



Safety Analysis & Recommendation Report on Work at Height

A study of 126 Falls from Height (FFH) cases

This Report is jointly issued by the Ministry of Manpower, the Workplace Safety and Health Council and the National Work at Height Safety Taskforce

Content Page

1. Introduction	3
1.1 Background.....	3
1.3 Objectives of this Study Report.....	5
2. Research and Analysis of the 126 investigated cases	6
2.1 Classification of Falls.....	6
2.2 Classification by Industry.....	6
2.3 Contributing Factors Leading to FFH at Workplace	7
2.3.1 Lack of Safe Work Procedures.....	8
2.3.2 Lack of or improper use of individual fall arrest systems.....	8
2.3.3 Poor Working Environment	9
2.3.4 Inadequate Fall Prevention/Protection System	10
2.3.5 Violation of Rules/Improper Working Behaviour	10
2.3.6 Lack of supervision	11
2.3.7 Lack of training/ knowledge for task assigned	11
3. Summary.....	12
4. Recommendations for Work at Height Safety	13
4.1 First recommendation - Building strong capabilities for safer Work at Heights	13
4.2 Second recommendation: Promoting the benefits of WAH safety	14
4.3 Third recommendation: Enhancing the Intervention Framework for WAH.....	15
5 Measurement targets set by National Taskforce.....	16
6 Conclusion	17

1. Introduction

1.1 Background

Work at Height (WAH) is a key area of concern for workplace safety in Singapore as falls from height (FFH) has been the top contributor to workplace deaths in Singapore over the years.

In the last decade, FFH accounted for about one-third of all fatalities – see Figure 1 below.

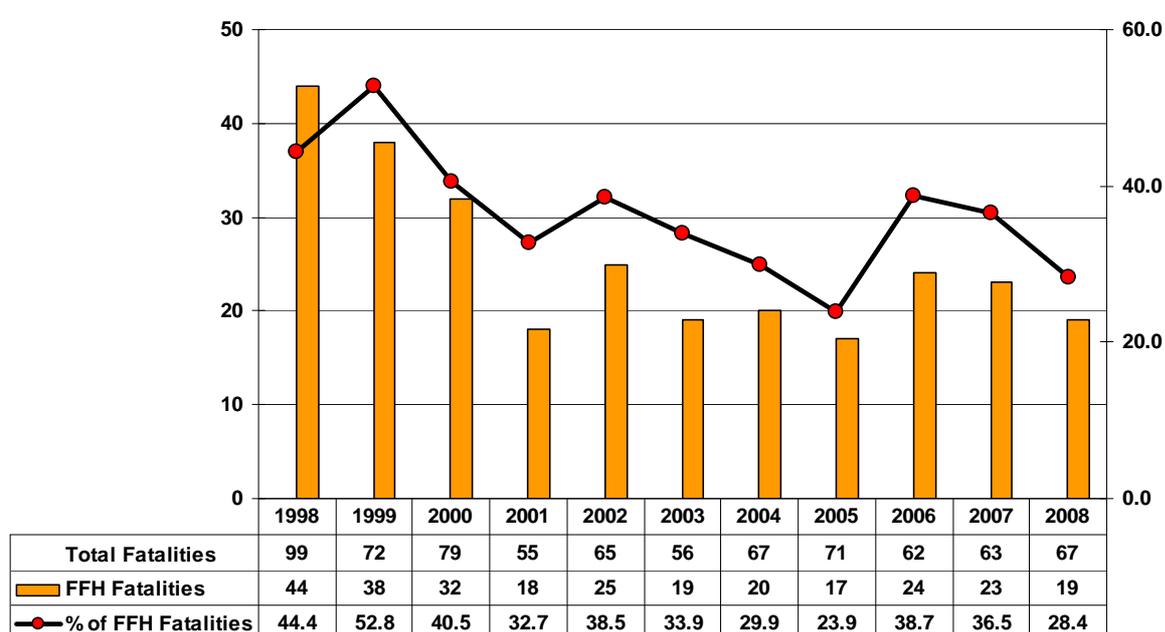


Figure 1: FFH workplace fatalities in Singapore 1998-2008

Notes: The total fatalities for 1998 to 2005 cover only factories (covered under the previous Factories Act). The total fatalities from 2006 to 2008 cover all workplaces, after the WSH (Incident Reporting) Regulations took effect on 1 March 2006. The Regulations requires all workplaces to report all work accidents.

Over the years, there are continued efforts to address FFH. This was heightened in 2006 when the Ministry of Manpower (MOM) and the then-WSH Advisory Committee¹ launched the Programme-based Engagement (ProBE²) initiative on WAH.

As FFH continues to be the top contributor to workplace fatalities from 2006 to 2008, WAH continued to be a priority area under ProBE to-date. Both enforcement and engagement efforts under ProBE on WAH saw some initial success in the gradual decline in FFH fatalities from 24 in 2006 to 19 in 2008, a 20% reduction.

¹ The WSH Advisory Committee was formed in Sept 2005 and elevated to WSH Council in April 2008.

² ProBE is a national programme aimed at reducing workplace injuries and fatalities through targeting priority or high-risk areas that contribute to the bulk of deaths and injuries.

There is, however, a 30% increase in the number of workplace injuries reported over the last 3 years from 1,141 (2006) to 1,482 (2008) - please refer to Figure 2. The trends seen in these two figures show that there is a need to continue and further enhance efforts to reduce FFH fatalities and injuries at the workplace.

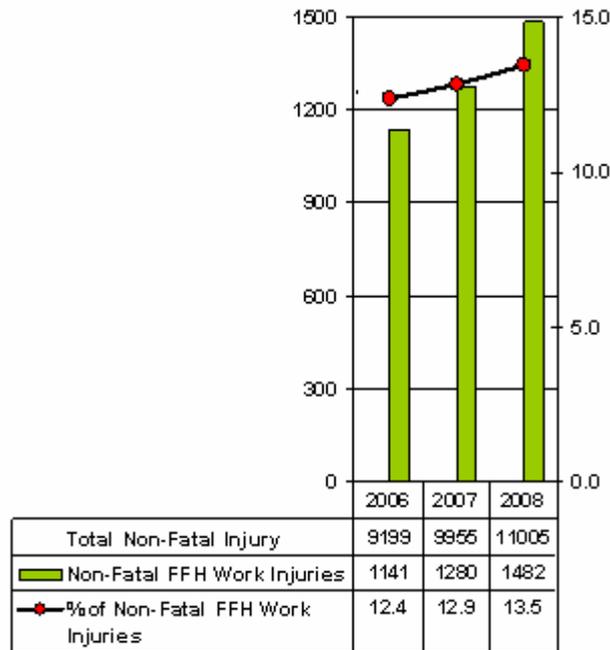


Figure 2: FFH workplace injuries in Singapore 2006-2008

In particular, reducing FFH fatalities will contribute significantly towards the national goal of reducing the workplace fatality rate to 1.8 per 100,000 employed persons by the year 2018. Figure 3 below shows that, if deaths due to FFH were excluded, the fatality rates from 2006 to 2008 would have reduced significantly.

Hence, to further improve the safety of Work at Height (WAH), a National Taskforce on WAH Safety has been formed. This safety analysis and recommendation report is the first effort by the Taskforce.

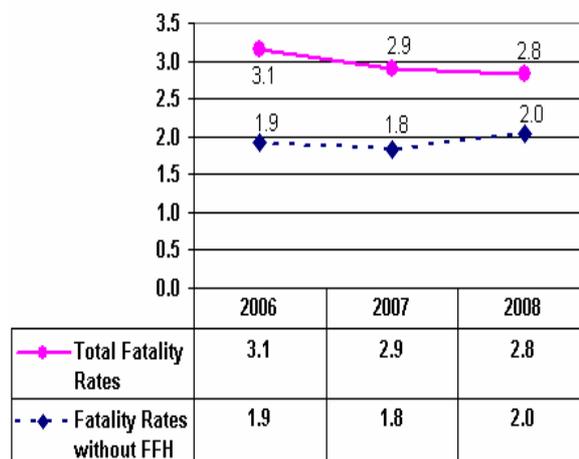


Figure 3: Workplace fatality rates in Singapore 2006-2008

1.2 Present Legal Requirements

The following legal requirements are currently in place for the prevention of falls from height:

- 1) Workplace Safety and Health Act (Chapter 354A)
- 2) Workplace Safety and Health (General Provisions) Regulations
- 3) Workplace Safety and Health (Construction) Regulations
- 4) Workplace Safety and Health (Shipbuilding and Ship-repairing) Regulations

Relevant codes of practice related to working at height are as follow:

- 1) Singapore Standards CP 14: 1996 Code of Practice for Scaffolds;
- 2) Singapore Standards CP 20: 1999 Code of Practice for Suspended Scaffolds;
- 3) Singapore Standards CP 23: 2000 Code of Practice for Formworks;
- 4) Singapore Standards SS 536: 2008 Code of Practice for the Safe Use of Mobile Cranes;
- 5) Singapore Standards CP 62: 1995 Code of Practice for Safe Use of Tower Cranes;
- 6) Singapore Standards CP 63: 1996 Code of Practice for the Lifting of Persons in Work Platforms Suspended from Cranes
- 7) Singapore Standards CP 79: 1999 Code of Practice for Safety Management System for Construction Worksites

1.3 Objectives of this Study Report

The National Taskforce on Work at Height Safety developed this safety analysis and recommendations report to:

- 1) Identify the major contributing factors for FFH incidents through a study on investigated cases related to falls from height to identify the major contributing factors; and
- 2) Make recommendations to improve Work at height safety.

The final part of this analysis report will focus on recommendations and proposal of suitable changes/improvements to enhance the current working condition at height.

2. Research and Analysis of the 126 investigated cases

2.1 Classification of Falls

Please see **Figure 4 below** for the breakdown of the type of falls amongst the 126 investigated cases:

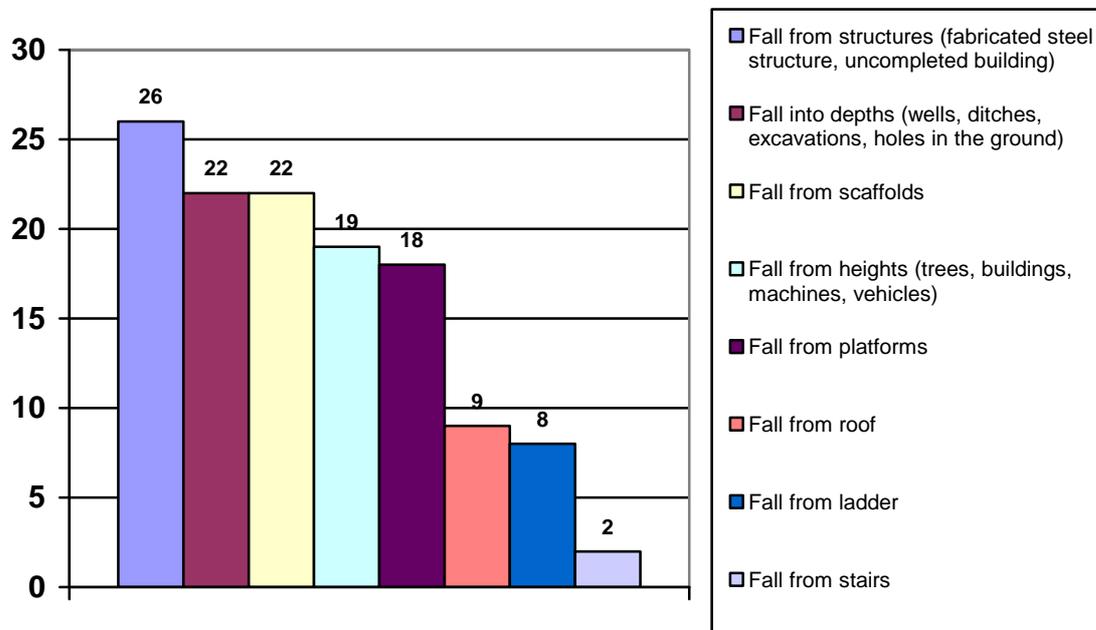


Figure 4: Types of falls amongst 126 investigated cases

2.2 Classification by Industry

Please see Figure 5 below for the breakdown of the 126 investigated cases based on industry classification:

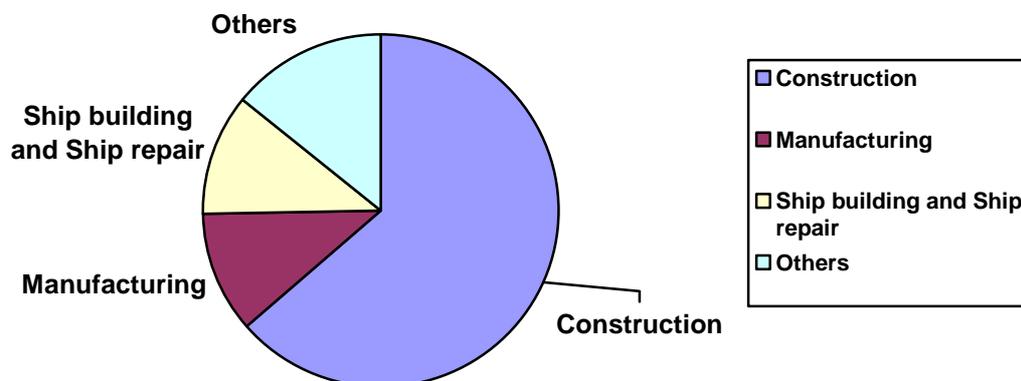
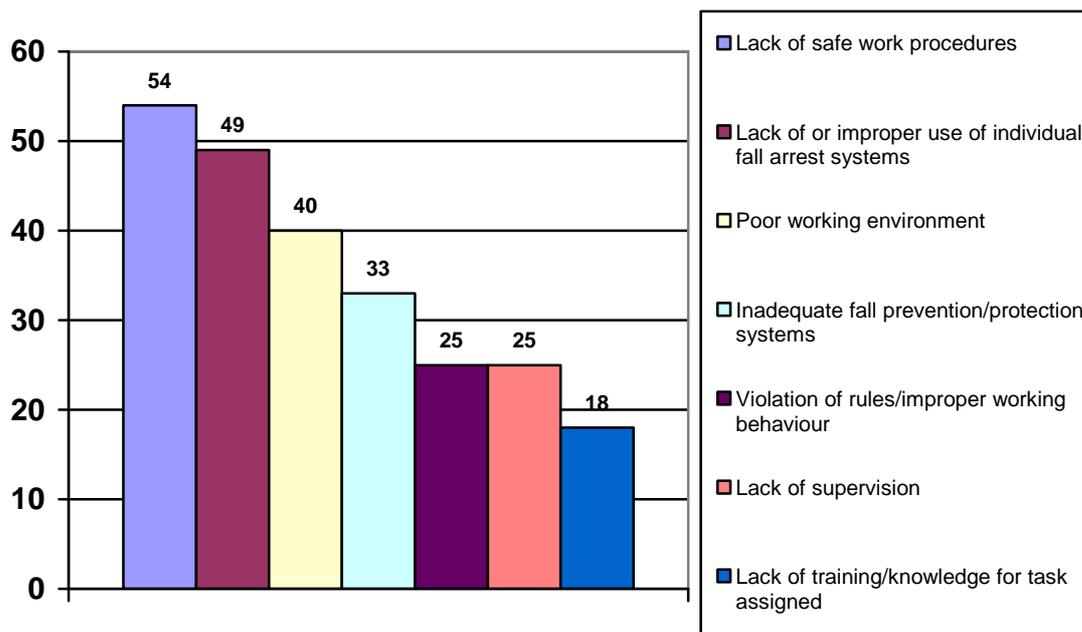


Figure 5: Industry classification of 126 investigated cases of falls

2.3 Contributing Factors Leading to FFH at Workplace

This Report analyses 126 MOM investigation reports on fatal or serious FFH cases from 2003 to 2007 to understand better the contributing factor(s) of these cases. The contributing factors are broadly classified into seven main categories as seen in Figure 6 below:

Contributing Factors leading to FFH
(for the 126 investigated cases)



	Lack of safe work procedures	Lack of or improper use of individual fall arrest systems	Poor working environment	Inadequate fall prevention or protection systems	Violation of rules/improper working behaviour	Lack of supervision	Lack of training/knowledge for task assigned
Number of cases	54	49	40	33	25	25	18
% of cases	43%	39%	32%	26%	20%	20%	14%

Figure 6: Number and percentage of cases for various contributing factors

***Note that there may be more than 1 contributory factor for each investigated FFH case**

The following sections give more details on each of these categories.

2.3.1 Lack of Safe Work Procedures

43% of the cases studied did not have proper safe work procedures in place. There are procedures required for carrying out any work safely, such as planning for a specific job task, training workers on a step-by-step work process of how a job can be done in as safe a manner as possible and emergency measures.

Without a properly implemented safe work procedure in place, workers are exposed to unnecessary risks which could have been avoided or mitigated through proper planning. There is, therefore, a need to step up the industry's adoption and implementation of safe work procedures to reduce FFH injuries.

It is, therefore, essential for the management and safety personnel to proactively plan adequate safe work procedures, communicate them to the relevant personnel, and ensure that they are implemented at the workplaces.

2.3.2 Lack of or improper use of individual fall arrest systems

The lack of or improper use of individual fall arrest system (IFAS) was identified as the second most common contributing factor in FFH incidents, accounting for 49 cases or about 39%. Amongst the 49 cases, please see the table below on how IFAS were lacking or misused:

Workers did not anchor the IFAS provided even though anchor points are available	31%
Workers did not wear the IFAS provided	29%
There were no suitable anchor points available	24%
Workers were not provided with IFAS	16%

From the above, it can be seen that workers themselves played an important role in ensuring their own safety while working at height. Not anchoring or wearing the IFAS provided were the two most common reasons for FFH injuries in this category.

This highlights the need for more effective education on the importance and proper use of IFAS, as well as the need for more vigilant supervision of those working at height.

Beside supervision, organisations also need to ensure that appropriate IFAS are issued to the workers, with suitable anchor points provided in strategic locations.

2.3.3 Poor Working Environment

Poor working environment refers to workplaces which are unsafe and increase the likelihood of workers falling from height.

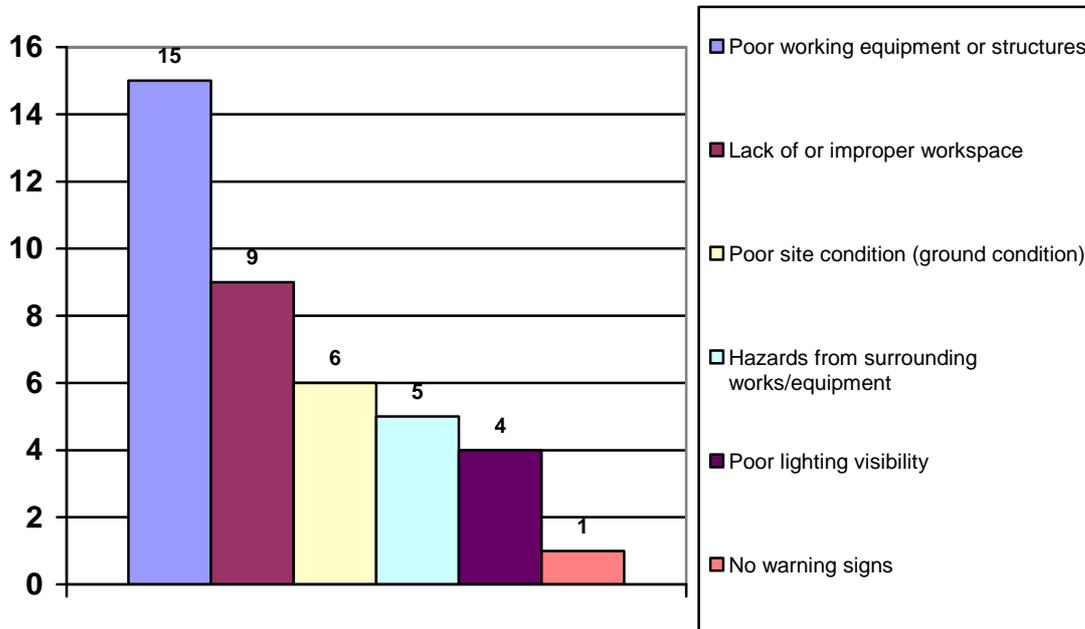


Figure 7: Reasons for working environment contributing to falls from height

The top reason is poor working equipment (such as that shown in Figure 8) or structures (mainly from collapsed or toppled scaffolds, platforms, formworks or panels). This is followed by the lack of proper workspace, e.g. workplace too cramped or without proper foothold for workers.

Poor site or ground conditions, hazards from surrounding works and poor visibility contributed to almost a third of incidents in this category. This type of incidents can be avoided if proper site assessments are carried out prior to commencement of work. Proper housekeeping and maintenance can also help.



Figure 8: Poor working platform

2.3.4 Inadequate Fall Prevention/Protection System

Fall prevention/protection system such as perimeter screen, guard railing, scaffold, and cover for open penetration, can protect workers from falling (Figures 9 to 11). These should be adequately installed and correctly used.

The absence or improper use of such equipment contributed significantly to workers falling from height or into depth. Organisations should take due diligence in conducting proper risk assessments and follow up with the necessary implementations of fall prevention/protection systems.

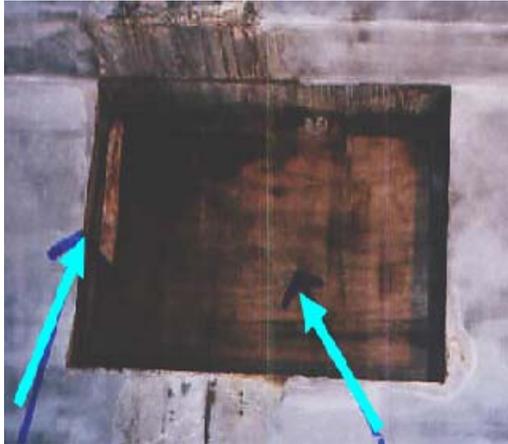


Figure 9: Partially covered opening (left arrow: opening; right arrow: covering)



Figure 10: Lack of covering for open penetration (indicated by the arrows)



Figure 11: No barricade for pit

2.3.5 Violation of Rules/Improper Working Behaviour

Almost 20% of the cases studied were a result of violation of rules or improper working behaviour among workers. In most fatal cases, incidents occurred mainly due to the following behaviour:

- Workers did not use their personal protective equipment (PPE) or IFAS correctly.
- Workers did not follow safe work procedure.

- Workers used uncertified equipment.
- Workers misused the equipment.
- Workers used an unauthorised route of access.

With such unsafe acts, workers often put themselves and their co-workers in danger. However, this cannot be solely attributed to the workers as their improper behaviour may stem from inadequate knowledge of safety issues on the task being performed.

This could be a reflection on the effectiveness of their training. Another reason could be the condoning of bad work practices (e.g. violations of rules) by their supervisors, which resulted in subsequent adoption of these bad practices as the norm. Proper supervision and better training can deter such violations and improper working behaviour among workers.

2.3.6 Lack of supervision

Lack of supervision contributed to a fifth of the FFH cases studied. Consequences of this lack in supervision included workers not using their IFAS properly or violating the safety rules and regulations. As discussed in sections 2.3.2 and 2.3.5, adequate supervision on site can play an important role in ensuring workers behaved and worked safely at height.

2.3.7 Lack of training/ knowledge for task assigned

Lack of training/knowledge contributed to 14% of the cases studied. This also links to improper working behaviour among workers (as discussed in section 2.3.5). Workers not competent to carry out their job safely at height will also endanger the lives of others. It is important to ensure that robust and comprehensive training is provided for all workers who need to work at height.

3. Summary

The table below highlights the main contributing factors for FFH incidents and the respective areas of concern to be addressed.

Contributing Factors	Frequency of Occurrence (with respect to cases studied)	Proposed action to address concerns
Lack of safe work procedures	43 %	<ul style="list-style-type: none"> To proactively plan, communicate and implement safe work procedures for work carried out at height or where workers may fall into depth
Lack of or improper use of fall arrest systems	39%	<ul style="list-style-type: none"> To provide effective education to workers on the importance and proper use of Individual Fall Arrest Systems (IFAS) To issue IFAS and provide suitable anchor points to workers To ensure more vigilant supervision of workers working at height
Poor working environment	32%	<ul style="list-style-type: none"> To conduct proper site assessment prior to commencement of work To ensure proper housekeeping
Inadequate fall prevention/protection systems	26%	<ul style="list-style-type: none"> To conduct proper risk assessment to identify areas where fall prevention/ protection systems are needed To implement and enforce the use of proper fall prevention/ protection system, including IFAS
Violation of rules / improper working behaviour	20%	<ul style="list-style-type: none"> To actively engage and educate workers to ensure that they understand and adhere to safety rules/regulations To ensure sufficient supervision to deter “risk-taking” behaviour among workers
Lack of supervision	20%	<ul style="list-style-type: none"> To provide adequate supervision to ensure worker use IFAS properly and not violate safety rules and regulations
Lack of training/ knowledge for task assigned	14%	<ul style="list-style-type: none"> To provide adequate training for workers involved in working at height

4. Recommendations for Work at Height Safety

Guided by the National WSH 2018 Strategy, the National Work at Height Safety Taskforce has made three key recommendations to address the various contributing factors linked to workers falling from height or into depth.

4.1 First recommendation - Building strong capabilities for safer Work at Heights

Many of the contributing factors raise the issue that stakeholders involved in WAH tasks were not well equipped to direct or perform the work safely. This was seen in the lack of safe work procedures, inadequate risk and site assessment, insufficient supervision and training of workers.

To address these issues, stakeholders – WSH professionals, management, line supervisors and workers – must be equipped with the relevant skills and competencies to better comprehend, control and deal with WAH risks.

To realise this key objective, the Taskforce recommends several areas of focus:

a. Implement Fall Protection Plan

- To manage WAH at a systemic level, companies should implement a proper and robust Fall Protection Plan. Please refer to **Annex C** for a fact sheet on the Fall Protection Plan (FPP).
- This Plan will help stakeholders adopt a systematic approach towards eliminating or reducing the risks of accidents due to FFH. It will ensure that all reasonable fall protection measures and procedures are taken prior to the commencement of the work.
- As part of enhancing the risk management component of the FPP, the Taskforce will also review the current work methods to eliminate the risks of work at height. This will include re-evaluating the need to conduct work done at height by tapping on possible new technologies.

b. Provide Practical Assistance

- The Taskforce has worked with the WSH Council and industry stakeholders to develop a new Code of Practice (CP) for Working Safely at Height (Please refer to the WSH Council website [HERE](#).)
- An integral part of this CP is the requirement for the establishment and implementation of the Fall Protection Plan for all works conducted at heights or where workers may fall from a height or into depths. It also provides practical guidance on measures and good practices to be taken so as to prevent deaths and injuries due to FFH for all industries.
- The CP is part of a new WAH Kit which provides educational videos and booklets to provide information on how to ensure WAH safety. There are materials for all stakeholders, including WSH professionals, supervisors and workers.

c. **Develop national Competency**

- The Taskforce is working on a national WAH competency enhancement plan. This includes setting competency standards for any work that may need to be performed at height as well incorporating WAH awareness modules into existing orientation courses, professional courses, etc.
- In the meantime, stakeholders are advised to provide adequate training to their supervisors and workers. They can tap on existing training providers that are currently available or develop in-house training customised to their work.

4.2 Second recommendation: Promoting the benefits of WAH safety

To heighten the adoption of good WAH practices by stakeholders, the Taskforce emphasised the need to get businesses to recognise that doing so will enhance business competitiveness. Workers and supervisors must also understand what is what they need to do for their own safety. This will involve two main approaches.

First, businesses must be made aware that accidents and injuries due to FFH in the workplaces will prove disruptive in terms of remedial costs and corporate image. Workers should be made aware of the need to abide by safety rules so as not to risk their lives.

Second, the Taskforce recommends that we recognise both employers and workers who demonstrate good WAH practices and behaviours, and share their experiences with industry. The above can be achieved in the following ways:

a) **Outreach and Education**

- The Taskforce will collaborate with relevant industry associations and partners to reach and engage a wider audience (ranging from large organisations to SMEs, from management to workers).
- This will raise awareness on the importance of WAH safety, enhance the understanding of prevailing WSH trends and practices, and promote the benefits of WSH.
- Initiatives enabling outreach and education include the annual National WSH Campaign as well as other outreach platforms such as dedicated WAH Campaigns, Workshops, Roadshows and Dorm Visits.

b) **Certification and Recognition**

- A recognition framework is necessary to inspire widespread participation and improvement in WSH standards for WAH.
- Learning from the success of bizSAFE³, the Taskforce a new FALLPROTECT Certification/Recognition Scheme is currently explored and proposed to be launched by the WSH Council.

³ bizSAFE is a five-step programme to assist SMEs to build up their WSH capabilities in order to achieve quantum improvements in safety and health standards at the workplace. SMEs are guided through a journey, starting from top management demonstrating their commitment towards WSH, to acquiring risk management capabilities and implementing a Workplace Safety and Health Management System. In the process, participating SMEs gain recognition and benefits of having a comprehensive WSH system in place.

- The proposed Scheme aims to certify or recognise the Fall Protection Plan of companies and for their commitment to safety. FALLPROTECT certified/recognised enterprises are expected to enjoy other business privileges and advantages offered by other FALLPROTECT enterprises who participate in this programme.
- In addition to FALLPROTECT, the Taskforce will also look into how supervisors and workers can be recognised for their efforts to ensure WAH safety.

c) Information Dissemination and Hazards Communication

- It is essential for the industry to be well informed of the key WSH issues of interest such as accident statistics and trends at the national and industry levels, and WSH best practices locally and abroad.
- For the purpose of communication WAH safety, a new dedicated WAH information webpage will be developed by the WSH Council to provide a one-stop info hub, solutions and other resources on WAH.

4.3 Third recommendation: Enhancing the Intervention Framework for WAH

The Taskforce also recommends the need to establish and maintain an effective regulatory framework for better WAH standards.

Under this strategy, targeted interventions and enforcement actions will be developed based on comprehensive analysis of industry trends and developments.

Existing WSH legislation related to WAH will also need to be reviewed to ensure that they remain relevant to industry trends. More emphasis will also be placed on creating a self-regulatory framework in order to promote greater industry ownership. A few priority areas have been identified to support this objective:

a. Strategic Intervention

- To ensure that WAH issues continue to receive critical attention, WAH will continue to be featured as a priority area for programmes such as ProBE.
- The Taskforce will work with various industry associations to introduce an “industry self-assessment” element as part of the intervention framework for work at heights.

b. Legislation Review and Extending Enforcement Reach

- As part of its regular legislation review, the Ministry of Manpower will be reviewing relevant legislation on WAH safety to ensure that it remains robust and relevant to current operating conditions. The Taskforce will contribute to this review.
- To extend enforcement reach to more workplaces, especially the smaller ones, MOM will also be looking into other avenues to complement its enforcement efforts in the area of WAH safety.

5 Measurement targets set by National Taskforce

The Taskforce has outlined several targets that it aims to achieve. This will support the WSH 2018 vision to help Singapore achieve one of the best WSH records in the world.

5.1 Reduction in Workplace Fatalities and Injuries for WAH

While the longer term goal is to achieve a safe and healthy workplace with zero fatality and injury for all work conducted at heights, the Taskforce has set intermediate targets to halve current WAH fatality and injury rates in all workplaces to:

- a. A WAH fatality rate of less than 0.40 fatalities per 100,000 workers by 2013 and less than 0.20 fatalities per 100,000 workers by 2018 ⁴.
- b. WAH injury rate of less than 31 injuries per 100,000 workers by 2013 and less than 15 injuries per 100,000 workers by 2018.

5.2 Stronger Industry Capability to Manage WAH

Stakeholders need to possess strong capabilities in managing WAH safety. Proper implementation of a Fall Protection Plan (FPP) is an important capability that will effectively help to eliminate or reduce the risk of falling from height. The goals set for stronger capability for safe works at height are as follows:

- a. Implementation of the FPP in all construction worksites and shipyards by 2012
- b. Implementation of FPP for all workplaces by 2015

5.3 Heightened Awareness in WAH Safety at Workplaces

Employers, workers and other stakeholders should view WAH safety as a personal responsibility and share the belief that workplace accidents are preventable and unacceptable.

In the longer term, this mindset can be shifted with management proactively addressing WAH safety concerns, while workers take proactive precautionary steps to complete a WAH task in a safe manner and look out not only for their own safety, but that of those around them as well.

⁴ In the UK, for the year of 2008 the estimated FFH fatality rate was 0.11 per 100,000 workers, while the estimated non-fatal injury rate stood at 23.7 per 100,000 workers.

6 Conclusion

The National Work at Height Safety Taskforce has started work with the Ministry of Manpower and the WSH Council on the recommendations outlined in this report. The Code of Practice on Safe Working at Height and the Work at Height kit are two initial quick-wins to get industry stakeholders on board.

Following this, the Taskforce will be working on the competency framework, the FALLPROTECT Certification Scheme and review WAH legislation, amongst other engagement and capability building work.

The Taskforce will provide updates on its implementation progress later next year.