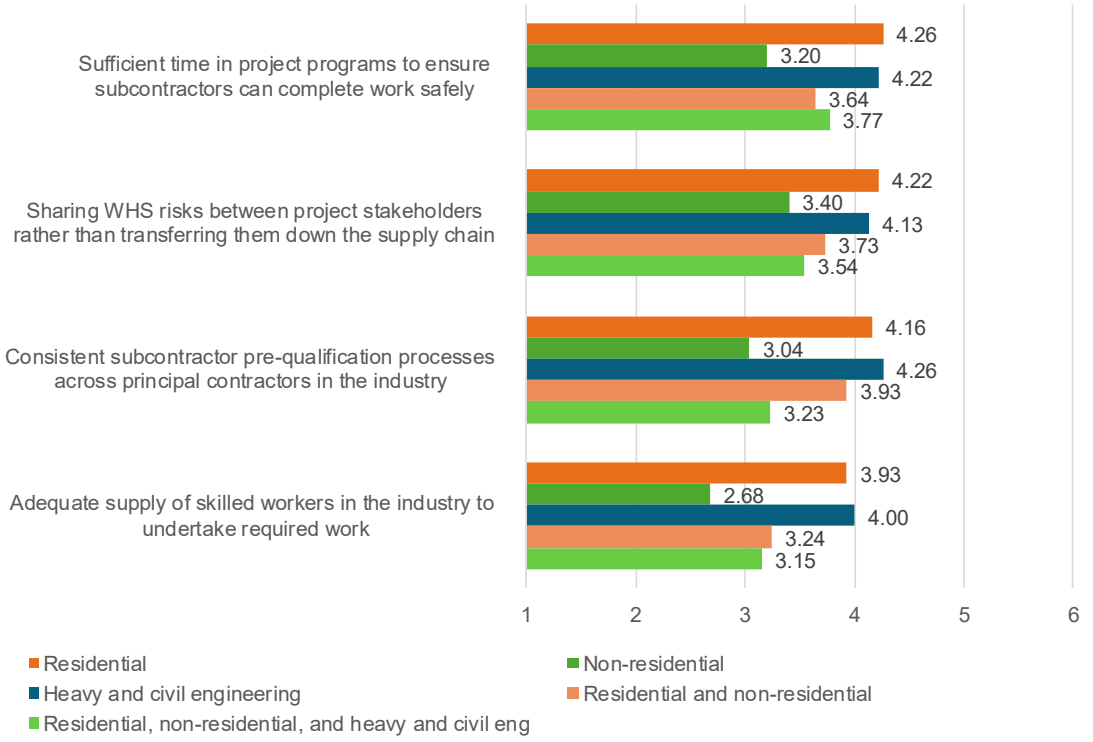

Figure 18: 'Industry context and supply chain environment' mean scores across construction sectors

Subcontractor management practices by principal contractors

Table 10 presents the mean scores for factors related to subcontractor management practices by principal contractors for each construction sector. Kruskal-Wallis tests (presented in Table 25 in Appendix B) identified significant differences in the mean scores across the sectors for four factors, namely:

effective subcontractor WHS performance measurement,
limiting subcontractor tiers on projects to ensure effective WHS control,
alignment between principal contractors' WHS management systems and those of subcontractors, and
use of reward systems to incentivise subcontractor WHS compliance.

Table 10: Mean scores for factors related to subcontractor management practices by principal contractors across sectors

Subcontractor management practices by principal contractors	*Residential*		*Non-residential*		*Heavy and civil engineering*		*R&NR*		*R&NR&HCE*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Consistent emphasis on WHS matters, even under production pressure	*4.25*	*1.32*	*3.63*	*1.17*	*3.86*	*1.25*	*3.90*	*0.98*	*4.08*	*0.52*
Clear communication of WHS information (including any revisions) to all subcontractors	*4.25*	*1.26*	*3.92*	*1.18*	*4.09*	*1.41*	*4.10*	*0.98*	*4.00*	*1.21*

Active monitoring and ensuring subcontractor compliance with WHS	*4.22*	*1.25*	*3.83*	*1.12*	*4.18*	*1.22*	*4.00*	*1.01*	*3.42*	*1.62*
Provision of essential WHS training and inductions to subcontractors	*4.20*	*1.29*	*3.54*	*1.41*	*4.32*	*1.21*	*4.10*	*0.85*	*3.83*	*1.27*
Developing a collaborative and trusting relationship between principal contractors and subcontractors	*4.32*	*1.29*	*3.75*	*1.07*	*4.41*	*1.30*	*3.95*	*1.14*	*3.91*	*1.14*
Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS	*4.25*	*1.32*	*3.92*	*0.88*	*4.14*	*1.25*	*4.17*	*1.02*	*3.55*	*1.29*
Effective consultation with subcontractors on identifying, assessing and controlling WHS risks	*4.14*	*1.26*	*3.83*	*1.17*	*3.95*	*1.25*	*4.02*	*0.98*	*3.75*	*1.36*
**Effective subcontractor WHS performance measurement*	*4.41*	*1.27*	*3.46*	*1.02*	*4.36*	*1.22*	*3.95*	*1.05*	*3.45*	*1.21*
**Limiting subcontractor tiers on projects to ensure effective WHS control*	*4.19*	*1.20*	*3.37*	*1.01*	*4.41*	*1.01*	*3.76*	*1.22*	*3.27*	*1.49*
**Alignment between principal contractors' WHS management systems and those of subcontractors*	*4.19*	*1.24*	*3.17*	*1.05*	*3.95*	*1.25*	*3.95*	*1.13*	*3.33*	*1.30*
Robust competence assessments of subcontractors before engagement	*4.19*	*1.37*	*3.38*	*1.28*	*4.27*	*1.32*	*3.78*	*1.28*	*3.55*	*1.37*
**Use of reward systems to incentivise subcontractor WHS compliance*	*4.08*	*1.52*	*2.92*	*1.35*	*3.91*	*1.54*	*3.41*	*1.28*	*3.36*	*1.29*
Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)	*4.19*	*1.19*	*3.42*	*1.32*	*3.91*	*1.31*	*3.83*	*1.17*	*3.50*	*1.31*

**. There is a significant difference across the sectors; R&NR = Residential and non-residential construction sectors; R&NR&HCE = Residential, non-residential and heavy and civil engineering construction sectors; SD = Standard deviation*

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 19 shows the mean scores for the four factors that exhibited significant differences across respondent groups. The *post hoc* analysis (presented in Table 25 in Appendix B) indicates that:

- respondents from the non-residential building construction sector perceived all four factors as being addressed significantly less effectively in the NSW construction industry compared to those from the residential building construction sector, and
- respondents from the non-residential building construction sector perceived the two factors '*effective subcontractor WHS performance measurement*' and '*limiting subcontractor tiers on projects to ensure effective WHS control*' as being addressed significantly less effectively in the NSW construction industry compared to those from the heavy and civil engineering construction sector.

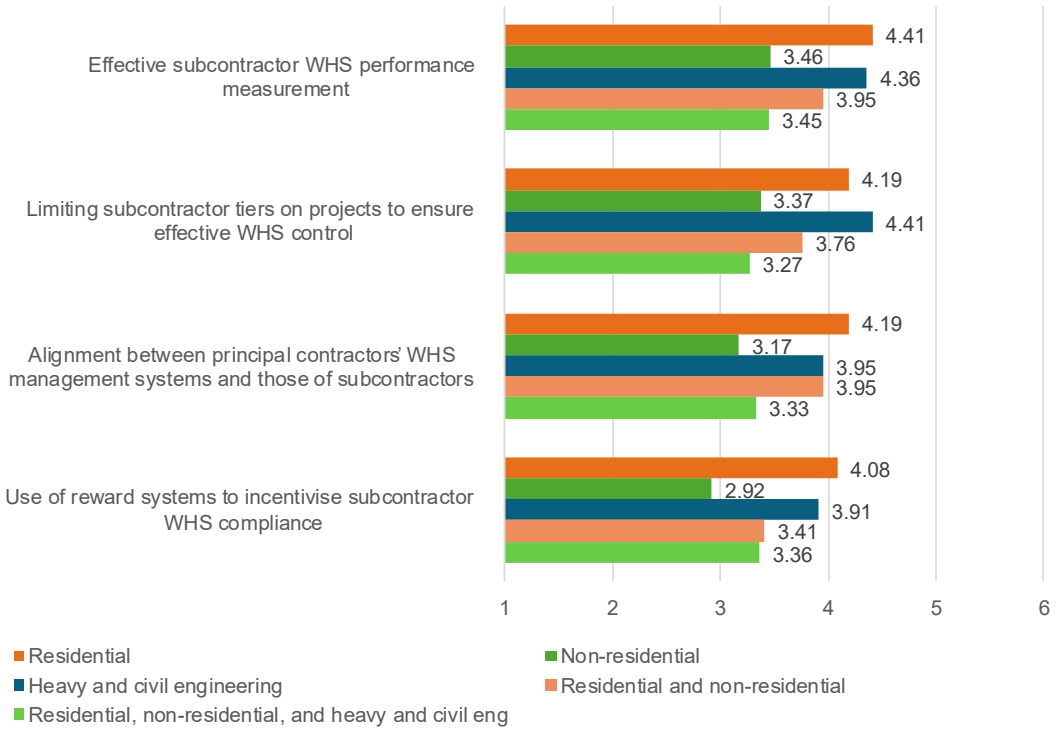

Figure 19: 'Subcontractor management practices by principal contractors' mean scores across construction sectors

Workplace environment

Table 11 presents the mean scores for factors related to workplace environment for each construction sector. Kruskal-Wallis tests (presented in Table 26 in Appendix B) identified significant differences in the mean scores across the sectors for one factor, namely:

- subcontractors' effective coordination of activities to avoid creating WHS risks for each other.

Table 11: Mean scores for factors related to workplace environment across sectors

Workplace environment	Residential		Non-residential		Heavy and civil engineering		R&NR		R&NR&HCE	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Developing effective systems by principal contractors for reporting WHS issues, including unworkable rules and procedures	4.35	1.18	3.67	1.31	4.19	1.08	4.20	0.90	3.90	1.29
Adaptation of WHS rules and procedures (e.g., SWMSs) into specific work contexts through collaboration between principal contractors and subcontractors	4.25	1.09	3.67	1.13	4.00	1.31	4.15	1.04	4.00	1.33
Effective coordination of work interfaces between multiple subcontractors by principal contractors	4.38	1.16	3.75	0.99	4.05	1.33	3.90	0.92	3.40	1.51
Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors	4.22	1.24	3.50	1.02	4.27	1.16	4.02	1.04	4.10	1.37
*Subcontractors' effective coordination of activities to avoid creating WHS risks for each other	4.22	1.25	3.17	1.20	4.32	1.36	3.93	1.13	3.90	1.37

**. There is a significant difference across the sectors; R&NR = Residential and non-residential construction sectors; R&NR&HCE = Residential, non-residential and heavy and civil engineering construction sectors; SD = Standard deviation*

The factor that displayed statistically significant differences across respondent groups was subject to further analysis.

Figure 20 shows the mean score for the factor that exhibited significant differences across respondent groups. The *post hoc* analysis (presented in Table 26 in Appendix B) indicates that:

> respondents from the non-residential building construction sector perceived this factor as being addressed significantly less effectively in the NSW construction industry compared to those from the residential building and heavy and civil engineering construction sectors.

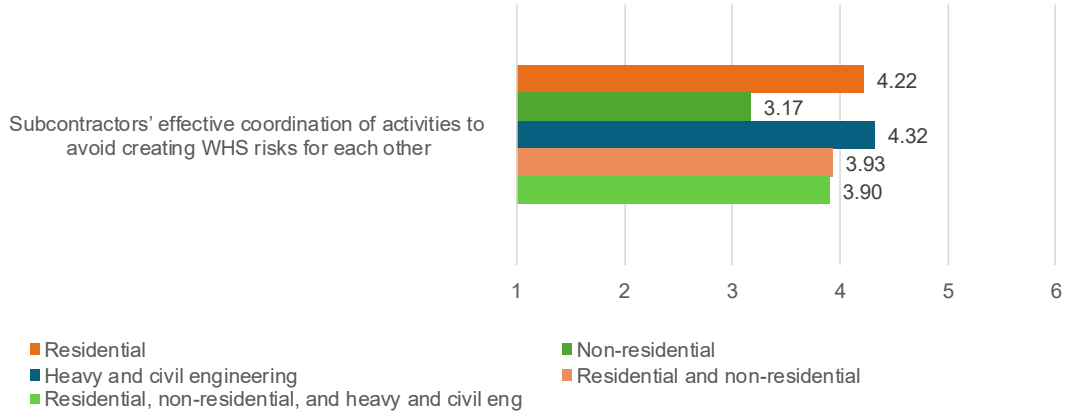

Figure 20: 'Workplace environment' mean scores across construction sectors

Subcontractor knowledge, capability, and attitude

Table 12 presents the mean scores for factors related to subcontractor knowledge, capability, and attitude for each construction sector. Kruskal-Wallis tests (presented in Table 27 in Appendix B) identified significant differences in the mean scores across the sectors for all the factors, namely:

- subcontractors' awareness of their WHS duties
- subcontractors having the knowledge and skills for effective WHS risk management
- subcontractors having the resources to perform their WHS duties
- subcontractors having positive attitudes about WHS, and
- subcontractors following WHS requirements, even under production pressure.

Table 12: Mean scores for factors related to subcontractor knowledge, capability, and attitude across sectors

Subcontractor knowledge, capability, and attitude	*Residential*		*Non-residential*		*Heavy and civil engineering*		*R&NR*		*R&NR&HCE*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
**Subcontractors' awareness of their WHS duties*	*4.27*	*1.30*	*3.25*	*1.23*	*4.27*	*1.35*	*4.13*	*1.36*	*4.20*	*1.48*
**Subcontractors having the knowledge and skills for effective WHS risk management*	*4.30*	*1.38*	*3.12*	*0.99*	*4.45*	*1.19*	*3.72*	*1.28*	*3.50*	*1.27*
**Subcontractors having the resources to perform their WHS duties*	*4.29*	*1.35*	*2.96*	*1.23*	*4.14*	*1.21*	*3.80*	*1.34*	*3.50*	*1.27*
**Subcontractors having positive attitudes about WHS*	*4.38*	*1.29*	*2.75*	*1.51*	*4.45*	*1.10*	*3.68*	*1.19*	*3.50*	*1.65*
**Subcontractors following WHS requirements, even under production pressure*	*4.27*	*1.36*	*2.63*	*1.31*	*4.14*	*1.17*	*3.65*	*1.29*	*3.30*	*1.83*

. There is a significant difference across the sectors; R&NR = Residential and non-residential construction sectors; R&NR&HCE = Residential, non-residential and heavy and civil engineering construction sectors; SD = Standard deviation

The factors that displayed statistically significant differences across respondent groups were subject to further analysis.

Figure 21 shows the mean scores for the five factors that showed significant differences across respondent groups. The *post hoc* analysis (presented in Table 27 in Appendix B) indicates that:

- respondents from the non-residential building construction sector perceived all five factors as being addressed significantly less effectively in the NSW construction industry compared to those from the residential building construction sector,
- respondents from the non-residential building construction sector perceived all five factors, except for 'subcontractors' awareness of their WHS duties', as being addressed significantly less effectively in the NSW construction industry compared to those from the heavy and civil engineering construction sector, and
- respondents from the non-residential building construction sector perceived the factor 'subcontractors' awareness of their WHS duties' as being addressed significantly less effectively in the NSW construction industry compared to those working in both residential and non-residential building construction sectors.

Figure 21: 'Subcontractor knowledge, capability, and attitude' mean scores across construction sectors

3.3.5 Comparison of responses by company size

Mean scores were compared to determine any significant differences in respondents' perceptions of how well the factors of potential influence on subcontractor WHS

compliance are currently being addressed in the NSW construction industry across three categories of company size:

1-19 employees

20-199 employees, and

over 200 employees.

For this comparison, the company sizes were regrouped to include only companies employing at least one employee. Sole traders (non-employing businesses) were excluded from the comparison due to their unique characteristics. Companies with 1-4 employees and those with 5-19 employees were combined into one category, i.e. 1-19 employees, as both are considered small businesses.

Regulatory effectiveness

Table 13 presents the mean scores for factors related to regulatory effectiveness for each company size. Kruskal-Wallis tests (presented in Table 28 in Appendix B) did not identify any significant differences in the respondents' responses across company sizes.

Table 13: Mean scores for factors related to regulatory effectiveness across company sizes

Regulatory effectiveness	*1-19 employees*		*20-199 employees*		*Over 200 employees*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Clearly defined WHS duties for principal contractors and subcontractors in the legislation	*4.43*	*0.99*	*4.45*	*0.85*	*4.44*	*1.08*
Clear communication of subcontractors' WHS duties by the regulator	*4.27*	*1.11*	*4.11*	*1.21*	*4.22*	*1.10*
Support by the regulator to help subcontractors comply with WHS duties	*4.02*	*1.24*	*4.17*	*1.06*	*4.22*	*1.21*
Adequate regulatory oversight to ensure subcontractors' WHS compliance	*3.97*	*1.29*	*4.11*	*1.18*	*3.75*	*1.27*
SafeWork NSW's direct engagement with subcontractors regarding WHS	*3.80*	*1.31*	*3.84*	*1.14*	*3.78*	*1.36*

SD = Standard deviation

Industry context and supply chain environment

Table 14 presents the mean scores for factors related to industry context and supply chain environment for each company size. Kruskal-Wallis tests (presented in Table 29 in Appendix B) identified a significant difference in the mean scores across company sizes for one factor, namely:

ensuring subcontractors are paid on time.

Table 14: Mean scores for factors related to industry context and supply chain environment across company sizes

Industry context and supply chain environment	*1-19 employees*		*20-199 employees*		*Over 200 employees*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Stipulating specific WHS requirements in subcontract agreements	*4.19*	*1.10*	*4.31*	*1.07*	*4.03*	*1.20*
Avoiding duplication of activities for subcontractors by principal contractors	*4.00*	*1.08*	*3.87*	*1.13*	*3.84*	*1.22*
Consistent subcontractor pre-qualification processes across principal contractors in the industry	*4.00*	*1.26*	*3.63*	*1.29*	*3.78*	*1.48*
Sufficient time in project programs to ensure subcontractors can complete work safely	*3.85*	*1.20*	*4.09*	*1.24*	*3.62*	*1.29*
Sharing WHS risks between project stakeholders rather than transferring them down the supply chain	*3.76*	*1.24*	*4.03*	*1.15*	*4.00*	*1.55*
**Ensuring subcontractors are paid on time*	*3.75*	*1.39*	*4.25*	*1.10*	*4.22*	*1.16*
Considering the cost of subcontractor WHS compliance in head contract procurement	*3.69*	*1.29*	*3.83*	*1.15*	*3.84*	*1.37*
Sufficient financial allocation for meeting WHS requirements in subcontract procurement	*3.63*	*1.30*	*3.81*	*1.08*	*3.78*	*1.45*
Adequate supply of skilled workers in the industry to undertake required work	*3.59*	*1.34*	*3.38*	*1.61*	*3.37*	*1.66*
Preventing aggressive tendering practices (e.g. bid shopping) by principal contractors	*3.47*	*1.43*	*3.97*	*1.32*	*3.69*	*1.49*

** There is a significant difference across company size; SD = Standard deviation*

The factor that displayed a statistically significant difference across respondent groups was subject to further analysis.

Figure 22 shows the mean score for the factor that displayed significant differences across respondent groups. The *post hoc* analysis (presented in Table 29 in Appendix B) indicates that:

> respondents from companies with 1-19 employees perceived this factor as being addressed significantly less effectively in the NSW construction industry compared to those from companies with 20-199 employees.

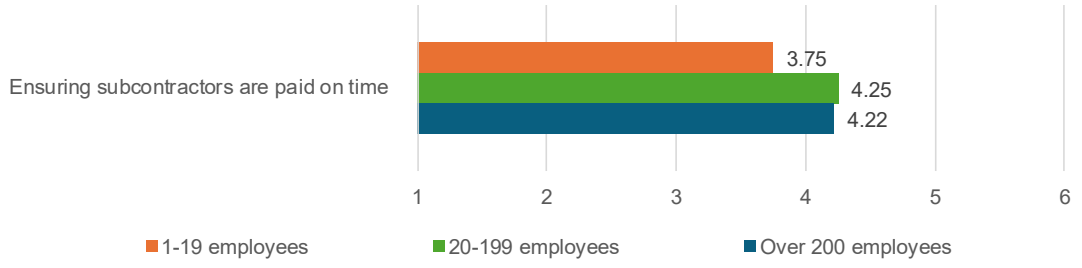

Figure 22: 'Industry context and supply chain environment' mean scores across company sizes

Subcontractor management practices by principal contractors

Table 15 presents the mean scores for factors related to subcontractor management practices by principal contractors for each company size. Kruskal-Wallis tests (presented in Table 30 in Appendix B) did not identify significant differences in the respondents' responses across company sizes.

Table 15: Mean scores for factors related to subcontractor management practices by principal contractors across company size

Subcontractor management practices by principal contractors	*1-19 employees*		*20-199 employees*		*Over 200 employees*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS	*4.11*	*1.19*	*4.07*	*1.00*	*4.03*	*1.45*
Clear communication of WHS information (including any revisions) to all subcontractors	*4.08*	*1.18*	*4.10*	*1.28*	*3.97*	*1.27*
Developing a collaborative and trusting relationship between principal contractors and subcontractors	*4.04*	*1.16*	*4.34*	*0.98*	*4.07*	*1.41*
Effective subcontractor WHS performance measurement	*3.99*	*1.15*	*4.05*	*1.21*	*4.07*	*1.29*
Active monitoring and ensuring subcontractor compliance with WHS	*3.97*	*1.18*	*4.17*	*1.25*	*3.83*	*1.29*
Effective consultation with subcontractors on identifying, assessing and controlling WHS risks	*3.96*	*1.20*	*3.98*	*1.12*	*4.00*	*1.20*
Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)	*3.93*	*1.21*	*3.86*	*1.25*	*3.77*	*1.38*
Robust competence assessments of subcontractors before engagement	*3.93*	*1.31*	*3.85*	*1.31*	*3.50*	*1.38*
Limiting subcontractor tiers on projects to ensure effective WHS control	*3.93*	*1.22*	*3.88*	*1.13*	*3.73*	*1.39*
Provision of essential WHS training and inductions to subcontractors	*3.91*	*1.22*	*4.03*	*1.26*	*4.13*	*1.36*
Consistent emphasis on WHS matters, even under production pressure	*3.91*	*1.22*	*4.05*	*1.15*	*3.93*	*1.20*
Alignment between principal contractors' WHS management systems and those of subcontractors	*3.89*	*1.16*	*3.68*	*1.27*	*3.87*	*1.50*
Use of reward systems to incentivise subcontractor WHS compliance	*3.45*	*1.50*	*3.73*	*1.35*	*3.47*	*1.78*

SD = Standard deviation

Workplace environment

Table 16 presents the mean scores for factors related to workplace environment for each company size. Kruskal-Wallis tests (presented in Table 31 in Appendix B) did not identify significant differences in the respondents' responses across company sizes.

Table 16: Mean scores for factors related to workplace environment across company size

Workplace environment	*1-19 employees*		*20-199 employees*		*Over 200 employees*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Adaptation of WHS rules and procedures (e.g., SWMSs) into specific work contexts through collaboration between principal contractors and subcontractors	*4.02*	*1.30*	*4.19*	*0.94*	*3.79*	*1.01*
Effective coordination of work interfaces between multiple subcontractors by principal contractors	*4.02*	*1.18*	*4.19*	*0.84*	*3.79*	*1.26*
Subcontractors' effective coordination of activities to avoid creating WHS risks for each other	*3.96*	*1.18*	*3.98*	*1.23*	*3.59*	*1.62*
Developing effective systems by principal contractors for reporting WHS issues, including unworkable rules and procedures	*3.94*	*1.24*	*4.20*	*1.08*	*4.21*	*1.08*
Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors	*3.93*	*1.17*	*4.08*	*1.07*	*4.00*	*1.46*

SD = Standard deviation

Subcontractor knowledge, capability, and attitude

Table 17 presents the mean scores for factors related to subcontractor knowledge, capability and attitude for each company size. Kruskal-Wallis tests (presented in

Table 32 in Appendix B) did not identify any significant differences in the respondents' responses across company sizes.

Table 17: Mean scores for factors related to subcontractor knowledge, capability, and attitude across company size

Subcontractor knowledge, capability, and attitude	*1-19 employees*		*20-199 employees*		*Over 200 employees*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Subcontractors' awareness of their WHS duties	*4.03*	*1.34*	*3.88*	*1.39*	*4.10*	*1.45*
Subcontractors having the knowledge and skills for effective WHS risk management	*3.96*	*1.18*	*3.76*	*1.46*	*3.90*	*1.57*
Subcontractors having the resources to perform their WHS duties	*3.96*	*1.31*	*3.62*	*1.36*	*3.76*	*1.46*
Subcontractors having positive attitudes about WHS	*3.87*	*1.30*	*3.69*	*1.57*	*3.79*	*1.61*

Subcontractors following WHS requirements, even under production pressure	*3.84*	*1.36*	*3.50*	*1.53*	*3.69*	*1.69*

SD = Standard deviation

3.3.6 Comparison of responses by respondent's perceptions of subcontractor WHS compliance performance

As explained in Section 3.3.1, participants were asked to rate subcontractors' WHS compliance performance based on their experience in the NSW construction industry. Respondents were divided into two groups based on their responses. Those who rated the performance as 'poor', 'very poor', or 'extremely poor' were categorised into the 'poor' group, and those who rated the performance as 'good', 'very good', or 'excellent' were categorised into the 'good' group.

3.3.7 Between-group demographic comparison

Figure 23 shows how respondents from different types of organisations rated subcontractor WHS compliance performance. Overall, respondents from principal contractors were more likely to rate subcontractor WHS performance as 'poor' compared to those from subcontractors or organisations operating as both principal contractors and subcontractors.

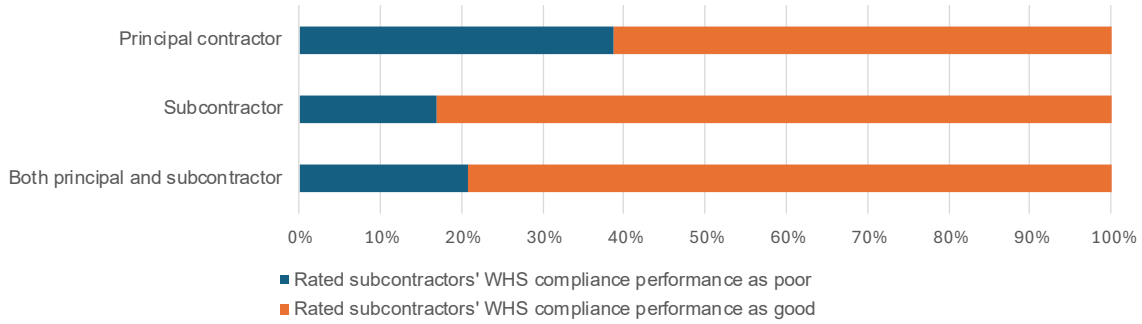

Figure 23: Overall perceptions of subcontractor WHS compliance performance across organisation types

As discussed in Section 3.2.2, respondents who indicated that their company operates as a principal contractor or both a principal contractor and a subcontractor were asked to specify the tier of operation. Figure 24 illustrates how respondents from different tiers of contractors rated subcontractor WHS compliance performance. Respondents from Tier 3 contractors were more likely to rate subcontractor WHS performance as 'poor' compared to those from Tier 1 contractors and Tier 2 contractors.

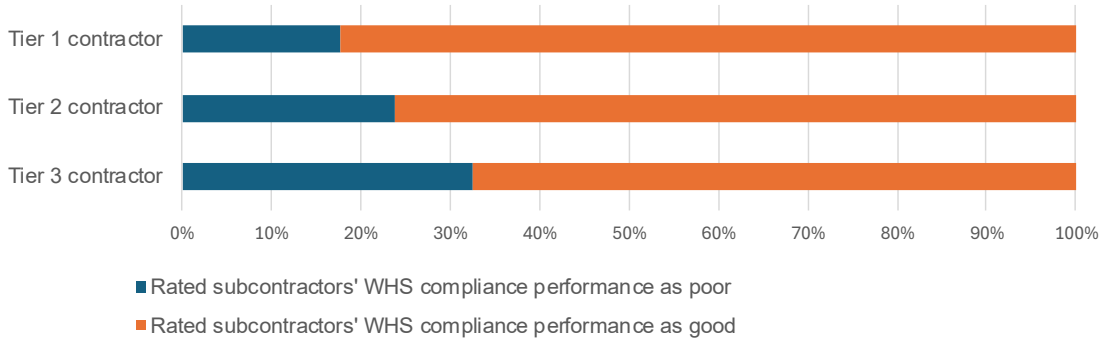

Figure 24: Overall perception of subcontractors' WHS compliance across tiers of contractor

Considering industry sectors, as shown in Figure 25, respondents from the non-residential construction sector and those working across three sectors were more likely to rate subcontractor WHS performance as 'poor' compared to respondents from other sectors.

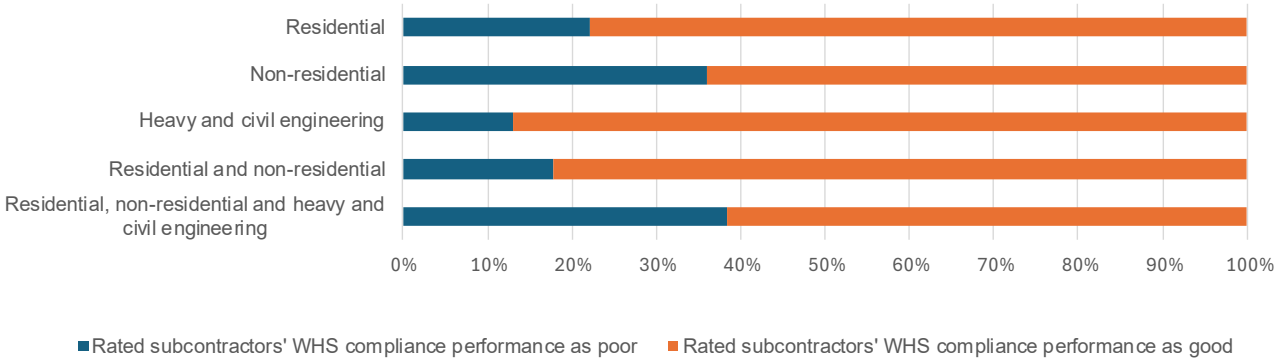

Figure 25: Overall perceptions of subcontractor WHS compliance across construction sectors

3.3.8 Comparison of responses between groups of different perceptions of subcontractor WHS compliance performance

The respondents' perceptions of the extent to which the identified factors of potential influence on subcontractor WHS compliance are currently being effectively addressed in the construction industry were compared between those who rated subcontractors' WHS compliance performance as good and those who rated it as poor.

T-tests were conducted to compare the mean scores for the factors at each level of influences between the two groups. The results (provided in Table 33 - Table 37 in Appendix B) indicate that:

- those who rated subcontractors' WHS compliance performance as good also rated the factors at all levels higher (i.e. higher mean scores for the factors) than those who rated subcontractors' WHS performance as poor, and
- the differences in mean scores for all the factors between the two groups were statistically significant.

The results suggest that those who perceived subcontractor WHS compliance performance as 'good', 'very good' or 'excellent' also had more positive perceptions about the extent to which the factors with the potential to influence subcontractor WHS compliance are being effectively addressed in the NSW construction industry.

The results for factors at each level of influence are described below.

Regulatory effectiveness

Figure 26 shows the mean scores for the factors related to regulatory effectiveness.

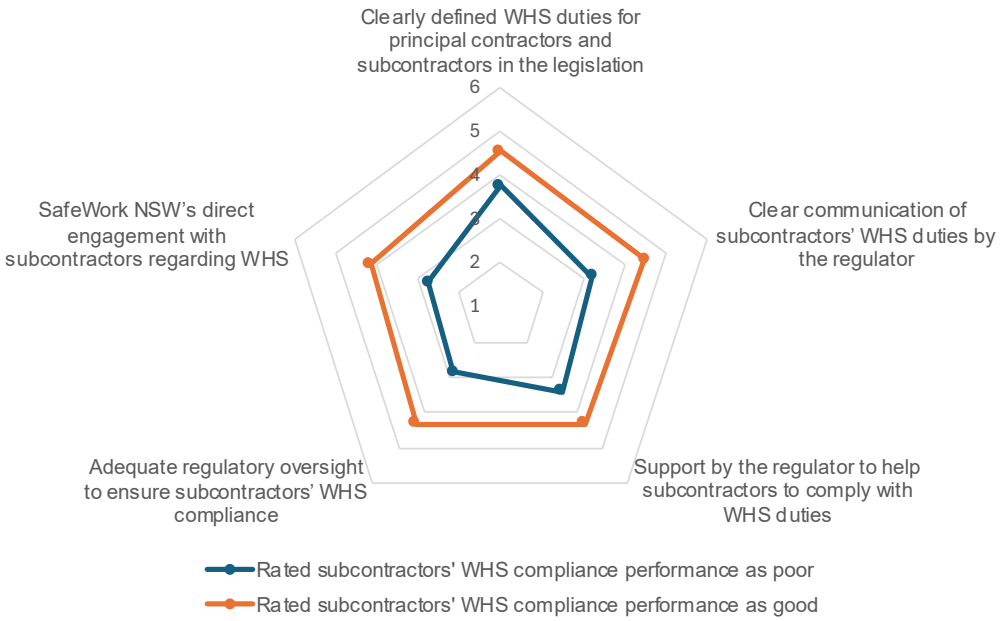

Figure 26: Between-group comparison of 'regulatory effectiveness' mean scores

The largest between-group differences in mean scores were identified for the following factors:

adequate regulatory oversight to ensure subcontractors' WHS compliance
SafeWork NSW's direct engagement with subcontractors regarding WHS, and
clear communication of subcontractors' WHS duties by the regulator.

Industry context and supply chain environment

Figure 27 shows the mean scores for the factors related to industry context and supply chain environment.

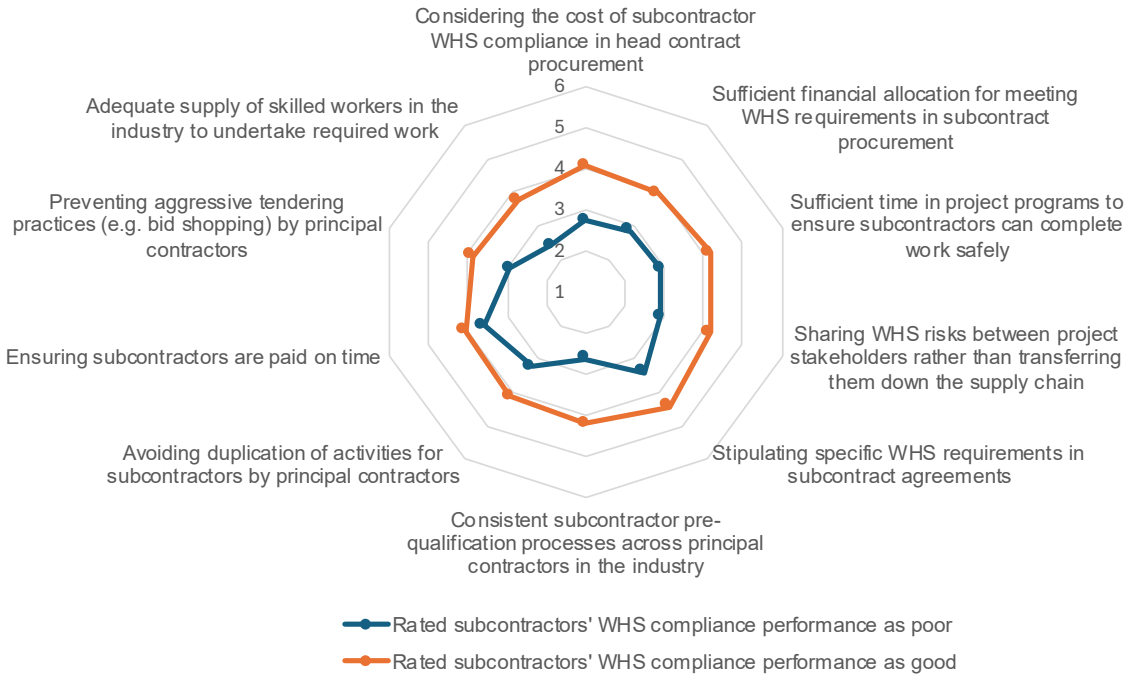

Figure 27: Between-group comparison of 'industry context and supply chain environment' mean scores

The largest between-group differences in mean scores were identified for the following factors:

- consistent subcontractor pre-qualification processes across principal contractors in the industry
- adequate supply of skilled workers in the industry to undertake required work, and
- considering the cost of subcontractor WHS compliance in head contract procurement.

Subcontractor management practices by principal contractors

Figure 28 shows the mean scores for the factors related to subcontractor management practices by principal contractors.

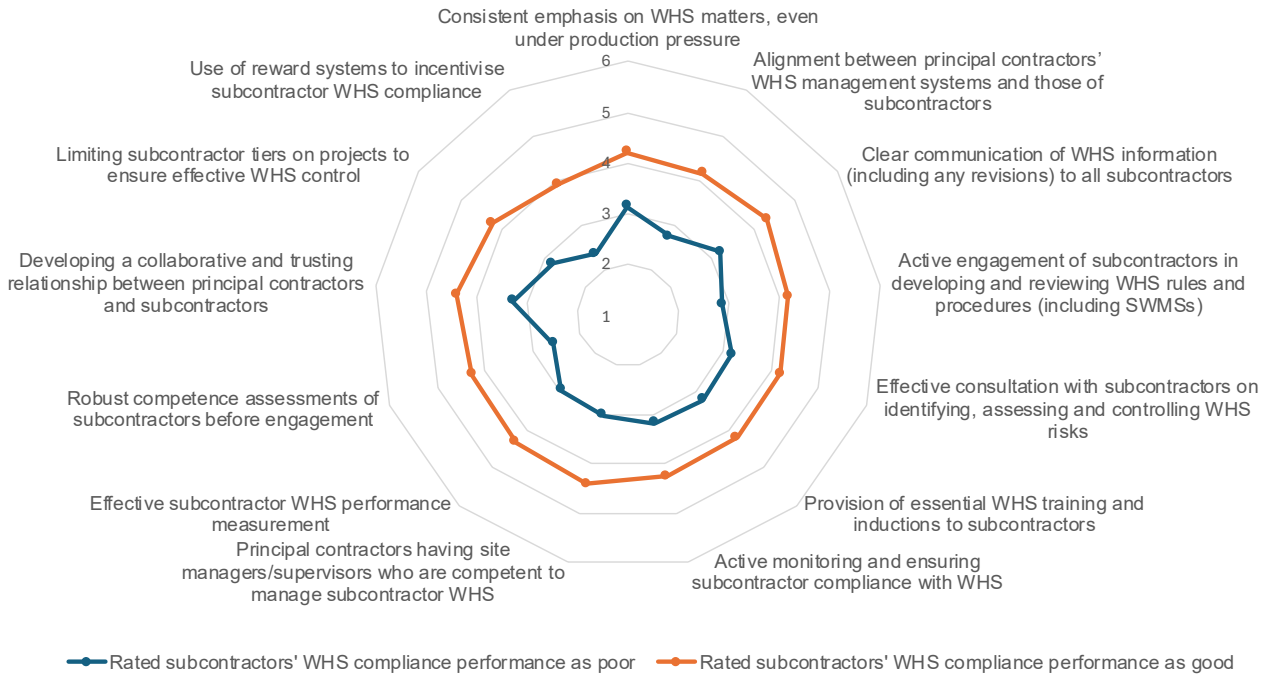

Figure 28: Between-group comparison of 'subcontractor management practices by principal contractors' mean scores

The differences in mean scores for all factors exceeded 1 point, highlighting notable disparities in the perceptions of the two respondent groups regarding the extent to which these factors are being effectively addressed in the NSW construction industry.

The largest between-group differences in mean scores were identified for the following factors:

> robust competence assessments of subcontractors before engagement
> use of reward systems to incentivise subcontractor WHS compliance
> limiting subcontractor tiers on projects to ensure effective WHS control, and
> alignment between principal contractors' WHS management systems and those of subcontractors.

Workplace environment

Figure 29 shows the mean scores for the factors related to workplace environment.

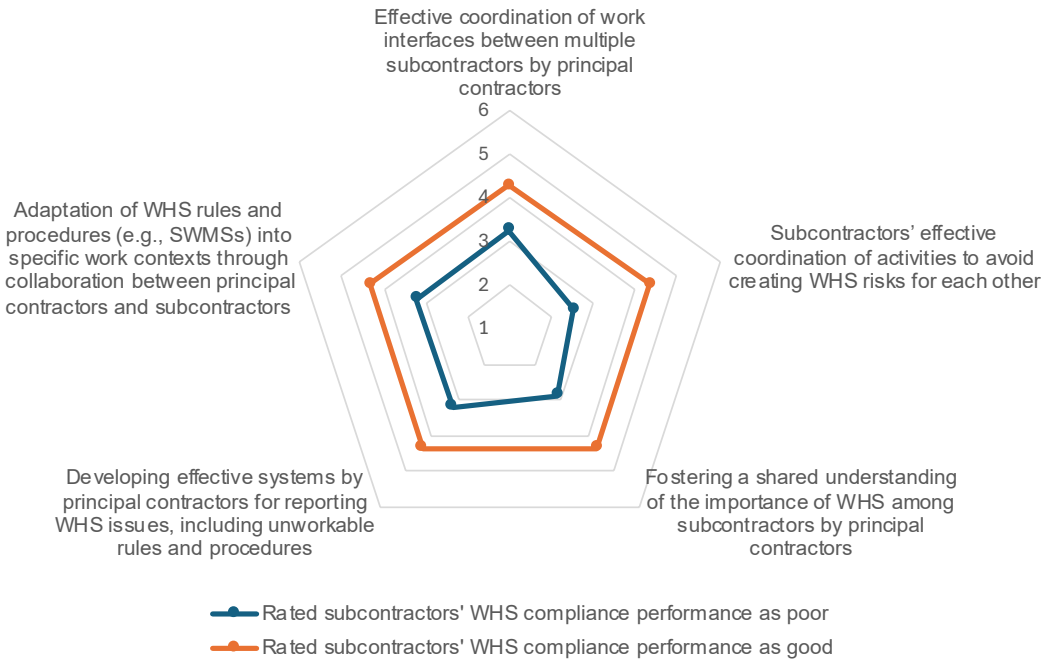

Figure 29: Between-group comparison of 'workplace environment' mean scores

The differences in mean scores for factors at this level of influence all exceeded 1 point, indicating significant divergencies in the perceptions of the two respondent groups.

The largest between-group differences in mean scores were identified for the following factors:

- subcontractors' effective coordination of activities to avoid creating WHS risks for each other, and
- fostering a shared understanding of the importance of WHS among subcontractors by principal contractors.

Subcontractor knowledge, capability and attitude

Figure 30 shows the mean scores for the factors related to subcontractor knowledge, capability and attitude.

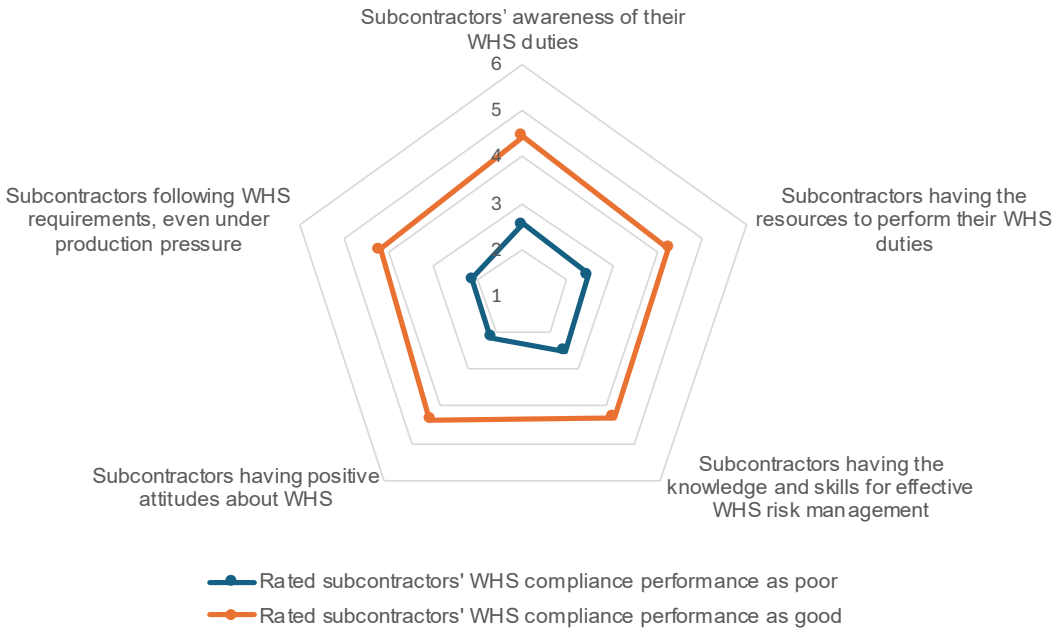

Figure 30: Between-group comparison of 'subcontractor knowledge, capability and attitude' mean scores

The differences in mean scores for factors at this level of influence were the largest (all above 1.8) compared to those for factors at other levels of influence. This suggests that the two respondent groups largely differed in their perceptions about the extent to which these factors are being effectively addressed within the NSW construction industry. While those with positive perceptions of subcontractor WHS compliance performance rated all the factors, on average, above 4, those with negative views on subcontractor WHS performance rated these factors below 2.6.

The largest between-group differences in mean scores were identified for the following factors:

subcontractors having positive attitudes about WHS,

subcontractors following WHS requirements, even under production pressure, and

subcontractors having the resources to perform their WHS duties.

3.3.9 Comparison of responses between groups of different perceptions of subcontractor WHS compliance performance

3.6 Qualitative responses to the open-ended question

At the end of the survey, respondents were asked to provide their suggestions on anything else that should be considered to ensure subcontractor WHS compliance in the NSW construction industry. For this open-ended question, 62 qualitative responses were received and thematically analysed. Excerpts from the responses are used as exemplars for the identified themes.

The responses offer insights into challenges as well as potential solutions to ensure subcontractor WHS compliance within the NSW construction industry. Twelve themes were identified, namely:

- training and education
- simplification of WHS management processes
- inspections and audits
- accountability, incentives and support
- collaborative WHS culture and shared responsibility
- differences in WHS attitudes and competency across the industry
- fostering regulatory trust
- insurance and legal compliance
- prompt payment
- clear WHS expectations in sub-contracts
- leveraging technology, and
- psychosocial impacts.

3.6.1 Training and education

Several respondents noted the need for training and educational interventions tailored to subcontractors. These suggestions were grouped under two sub-categories, namely:

- need for targeted WHS training, and
- introduction of continuous professional development for WHS.

Need for targeted WHS training

Reponses emphasising the need for targeted WHS training to improve subcontractors' understanding of WHS regulatory requirements and compliance include:

> *"Mandatory safety training sessions specifically tailored for subcontractors' workers could be implemented. These training sessions would ensure that all*

workers are well - versed in the relevant WHS regulations and best practices." (Respondent 29)

"Training of subcontractors managing teams, senior managers & workers in regards to WHSE compliance." (Respondent 153)

Respondents also suggested that targeted training on safe work method statements (SWMS) for high-risk activities could help subcontractors better understand how to comply with SWMS requirements:

"High risk SWMS and the content requirements are a bit confusing amongst subcontractors and principal contractors as well. Not sure if another campaign may be beneficial or a more specific training or information process is required." (Respondent 76)

Introduction of continuous professional development for WHS

One respondent highlighted the language and literacy challenges faced by subcontractors in understanding WHS regulations, and suggested continuous professional development (CPD) as an educational intervention to improve subcontractors' comprehension of regulatory requirements:

"Language and literacy levels and resources. The WHS regulations are extremely onerous on design and competencies, including registration of plant… Principal contractors have higher resources and LLN (language, literacy and numeracy), so they end up doing the brunt of the work trying to keep subcontractors in line. This means smaller principal contractors and subcontractors working in residential are much more exposed to risk, yet seem to avoid the regulation- primarily through education. There are mandatory CPD points for quality, and I think this should apply to safety too." (Respondent 102)

Aligning with the importance of enhancing WHS knowledge through ongoing professional development, two respondents noted:

"An advanced white card system that shows biannual refreshing of subcontractor WHS skills." (Respondent 129)

"Suggest all subcontractors and PCBU's, principal contractors spend one day every 2 years to refresh the white card or accredited (SafeWork NSW) supervisors training." (Respondent 136)

3.6.2 Simplification of WHS management processes

Some suggestions emphasised the need to simplify WHS management processes, which are currently perceived as bureaucratic, involving excessive documentation and diverting resources away from essential operational activities. For example:

"Safety should be simplified, all the documentation now required is taking away from on the onsite ability to carry out the work safely at times." (Respondent 199)

"For smaller subcontractors (1-5 staff), they are less inclined to have documented systems, and more focused on the task and cost in an extremely competitive market, to some of them it is just more paperwork including time & money.

Education that safe systems does not necessarily mean hundreds of forms. It is about communication and awareness." (Respondent 73)

Particularly, respondents highlighted that SWMS are unnecessarily lengthy and complicated, often failing to serve their intended purpose.

"SWMS drive all the wrong behaviours and needs to be revised - 20-page SWMS that are not job specific are ridiculous, and the mandated 'paperwork' has created a culture of 'the paperwork keeps us safe'. The regulatory framework needs to be revised to shift to a practical management of safety in dynamic workplace environments." (Respondent 128)

The burden of excessive paperwork for subcontractors is exacerbated by the varying requirements imposed by principal contractors, such as pre-qualification processes and SWMS development. This highlights the need for greater standardisation for certain WHS management processes across the industry, as noted by a respondent:

"... (2) Pre-qual systems are too varied with hundreds of slightly different systems out there, (3) Each company has its own interpretation of what and how a SWMS should be written. I re-write our SWMS for almost every primary contractor." (Respondent 105)

3.6.3 Inspections and audits

This theme focuses on the importance of performing regular, unannounced inspections and audits by regulators. Respondents explained that these inspections and audits would help identify WHS issues proactively and ensure ongoing WHS compliance. Suggestions from respondents are outlined below:

"Regular and unannounced onsite inspections should be carried out at the subcontractors' workplaces. This would help identify any potential non-compliance issues promptly." (Respondent 29)

"Establish a strict supervision mechanism: regularly inspect and evaluate the work of subcontractors, and promptly detect and correct behaviours that do not comply with WHS regulations." (Respondent 33)

"Subcontractors should be audited by the regulator." (Respondent 104)

"Greater presence in workplaces by regulator inspectors." (Respondent 154)

3.6.4 Accountability, incentives and support

Suggestions related to accountability, incentives and support include the need to:

hold subcontractors accountable for their actions

implement a reward and penalty system for WHS compliance, and

provide support for subcontractor WHS compliance.

Hold subcontractors accountable for their actions

Responses under this subcategory highlighted some attitude-related challenges to WHS compliance among subcontractors in NSW, suggesting the need for greater accountability to address these issues. These responses include:

> *"Make subcontractors aware that they also have a responsibility to perform WHS compliance, cleaning up, handrails, and consultation. It is not all on the principal contractor. Consultation, meetings, safety walks all need to have attendance, subcontractors come and go as they please, do not want to wear PPE, sign in or abide by a safety rule/law." (Respondent 86)*

> *"Holding subcontractors accountable and not just principal contractor. Holding workers accountable." (Respondent 202)*

However, one respondent explained that a lack of WHS accountability among subcontractors can be attributed to principal contractors' insufficient supervision and their disregard for subcontractor's WHS needs. They suggested using a WHS compliance rating system to ensure accountability among both principal contractors and subcontractors:

> *"Contractors and subcontractors should be rated on their WHS compliances across a rating system to ensure companies are adhering to the correct requirements. Many residential subcontractors have minimal to no knowledge, care and regard for WHS, as many principal contractors don't have the qualified supervisors nor the care for WHS of their subcontractors" (Respondent 116)*

Implement a reward and penalty system for subcontractor WHS compliance

A few respondents suggested implementing a reward and penalty system to encourage subcontractors to comply with WHS requirements, for example:

> *"Sweeten the pot with incentives for stellar safety records and enforce strict consequences for lapses." (Respondent 40)*

> *"A system of incentives and penalties could be established. Subcontractors who consistently demonstrate high levels of WHS compliance could be rewarded, while those who fail to meet the requirements could face financial penalties or restrictions on future contracts." (Respondent 29)*

Respondents emphasised incentives for positive WHS performance as a means to motivate subcontractors to adhere to WHS standards:

> *"Establish a safety deposit system, establish an incentive mechanism." (Respondent 24)*

> *"Establish a pain/gain share and additional bonus for WHS compliance during procurement and contractual agreements." (Respondent 170)*

Provide support for subcontractor WHS compliance

Costs related to WHS compliance are a significant concern for subcontractors, particularly those small businesses that often have limited resources. One respondent proposed

reducing insurance premiums or offering financial incentives, such as rebates, to help offset time and expense associated with WHS compliance for subcontractors:

> *"Reduction/rebates of icare premiums or other insurances to offset the administration time and expense for compliance, which is an indirect cost to small businesses, which is hard to absorb and still competitive." (Respondent 111)*

Other respondents suggested that providing support for subcontractors to comply with WHS requirements could include more accessible (or potentially free) training programs and introducing training incentives. These comments include:

> *"Unfortunately, safety to most subbies is a dirty word and the perception is that it's not their job for safety because it is expensive and takes time to do a job in a safe manner. I have been told so many times in the past Safety is your job I'm just here to do my job. The latest SafeWork law is about Silica, yet there is no free training on SafeWork website." (Respondent 110)*

> *"Government should provide incentive for contractors and subcontractors to undertake training in WHS." (Respondent 118)*

3.6.5 Collaborative WHS culture and shared responsibility

Under this theme, suggestions to ensure subcontractors' WHS compliance emphasise promoting a collaborative WHS culture and shared responsibility instead of shifting WHS responsibilities to subcontractors.

Some respondents highlighted the tendency of principal contractors to shift all compliance burdens onto subcontractors and suggested the need for a more collaborative approach to WHS management:

> *"In most instances of larger projects, there is definitely a passing of all responsibility down to subcontractors from the principal contractors, believing primarily that they are limiting their liability. This is an attitude that needs to change, and the principal contractors need to work with the subcontractors to ensure that the risks are managed and that there is full clarity as to who is responsible for each portion." (Respondent 186)*

> *"It's a common concern that large organisations, especially in government sectors, often shift responsibilities onto subcontractors without providing the necessary support or resources to ensure safety compliance. The structure of safety regulations can sometimes feel more like a punitive system rather than a collaborative framework designed to help all stakeholders meet their obligations effectively." (Respondent 87)*

Other respondents suggested that fostering a culture of safety empowerment, mutual care, shared responsibility, and collaborative learning between principal contractors and subcontractors could enhance subcontractor WHS compliance. These suggestions include:

"Subcontractors have the authority to stop work if concerned about their safety or concerned about the principal contractors' ability to manage safety on the site. A culture in which people all care about each other." (Respondent 80)

"Establish cooperative relationships with subcontractors to share safety experience and resources. Organize safety seminars and exchange activities to promote the learning and progress of both sides in safety management." (Respondent 25)

3.6.6 Differences in WHS attitudes and competency across the industry

The responses under this theme highlight the differences in WHS attitudes and competency between contractors of different tiers or between contractors operating in different construction sectors:

"Residential is vastly poorer performing than non-residential. In 2nd and 1st tier non-residential and civil, everyone is trying. It would be interesting to study how some organisations are achieving good safety outcomes while others are not." (Respondent 143)

"There is a marked difference to WHS attitudes and competency when you work for Tier 1 builders versus Tier 2 and 3." (Respondent 194)

Therefore, respondents suggested that WHS support provided to subcontractors should be tailored to consider their specific characteristics and needs:

"Direct all subcontractors to the SafeWork NSW Housing Industry Site Safety Pack. It's a great example of a small-scale WHS management plan. If the industry WHS management plans were in a standard format/order/contents like this and tiered in scale (large scale principal contractor, small residential principal contractor, subcontractor), compliance would be easier instead of each principal contractor having their own and then Subcontractors having to read and comply with them all." (Respondent 160)

3.6.7 Fostering regulatory trust

Responses under this theme emphasise the need to establish credible regulations and ensure better alignment between legislation and industry requirements.

One respondent indicated the need to address conflict of interest in SafeWork NSW guidelines:

"Remove the conflict of interest between SafeWork NSW help and aid sections vs their real set-up to help and aid prosecutions." (Respondent 105)

Another respondent pointed out that SafeWork NSW needs to collaborate with industry to develop practical and informed WHS protocols:

"Safe Work NSW should be researching and working with suppliers and contractors in the industry when coming up with their baseline standards and guidelines. They are proving themselves to be contradictory and to be basing standards without having industry knowledge in certain areas." (Respondent 189)

3.6.8 Insurance and legal compliance

A few respondents suggested ensuring proper insurance coverage and proactively addressing legal obligations and liabilities, as they are crucial to subcontractors' responsibilities. These suggestions are:

"Ensure subcontractors have the appropriate insurances." (Respondent 189)

"Ensure the legal interests of the subcontractor and their liability under the Contract Law are addressed in a timely manner." (Respondent 42)

3.6.9 Prompt payment

One respondent highlighted the need for prompt payment to subcontractors so that subcontractors have sufficient allocation for WHS:

"Being paid on time is a massive problem. How are subcontractors meant to be positive and happy onsite. Safety and developing SWMS cost a lot of money to some people and implementing what is shown on SWMS is costly." (Respondent 196)

3.6.10 Clear WHS expectations in sub-contracts

There were a few suggestions related to the need to clearly communicate WHS expectations and obligations in sub-contracts:

"Transparency about WHS requirements before engagement of subcontractors, financial expenditures included in contracts." (Respondent 161)

"Refine contracts and communication." (Respondent 21)

3.6.11 Leveraging technology

There were suggestions highlighting the use of technology to improve WHS compliance. One participant suggested using a collaborative software to support WHS on site:

"Using a collaboration software for WHS purpose only and make the subbies aware prior to every site visit." (Respondent 193)

Another participant highlighted the importance of considering the impact of technology platforms on onsite safety application:

"Consider the following: … - the use of software platforms for safety compliance and the impact this has on practical application of safety…" (Respondent 117)

3.6.12 Psychosocial impacts

A few suggestions emphasised the need to consider mental health awareness and the effect of psychosocial hazards (e.g. work and time pressures) created by principal contractors on subcontractor WHS compliance.

"Mental awareness" (Respondent 79)

"Consider the following: …impact of psychosocial hazards created/generated by principal contractors on subcontractor WHS compliance and performance." (Respondent 117)

4 Discussion

The survey was developed based on the synthesised findings from the previous stage of the research project that involved conducting a literature review to identify factors with the potential to influence subcontractors' work health and safety (WHS) compliance in relation to five levels of influence. The survey was undertaken with the primary objectives of:

seeking evidence about how well industry participants perceive the identified factors of potential influence on subcontractor WHS compliance are currently being addressed in the NSW construction industry
highlighting areas (or 'pain points') that need to be focused on for intervention and improvement, and
identifying aspects that warrant further exploration in the subsequent stage of qualitative interviews.

4.1 Overall results about factors of potential influence on subcontractor WHS compliance

4.1.1 Regulatory effectiveness

Among the factors related to regulatory effectiveness, survey respondents perceived the following two factors as being the least effectively addressed in the NSW construction industry:

adequate regulatory oversight to ensure subcontractors' WHS compliance, and

SafeWork NSW's direct engagement with subcontractors regarding WHS.

The survey findings align with evidence from previous Australian studies. For example, in the Australian regulatory context, Quinlan et al. (2009) highlighted a few significant challenges in ensuring effective regulatory oversight in construction subcontracting arrangements:

> First, the inherent disorganisation of subcontracting complicates WHS monitoring and enforcement. Construction projects typically involve multiple subcontractors working under agreements with a principal contractor. These subcontractors often spend limited time at one site and frequently move between sites, working for different principal contractors. The transient and fragmented nature of subcontractor engagement makes it difficult for WHS inspectors to track practices and maintain consistent regulatory oversight.
>
> Second, despite the legislative framework defining WHS duties for principal contractors and subcontractors, ambiguity remains in duty holders' understanding of their specific WHS responsibilities. This leads to confusion about compliance expectations, further hindering the effectiveness of regulatory enforcement.
>
> Third, WHS inspectorates face significant logistical and resource challenges in addressing issues associated with subcontracting. Inspectors often need to make repeated site visits to ensure subcontractor WHS compliance, which stretches the already limited resources of inspectorates and challenges inspectors' ability to provide sustained regulatory oversight.

In the NSW construction industry, Loosemore and Andonakis (2007) conducted a study to understand the challenges that subcontractors experience in complying with WHS regulatory requirements. Subcontractors in this study reported that they have little direct interactions with regulators, and primarily rely on principal contractors for information about how to comply with WHS duties. Loosemore and Andonakis (2007) pointed out that the heavy reliance of subcontractors on principal contractors for WHS information can

potentially lead to inconsistent WHS standards and practices across the industry. While subcontractors in the study recognised that the guidance resources (e.g. the Subby Pack) provided by regulators are useful, many also suggested that the guidance resources should be supplemented by increased direct engagement with regulators, for example, through regulator representatives conducting site visits, providing advice about WHS requirements and assisting subcontractors to achieve WHS compliance (Loosemore & Andonakis, 2007).

However, it is acknowledged that subcontracting is pervasive in the Australian construction industry, with 98.6% of businesses in the industry being small business and primarily operating as subcontractors (Master Builders Australia, 2024). The large number of subcontractors, combined with limited regulatory resources discussed above, presents challenges for regulators to maintain direct interactions with subcontractors. The next stage of the research project, which will involve interviews with industry stakeholders, will further explore this issue and identify strategies with the potential to enhance regulatory involvement and oversight of subcontractor operations in the construction industry.

4.1.2 Industry context and supply chain environment

Overall, the survey results suggest that respondents perceived the NSW construction industry as performing relatively poorly in addressing factors related to the industry context and supply chain environment. This is reflected in 9 out of 10 factors being rated lower than 4 (i.e. the rating of 'good'). Specifically, respondents were most concerned about the following factors:

> adequate supply of skilled workers in the industry to undertake required work
> preventing aggressive tendering practices (e.g. bid shopping) by principal contractors considering the cost of subcontractor WHS compliance in head contract procurement
> sufficient financial allocation for meeting WHS requirements in subcontract procurement, and
> consistent subcontractor pre-qualification processes across principal contractors in the industry.

Skill shortages in the construction industry have been a great concern across Australia, and the lack of skilled workforce presents a major threat to the industry's ability to deliver planned infrastructure construction projects (Infrastructure Australia, 2021) and residential homes (Housing Industry Association, 2024). The WHS Radar Report published by the Centre for Work Health and Safety (2023) highlights that skill shortages can adversely affect WHS compliance through creating overwork and/or relying on inexperienced workers to undertake specific work tasks. In the construction industry, a lack of skilled workers can cause increased workload and time pressure for subcontractors to meet project timelines. The pressure can lead subcontractors to "*push to get the job done*" but compromise WHS (Centre for Work Health and Safety, 2023, p.5). The report also noted that skill shortages have shifted recruitment priorities towards availability of labour over skill, and the subsequent inexperience and lack of competence of the workforce pose increased WHS challenges. For instance, the recruitment of inexperienced site supervisors by subcontractors can potentially lead to lower supervision quality and poorer WHS outcomes on-site. Additionally, inexperienced subcontractors are being awarded more work due to the shortage of available labour, which increases the likelihood of poor WHS practices and substandard WHS performance. The report also noticed that the "*employees' market*" has made site managers and supervisors cautious about disciplining non-compliant subcontractors, as many can "*pack up their tools and leave when it gets uncomfortable*" (Centre for Work Health and Safety, 2023, p.6).

Our survey results are consistent with findings by Loosemore (2014) and Chalker and Loosemore (2016), who reported that aggressive tendering practices, such as bid shopping,

remain a serious issue in the NSW construction industry. In addition to disclosing a low bidder's price to another subcontractor to secure an even lower price, Loosemore (2014) found that principal contractors also often share subcontractors' intellectual property during the tendering process to further drive down prices. These tendering practices significantly undermine subcontractors' trust in principal contractors and negatively affect innovation and productivity. Bid shopping compromises project quality and WHS outcomes (Arditi & Chotibhongs, 2005) as subcontractors awarded contracts at unreasonably low prices are likely to struggle with meeting project performance expectations.

Our survey reveals respondents' concerns about cost allocation in project procurement for subcontractors to comply with WHS requirements, which is consistent with existing research. Economic pressures have been identified as a key contributing factor to poor WHS outcomes for subcontractors in the Australian construction industry (Mayhew & Quinlan, 1997; Mayhew et al., 1997). The prevailing competitive tendering in the industry prioritises cost minimisation and speed, with project clients placing considerable economic and time pressures on principal contractors, who then pass these onto subcontractors through back-to-back subcontract agreements (McDermott & Hayes, 2018). Intense competition drives subcontractors to lower service prices, prioritising economic survival over WHS compliance (Mayhew et al., 1997). In the NSW construction industry, Loosemore and Andonakis (2007) identified cost as the greatest barrier to subcontractors' WHS compliance, highlighting how insufficient cost allocation in project procurement undermines subcontractors' ability to spend resources on WHS.

Our survey results also highlight the need to improve and standardise pre-qualification processes by principal contractors in the NSW construction industry. Subcontractors need to make duplicated efforts when they attempt to satisfy varying pre-qualification requirements from different principal contractors and project clients, depleting their capacity to focus on practical WHS issues in the workplace. International research has demonstrated the initiative to develop assessment indicators for standardised subcontractor pre-qualification processes that can be consistently implemented by principal contractors (Dennerlein et al., 2020). However, in the Australian context, no similar initiative has been identified. In the next stage of this study, interviews with industry stakeholders will further explore what assessment criteria should be included in pre-qualification processes and how to promote consistent pre-qualification processes among principal contractors.

4.1.3 Subcontractor management practices by principal contractors

Overall, respondents perceived the need for principal contractors to improve their performance in managing subcontractors to ensure subcontractor WHS compliance in NSW. This is indicated by 10 out of 13 factors receiving a mean score lower than 4 (i.e. the rating of 'good'). The factors that were most concerned by respondents include:

> use of reward systems to incentivise subcontractor WHS compliance
> alignment between principal contractors' WHS management systems and those of subcontractors
> robust competence assessments of subcontractors before engagement
> limiting subcontractor tiers on projects to ensure effective WHS control, and
> active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs).

Previous research has demonstrated that WHS reward schemes implemented by principal contractors can effectively drive subcontractors' commitment to WHS (Manu et al., 2013). Similarly, in response to the open-ended question of what else should be considered to

ensure subcontractor WHS compliance in our survey, many respondents suggested introducing a reward and penalty system or other incentives to motivate compliance. However, our survey findings indicate that such reward systems, as perceived by respondents, have not been effectively implemented by principal contractors in NSW to promote subcontractor WHS compliance. Strategies for developing and implementing effective reward systems to improve subcontractor WHS compliance will be explored in the next stage of the study. This would involve strategies that promote subcontractor WHS compliance while avoiding undesired behaviour, such as under-reporting, which has been flagged as an unintended consequence of WHS incentive systems (Probst & Estrada, 2010), including in the Australian construction industry context (Lingard & Pirzadeh, 2025).

Previous research suggests that the fragmented, multi-employer worksite structures created by subcontracting can inhibit the consistent implementation of WHS management systems and controls in a construction project (Nygren et al., 2017). This is clearly an issue, as perceived by the respondents in our survey. Misalignment between principal contractors' WHS management systems and those of subcontractors can result in duplicated efforts and/or conflicting requirements (Bahn, 2013). The temporary and transient nature of subcontractor engagement further complicates issues related to implementing WHS management systems. Subcontractors frequently move between sites managed by different principal contractors, requiring them to adjust to different WHS management systems. This potentially causes confusion and difficulties in understanding and complying with varying WHS requirements from different principal contractors (Valluru et al., 2020). The next stage of our research, involving interviews with industry stakeholders, will explore strategies to improve implementation of WHS management systems and controls within construction projects.

In addition to the need for more consistent pre-qualification processes by principal contractors, survey respondents were also concerned about the quality of subcontractor competence assessments. Dennerlein et al. (2020) argue that many pre-qualification assessments fail to capture essential and important aspects of subcontractor WHS performance. However, it is equally importance to avoid excessive scrutiny of factors of limited relevance to prevent unnecessary evaluation and resource waste. In the next stage of our study, what constitutes a robust, yet fair, approach to evaluating subcontractor competence will be investigated.

Another area that could potentially produce improvement, as suggested by our survey results, is principal contractors limiting subcontractor tiers on projects to ensure effective WHS control. Previous research shows that multi-tiered subcontracting

- hinders effective project communication (including communicating WHS-related information) (Tam et al., 2011),
- reduces principal contractors' oversight and control over construction work along the vertical chain of subcontractors (Ofori & Lim, 2009), and
- creates poor WHS outcomes among lower-tier subcontractors who succumb to price competition and, in doing so, compromise WHS in the interests of business survival due to experiencing slim profit margins (Chiang, 2009).

Our survey results suggest that principal contractors in NSW could potentially limit the number of subcontractor tiers on projects to achieve improved subcontractor WHS compliance.

In addition, survey respondents were concerned about principal contractors' level of engagement of subcontractors in developing and reviewing WHS rules and procedures

(including SWMSs). Australian research shows that impracticability, i.e. WHS rules and procedures being unworkable in the work context, contributes to subcontractor non-compliance (Embrey, 2007; Lingard et al., 2015). This is because WHS rules and procedures developed by managers and technical experts may not have adequately considered site-specific contexts. Moreover, in construction, specialist subcontractors often possess more detailed technical knowledge about their specific fields of work than principal contractors and their knowledge is potentially useful for designing work processes that are both practical and safe.

Hale and Borys (2013) emphasised the need for adapting WHS rules and procedures to the local situation through consultation and collaboration with workers. In the construction industry, this would include subcontracted workers who perform much of the direct on-site work. In terms of SWMSs, research shows the collaboration and knowledge sharing between principal contractor frontline leaders (e.g. supervisors and WHS advisors) and subcontractors are instrumental in translating SWMSs into practical on-site implementation (Lingard & Oswald, 2020). The next phase of this study will further investigate barriers to and strategies for improving principal contractors' engagement with subcontractors in adapting and implementing WHS rules and procedures, including SWMSs, at the site level.

4.1.4 Workplace environment

Among the factors related to local workplace environment, respondents perceived the following two factors as being the least effectively addressed in the NSW construction industry:

> subcontractors' effective coordination of activities to avoid creating WHS risks for each other, and
> fostering a shared understanding of the importance of WHS among subcontractors by principal contractors.

Our survey findings are consistent with previous research, which identified poor coordination of activities among subcontractors as a significant WHS concern in the construction workplace (Mayhew & Quinlan, 1997; Wadick, 2007). Particularly, in the NSW building sector, Wadick (2007) identified a culture of independence and thoughtlessness among subcontractors, which is primarily driven by economic and time pressures and significantly undermines subcontractor cooperation. Subcontractors often want to complete tasks quickly and thus can neglect the impact of their activities on others, creating invisible dangers for other subcontractors performing adjacent or interdependent tasks within the same workplace (Wadick, 2007). How to improve coordination among subcontractors warrants further exploration in the next stage of the study.

Additionally, survey respondents perceived that fostering a shared understanding of the importance of WHS among subcontractors remains an issue in the NSW construction workplace. Previous research has shown that subcontracted workgroups can have their own distinct safety climates, which are different from that of the principal contractor (Lingard et al. 2010). Potentially this explains differences in the WHS performance of subcontractors who are exposed to the same risks. Moreover, within the interorganisational network of a construction project, a project WHS culture typically differs from the organisational cultures of participating organisations but is shaped by their dynamic interactions (Fang & Wu, 2013). Through the interactions, shared perceptions, norms, and processes within project networks should be established to support coordination, reduce uncertainty and avoid ambiguity in relation to WHS (Oedewald & Gotcheva, 2015). Australian research confirms that subcontracting adds complexity to developing a shared culture for WHS in construction projects due to a transient subcontractor workforce, cultural integration

challenges, and competency gaps among subcontractors (Biggs et al., 2013). These factors potentially hinder the establishment of a cohesive approach to WHS across project participants. The next stage of this study will seek industry stakeholders' opinions on how to more effectively cultivate a shared understanding of WHS importance among subcontractors in construction projects.

4.1.5 Subcontractor knowledge, capability, and attitude

Regarding subcontractor knowledge, capability and attitude, respondents perceived the factors being the least effectively addressed in the NSW construction industry as:

subcontractors following WHS requirements, even under production pressure

subcontractors having positive attitudes about WHS, and

subcontractors having the resources to perform their WHS duties.

The survey findings align with existing literature identifying resource constraints as a significant hindrance to WHS compliance for subcontractors, especially small businesses (Wong et al., 2015; Hon et al., 2012). Resource challenges for small subcontractors include costs, paperwork, and lack of skills, time and staff (Champoux & Brun, 2003). When faced with production pressure, subcontractors are likely to prioritise their limited resources toward meeting production demands, sometimes compromising WHS (Hashemian & Triantis, 2023). Additionally, subcontractors tend to develop negative attitudes toward WHS when regulators are seen as authoritarian disciplinarians, rather than adopting an educative and consultative approach that respects subcontractors' practical knowledge and expertise (Wadick, 2010). Collaborative efforts from industry stakeholders are likely to be essential to support subcontractors to address resource constraints and foster more positive attitudes and behaviours toward WHS compliance. Ways that industry stakeholders can foster this collaboration will be further examined in the next stage of the study.

4.2 Comparison of responses across organisation types

Responses were compared between respondents who identified their companies as principal contractors, subcontractors, or both principal contractors and subcontractors. For the factors that exhibited significant differences in responses between respondent groups, the results suggest the following overall patterns:

respondents from principal contractors had the least positive perceptions of how well these factors are currently being addressed in the NSW construction industry, and
respondents from organisations operating as both principal contractors and subcontractors had the most positive perceptions of how well these factors are currently being addressed in the NSW construction industry.

While the exact reasons for these patterns are not clear and warrant further exploration in the next stage of interviews, it is plausible that the differences are related to the characteristics of the survey sample. Table 38 provides a closer examination of the demographic information of the survey respondents who reported their job roles and organisation types. Most of the respondents from principal contractors held WHS-related roles, while the majority of respondents from subcontractors and organisations operating as both principal contractors and subcontractors reported senior management or executive roles. WHS professionals may be expected to have greater awareness and understanding of WHS issues within the construction industry compared to people in other professional roles, potentially contributing to their more critical views on to which extent the factors with the potential to influence subcontractor WHS compliance are being effectively addressed in the NSW construction industry.

The other possible explanation for the differences in perceptions can be the distinct roles and responsibilities of each respondent group in the construction industry. Principal contractors bear the overarching responsibility for project outcomes, including project management, regulatory compliance, and managing and coordinating subcontractors (Manu & Knight, 2020). Principal contractors need to address challenges and complexities across all five levels of influence to meet the expectations of regulators, clients and other industry stakeholders, ensuring successful project delivery. Given these responsibilities, principal contractors may be likely to be more critical of how the factors are currently being addressed in the NSW construction industry.

Organisations operating as both principal contractors and subcontractors perform a dual role in the construction industry, allowing them to take the perspective of both types of organisations. Their dual role may foster a sense of empathy in the principal contractor-subcontractor relationship, enhancing their trust in principal contractors' ability to manage subcontractors and WHS issues (Chalker & Loosemore, 2016) as well as increasing their confidence in subcontractors' WHS-related competency and capabilities. Their unique position in the construction supply chain may have led them to develop more positive views about how factors with the potential to influence subcontractor WHS compliance are being addressed in the construction industry. Further insights about whether this is the case will be gathered in the next stage of interviews, where we will delve deeper into the WHS-related experiences and perspectives of dual-role companies in the NSW construction industry.

4.3 Comparison of responses across construction sectors

Responses were also compared between respondents working for organisations operating in the residential, non-residential and civil and heavy engineering construction sectors. For the factors that revealed significant differences in responses between respondent groups, the following overall pattern was observed:

> respondents from the non-residential building construction sector had the least positive perceptions of how well these factors are currently being addressed in the NSW construction industry compared to those from the residential building construction sector or the heavy and civil engineering construction sector.

The reason for this pattern is not known at this stage and will be further explored in the interview phase of the study. However, the high level of effort involved in subcontractor management in the non-residential construction sector has been highlighted in previous research, which may partially explain the relatively negative perceptions held by respondents from this sector. Costantino et al. (2001) compared the subcontracting practices between the residential and commercial (i.e. non-residential) building construction sectors. They reported that, on average for each section of building construction, the number of subcontractors engaged by contractors in the commercial (non-residential) building sector ranged from 7.2 to 15.1, while the number for contractors engaged in residential building construction ranged from 1.7 to 2.8. This suggests increased complexity in subcontractor coordination experienced by contractors in the non-residential building sector of the construction industry (relative to builders in the residential sector). In addition, driven by maintaining competitiveness in the market, non-residential building contractors tend to more frequently engage in competitive bidding to seek lower prices from subcontractors. As a result, contractors in the non-residential building sector have less recurring collaborative relationships with subcontractors compared to residential building contractors, adding complexity to subcontractor management (Costantino et al., 2001). In a previous study conducted in the Australian ACT construction industry, respondents from the non-residential building sector perceived WHS management as less positive at

organisational and workgroup levels compared to participants from the residential building sector and civil engineering sector (Lingard et al., 2017). Focus group discussion in this study subsequently revealed that this issue is related to work intensification and the challenges associated with managing subcontractors by principal contractors in the non-residential building construction sector.

Furthermore, as indicated in Table 39, an analysis of job role distribution among respondents across sectors revealed that a higher proportion of respondents from the non-residential building sector held WHS-related positions. As mentioned earlier, WHS professionals potentially have more critical views about WHS issues, and thus, they may have more stringent evaluations of how factors with the potential to influence subcontractor WHS compliance are being addressed in NSW. In the next stage of the study, which involves interviewing construction industry stakeholders, further insights will be sought to understand why respondents from the non-residential building construction sector perceive the factors identified as having the potential to impact WHS as being the least effectively addressed compared to respondents from the residential building and heavy and civil engineering construction sectors.

4.4 Comparison of responses across company sizes

Comparison of responses across company sizes did not reveal noticeable differences, except for one factor. Previous research consistently reported that WHS-related perceptions vary according to company sizes in the construction industry (Ma & Yuan, 2009; Lingard et al., 2017). It is unclear why such differences were not found in our survey. This will be explored in the next stage of interviews.

The only factor that displayed a significant difference between respondents from companies of different sizes is "*ensuring subcontractors are paid on time*". Specifically, respondents from companies with 1-19 employees had significantly less positive perceptions of how well this factor is being addressed in the NSW construction industry compared to those from companies with 20-199 employees. Existing literature has also highlighted differences in perceptions between small- and medium-sized contractors in relation to late payment (Peters et al., 2019). Specifically, small-sized contractors are more vulnerable to the impact of delays in payment related to cash-flow problems, reduced progress on work, and financial failure compared to medium-sized contractors. This is because medium-sized companies often have larger cash reserves and assets, thus having more leverage ability than small-sized companies in the face of payment delay (Peters et al., 2019).

Further analysis of the respondents' distribution revealed that the majority of those from companies with 1-19 employees specified their organisations as operating as subcontractors only (see Table 40 in Appendix B). This might have influenced their perspective of how well this factor is being addressed in the NSW construction industry. Literature shows that, despite the implementation of regulatory and contractual measures over time, late payment remains a persistent issue in the construction industry, disproportionately impacting subcontractors who are frequently the main victims of such delays (Bolton et al., 2022). Also, the impact of late payment on subcontractors has been identified to include financial strain, leading to difficulties in paying their staff, an increased risk of insolvency, and reduced work performance (Bolton et al., 2022; Yiu et al., 2019).

4.5 Comparison of responses by respondents' perceptions of subcontractor WHS compliance performance

Respondents rating subcontractor WHS compliance performance as “good”, “very good” or “excellent” were categorised into the ‘good’ group, and those rating subcontractor WHS compliance performance as “poor”, “very poor” or “extremely poor” were categorised into the ‘poor’ group. Responses were compared between these two groups.

Between-group demographic analysis revealed that respondents from principal contractors are more likely to rate subcontractor WHS compliance performance as poor compared to respondents from subcontractors and organisations operating as both principal contractors and subcontractors. Respondents from the non-residential building construction sector are more likely to rate subcontractor WHS performance as poor compared to those from the residential building construction and heavy and civil engineering sectors. These between-group differences may be explained by similar reasons outlined in Section 4.2 and Section 4.3. In addition, respondents from Tier 3 contractors are more likely to rate subcontractor WHS performance as poor compared to those from Tier 1 contractors and Tier 2 contractors. This may be attributed to Tier 3 contractors having less resources for developing systematic approaches to managing WHS as well as having less influence over subcontracted workers, compared to larger contractors (Lingard et al., 2017).

A comparison between these two groups also indicated that respondents who rated subcontractor WHS compliance performance as good had significantly more positive perceptions of how well the factors of potential influence on WHS compliance are currently being addressed in the NSW construction industry compared to those who rated subcontractor WHS compliance performance as poor. Notably, the factors that displayed the largest differences in mean scores between these two groups at each level of influence were similar to those that received the lowest overall mean scores rated by all respondents. It appears that these factors not only highlight areas requiring focused attention within the NSW construction industry, but also reflect areas of divergent views among industry stakeholders. The next stage of interviews will delve into the reasons behind these divergences.

It is noteworthy that the between-group differences progressively increase along the hierarchy of influences. Specifically, the between-group differences are smaller at the higher levels of regulatory effectiveness and industry context and supply chain environment, compared to the larger differences observed at the lower levels of subcontractor management practices by principal contractors, workplace environment, and subcontractor knowledge, capability and attitude. This trend may be attributed to the fact that influences at the lower levels are more tangible and directly observable, while influences at the higher levels are more latent and systemic, shaping the conditions and dynamics at the lower levels. Walter et al. (2012) similarly mentioned that regulatory and industry contexts influence workplace WHS indirectly through the mediated supply chain practices and activities. Therefore, compared to the higher-level influences, survey respondents are likely to have more direct and varied experiences with the lower-level influences, leading to greater divergences in their opinions.

4.6 Next steps

Based on the survey results, the next stage of the study will involve interviewing a range of stakeholders in the NSW construction industry to:

- further explore specific patterns identified from the survey
- investigate strategies for addressing the identified areas that need improvement
- examine stakeholders’ experiences and views relating to subcontractor WHS compliance, and

understand the ways in which influential factors operate interactively to determine subcontractor WHS compliance.

The interview results will provide the basis for applying the system dynamics (SD) approach to qualitatively develop a SD model of subcontractor WHS compliance. A focus group will subsequently be conducted with industry stakeholders to review and validate the SD model and ascertain how change in a particular variable will influence the other variables and behaviour of the system. The focus groups will capture industry perspectives on the dynamics among the variables and the impacts of the variables in the SD model, which will identify the “pain points” in the system for intervention.

The findings from these stages will enable the development of guidance material recommending actions and best practices at different industry levels to enhance subcontractor WHS compliance in the NSW construction industry.

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6 Appendices

Appendix A: Description of statistical procedures

Kruskal-Wallis one-way ANOVA test

Kruskal-Wallis one-way ANOVA, otherwise called Kruskal-Wallis test, is a non-parametric statistical test used to determine whether there are statistically significant differences between the responses of three or more independent groups (McKight & Najab, 2010). It tests the null hypothesis that "all the distributions of responses for all the groups are the same" at a significance level (p) commonly 0.05 (McKight & Najab, 2010). For this study, this implies that the null hypothesis for each comparison group is that all three (or more) different types of groups have the same distribution of response.

If the test yields a p-value lower than 0.05 ($p < 0.05$, the null hypothesis is rejected, indicating that there is a statistically significant difference in the response between at least two groups. To determine where the difference exists, post hoc pairwise analysis can be performed.

In the Kruskal-Wallis test, the H value measures the variation in the ranks of the observations among the groups. A larger H value indicates greater differences between the groups, while a smaller H value suggests that the groups are more similar. A larger H value corresponds to a smaller p-value, increasing the chance of rejecting the null hypothesis.

Post hoc analysis

Post hoc pairwise analysis is conducted after a statistically significant difference has been identified in a between-group test such as Kruskal-Wallis test. Post hoc analysis determines where exactly the difference is situated (Cleophas & Zwinderman, 2016). It provides clarity on which group comparisons (e.g. group 1 versus group 2, group 2 versus group 3, etc.) are responsible for the observed significant difference to enable a more precise conclusion.

Dunn's test is commonly used for post hoc analysis after Kruskal-Wallis test (Dinno, 2015). The Dunn's test is conducted for all possible pairs of groups. The results of the pairwise comparisons are usually adjusted with Bonferroni correction to prevent a Type 1 error (i.e., a false positive of saying there is a statistically significant difference between groups when there is none). Therefore, only pairwise comparisons that have a p-value less than 0.05 after Bonferroni correction are considered.

Independent samples T-test

Independent samples t-test (commonly known as T-test) is used to determine whether there is a statistically significant difference between the means of two independent groups. The T-test produces a standardised score known as the T-score that measures how far the difference in means deviates from the null hypothesis. In T-test, the null hypothesis assumes that the means of the two groups are equal. The null hypothesis is rejected if the p-value is less than or equal the commonly used threshold of 0.05, indicating a statistically significant difference between the two groups.

Appendix B: Analysis of results

Comparison of responses across the types of organisations

Table 18: Kruskal-Wallis test and post hoc analysis for factors related to regulatory effectiveness across the types of organisations

Regulatory effectiveness	Kruskal-Wallis test		Post hoc analysis*		
	H value	Significance (p-value)	*Significant comparisons between groups	Mean difference	*Significance (p-value)
Clear communication of subcontractors' WHS duties by the regulator	15.85	0.001	Principal contractor - subcontractor	-0.55	0.017
			Principal contractor – both a principal contractor and a subcontractor	-0.78	0.000
Support by the regulator to help subcontractors comply with WHS duties	9.62	0.008	Principal contractor - both a principal contractor and a subcontractor	-0.56	0.009
Adequate regulatory oversight to ensure subcontractors' WHS compliance	12.64	0.002	Principal contractor - subcontractor	-0.56	0.030
			Principal contractor - both a principal contractor and a subcontractor	-0.74	0.001
SafeWork NSW's direct engagement with subcontractors regarding WHS	11.41	0.003	Principal contractor - both a principal contractor and a subcontractor	-0.72	0.002

*. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.

Table 19: Kruskal-Wallis test and post hoc analysis for factors related to industry context and supply chain across the types of organisations

Industry context and supply chain environment	Kruskal-Wallis test		Post hoc analysis*		
	H value	Significance (p-value)	*Significant comparisons between groups	Mean difference	*Significance (p-value)
Consistent subcontractor pre-qualification processes across principal contractors in the industry	18.02	0.001	Principal contractor – subcontractor	-0.74	0.004
			Principal contractor-Both a principal contractor and a subcontractor	-0.93	0.000
Adequate supply of skilled workers in the industry to undertake required work	14.98	0.001	Principal contractor-Both a principal contractor and a subcontractor	-1.07	0.000

*. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.

Table 20: Kruskal-Wallis test and post hoc analysis for factors related to subcontractor management practices by principal contractors across the types of organisations

Subcontractor management practices by principal contractors	Kruskal-Wallis test		Post-hoc analysis*		
	H value	Significance (p-value)	*Significant comparisons between groups	Mean difference	*Significance (p-value)
Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS	6.42	0.040	Principal contractor- both a principal contractor and a subcontractor	-0.49	0.043
Effective consultation with subcontractors on identifying, assessing and controlling WHS risks	6.31	0.043	Principal contractor- both a principal contractor and a subcontractor	-0.45	0.037
Effective subcontractor WHS performance measurement	8.00	0.018	Principal contractor- both a principal contractor and a subcontractor	-0.61	0.014
Alignment between principal contractors' WHS management systems and those of subcontractors	8.93	0.012	Principal contractor – both a principal contractor and a subcontractor	-0.69	0.009
Robust competence assessments of subcontractors before engagement	15.96	0.001	Principal contractor- subcontractor	-0.86	0.002
			Principal contractor- both a principal contractor and a subcontractor	-0.85	0.001
Use of reward systems to incentivise subcontractor WHS compliance	6.84	0.033	Principal contractor- both a principal contractor and a subcontractor	-0.67	0.046

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 21: Kruskal-Wallis test and post hoc analysis for factors related to workplace environment across the types of organisations

Workplace environment	Kruskal-Wallis test		Post hoc analysis*		
	H value	Significance (p-value)	*Significant comparisons between groups	Mean difference	*Significance (p-value)
Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors	8.04	0.018	Principal contractor - Both a principal contractor and a subcontractor	-0.58	0.014
Subcontractors' effective coordination of activities to	15.56	0.001	Principal contractor - subcontractor	-0.67	0.015

avoid creating WHS risks for each other			*Principal contractor - Both a principal contractor and a subcontractor*	*-0.91*	*0.000*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 22: Kruskal-Wallis test and post hoc analysis for factors related to subcontractor knowledge, capability, and attitude across the types of organisations

Subcontractor knowledge, capability, and attitude	*Kruskal-Wallis test*		*Post hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Subcontractors' awareness of their WHS duties	*11.98*	*0.003*	*Principal contractor - subcontractor*	*-0.71*	*0.030*
			Principal contractor - Both a principal contractor and a subcontractor	*-0.87*	*0.004*
Subcontractors having the knowledge and skills for effective WHS risk management	*15.03*	*0.001*	*Principal contractor - subcontractor*	*-0.71*	*0.019*
			Principal contractor - Both a principal contractor and a subcontractor	*-0.96*	*0.000*
Subcontractors having the resources to perform their WHS duties	*14.01*	*0.001*	*Principal contractor - subcontractor*	*-0.74*	*0.031*
			Principal contractor - Both a principal contractor and a subcontractor	*-0.99*	*0.001*
Subcontractors having positive attitudes about WHS	*8.65*	*0.013*	*Principal contractor - Both a principal contractor and a subcontractor*	*-0.79*	*0.014*
Subcontractors following WHS requirements, even under production pressure	*12.47*	*0.002*	*Principal contractor - subcontractor*	*-0.92*	*0.008*
			Principal contractor - Both a principal contractor and a subcontractor	*-0.96*	*0.003*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Comparison of responses across construction sectors

Table 23: Kruskal-Wallis test and post hoc analysis for factors related to regulatory effectiveness across construction sectors

Regulatory effectiveness	*Kruskal-Wallis test*		*Post hoc analysis**		
	H value	*Significance (p-value)*	**Significant Comparisons between groups*	*Mean difference*	**Significance (p-value)*

Clear communication of subcontractors' WHS duties by the regulator	*10.40*	*0.034*	*Non-residential - Residential*	*-0.81*	*0.021*
SafeWork NSW's direct engagement with subcontractors regarding WHS	*12.78*	*0.012*	*Non-residential - Residential*	*-0.82*	*0.049*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 24: Kruskal-Wallis test and post hoc analysis for factors related to industry context and supply chain environment across construction sectors

Industry context and supply chain environment	*Kruskal-Wallis test*		*Post hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Sufficient time in project programs to ensure subcontractors can complete work safely	*16.85*	*0.002*	*Non-residential - Residential*	*-1.06*	*0.003*
			Non-residential – Heavy and civil engineering	*-1.02*	*0.034*
Sharing WHS risks between project stakeholders rather than transferring them down the supply chain	*11.41*	*0.022*	*Non-residential - Residential*	*-0.82*	*0.029*
Consistent subcontractor pre-qualification processes across principal contractors in the industry	*19.79*	*0.001*	*Non-residential – Residential*	*-1.12*	*0.001*
			Non-residential - Heavy and civil engineering	*-1.22*	*0.005*
			Non-residential – Residential and non-residential	*-0.89*	*0.043*
Adequate supply of skilled workers in the industry to undertake required work	*16.55*	*0.002*	*Non-residential - Residential*	*-1.25*	*0.005*
			Non-residential - Heavy and civil engineering	*-1.32*	*0.020*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 25: Kruskal-Wallis test and post hoc analysis for factors related to subcontractor management practices by principal contractors across construction sectors

Subcontractor management practices by principal contractors	*Kruskal-Wallis test*		*Post hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Effective subcontractor WHS performance measurement	*18.41*	*0.001*	*Non-residential - Residential*	*-0.95*	*0.002*
			Non-residential – Heavy and civil engineering	*-0.90*	*0.045*

Limiting subcontractor tiers on projects to ensure effective WHS control	*14.91*	*0.005*	*Non-residential - Residential*	*-0.82*	*0.042*
			Non-residential – Heavy and civil engineering	*-0.22*	*0.019*
Alignment between principal contractors' WHS management systems and those of subcontractors	*16.36*	*0.003*	*Non-residential - Residential*	*-1.02*	*0.012*
Use of reward systems to incentivise subcontractor WHS compliance	*13.37*	*0.010*	*Non-residential - Residential*	*-1.16*	*0.010*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 26: Kruskal-Wallis test and post hoc analysis for factors related to workplace environment across construction sectors

Workplace environment	*Kruskal-Wallis test*		*Post-hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Subcontractors' effective coordination of activities to avoid creating WHS risks for each other	*15.17*	*0.004*	*Non-residential - Residential*	*-1.05*	*0.005*
			Non-residential – Heavy and civil engineering	*-1.15*	*0.006*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 27: Kruskal-Wallis test and post hoc analysis for factors related to subcontractor knowledge, capability, and attitude across construction sectors

Subcontractor knowledge, capability, and attitude	*Kruskal-Wallis test*		*Post-hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Subcontractors' awareness of their WHS duties	*12.70*	*0.013*	*Non-residential - residential*	*-1.02*	*0.001*
			Non-residential – Residential and non-residential	*-0.88*	*0.048*
Subcontractors having the knowledge and skills for effective WHS risk management	*22.49*	*0.001*	*Non-residential - residential*	*-1.18*	*0.000*
			Non-residential – Heavy and civil engineering	*-1.33*	*0.002*
Subcontractors having the resources to perform their WHS duties	*20.13*	*0.001*	*Non-residential - residential*	*-1.33*	*0.001*
			Non-residential – Heavy and civil engineering	*-1.18*	*0.022*

Subcontractors having positive attitudes about WHS	*27.07*	*0.001*	*Non-residential - residential*	*-1.63*	*0.000*
			Non-residential – Heavy and civil engineering	*-1.70*	*0.001*
Subcontractors following WHS requirements, even under production pressure	*25.42*	*0.001*	*Non-residential - residential*	*-1.64*	*0.000*
			Non-residential – Heavy and civil engineering	*-1.51*	*0.006*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Comparison of responses across company sizes

Table 28: Kruskal-Wallis test of factors related to regulatory effectiveness across company sizes

Regulatory effectiveness	*Kruskal-Wallis test*	
	H value	*Significance (p-value)*
Clearly defined WHS duties for principal contractors and subcontractors in the legislation	*0.87*	*0.647*
Clear communication of subcontractors' WHS duties by the regulator	*0.73*	*0.693*
Support by the regulator to help subcontractors comply with WHS duties	*1.18*	*0.555*
Adequate regulatory oversight to ensure subcontractors' WHS compliance	*1.98*	*0.372*
SafeWork NSW's direct engagement with subcontractors regarding WHS	*0.35*	*0.838*

The significance level is at p-value of 0.050.

Table 29: Kruskal-Wallis test and post hoc analysis of factors related to industry context and supply chain environment across company sizes

Industry context and supply chain environment	*Kruskal-Wallis test*		*Post-hoc analysis**		
	H value	*Significance (p-value)*	**Significant comparisons between groups*	*Mean difference*	**Significance (p-value)*
Ensuring subcontractors are paid on time	*6.75*	*0.034*	*1-19 employees – 20-199 employees*	*-0.50*	*0.048*

**. Significance is based on Bonferroni correction. The significance level is at p-value of 0.050.*

Table 30: Kruskal-Wallis test of factors related to subcontractor management practices by principal contractors across company sizes

Subcontractor management practices by principal contractors	*Kruskal-Wallis test*	
	H value	*Significance (p-value)*

Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS	*0.21*	*0.901*
Clear communication of WHS information (including any revisions) to all subcontractors	*0.20*	*0.904*
Developing a collaborative and trusting relationship between principal contractors and subcontractors	*3.04*	*0.218*
Effective subcontractor WHS performance measurement	*0.13*	*0.937*
Active monitoring and ensuring subcontractor compliance with WHS	*2.53*	*0.282*
Effective consultation with subcontractors on identifying, assessing and controlling WHS risks	*0.03*	*0.987*
Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)	*0.53*	*0.768*
Robust competence assessments of subcontractors before engagement	*3.04*	*0.218*
Limiting subcontractor tiers on projects to ensure effective WHS control	*0.37*	*0.832*
Provision of essential WHS training and inductions to subcontractors	*0.97*	*0.614*
Consistent emphasis on WHS matters, even under production pressure	*0.39*	*0.822*
Alignment between principal contractors' WHS management systems and those of subcontractors	*1.01*	*0.603*
Use of reward systems to incentivise subcontractor WHS compliance	*1.15*	*0.563*

The significance level is at p-value of 0.050.

Table 31: Kruskal-Wallis test of factors related to workplace environment across company sizes

Workplace environment	*Kruskal-Wallis test*	
	H value	*Significance (p-value)*
Adaptation of WHS rules and procedures (e.g., SWMSs) into specific work contexts through collaboration between principal contractors and subcontractors	*2.40*	*0.301*
Effective coordination of work interfaces between multiple subcontractors by principal contractors	*1.53*	*0.465*
Subcontractors' effective coordination of activities to avoid creating WHS risks for each other	*1.10*	*0.578*
Developing effective systems by principal contractors for reporting WHS issues, including unworkable rules and procedures	*1.75*	*0.416*
Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors	*0.48*	*0.787*

The significance level is at p-value of 0.050.

Table 32: Kruskal-Wallis test of factors related to subcontractor knowledge, capability, and attitude across company sizes

Subcontractor knowledge, capability, and attitude	Kruskal-Wallis test	
	H value	Significance (p-value)
Subcontractors' awareness of their WHS duties	0.66	0.720
Subcontractors having the knowledge and skills for effective WHS risk management	0.80	0.672
Subcontractors having the resources to perform their WHS duties	2.11	0.348
Subcontractors having positive attitudes about WHS	0.29	0.863
Subcontractors following WHS requirements, even under production pressure	1.51	0.470

The significance level is at p-value of 0.050.

T-test comparing responses between those who rated subcontractor WHS compliance performance as poor or good

Table 33: T-test results for factors related to regulatory effectiveness

Regulatory effectiveness	Groups[a]	N	Mean	Std. Deviation	t-value	p-value
Clearly defined WHS duties for principal contractors and subcontractors in the legislation	1	51	3.76	1.159	-5.025	<.001**
	2	151	4.53	0.855		
Clear communication of subcontractors' WHS duties by the regulator	1	51	3.22	1.101	-7.602	<.001**
	2	152	4.49	1.01		
Support by the regulator to help subcontractors to comply with WHS duties	1	51	3.41	1.043	-5.131	<.001**
	2	152	4.31	1.093		
Adequate regulatory oversight to ensure subcontractors' WHS compliance	1	51	2.86	1	-8.489	<.001**
	2	152	4.32	1.076		
SafeWork NSW's direct engagement with subcontractors regarding WHS	1	51	2.75	1.017	-7.9	<.001**
	2	152	4.15	1.126		

a. Group 1: Respondents who rated subcontractor WHS compliance performance as poor; Group 2: Respondents who rated subcontractor WHS compliance performance as good
**. Differences between the two groups significant at 0.05 level.*
***. Differences between the two groups significant at 0.01 level.*

Table 34: T-test results for factors related to industry context and supply chain environment

Industry context and supply chain environment	Groups[a]	N	Mean	Std. Deviation	t-value	p-value
Considering the cost of subcontractor WHS compliance in head contract procurement	1	51	2.75	1.036	-7.392	<.001**
	2	152	4.07	1.126		
Sufficient financial allocation for meeting WHS requirements in subcontract procurement	1	51	2.84	1.065	-6.23	<.001**
	2	152	3.98	1.148		
Sufficient time in project programs to ensure subcontractors can complete work safely	1	51	2.92	1.146	-6.935	<.001**
	2	152	4.16	1.095		
Sharing WHS risks between project stakeholders rather than transferring them down the supply chain	1	51	2.92	1.181	-6.722	<.001**
	2	152	4.17	1.138		
Stipulating specific WHS requirements in subcontract agreements	1	51	3.41	1.236	-6.09	<.001**
	2	152	4.43	0.953		
Consistent subcontractor pre-qualification processes across principal contractors in the industry	1	51	2.61	1.115	-8.937	<.001**
	2	152	4.2	1.1		
Avoiding duplication of activities for subcontractors by principal contractors	1	51	3.22	1.026	-5.435	<.001**
	2	152	4.13	1.046		
Ensuring subcontractors are paid on time	1	51	3.59	1.344	-2.318	0.021*
	2	152	4.07	1.248		
Preventing aggressive tendering practices (e.g. bid shopping) by principal contractors	1	51	2.92	1.339	-4.428	<.001**
	2	151	3.89	1.349		
Adequate supply of skilled workers in the industry to undertake required work	1	51	2.41	1.169	-6.278	<.001**
	2	152	3.79	1.412		

a. Group 1: Respondents who rated subcontractor WHS compliance performance as poor; Group 2: Respondents who rated subcontractor WHS compliance performance as good
**. Differences between the two groups significant at 0.05 level.*
***. Differences between the two groups significant at 0.01 level.*

Table 35: T-test results for factors related to subcontractor management practices by principal contractors

Subcontractor management practices by principal contractors	Groups[a]	N	Mean	Std. Deviation	t-value	p-value
Consistent emphasis on WHS matters, even under production pressure	1	49	3.14	1.19	-5.994	<.001**
	2	143	4.21	1.034		
Alignment between principal contractors' WHS management systems and those of subcontractors	1	49	2.76	1.031	-7.9	<.001**
	2	142	4.16	1.089		
Clear communication of WHS information (including any revisions) to all subcontractors	1	49	3.2	1.154	-6.181	<.001**
	2	143	4.33	1.08		
Active engagement of subcontractors in developing and reviewing WHS rules and procedures (including SWMSs)	1	49	2.88	1.111	-7.153	<.001**
	2	143	4.18	1.098		
Effective consultation with subcontractors on identifying, assessing and controlling WHS risks	1	49	3.18	1.054	-5.827	<.001**
	2	143	4.21	1.067		
Provision of essential WHS training and inductions to subcontractors	1	49	3.22	1.279	-5.207	<.001**
	2	143	4.22	1.116		
Active monitoring and ensuring subcontractor compliance with WHS	1	49	3.18	1.131	-5.786	<.001**
	2	143	4.25	1.11		
Principal contractors having site managers/supervisors who are competent to manage subcontractor WHS	1	49	3.02	1.145	-8.354	<.001**
	2	140	4.41	0.952		
Effective subcontractor WHS performance measurement	1	49	2.96	1.06	-7.845	<.001**
	2	140	4.33	1.049		
Robust competence assessments of subcontractors before engagement	1	49	2.55	1.191	-9.373	<.001**
	2	140	4.26	1.062		
Developing a collaborative and trusting relationship between principal contractors and subcontractors	1	49	3.27	1.221	-6.307	<.001**
	2	140	4.39	1.023		
Limiting subcontractor tiers on projects to ensure effective WHS control	1	49	2.8	1.04	-8.344	<.001**
	2	140	4.22	1.025		
Use of reward systems to incentivise subcontractor WHS compliance	1	49	2.37	1.149	-7.096	<.001**
	2	140	3.92	1.373		

a. Group 1: Respondents who rated subcontractor WHS compliance performance as poor; Group 2: Respondents who rated subcontractor WHS compliance performance as good
**. Differences between the two groups significant at 0.05 level.*
***. Differences between the two groups significant at 0.01 level.*

Table 36: T-test results for factors related to workplace environment

Workplace environment	Groups[a]	N	Mean	Std. Deviation	t-value	p-value
Effective coordination of work interfaces between multiple subcontractors by principal contractors	1	48	3.27	1.198	-6.064	<.001**
	2	140	4.28	0.914		
Subcontractors' effective coordination of activities to avoid creating WHS risks for each other	1	48	2.52	0.989	-11.088	<.001**
	2	140	4.34	0.98		
Fostering a shared understanding of the importance of WHS among subcontractors by principal contractors	1	48	2.85	0.922	-9.433	<.001**
	2	140	4.36	0.969		
Developing effective systems by principal contractors for reporting WHS issues, including unworkable rules and procedures	1	48	3.19	1.214	-6.706	<.001**
	2	139	4.35	0.961		
Adaptation of WHS rules and procedures (e.g., SWMSs) into specific work contexts through collaboration between principal contractors and subcontractors	1	48	3.21	1.071	-6.471	<.001**
	2	140	4.31	0.996		

a. Group 1: Respondents who rated subcontractor WHS compliance performance as poor; Group 2: Respondents who rated subcontractor WHS compliance performance as good
**. Differences between the two groups significant at 0.05 level.*
***. Differences between the two groups significant at 0.01 level.*

Table 37: T-test results for factors related to subcontractor knowledge, capability and attitude

Subcontractor knowledge, capability and attitude	Groups[a]	N	Mean	Std. Deviation	t-value	p-value
Subcontractors' awareness of their WHS duties	1	47	2.55	1.157	-10.615	<.001**
	2	139	4.47	1.038		
Subcontractors having the resources to perform their WHS duties	1	47	2.45	1.119	-9.771	<.001**
	2	139	4.26	1.092		
Subcontractors having the knowledge and skills for effective WHS risk management	1	47	2.51	1.101	-9.898	<.001**
	2	139	4.31	1.069		

Subcontractors having positive attitudes about WHS	*1*	*47*	*2.15*	*0.955*	*-12.234*	*<.001***
	2	*139*	*4.35*	*1.102*		
Subcontractors following WHS requirements, even under production pressure	*1*	*47*	*2.13*	*1.154*	*-10.662*	*<.001***
	2	*139*	*4.21*	*1.158*		

a. Group 1: Respondents who rated subcontractor WHS compliance performance as poor; Group 2: Respondents who rated subcontractor WHS compliance performance as good
**. Differences between the two groups significant at 0.05 level.*
***. Differences between the two groups significant at 0.01 level.*

Cross-tabulation of job roles and types of organisations

Table 38: Cross-tabulation of job role and type of organisation

Job role	*Principal contractor*	*Subcontractor*	*Both a principal contractor and a subcontractor*	*Total*
Senior management/Executives	*10*	*31*	*26*	*67*
WHS professionals	*22*	*6*	*11*	*39*
Project and site management	*6*	*3*	*2*	*11*
Engineering and technical roles	*1*	*5*	*2*	*8*
Administrative and business support	*5*	*6*	*5*	*16*
Others	*2*	*5*	*1*	*8*
Total	*46*	*56*	*47*	*149*

Table 39: Cross-tabulation between job role and construction sector

Job role	*Residential*	*Non-residential*	*Heavy and civil engineering*	*Residential and non-residential*	*Residential, non-residential and heavy engineering*	*Total*
Senior management/Executives	*21*	*6*	*3*	*24*	*7*	*61*
WHS professionals	*5*	*12*	*7*	*7*	*3*	*34*
Project and site management	*5*	*3*	*0*	*2*	*0*	*10*
Engineering and technical roles	*6*	*0*	*0*	*1*	*0*	*7*

Administrative and business support	*7*	*0*	*3*	*5*	*0*	*15*
Others	*4*	*0*	*0*	*2*	*1*	*7*
Total	*48*	*21*	*13*	*41*	*11*	*134*

Table 40: Cross-tabulation between type of organisation and company size

Type of organisation	*1-19 employees*	*20-199 employees*	*200+ employees*	*Total*
A principal contractor	*13*	*21*	*12*	*46*
A subcontractor	*50*	*11*	*4*	*65*
Both a principal contractor and a subcontractor	*26*	*31*	*13*	*70*
Total	*89*	*63*	*29*	*181*

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