Safety Platforms:

An Opportunity To Improve Worker Health and Safety On Residential Construction Sites?

March 2024

Dave Simmons

Executive Summary

This study investigates the ***potential benefits of using safety decks as an alternative to safety nets on residential construction sites***. The research is motivated by the high prevalence of injuries in these settings. The hypothesis is that safety platforms can reduce injury risk and improve general wellbeing.

The research methodology comprised two workstreams; 1) an ergonomic assessment conducted by a certified CHASNZ ergonomist and peer reviewed by an external Certified Generalist OHS Professional from Australia; and 2) in-depth interviews with builders. The ergonomic assessment, based on photographs, videos, and observations, compares working conditions on decking versus a simulated net environment. The interviews explore builders' opinions on the use of nets and decking, with discussions taking place after builders had worked on decking for the first time.

Results demonstrate that decking provides a more stable base, better posture, and increased freedom of movement, with ***builders on decking demonstrating considerably less strain on the lower back*** and the ability to rest tools on the surface. In contrast, those simulating a net environment faced challenges like forward leaning, potential instability, and limited space for tool placement.

In-depth interviews further support these findings, with builders highlighting the ***reduced risk of falls from height***, increased comfort, and ***improved efficiency associated with using decking***. The perception that decking provides a safer, more relaxed work environment could have positive implications for worker well-being, stress levels, and overall job satisfaction.

Based upon the evidence from this research, ***using safety platforms on building sites does have the potential to reduce the risk of injuries and improve the general wellbeing of employees***.

"(Using decking) would definitely lead to a reduction in injuries on site"

Builder, Summerset, Whangarei

Table of Contents

"I reckon I'd be less angry and stressed at the end of the day"

Builder, Summerset, Whangarei

1.0 Introduction

Accidents on building sites in New Zealand resulting in injuries and fatalities continue to be a major issue for the construction sector. During the period 2018 – 2021 there was a 7.5% increase in injury claims from construction sites, with associated costs escalating by approximately 38%[1]. During this period, construction sites become the most hazardous work environments in New Zealand, evidenced by the 29 fatalities recorded[2]. Notably, residential construction sites report more injuries than any other sector within the industry[3].

In the year 2021, the Accident Compensation Corporation (ACC) reported the highest tally of construction site injury claims in ten years, amounting to 48,650 cases and incurring costs of $153 million. The most prevalent injuries in the sector are sprains and strains. In 2020 alone, ACC acknowledged 17,871 claims for soft-tissue injuries, with the total number exceeding 91,000 from 2017 to 2021.

To put this into stark context, New Zealand has some of the worst statistics for construction deaths in the Organisation for Economic Co-operation and Development (OECD). As at December 2022, the New Zealand construction sector had experienced a 5 year rolling average of 3.82 deaths per 100,000 workers per annum . This contrasts with Australia and the UK where the comparable measure is 2.10 and 1.47 deaths per 100,000 workers annum[4] respectively.

Research conducted by the Ministry of Business, Innovation and Employment reveals that over half of the falls on construction sites occur from heights of less than three meters, and around 70% of those falls involve ladders and roofs. The financial impact of these falls is estimated at $24 million annually, not to mention the significant workplace disruption (i.e. lost work days, impacts on fellow workers, etc) and human toll they represent (i.e. mental health, impacts on family, etc)[5].

Despite the implementation of the Health and Safety at Work Act (2015) in New Zealand, the statistics indicate that construction workers continue to be exposed to considerable risk of work-related injuries. The guiding principle of the act is that workers should be given the highest level of protection against harm to their health, safety and welfare from work risks, by eliminating or minimising those risks to the extent that is reasonably practicable.[7] The question therefore, is can more be done to drive targeted change within the construction sector to improve the chances of employees getting home safely at the end of each day.

Over the past decade, the use of safety nets on New Zealand construction sites has increased significantly. This rise is attributed to the industry seeking to comply with the objectives established in the Health and Safety at Work Act (2015)[8]. Safety nets, installed below high-

[1] Tackling the hidden cost of the building boom. ACC Website
[2] WorkSafe New Zealand website
[3] ACC Website
[4] Chris Alderson, presentation H&S conference 2023
[5] Working at Height in New Zealand. WorkSafe New Zealand website
[7] Dr Hillary Bennet, 'Better Work By Design'. Safeguard. Jan/Feb 24
[8] Safe use of Safety Nets. Worksafe website.

level work areas, are intended to reduce the distance a worker can fall and absorb the impact, providing a 'soft landing' to reduce the likelihood of injury.

However, incidents involving the failure of safety nets have been reported, resulting in workers being injured, some very seriously. These failures often fall into two categories: incorrect installation or non-compliant use of product. Key issues include nets being installed too tight or too loose, nets not coupled correctly when multiple nets are used, and nets being uninstalled and reinstalled by untrained workers on site[9]. It is widely acknowledged amongst industry participants that the number of unreported falls and injuries of workers falling into safety nets is significant.

Interestingly, in the construction industry, the hierarchy of controls for managing the risk of falls is generally defined as including four levels:

1. **Level 1**: Undertake the work on the ground or on a solid construction.
2. **Level 2**: Undertake the work using a passive fall protection device.
3. **Level 3**: Undertake the work using a work positioning system.
4. **Level 4**: Undertake the work using a fall injury prevention system.

Safety nets fall under Level 4 as a fall injury prevention system[10].

Given the prevalence of injuries occurring on residential building sites where the common form of internal fall protection is safety nets, this study seeks to understand whether there are benefits to be had from using safety decks as an alternative.

Safety decks are a temporary platform installed at height to prevent falls and to provide a safe working surface. Safety decks are widely used in the UK construction sector, where the 2005 Work at Height regulations mandate the use of collective protection and risk management to prevent falls when work at height cannot be avoided[11].

The trend for both fatal and non-fatal injuries in the UK construction sector over the past 20 years, since the introduction of the 2005 Work at Height regulations, has generally been decreasing. The Health and Safety Executive (HSE) reports a long-term downward trend in the rate of fatal injuries, with the number of workers killed in work-related accidents in the construction sector decreasing over time[1]. For non-fatal injuries, the Labour Force Survey (LFS) indicates a reduction in self-reported injuries, and the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) also show a downward trend in reported non-fatal injuries.[12] [13] [14]

The hypothesis of the research is therefore:

Using safety platforms on a building site reduces
the risk of injuries and improves worksite wellbeing.

[9] Safety Alert – Safet Nets. August 2017, Worksafe website
[10] Safe use of Safety Nets. Worksafe website
[11] A Complete Guide to Working at Heights Regulations 2005. May 2023. Humanfocus.co.uk
[12] Construction Industry Safety Statistics, Health and Safety Executive. HSE.co.uk/statistics
[13] Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR). HSE.co.uk/RIDDOR
[14] The History of Working at Height – What's Changed? PWC.uk.com/the-history-of working-at-height

2.0 Research Objectives:

The objectives that have been set for this research are as follows:

1. To assess the impact of safety platforms on reducing the risk of injuries during building tasks such as installing mid-floors and standing trusses.
2. To understand the impact of the use of safety platforms on improving mental health and wellbeing on building sites.

3.0 Research Methodology:

The research objectives have been addressed through two research workstreams

1) Ergonomic Assessment:

The ergonomic assessment was conducted by a Certified New Zealand ergonomist and peer reviewed by an external Certified Generalist OHS Professional from Australia. The assessment is based on the still photographs, videos, and observations taken on the day.

2) In-depth Interviews of Builders:

In-depth interviews were conducted to delve into the opinions of construction workers regarding the use of nets and decking on residential building sites. This involved crafting a set of questions that served as the foundation for one-on-one discussions with each builder. The interviews took place after each builder had worked on decking for half a day for the first time. The sessions took place in a secluded office setting, with each lasting approximately 10 minutes. Following the interviews, the transcripts were examined to pinpoint and group together common themes.

4.0 Caveats

Commentary is based on a visual assessment of the task in terms of work posture (and position) and principles of ergonomics.

Due to logistical circumstances, a comparison with a net was not observed. From a psychological perspective, workers may not demonstrate the same perception of risk as having a net. Having the nets available would help control these real-world variables. Future assessments should use a separate (but same layout) site with the net in place.

The tasks presented in this assessment may not be fully representative of the work conducted for this activity, nor may it represent some of the most awkward postures. However, due to their repetitiveness and type of movements and postures, they may still represent uncaptured tasks[15].

The sample of two builders limited the robustness of the insights gathered from the in-depth interviews. Ideally, the in-depth interviews would be conducted across a sample of 8 – 10 subjects. Future assessment would ideally involve a larger pool of builders.

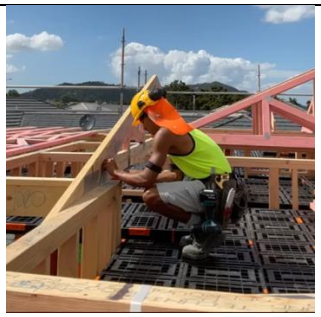
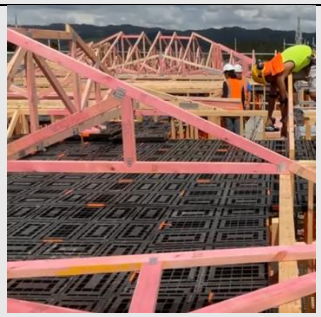
[15] The first 3 caveats were identified by Dr Stephven Kolose and Chris Polaczuk

5.0 Results

5.1 Ergonomic Assessment:

The following are observational assessments of comparable actions on an environment where builders were working on decking and a second environment where the builders simulated nets (non-decking), i.e. working off the top plate, trusses, surrounding scaffolding. NB: whilst care has been taken to align activities, it is acknowledged that it may not be exact and/or there may be a misinterpretation of the actual activity. However, the activities do align with comparable physical actions.

Decking	**Non-Decking** *(simulation of a net environment)*
 Standing Small Truss • The worker has a solid base to stand on. Slight bending at the lower back is observed. The worker is also using his left knee to brace the truss which is advantageous (as opposed to holding the truss away from the body). • The worker was able to rest his power tool on the decking allowing him time to adjust the truss where needed. • The worker is able to freely move around the work area (walking on the decking). • Base of support bilateral using all of soles of both boots/feet. • Base of support closer to load. • Base of support allowing stance with 1 foot further forward towards load therefore reducing cantilever/leverage effect on lower back.	 Standing Small Truss • The worker is standing in between two trusses. The forward leaning motion provides instability that can be a source of harm if they fall awkwardly, especially while holding a live power tool. Repeated tasks such as this will likely cause injury to the lower back followed by the shoulders unless they take frequent breaks from this position (Kolose & Matulino, 2022). • This position does not afford a convenient place for the worker to put his tool down. • Subsequent movements to adjust the small truss will require fine movements and balance. • Base of support limited to partial areas of the soles of boot/feet. • Base of support further from load. • Posture is a perching and balancing over the limited contact areas of the boots/feet with very limited ability of the feet to be utilised in maintaining dynamic balance in responding to load forces for example by putting more pressure on the various parts of foot front/rear/sides in response and reaction to generating and resisting forces during movement of the body and materials handled. This will be compensated for by generating force in the trunk and limbs creating awkward posture and movement. This comment applies to all work being done standing on the top plates of the walls and the truss members.
 Nailing off Truss • The worker is standing on stable surface using the truss to support his weight while leaning forward. The working area (to nail) is at knee height. The worker is likely to experience strain in the lower back if this task was for a significant length of time or performed repeatedly throughout the shirt. Observations	 Nailing off Truss • While the worker has a wide stance with sufficient stability, his forward bending motion will add increasing strain on his lower back and potentially, his shoulders, arms, and quadriceps. • The working area is either at foot height or below. This is not ideal from a safety perspective as they can fall forward. Further injuries can occur if they fall whilst using a live power tool.

show that this is not the case. There is ample space on the decking for the worker to move, readjust position or rest. • The deck enables the worker to hand off the power tool to his colleagues. Both can walk to each other on the decking. • Less than 90° flexion at the low back and hips with partial trunk support being taken through the left upper limb therefore the opportunity to partially reduce load on the low back.	Safety would be improved if the work area is at elbow height and closer to the body (for balance and stability). • Tool hand off to his colleague was not observed in the still image, however observations showed that both workers would take longer to hand over tools and equipment due to movement and balancing around the perimeter. • Greater than 90° flexion of the low back and hips. • The comments regarding perching and balancing apply here also.
 Nailing off Truss • Posture is suboptimal (with the decking the worker should be able to complete this task from the opposite side) however it is acceptable because he is right-handed. • The absence of decking would complicate this task as they would need to hold an awkward position whilst balancing on the truss itself.	 Nailing off Truss • This is example is the most extreme work posture and position observed in the assessment (also observed on site). • Potential injuries could occur in the lower back, quadriceps (depending on flexibility), and truss abrasion across the pectoral and scye region. • Issues can also arise if the truss is not stable (in a fixed position) and can topple over. • As mentioned earlier, drilling is conducted below the level of the foot, towards the body and from a difficult line of sight. All of which are dangerous to their safety. •
 Installing Joist Hanger • In isolation this position adds stress on his knees, upper thigh, and lower back. However, this position is only maintained for a short amount of time (less than 10 sec) so very low risk. • Decking enables the worker to move freely around the site as observed when he was retrieving the joist hanger. • Decking enables the worker to reset his posture when taking measurements and readjustments. This is a key point, the ability to walk approximating a natural gait provides the opportunity for low back and associated supporting tissues and structures to recover.	 Installing Joist Hanger • This extreme posture has implications for the workers lower back, shoulders, and arms. • Leaning over the apex of the truss may cause injury to the abdominal area. Use of the power drill is dangerous (grip position) and can potentially cause harm (e.g. drilling his foot) caused by 1) obstructed view of the drilling area and 2) balance issues trying to maintain the awkward posture.

Installing Joist Hanger

- Posture here is not an issue.
- Decking provides stable base for crouch position.
- Decking provides a stable base for the worker to complete their task whilst using both hands.

Installing Joist Hanger

- Posture is stable however the body is in an awkward position (with leaning and slight side flexion in the back).
- Leaning over the truss requires increased concentration on drilling (compared decking).
- Significant low back flexion with asymmetrical loading.
- Significant loading on left knee when bend ~90°

Slotting Truss into Joist Hanger

- Minimal postural issues (as it's a simple carry).
- Decking provides a surface for the worker to carry the truss even while manoeuvring around existing structures.

Slotting Truss into Joist Hanger

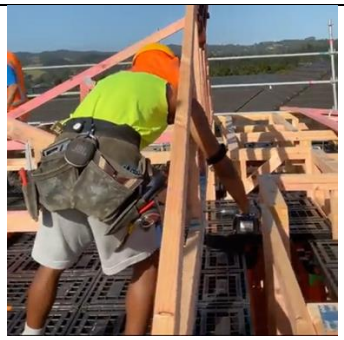
- Posture and working position are not an issue.
- Movement around the existing structure is still achievable.
- Performing the equivalent tasks using decking may still achieve the same result but at a slightly slower pace.
- Greater than 90° flexion of the low back and hips.
- The comments regarding perching and balancing and resulting increase of force application and resistance as risk factors applies here also.

Fixing Truss in Joist Hanger

- Posture and body position relative to the working area is suboptimal as the worker must lean over the truss.
- Drilling towards the body poses some risks particularly with the line of sight above the work area.
- This task would be better served from the opposite side of the truss. The worker can easily move with the deck in place.

Fixing Truss in Joist Hanger

- Posture is suboptimal (leaning over the truss) affecting the lower back. With the arms outreach, the scye (arm pit) area is grating against the truss. Strong potential for bruising in this area.
- Drilling towards the body from behind the truss is suboptimal but recognizing that the absence of decking will force this position.
- Significant low back flexion increased risk of injury.



Fixing Truss into Joist Hanger

- Posture includes forward leaning back flexion and twist.
- This posture is suboptimal.
- Drill grip is at right angles to the wrist drilling towards the body.
- Potential minor injuries to right deltoid, trapezious at the point of the acromiale on the shoulder.
- While the tasks if very short in duration, it can be optimized by being on the other side of

Fixing Truss into Joist Hanger

- Another awkward posture due to the need to balance on the base of truss and drilling position (below foot).
- The head and neck are flexed forward, potentially minor bruising to the posterior base of the neck. Lower back is also strained.
- Decking would provide the opportunity to drill the joint hanger from 1) the ground/deck and 2) opposite side of the truss (promoting drilling away from the body).

Moving Large Truss

- Lifting action here is optimal because:
  - The trusses are handled close to the body.
  - Grip and position of the wrists are strong and in neutral position (maximising strength and control).
  - Footing is stable due to the decking.

Moving Large Truss

- Posture is suboptimal due to:
  - Balancing on the existing structure, standing stance is wide and foot plantarflexed (not stable).
  - Potential lower back strain due to forward flexion.
  - The comments regarding perching and balancing and resulting increase of force application and resistance as risk factors applies here also.
- Grip however is solid

5.2 Summary of Ergonomic Assessment:

Decking provides a platform where workers can move freely around the worksite.

The stability offered by decking enables the worker to have a stable base of which to stand and perform their required tasks. The absence of decking requires more complex movements, postures, and balance to hold their body position relative to the work area (e.g. plate location, drilling site). This can lead to injuries especially if the worker is not vigilant.

The suboptimal body positions from non-decking can lead to potential strains on different parts of the body - depending on the task. For example, the lower back, neck, shoulders, and upper thigh. With non-decking these injuries to the body may be inevitable.

Overall, the non-decking tasks of **installing the joist hanger** and **nailing of the truss** is the most extreme in terms of posture and body position relative to the task. They are suboptimal because the worker is straining to hold their position and stance with a poor line of sight to what they are

drilling into. Drilling grip position (full wrist extension) and direction (drilling towards the body) is concerning and potentially conducive to injury. Decking can help alleviate some of these factors as the worker can move to a better position (the other side of the truss drilling away from the body) whilst still maintaining the ability to change position and be stable.[16]

[16] Attributable to Dr Stephven Kolose and Chris Polaczuk

5.3 In-depth Interviews of Builders[17]:

The common themes identified from the interviews with two builders regarding the use of decking are:

Falls from height:

- Falls from height are a regular (unreported) occurrence. Both builders had experienced falls over the preceding two years working with trusses.

Ergonomics and Comfort:

- Decking allows for more extensive use of arms and legs, reducing the need for bending over, which can lead to less back pain.

"There was nowhere near as much bending over".

Wellbeing:

- It is considered that decking provides a more relaxed and comfortable environment to work in through the ease of movement around site and the reduction of physical stress on the body.

"You don't need to think about your foot position, or your hand holds – it's heaps easier".

- It was suggested that decking could lead to reduction in stress and anger at home at the end of a day's works.

"I reckon I'd be less angry and stressed at the end of the day" (after using decking)

Safety:

- Decking provides a safer work environment by preventing tools from falling to the ground and reducing the risk of slipping or falling for builders.

"When you drop tools they don't fall to the ground".

(Using decking) "… would definitely lead to a reduction in injuries on site".

[17] In-depth interviews and subsequent analysis were conducted by Dave Simmons

Efficiency:

- It is seen as a more efficient method for tasks related to the top cord or girder trusses, such as standing trusses and installing joist hangers.

Comparison to Safety Nets:

- Builders perceive decking to be superior to safety nets, which are viewed as a mere safeguard that do not contribute to the work process.

Perception and Learning Curve:

- Initial impressions of decking are positive, with one builder remarking that it "looks mean" (impressive).
- New workers might find building easier to learn on decking compared to nets, which can appear intimidating.

"For a new person starting on decks they'd think building is easy".

Workforce Implications:

- It is perceived that the use of nets could limit the potential workforce and is not as accommodating for larger individuals and those who aren't comfortable working at height.

"If you're a bigger lad using nets is not so easy".

- Decking is believed to be suitable for builders of varying fitness levels and could lead to a reduction in on-site injuries.

"A lot of builders aren't that fit – anyone could work on the decking.
You wouldn't need to worry about slipping or falling".

6.0 Discussion

The results of the ergonomic assessment comparing working on decking versus simulating a net environment for builders reveal significant implications for safety, efficiency, and employee well-being. The observations indicate that working on decking provides a more stable base, better posture, and increased freedom of movement, all of which contribute to a safer and more comfortable work environment.

When standing small trusses, builders on decking demonstrated advantages such as solid footing, less strain on the lower back, and the ability to rest tools on the surface. In contrast, those simulating a net environment faced challenges like forward leaning, potential instability, and limited space for tool placement. These differences underscore the importance of a stable base and ergonomic considerations in preventing injuries, particularly to the lower back and shoulders.

Nailing off trusses also showed distinct contrasts. Workers on decking could maintain better posture with less strain on the lower back, while those simulating a net environment faced increased risk due to forward bending and potential falls. The ability to hand off tools easily and move freely around the work area further highlights the advantages of decking in promoting efficiency and reducing physical stress.

Installing joist hangers similarly revealed the benefits of decking in allowing for better posture, stability, and freedom of movement. Workers on decking could reset their posture and take measurements comfortably, while those without decking faced challenges like increased strain on knees, thighs, and lower back.

The common themes from in-depth interviews further support these findings. Builders highlighted the reduced risk of falls from height, increased comfort, and improved efficiency associated with using decking. The perception that decking provides a safer, more relaxed work environment could have positive implications for worker well-being, stress levels, and overall job satisfaction.

Moreover, the comparison to safety nets suggests that decking is viewed as a superior option by builders, providing more than just a safety measure but also contributing positively to the work process. This perception, along with the belief that decking is suitable for builders of varying fitness levels, could lead to a more inclusive and injury-resistant workforce.

7.0 Conclusion

This assessment shows good promise for decking as a concept which can promote safer and more efficient building practices. From an ergonomics perspective, the main strength of decking is the freedom of movement and stability that is provided to the worker compared to similar actions from non-decking[18].

From a builder's perspective the ergonomic benefits are acknowledged, and the safety benefits are clearly recognised. Given the limited period of use of the decks, the wellness benefits were not fully acknowledged, however there was a sense that using decks would lead to benefits to overall wellbeing. Builders also identified the potential for decking to lead to a more inclusive and efficient work environment compared to safety nets.

In considering the hypothesis that was put forward, based upon the evidence from this research, it would appear that ***using safety platforms on residential building sites does have the potential to reduce the risk of injuries and improve the general wellbeing of employees***.

[18] Attributable to Dr Stephven Kolose and Chris Polaczuk.

8.0 Suggested next steps:

Based upon the positive insights from this research, it is suggested that there could be value in undertaking further assessment to validate the insights in a wider range of construction and environmental conditions and broadening the employee pool engaged. Further, additional research could be conducted using known methods of assessing biomechanical and postural load, and risk assessment.

9.0 Acknowledgements:

We extend our gratitude to the team at Construction Health and Safety New Zealand (CHASNZ), especially Chris Polaczuk and Dr. Stephven Kolose, for their initial support of this safety platform research project. Their subsequent support in conducting the field research and ergonomic assessment was invaluable. Their expertise and dedication were pivotal to the success of this research initiative. A special mention needs to be made for the assistance of Dora Kolose, who diligently supported the data collection process on site.

Furthermore, this research could not have been realized without the support of Summerset New Zealand. We are particularly thankful to Andrew Searle for his belief in the initial concept and to Craig Freeman from the Whangarei site, who's on-the-ground assistance and support was instrumental to the success of the research. A special mention should be made of Sonny and Finn, the two builders who took part in the field research. Sonny and Finn were extremely patient and accommodating and without their co-operation the research would not have been possible.

10.0 Disclosures:

The author of this research, Dave Simmons, is a Director at Workdek NZ, a supplier of safety platforms in New Zealand (the decking used in the research was provided by Workdek NZ). Additionally, Mr. Simmons is a partner at Joots.co.nz, a Customer Insights Research Agency.