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Falling Short in Workplace Safety

An analysis of falls in the construction sector

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EXECUTIVE SUMMARY

Falls from height and falls on the same level have been identified in New Zealand and overseas as a significant cause of harm in the construction sector (Australian Safety and Compensation Council, 2008). The Department of Labour estimates that nearly a third of serious harm accidents in construction result from slips, trips, or falls (Department of Labour, 2011). Serious harm as referred to in this report is defined in the same way as in the Health and Safety in Employment Act 1992, and includes death and the conditions outlined in the first schedule to the Act.

The Department of Labour conducted work to analyse data from serious harm investigation reports on construction falls-related accidents in New Zealand to find out more about falls in the construction sector. This report presents the findings of this analysis. The project examined 340 accident cases from 2007, 2008, and 2009.[1] Nine of the cases were fatal. The main findings of the analysis are presented below.

Summary of findings

The type and height of falls

Falls from a **temporary structure** made up the largest group of incidents, at just under half the total number of cases examined. This category of fall includes falls from ladders, trestles, and scaffolding. Falls from temporary structures had the following characteristics:

- They contributed to five of the nine fatal accidents examined.
- Over half of these falls were falls from ladders being used as a work platform.
- Seventy percent of the falls from temporary structures were recorded as being less than 3 metres in height[2].
- Falls from temporary structures less than 3 metres in height were the main fall type for painters and decorators (35 percent), electrical workers (28 percent), carpenters (25 percent), and general labourers (23 percent).
- Falls from temporary structures less than 3 metres in height were the second most common fall type for roofers (17 percent).

Falls from a **permanent structure** were the next most common type of fall (21 percent of all falls). These falls had the following characteristics:

- They contributed to three of the nine fatal accidents examined.
- Roofers experienced more falls from a permanent structure (40 percent of all falls for roofers) than any other industry group.
- Half the falls by roofers off permanent structures were over 3 metres in height.
- Only two of the falls from a permanent structure recorded safety harness or fall protection being used for falls over 3 metres in height.

[1] Two of these accidents had two serious harm victims.

[2] Percentage calculated excluding files where no height was recorded.

Up to 10 percent of all cases involved a **slip, trip, or stumble on the same level**. However, in a further 20 percent of all accidents, slips, trips, and stumbles contributed to a fall from height. Although slips, trips, and stumbles should be highlighted as a risk factor in falls, there is little evidence from this data to suggest that slips, trips, and stumbles on the same level should be the priority for any strategic or harm reduction related activity.

Falls **less than 3 metres in height** accounted for:

- almost 70 percent of falls from temporary structures
- fifty percent of falls from permanent structures, and
- 60 percent of all falls from height[3]

This suggests that lower-height falls are a significant cause of serious harm, and should be a priority for harm reduction activities. Regulation 21 of the Health and Safety in Employment Regulations 1995 states that employers should take all practicable steps to provide means to prevent employees falling where that fall would be more than 3 metres in height. This regulation does not exempt duty holders under sections 6–10 and 16–19 of the Health and Safety in Employment Act 1992 from providing fall protection where there is potential for harm from falls that are 3 metres or less in height. In Australia, the minimum height where fall protection is required was changed to 2 metres in 2010 (Safe Work Australia, 2008, 2010).

The victim's employment status

People working as self-employed contractors or employees of contractors make up 58 percent of all accidents analysed. Contractor procurement processes and supervision of contractors on a site could be potential areas of focus for strategy and harm reduction projects. A further 34 percent of the accident victims were employees, including labour hire workers.

Ninety-two percent of the accident victims were workers engaged in construction activities, as could be expected. A greater exposure to construction hazards appears to be related to accident causation, rather than the specific employment or contractual situation the person was engaged in.

The victim's trade and the type of construction activity

When divided into individual trades, most accidents happened to carpenters (26 percent), roofers (11 percent), electrical workers (8 percent), painters and decorators (8 percent), and general labourers (7 percent).

Forty-two percent of victims were classified as working in general construction, while 57 percent worked in construction trade services .

The construction and completion of commercial structures accounted for half of the accidents for all victims. Thirty-one percent of victims experienced their accident while working on residential structures. Civil construction accounted for

[3] Percentages calculated excluding slips trips and stumbles on the same level, and excluding files where no height was recorded.

only 8 percent of the total sample. For the remaining files there was insufficient information to determine what type of construction the victim was engaged in. Data limitations therefore prevented us from estimating the prevalence of falls in different sectors.

Factors that contributed to the accidents

A number of factors contributed to falls resulting in harm including poor health and safety management on site. Hazards were not always identified, and where hazards were identified, work at height was not always identified as a hazard. There was evidence of poor site induction, with only 17 percent of victims going through a site induction.

A lack of training and awareness about best practice was a factor. Only 16 percent of victims received training in health and safety. Only half of these workers were recorded as also receiving training in the technical aspects of the work. In two-thirds of the accidents failure to follow best practice as found in codes of practice and guidelines contributed to the accident. In almost a quarter of the cases where best practice was not followed, a lack of leadership or supervision was also noted. A misunderstanding of information also contributed to a small number of accidents.

The victim's deliberate disregard for, or ignoring of, instructions occurred in almost a third of the accidents. Some accidents occurred because the victim was distracted. In a small number of accidents mental or psychological stress, physical stress, and a lack of physical or psychological capability were noted as causative factors.

In 60 percent of the accidents, inadequate work standards were noted as a cause. Untidy work areas and people falling onto hazardous landing surfaces also contributed to a small number of accidents. Some of the cases where a slip or trip preceded a fall involved muddy footwear on ladders.

Structures collapsing, tipping over, failing, or breaking contributed to 38 percent of falls. This includes the collapse of structures that ladders had been propped against or people had been walking on. The failure of fall arrest or other safety equipment also contributed to four percent of accidents.

Injuries sustained in falls

The most common site of injury was to the victim's head (23 percent of cases). However, we cannot determine if these were serious concussion related head injuries, or something less severe, as Department of Labour data does not record details about the permanence or severity of the harm. Seven of the nine fatal accidents involved an injury to the head. Five percent of all victims received injuries to the neck, and 13 percent to the vertebrae.

Injuries to the shoulders, arms, wrist, chest, legs, and ankles were experienced by up to 14 percent of all victims, while injuries to the back, hand, fingers, hips, knees, and feet were experienced by up to 10 percent of all victims. Eight percent of victims experienced a significant loss of blood in the accident, and 6 percent of victims experienced crushing or damage to internal organs.

Fatal accidents

Nine fatal accident files were examined. Fatal accident victims were on average 10 years older than the average age for all accident victims (51 years old vs. 40 years old). Fatal accident victims were also concentrated in the 'Construction Trade Services' group.

Fatal accidents also differed from all accidents in the height of the fall. For all accidents, the largest group was for falls less than 3 metres in height. In contrast, fatal accidents were mostly higher than 3 metres. More serious injury would be expected with higher falls as a greater amount of energy is released in the fall.

Harm reduction

Data from this report has been used to inform the problem definition in the Department of Labour's '*Preventing Falls from Height*' Harm Reduction Project. This project will be launched in the 2011/2012 business year. Harm reduction projects are operational projects instigated by the Department of Labour based on the 'pick important problems and fix them' methodology of Malcolm Sparrow (Sparrow, 2000). The project is focused on reducing the harm caused to builders, roofers and painters & decorators by falls from less than 3 metres off ladders, and by falls from roofs.

Recommendations

Strategic and harm reduction projects should target principals[4] and employers[5] with responsibility for carpenters, electrical workers, roofers, painters and decorators, and general labourers. The focus of projects should include:

- Falls from less than 3 metres in height (particularly ladders and scaffolding), and also from permanent structures
- Messages that working at less than 3 metres in height is not necessarily safe
- Messages about the importance of meeting best practice as is outlined in codes and standards in all construction sites
- Emphasis on the importance of health and safety training for staff, both generally and for specific sites
- Ensuring the different people with duties under the Health and Safety in Employment Act 1992 are aware of their duties and what they need to do to fulfil those obligations
- Ensuring people working within a contracting environment are adequately protected
- Awareness of an increased risk of fatality when working over 3 metres in height
- Awareness about testing the structural integrity of permanent and temporary structures
- Awareness of correct use and maintenance of safety equipment designed to prevent falls.

[4] As defined in the Health and Safety in Employment Act 1992.

[5] Ibid.

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INTRODUCTION

The purpose of the analysis reported in this document was to provide evidence for policy in the further development of the *Construction Sector Action Plan 2010-2013*, and it also provided evidence for the design of the *Preventing Falls from Height* Harm Reduction Project.

Falls are a major cause for concern in the construction sector. An Australian report notes that 'falls from height are a fundamental risk factor in the construction industry', and that 'falls from height are a major cause of death and are one of the main causes of injury in the construction industry, after soft tissue and musculoskeletal injuries' (Australian Safety and Compensation Council, 2008). Analysis of causes of serious harm injuries in construction in New Zealand showed 32 percent of injuries resulting from slips, trips, or falls on the same level or from height (Department of Labour, 2011).

Data on accident causation in New Zealand is more difficult to collate than data about the incidence and prevalence of harm. Using Accident Compensation Corporation (ACC) data we can estimate the number of accidents, but it is difficult to break down this data to determine causes for the accident. Causation data is more likely to be found in Department of Labour accident investigation reports, and more in the paper files rather than the Department's administrative databases.

To find out more about accident causation from falls in construction activities, the Department commissioned research to analyse data from the paper files of accident investigations. This report presents the findings of the analysis of 340 accidents. The quality of many of the investigation reports has impacted this work. Less than 50 files presented a comprehensive report of the events leading to the accident. This means that for some questions, little useful data was collected.

The body of this report has three main sections:

1. Aim and Research Methodology
2. Results
3. Concluding Comments

Use of the findings from this report

Data from this report has been used in the problem definition for the Department of Labour's '*Preventing Falls from Height'* Harm Reduction Project. The Department's harm reduction projects are based on the method outlined by Sparrow (2000). This method involves collecting evidence, defining the problem that needs a solution, developing indicators to measure progress, developing and implementing interventions, and assessing progress against those indicators.

AIM AND RESEARCH METHODOLOGY

Aims

The aims of this project were to analyse serious harm investigation files to:

- determine patterns or trends in how 'serious harm' accidents caused by falls from height, or slips, trips, and falls on the same level, in the construction sector occur
- understand the nature and causes of these accidents in order to design interventions aimed at preventing further accidents of this nature.

Method

This project analysed data from serious harm investigation files coded for falls from height, or slips, trips, or stumbles on the same level in construction, for cases notified in 2007, 2008, and 2009. Three hundred and forty-two accident cases were examined, including two cases with two victims. Nine of the cases were fatal.

Case files meeting the following criteria were selected:

- All files with Australia and New Zealand Standard Industrial Classification (ANZSIC) Codes E4***
- Incidents coded as a 'fall from a height', 'fall, slip, or trip', and 'fall on the same level, slip, trip, stumble'
- Incidents occurring between 1 January 2007 and 30 December 2009

A coding framework was developed and was based on a similar framework that had previously been used to analyse quad bike investigation files. A construction safety expert within the Department helped develop the framework.

The coding framework included the following categories:

- General data about the accident
- Data about the victim and their workplace
- Data about the victim's experience and competence
- Data about the victim's work
- Data about the accident event

Data was coded in Excel. During analysis, some secondary coding was done as numbers were very small in some categories.

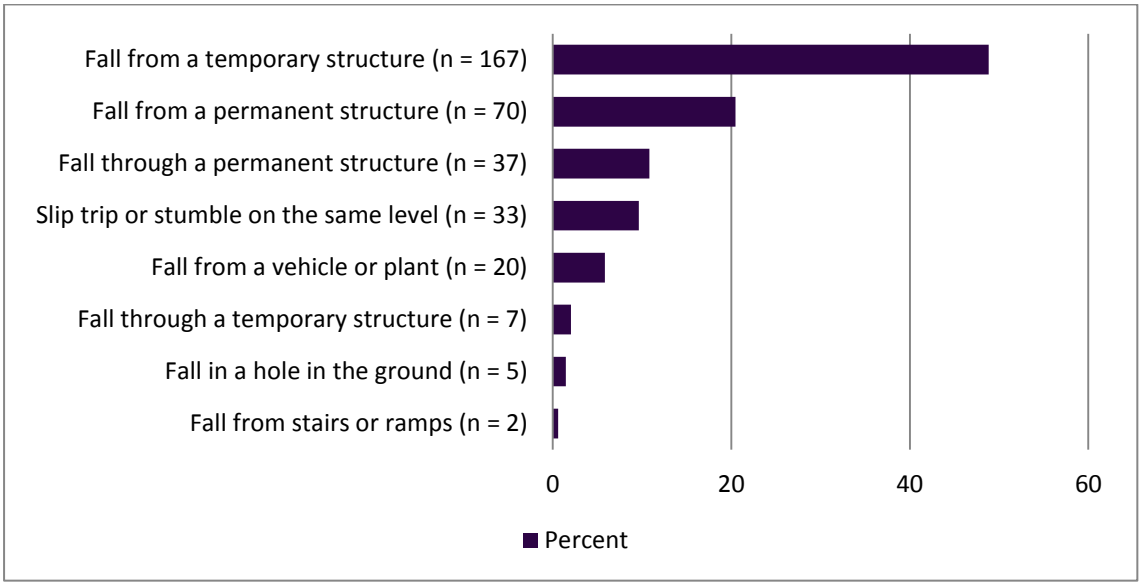
In all, 340 case files were coded. Two hundred and ninety-six of the cases included were coded in the INSITE database as 'falls from height' incidents, and 46 were coded in INSITE as 'slips, trips, and falls on the same level' incidents. Two files had two people harmed as a result of the fall. These have been separated so that each person harmed is treated as one case. This means that the database has 342 cases.

RESULTS

Type of event: Slips, trips, stumbles, and falls

Figure 1 shows the percentage of slip, trip, stumble, or fall events.[6] Falls from temporary structures, including falls from ladders, make up nearly half the fall events.

Figure 1: Percentage of falls by event type, 2007–2009



Source: Department of Labour

Slips, trips, and stumbles

Slips, trips, or stumbles were listed as a causative factor in the accident in 28 percent (*n* = 95) of the case files. Of these 95 files, 28 also involved a fall from a temporary structure, and 21 a fall from a permanent structure. This implies that most slips, trips, or stumbles were a precursor to a fall from height that was the actual cause of the serious harm. Only 33 files (10 percent of total) were slips, trips, and stumbles on the same level.

Slips, trips, and stumbles also involving a fall from a temporary structure occurred evenly across commercial and residential construction, and evenly across builders/constructors and specialised trades.

[6] The percentages in Figure 1 were obtained from a re-coding of data to ensure each record has one event as the main definition of the accident. Some events were coded more than once; for example, where a slip, trip, or stumble may have preceded a fall from height. Where a fall from height event was coded for the same record as a slip, trip, or stumble, the fall has been taken as the defining occurrence in the event.

For slips, trips, and stumbles that involved a fall from a permanent structure, the majority of accidents were for roofing workers. Again the accidents were evenly spread across commercial and residential construction.

Falls from height

Falls from height include falls from or through temporary and permanent structures, and include falls that were preceded by a slip, trip, or stumble. See Table 3 in 'Appendix 2: Detailed breakdown of falls' (p. 16) for a detailed breakdown of the types of fall by trade, employment status, and height.

Falls off temporary structures

Falls off temporary structures are the main cause of serious harm in the files examined, encompassing 49 percent (*n* = 167) of the files (Table 1). Of the falls from temporary structures, 58 percent were falls from ladders (*n* = 96). Falls off scaffolding were the second most common reason for falls off temporary structures.

Table 1: Falls off temporary structures by sector, 2007–2009

Falls off temporary structures	Sector				
	Commercial	**Residential**	**Civil**	**Not defined**	**Total**
Ladders	49	33	4	10	96
Scaffolding	30	17	3	6	56
Other	9	6	0	0	15
Total	88	56	7	16	167

Source: Department of Labour

Twenty percent of all falls were from temporary structures less than 3 metres in height. Falls less than three metres accounted for 70 percent of falls from a temporary structure[7]. For individual trade groups, falls from a temporary structure less than 3 metres in height was the main accident type for carpenters (25 percent), electrical workers (28 percent), painters and decorators (35 percent), and general labourers (23 percent). Of accidents involving roofers, 17 percent were falls from temporary structures under 3 metres.

The data suggests that most falls occurred while people were working on the structure, rather than climbing up or down. The structure was not secured in 82 cases, and the structure collapsed, tipped over, broke or failed in 81 cases. Fall prevention was not in place in 121 cases.

External causes for falls off temporary structures included:

- The structure a ladder was leaning against collapsing
- Equipment breaking while in use resulting in a loss of balance
- The victim jumping off the structure

[7] Percentage calculated excluding files where no height was recorded.

- A blow to the head before a fall
- An electric shock before the fall
- Knocking the side of scaffolding before the fall
- Wet floors
- The wheels of a scissor lift going over the edge of a concrete slab
- Bees flying in the area
- Release of tension in a power pole causing unbalance
- Undetected rot in a power pole
- The rung of a ladder breaking
- Transfer of weight from one side of a scaffold to another causing an unsecured wheel to come loose

Falls off permanent structures

Falls off a permanent structure accounted for 21 percent (*n* = 70) of the accidents. Of these, 42 occurred as a fall off a roof, and 18 from another above-ground structure such as the second floor of a building, decks, walls, and the edge of a floor or slab.

Most falls occurred as a result of working on the structure, or walking across the structure, rather than climbing up to or down from the structure. In 13 cases, the fall occurred as a result of the structure breaking or failing. Fifty-eight files specify that fall protection was not used, with only eight files recording fall protection being used. Four files record fall protection failing.

Three of the fatal accidents in the sample were falls from a permanent structure. Roofers experienced the highest rate of falls from a permanent structure (40 percent of all falls involving roofers). For roofers' falls from permanent structures, half were over 3 metres in height. Just under half were less than 3 metres in height, with a small number of files for which no height was recorded.

Falls through permanent structures

Falls through a permanent structure accounted for 11 percent (*n* = 37) of the accidents. The type of falls included in this category are falls through a penetration in the floor of a building, falls through polycarbonate skylights, and falls through a roof from the outside while it was being constructed. This category also includes falls through brittle roofing, and falls in lift shafts.

The main reason cited for the falls are a failure or collapse of the structure while working on or walking on the structure.

Other fall types

Other falls that resulted in serious harm included:

- Falls through a temporary structure, or between a permanent structure and temporary structure (2 percent of falls (*n* = 7)). Five of these occurred to carpenters falling through scaffolding planks that had collapsed.
- Falls that occurred on stairs or ramps (1 percent (*n* = 2)).
- Falls from vehicle or plant (6 percent (*n* = 20)). This category includes falls from the deck or load of trucks.

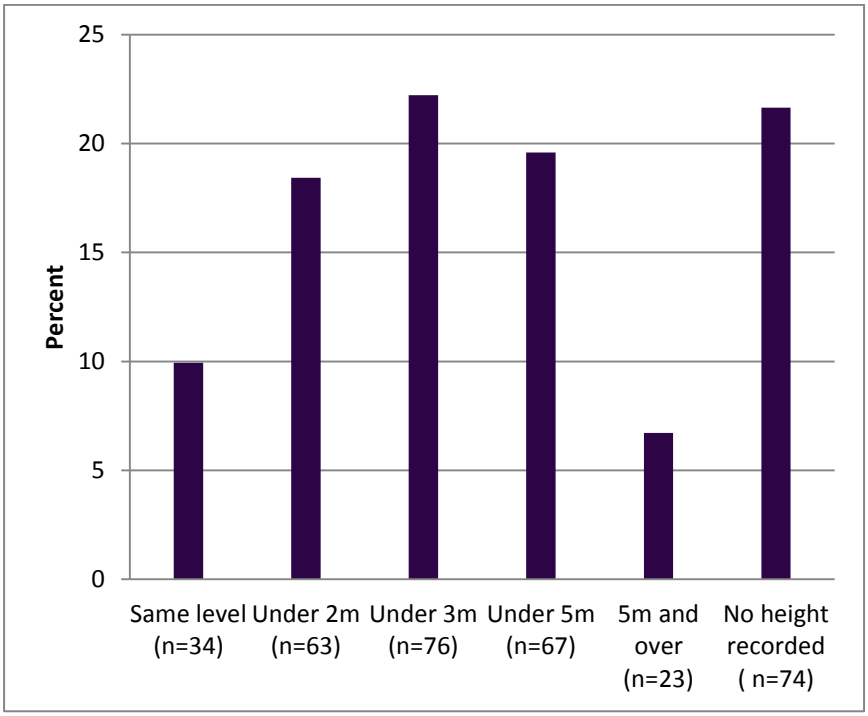
- Falls into a hole (1 percent (*n* = 5)). This category includes falls into trenches or manholes. Victims were working over or beside the hole. In at least one case the safety cover over the hole failed or collapsed.

Height of fall

Sixty percent of all falls were less than three metres in height (excluding falls on the same level, and files where no height data was recorded). Using the same exclusion criteria, 70 percent of falls from temporary structures were less than three metres in height, as were 50 percent of falls from permanent structures, and 40 percent of falls through permanent structures.

Almost a quarter of the files did not record the height of the fall, so the percentage of falls less than three metres could be higher. Two falls less than 3 metres from a permanent structure were fatal. All other fatal falls were over 3 metres in height.

Figure 2: Percentage of falls by height, 2007–2009



Source: Department of Labour

The victim's employment status

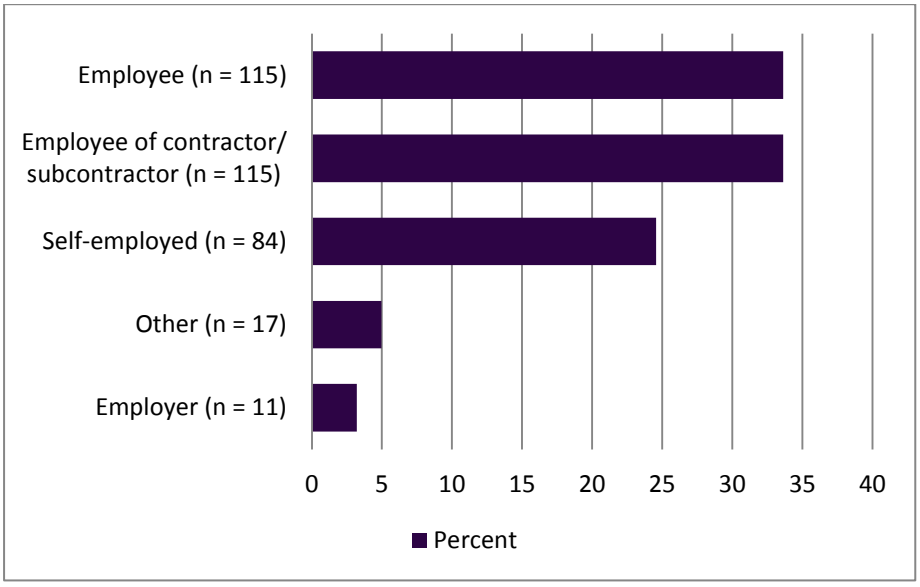
Two-thirds of victims were employees, either as employees, or employees of contractors or subcontractors (Figure 3). The 'employees' code includes a small number of casual workers, temporary workers, workers on loan from another employer, and employees from labour hire companies.

Fifty-eight percent of the victims worked under a principal–contractor relationship. This group includes self-employed contractors or subcontractors, contractors who were also employers, and employees of contractors or subcontractors. This group could well be larger if employees who were not

identified as working for a contractor or subcontractor in fact were working for a contractor. Employees were recorded as working for a contractor only when data in the file suggested this.

Other victims include volunteers, guests in the workplace, uninvited visitors, people in the vicinity of the workplace, official visitors such as inspectors, and files where the data did not allow the employment status to be determined.

Figure 3: Employment status of victims of falls, 2007–2009



Source: Department of Labour

The victim's trade or occupation

The victim's trade was coded both against a detailed list of construction trades (Figure 4), and by the Australia New Zealand Standard Classification of Occupation (ANZSCO).

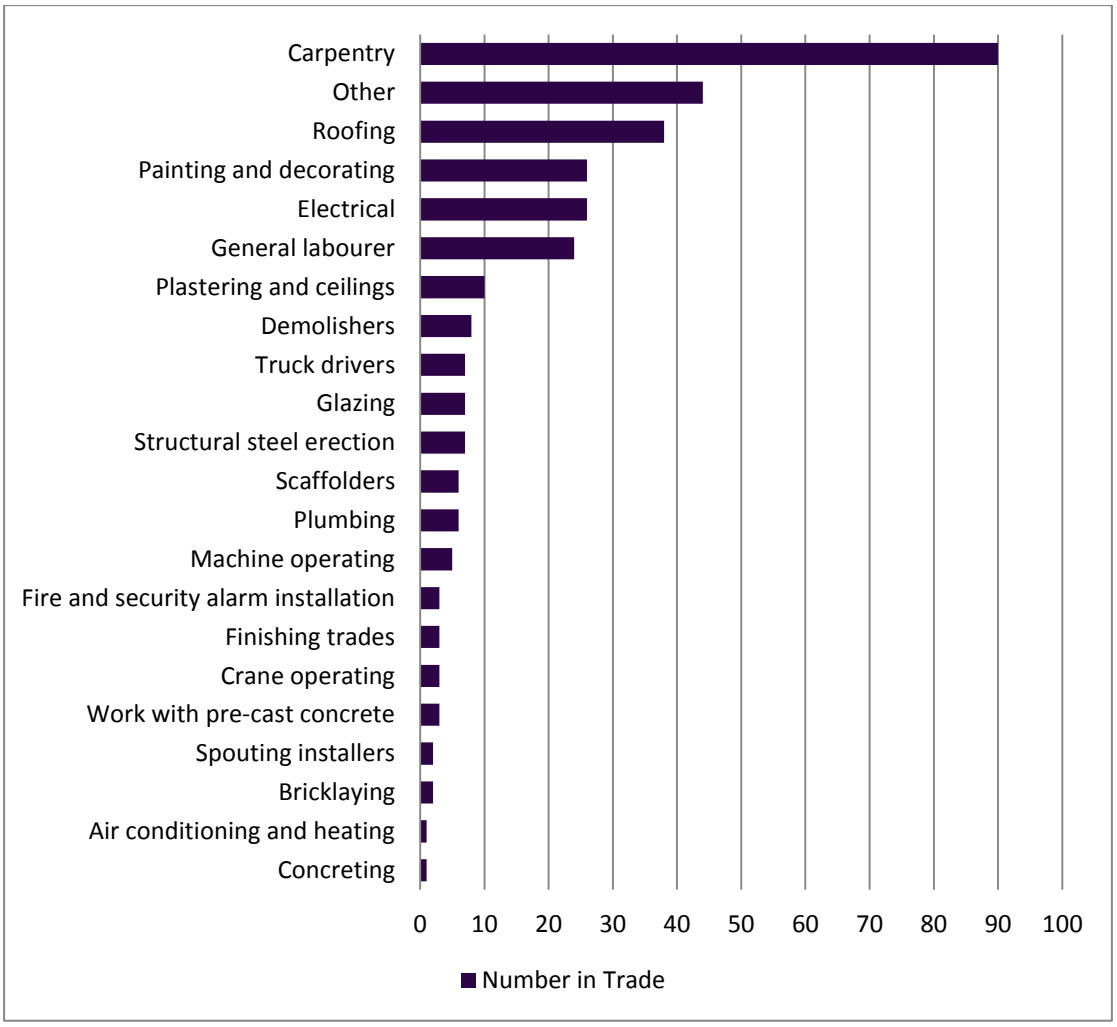
Figure 4 clearly shows that carpenters make up the largest victim group, followed by roofers, painters and decorators, electrical workers, and general labourers. The group listed as 'Other' are specialised tradespeople or officials such as building inspectors. Eleven percent of victims were apprentices or trainees.

The percentage of falls by the victim's trade (as defined by ANZSCO) was compared with the percentage of construction workers by trade in the 2006 Census (see Table 2). The number of accidents for these occupational groups is over-represented when compared with the number of those workers in the construction sector.

Given the tasks undertaken by these particular trades, over-representation in falls from heights is not surprising. Trades such as carpenters and roof tilers have greater exposure to working at a height, thus their chance of falling is increased. However, with a serious harm notification proportion over twice that of those employed in the construction industry (Table 2), carpenters (and joiners) and

roofers are two key groups that require future attention from harm reduction initiatives.

Figure 4: Trades of victims of falls, 2007–2009



Source: Department of Labour

Table 2: ANZSCO occupation notifications and percentage employed, 2007–2009

ANZSCO code/occupation	Proportion of occupation in serious harm files examined	Proportion of construction workers by occupation as per Census 2006
3312: Carpenters and joiners	27%	11%
3322: Painting trades workers	11%	8%
3333: Roof tilers	8%	3%
3411: Electricians	8%	10%
8211: Building and plumbing labourers	7%	5%

Source: Department of Labour

The type of construction activity the victim was engaged in

Half the falls accidents have been identified as occurring while constructing or finishing commercial buildings. A further 31 percent occurred in constructing residential buildings, 8 percent in civil construction, and for 11 percent of the falls the sector could not be identified. These figures were calculated according to the method outlined in 'Reclassifying by construction sites' (p. 15).

The Department believes that this data understates the proportion of accidents in the residential sector, probably due to an under-reporting of serious harm by residential builders. ACC data shows residential construction as the largest group of claimants, although "fall from height" accidents cannot be distinguished from other accidents in this data.

The victim's experience and training

The data recorded in the files showed that:

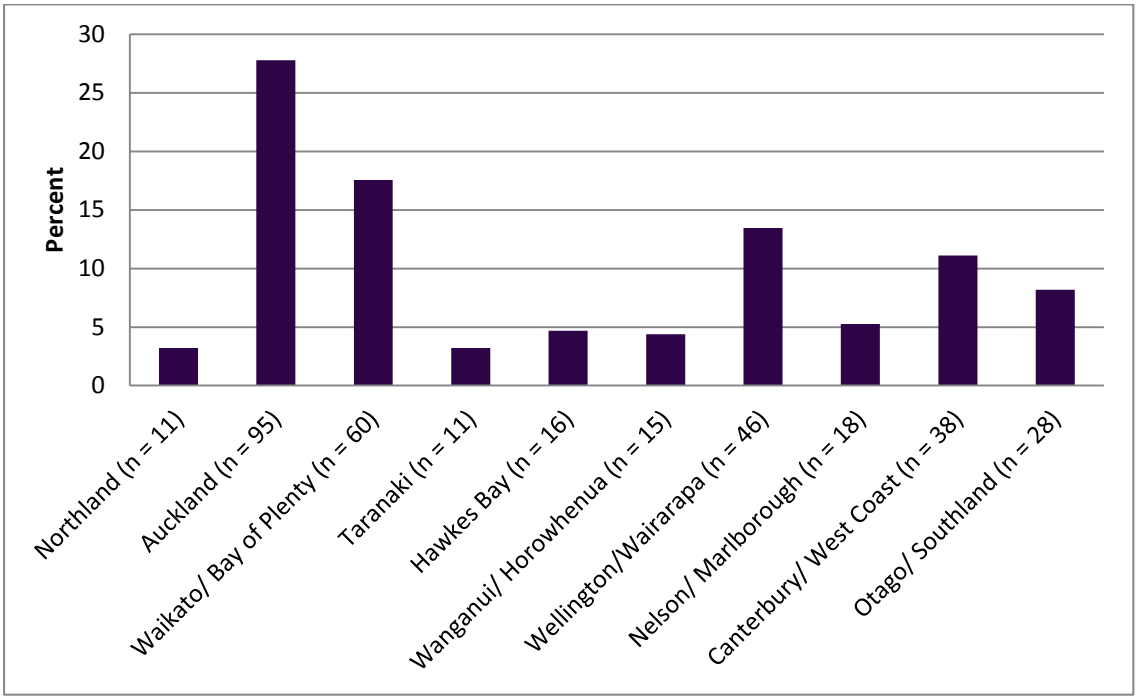
- Only 28 percent of victims regularly performed the task that led to the accident, implying that inexperience in the task could be a contributing factor in the accident.
- Only 16 percent of victims had been formally trained in health and safety.
- A further 16 percent of victims had been trained in the technical aspects of the job with only half this group (9 percent of all) being trained in both technical and health and safety aspects of the job.
- Fewer victims had received informal training: 9 percent in health and safety, and 8 percent in technical aspects of the job.
- Seventeen percent of victims had gone through a site induction session.

Although these figures are confounded by the large number of files for which no data could be found, it is a matter of concern if the rate of training in this data reflects the true situation in the industry.

Regional locations of notified accidents

Most of the accidents considered were notified in regional locations with large urban areas (Auckland, Hamilton, Wellington, and Christchurch) (Figure 5). Ninety percent of accidents occurred in urban rather than rural areas. Almost half the number of cases investigated occurred in the top half of the North Island (47 percent), in Northland, Auckland, and Waikato/Bay of Plenty/Taupō areas. This is consistent with the high population base for Auckland, Hamilton and Tauranga in particular. Less than 30 percent of cases investigated were in the South Island.

Figure 5: Regional locations of notified accidents involving falls, 2007–2009



Source: Department of Labour

Size of employers and workplaces

Just over a third of the files recorded the number of people on site. Where this data was recorded, no site exceeded six people, with most sites having less than four people on site.

Only 19 files contained information on the size of the workplace. The sizes ranged from small companies with less than 10 people, to employers with more than 300 employees. The data therefore suggests that despite the size of the company employing the victim, the work sites themselves are small.

Investigation outcomes

A number of factors contributed to falls resulting in harm including:

- Poor health and safety management
- Training and awareness of construction workers
- Factors related to the victim
- Inadequate work standards and practices (non-compliance)
- Failure of equipment or structures

Some files showed problems with poor health and safety management on site. Hazards were not always identified, and where hazards were identified, work at height was not always identified as a hazard. There was evidence of poor site induction, with only 17 percent of victims going through a site induction.

A lack of training and awareness about best practice was a factor. Only 16 percent of victims received training in health and safety. Only half of these workers were recorded as also receiving training in the technical aspects of the work. In two-thirds of the accidents failure to follow best practice as found in

codes of practice and guidelines contributed to the accident. In almost a quarter of the cases where best practice was not followed, a lack of leadership or supervision was also noted. A misunderstanding of information also contributed to a small number of accidents.

The victim's deliberate disregard for, or ignoring of, instructions occurred in almost a third of the accidents. Some accidents occurred because the victim was distracted. In a small number of accidents mental or psychological stress, physical stress, and a lack of physical or psychological capability were noted as causative factors.

In 60 percent of the accidents, inadequate work standards were noted as a cause. Untidy work areas and people falling onto hazardous landing surfaces also contributed to a small number of accidents. Some of the cases where a slip or trip preceded a fall involved muddy footwear on ladders where the footwear had no grip on the surface. Some accidents occurred due to lack of care, such as when the wheels of mobile scaffolds were allowed to slip off the end of a concrete slab. Conditions in some work sites contributed to workers slipping or tripping while working at height, which in turn resulted in a fall.

Structures collapsing, tipping over, breaking or failing accounted for 38 percent of falls, including the collapse of structures people had been walking on, or the collapse of structures ladders had been propped against. Equipment or structures to prevent falls failed in four percent of cases.

Causative factors and the height of the fall

Health and safety inspectors were more likely to raise non-compliance with best practice, or inadequate work practices, with an increase in the height of the fall. This may be an indicator of the way accidents are investigated and recorded with a more serious fall or more serious injury.

Results for fatal accidents

The sample of accident files examined in this project contained nine fatal accidents. The features of these fatal accidents are as follows:

- Seven of the victims were over 45 years old, one victim was between 15–24 years old, and one victim's age was not recorded.
- Eight victims were male, and one female.
- Five of the victims fell from a temporary structure, three from a permanent structure, and one through a permanent structure.
- Falls from ladders accounted for four of the five falls from a temporary structure.
- Two fatal falls occurred under 2 metres in height, with six falls over 3 metres in height and one fall where the height was not recorded. Three of the falls were over 5 metres in height.
- Employees, and employees of contractors and subcontractors, accounted for seven out of the nine fatal injuries, with one self-employed contractor, and one building inspector.
- Two electrical workers were fatally injured, as were a carpenter, a structural steel worker, a painter/decorator, a spouting installer, a fire and

security alarm installer, and a building inspector. One fatally injured person was not able to be classified by trade or occupation.
- Injuries to the victim's head were noted for seven of the nine fatal accidents.
- The files indicated that six victims did not follow best practice for the task at hand.

The data regarding fatal accidents appears to follow the data for all accidents except for the age of the victim, the height of the fall, and occupation of the victim. For all accidents in the files examined, the age of the victims is spread across the different age groups with an average age of 40 years old. For fatal accidents, the age for the majority of victims was over 45 years old, with an average age of 51 years.

For all accidents in the files examined, 42 percent involved a fall from a height of less than 3 metres. For fatal accidents, six of the nine accidents involved a fall greater than 3 metres in height. This is probably due to the greater amount of energy released in a higher fall, resulting in more serious injuries.

Although in the files examined carpenters had the highest frequency of accidents, only one person classified as a carpenter was fatally injured. Six of the nine fatal accidents involved victims classified as working in specialised trades.

CONCLUDING COMMENTS

The analysis above shows a clear focus for future serious harm projects in the construction sector. The majority of falls that cause serious harm are those from temporary structures (such as ladders and scaffolding) at heights less than 3 metres. These falls and the resulting harm are occurring below the mandatory height above which employers have a duty to provide fall protection under Regulation 21 of the Health and Safety in Employment Regulations 1995.

The next largest group of falls were those from permanent structures (such as roofs) at heights less than 3 metres.

In most cases, the injured party was not trained in health and safety practices formally, or in the specialised skills needed for the job being undertaken. Only a minority of the victims were trainees or apprentices, so this lack of training may be an indicator of an industry-wide issue of substandard training in health and safety. However, this cannot be conclusively established due to poor data quality at this stage.

Trades that make up the majority of the falls are carpenters (26 percent), roofers (11 percent), electrical workers (8 percent), painters and decorators (8 percent), and general labourers (7 percent). These figures point to areas for the harm reduction project to focus on.

Targeting the principal/employer in these trades is likely the most effective initiative, given the responsibilities of these parties laid out in section 6 of the Health and Safety in Employment Act 1992. Having legislation supporting such initiatives will improve the potential for positive outcomes.

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APPENDIX 1: CLASSIFYING THE CONSTRUCTION SECTOR

The construction sector can be classified by sector, and occupation or trade. The official methods are the Statistics New Zealand classifications of industry and occupation (ANZSIC and ANZSCO). There are also industry-based ways of understanding the sector.

Classification by industry

Australia New Zealand Standard Industrial Classification (ANZSIC)

The ANZSIC 'E4' codes classify the construction sector. 'E41' describes general construction, and is divided into residential (E4111), commercial (E4112), and civil construction (E412).

The division 'E42' describes construction trade services. Subdivisions include site preparation services (E421); building structure services (E422) (concreting, bricklaying, roofing, and structural steel); installation trade services (E423) (plumbing, electrical, heating/air conditioning, and fire/security services); building completion services (E424) (plastering/ceilings, carpentry, tiling/carpeting, painting/decorating, and glazing); and other construction services (E425) (landscaping and services not classified elsewhere).

Industry classifications

Another industry classification refers to 'builders/constructors' and 'specialised trades', that line up with the ANZSIC 'general construction' and 'construction trade services'. The justification for considering industry classifications is that many industry organisations that are a potential channel of communication with the sector are organised along these lines.

Reclassifying by construction sites

A potential problem with describing the sector by ANZSIC codes is that it does not describe what a company is working on at a given moment in time. Roofers (E422) work on residential or commercial buildings, as can many other specialised trades. Landscaping (E425) can occur as part of residential, commercial, or civil construction. It is also not unknown for companies who mainly construct commercial buildings to also build residential structures.

For this reason, all cases in the sample were coded according to whether they were working on a residential, commercial, or civil construction site at the time of the accident.

Classification by occupation

Australia New Zealand Standard Classification of Occupation (ANZSCO)

ANZSCO codes refer to a person's trade or profession. ANZSCO codes are referred to in Table 2, but otherwise they are quite general, so an industry-based classification has been used. The industry-based classification is shown in Figure 4.

APPENDIX 2: DETAILED BREAKDOWN OF FALLS

Table 3 presents the following data:

- Column A lists the trade group under consideration.
- Column B lists the type of fall—falls from temporary structures, falls from permanent structures, falls through permanent structures, and for carpenters only, falls through temporary structures.
- Column C lists whether the fall was higher or lower than 3 metres in height.
- Columns D, E, and F give the number of falls for each of the variables in Columns A, B, and C, for employees, employees of contractors, and self-employed contractors.
- Column G gives the line-by-line sum of all falls for the three employment groups.
- Column H gives the sum of all falls in each fall type.
- Columns I and J present the same data as in Columns G and H, but as a percentage of the total number of workers coded as that trade.
- Column K gives the percentage of the falls listed by the total number of workers in the dataset coded as that trade.
- Columns L, M, and N present the same data as in columns I, J, and K, but calculated as a percentage of the total number of files in the dataset.

Table 3: Detailed breakdown of falls that occurred in urban locations, 2007–2009

Trade	Fall type	3 metres	Employees	Employee of contractor	Self-employed contractors	Total for workers	Total for fall type	Percentages of individual trade group totals (see note 2)			Percentages of total number of files (see note 3)		
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Carpenters	From temporary structure	Under	6	7	6	19	39	25%	51%	79%	5.6%	11%	18%
		Over	4	4	2	10		13%			2.9%		
		No data	2	4	4	10		13%			2.9%		
	From permanent structure	Under	3	0	4	7	11	9%	15%		2.0%	3%	
		Over	0	1	3	4		5%			1.2%		
		No data	0	0	0	0		0%			0.0%		
	Through permanent structure	Under	1	2	1	4	6	5%	8%		1.2%	2%	
		Over	0	1	0	1		1%			0.3%		
		No data	0	1	0	1		1%			0.3%		
	Through temporary structure	Under	1	1	0	2	4	3%	5%		0.6%	1%	
		Over	0	0	0	0		0%			0.0%		
		No data	0	1	1	2		3%			0.6%		

Trade	Fall type	3 metres	Employees	Employee of contractor	Self-employed contractors	Total for workers	Total for fall type	Percentages of individual trade group totals (see note 2)			Percentages of total number of files (see note 3)		
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Roofers	From temporary structure	Under	2	3	1	6	9	17%	26%	74%	1.8%	3%	9%
		Over	0	1	0	1		3%			0.3%		
		No data	2	0	0	2		6%			0.6%		
	From permanent structure	Under	3	1	2	6	14	17%	40%		1.8%	4%	
		Over	0	2	5	7		20%			2.0%		
		No data	0	1	0	1		3%			0.3%		
	Through permanent structure	Under	0	1	0	1	3	3%	9%		0.3%	1%	
		Over	1	1	0	2		6%			0.6%		
		No data	0	0	0	0		0%			0.0%		
Electrical workers	From temporary structure	Under	1	4	2	7	14	28%	56%	80%	2.0%	4%	7%
		Over	1	2	0	3		12%			0.9%		
		No data	1	3	0	4		16%			1.2%		
	From permanent structure	Under	0	0	0	0	2	0%	8%		0.0%	1%	
		Over	1	1	0	2		8%			0.6%		
		No data	0	0	0	0		0%			0.0%		
	Through permanent structure	Under	0	0	0	0	4	0%	16%		0.0%	1%	
		Over	0	2	0	2		8%			0.6%		
		No data	2	0	0	2		8%			0.6%		

Trade	Fall type	3 metres	Employees	Employee of contractor	Self-employed contractors	Total for workers	Total for fall type	Percentages of individual trade group totals (see note 2)			Percentages of total number of files (see note 3)		
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Painters/ decorators	From temporary structure	Under	1	2	6	9	18	35%	69%	92%	2.6%	5%	8%
		Over	1	2	0	3		12%			0.9%		
		No data	2	0	4	6		23%			1.8%		
	From permanent structure	Under	1	0	0	1	3	4%	12%		0.3%	1%	
		Over	1	0	0	1		4%			0.3%		
		No data	1	0	0	1		4%			0.3%		
	Through permanent structure	Under	0	0	0	0	3	0%	12%		0.0%	1%	
		Over	0	1	1	2		8%			0.6%		
		No data	0	0	1	1		4%			0.3%		
Labourers	From temporary structure	Under	4	1	0	5	10	23%	46%	82%	1.5%	3%	6%
		Over	2	0	1	3		14%			0.9%		
		No data	1	1	0	2		9%			0.6%		
	From permanent structure	Under	1	1	0	2	7	9%	32%		0.6%	2%	
		Over	2	1	0	3		14%			0.9%		
		No data	2	0	0	2		9%			0.6%		
	Through permanent structure	Under	0	0	0	0	1	0%	5%		0.0%	0%	
		Over	0	0	1	1		5%			0.3%		
		No data	0	0	0	0		0%			0.0%		

Trade	Fall type	3 metres	Employees	Employee of contractor	Self-employed contractors	Total for workers	Total for fall type	Percentages of individual trade group totals (see note 2)			Percentages of total number of files (see note 3)		
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Specialised trades	From temporary structure	Under	11	17	15	43	82	23%	45%	74%	12.6%	24%	40%
		Over	7	10	2	19		10%			5.6%		
		No data	5	9	6	20		11%			5.8%		
	From permanent structure	Under	7	1	6	14	31	8%	17%		4.1%	9%	
		Over	4	4	6	14		8%			4.1%		
		No data	2	1	0	3		2%			0.9%		
	Through permanent structure	Under	1	1	1	3	23	2%	13%		0.9%	7%	
		Over	1	11	4	16		9%			4.7%		
		No data	2	2	0	4		2%			1.2%		
All trades	From temporary structure	Under	21	28	21	70	139	23%	45%	73%	20.5%	41%	66%
		Over	14	17	4	35		11%			10.2%		
		No data	10	14	10	34		11%			9.9%		
	From permanent structure	Under	11	5	10	26	56	8%	18%		7.6%	16%	
		Over	7	7	9	23		7%			6.7%		
		No data	4	1	2	7		2%			2.0%		
	Through permanent structure	Under	2	3	3	8	31	3%	10%		2.3%	9%	
		Over	2	12	4	18		6%			5.3%		
		No data	2	3	0	5		2%			1.5%		

Source: Department of Labour

Note 1: The data in this table includes urban locations only, and data for carpenters, roofers, electrical workers, painters and decorators, and general labourers. The 'All trades' section includes the five trades listed, and all other trades. Data for fall types other than those listed are not included.
Note 2: Percentages calculated in these columns are a percentage of the number of accident victims coded for that trade, excluding 'slips, trips, and stumbles' files.
Note 3: Percentages calculated are a percentage of the total number of records in the data set (n = 342).

More information

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