

CASE STUDIES
ACCIDENTS INVOLVING
WORK AT HEIGHTS



WSHCOUNCIL

Year of Issue: 2017

FOREWORD

Since the formation of the National Work-at-Heights (WAH) Safety Taskforce in 2009, many initiatives have been rolled out to address WSH concerns while carrying out WAH activities. Despite our efforts, Falls from Heights (FFH) continues to be the top contributor of all workplace fatal injuries every year. It is also one of the top contributors for workplace major injuries, accounting for about 14% of all incident types between 2012 and 2015. These injuries include broken or fractured bones, or even worse, permanent disabilities. You may refer to the next page for statistics on FFH workplace fatal injuries over the past 5 years.

We need to press on to address the high incidence of FFH and through our study of past incidents, we found that these accidents are similar in nature and could have been prevented if adequate measures or processes are in place. Therefore, it is important that we learn from past accidents to prevent re-occurrence.

I am pleased to present to you this booklet which is the result of collective efforts of Ministry of Manpower and National WAH Safety Taskforce. Past concluded fatal accidents were compiled and categorised according to incident types for ease of reference. Through root cause analysis of these accidents, causes were examined and key learning points shared. I hope the lessons and recommendations within will help you in implementing appropriate WSH measures at your workplaces. We also encourage you to share these cases with your colleagues and business partners so that together we can prevent work at heights injuries and have safer workplaces.

Chow Yew Yuen
Chairman
(National Work-at-Heights Safety) Taskforce
Workplace Safety and Health Council

Statistics of Fatal Workplace Injuries from Fall from Heights vs Other Fatal Accident Types (2012–2016)

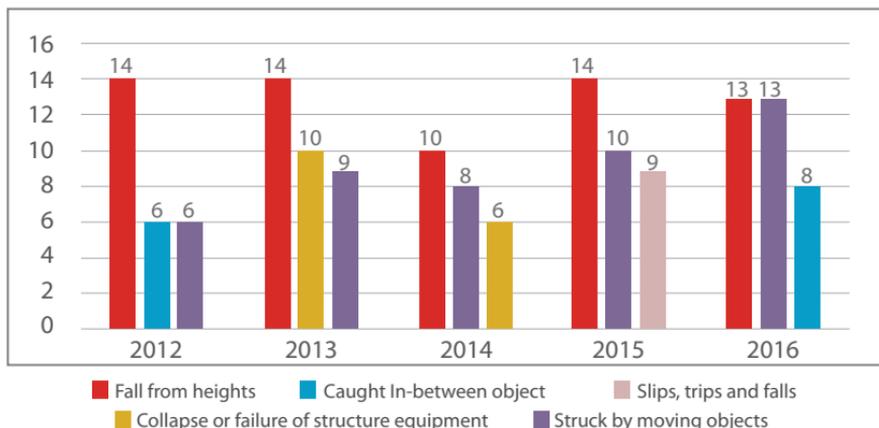


Figure 1: Fall from heights fatal injuries vs other fatal accident types.

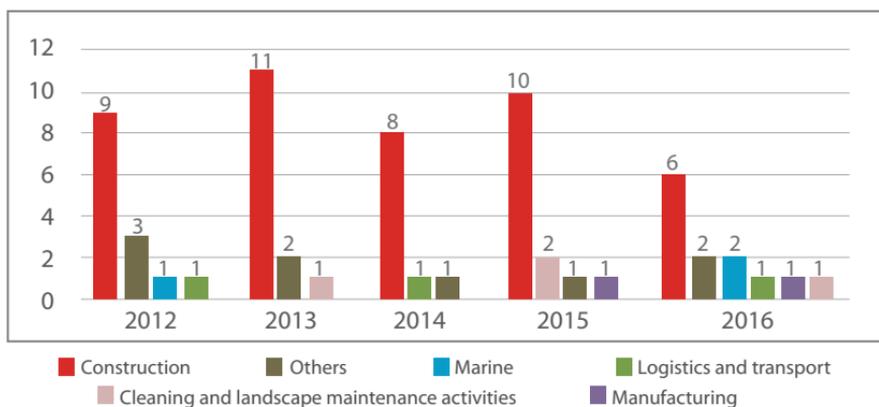


Figure 2: Fall from heights fatal injuries (by industry).

CONTENTS

FOREWORD

Fall from Heights Fatal Injuries Statistics (2012–2016)

i
ii

FALL FROM FORMWORK STRUCTURE

Case 1	Fall Together With Formwork Structure	02
Case 2	Fall From Formwork Structure	05
Case 3	Fall From Formwork Structure During Dismantling	08

FALL FROM LADDERS

Case 4	Fall From Vertical Access Ladder	12
Case 5	Fall From Fixed Ladder	15

FALL FROM ROOFS

Case 6	Fall Through Roof Opening	20
Case 7	Fall Through Roof Skylight	24
Case 8	Fall Off Sloping Roof	28

FALL FROM SCAFFOLD

Case 9	Fall From Scaffold During Dismantling	34
Case 10	Fall From Scaffold	37

FALL FROM STRUCTURE

Case 11	Fall From Opening Of A Hopper	42
Case 12	Fall From Top Of ISO Tank	45
Case 13	Fall From Lift Landing of a Building	48
Case 14	Fall Off Storage Rack	51

FALL FROM VEHICLE

Case 15	Fall From Lorry Bed	56
----------------	---------------------	----



**FALL FROM
FORMWORK STRUCTURE**

CASE 1

FALL TOGETHER WITH FORMWORK STRUCTURE

Description of Incident

The deceased was tasked to install barricades to the open sides of a system table formwork structure. While he was standing on top of the table formwork, the structure suddenly toppled and fell over the edge of the building. The deceased landed on a protruding slab on the second floor. He was sent to the hospital where he later succumbed to his injuries.



1. Location the table formwork structure landed.
2. Location deceased landed.

Background

Type of industry	• Construction
Type of work	• Formwork
Type of trade activity	• Installation of barricade for tableform
Occupation of deceased	• Construction worker

Findings

Mission

- The table formwork was erected for construction of the building's eighth storey floor slab. It was supported by means of six vertical floor props with two innermost props lashed to anchor points casted within the slab.
- While the deceased was on top of the table formwork structure, another worker was below adjusting a misaligned floor prop. The floor prop was adjusted by means of hitting with a mallet. After hitting the floor prop, the entire table formwork started to tilt and eventually toppled over the edge of the building.

- It was likely that during the process of adjusting the floor props, the lashing straps were not tensioned and/or connected to the anchor points casted within the slab.
 - The RA conducted did not address activities involving installation of lifelines and safety barricades.
 - Several formwork workers did not attend training conducted by the formwork supplier. The training was intended to equip workers with necessary skills to properly erect, adjust and dismantle table formworks.
- Management**
- The risk assessment (RA) conducted did not put in control measures to ensure that no one should be on top of the table formwork structure while the floor props are being adjusted.

Causal Analysis

Evaluation of loss	• One worker killed.
Type of contact	• Fall from heights.
Immediate cause(s)	• Worker fell together with a toppled formwork structure.
Basic cause(s)	• Failure to identify presence of incompatible work activities.
Failure of WSH management system	<ul style="list-style-type: none"> • Failure to ensure effective communication to inform relevant parties regarding incompatible works. • Failure to provide WSH training with regards to formwork.

Recommendations

Risk Assessment	• Conduct proper RA before start of any work activity. In this case, the work activities are installation of barricade on the table formwork and adjustment of the supporting floor props.
-----------------	--

Risk Assessment	<ul style="list-style-type: none"> Other than identifying hazards and control measures for each work activity, the RA process must also recognise presence of incompatible works. In this case, installation of barricade on the table formwork and adjustment of supporting floor props are two incompatible work activities taking place simultaneously at the same location.
Planning and coordination	<ul style="list-style-type: none"> Ensure that suitable means of communication and monitoring are in place so that work processes are carried out in the appropriate sequence. Where applicable, establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall. Where safety harnesses are to be used, ensure that proper and secured lifelines or anchorage points are provided for workers working at heights.
Safe Work Procedure	<ul style="list-style-type: none"> Ensure that all formwork structures are properly secured in place to prevent unwanted displacement. Ensure that no one is on top of formwork structure while adjustments are being made to its supporting floor props.
Training and awareness	<ul style="list-style-type: none"> Ensure that all personnel (including formwork supervisors and workers) involved in formwork activities have received adequate safety and health training with regards to hazards associated with construction, erection, alteration or dismantling of formwork structures. Ensure that workers understand importance of using the relevant Personal Protective Equipment (PPE) such as a safety harness.
Legislative requirements	<ul style="list-style-type: none"> Ensure that all formwork structures and related work activities complies with requirements stated in Regulation 9 of the WSH (Construction) Regulations and SS580:2012 (Code of Practice for Formwork).

CASE 2

FALL FROM FORMWORK STRUCTURE

Description of Incident

The deceased was erecting soffit formwork for a beam on the fourth floor of a building under construction. While he was working at the area, he had most likely lost his balance and fell over the edge of the formwork and landed on the second floor slab. He was pronounced dead at the scene by attending paramedics.



1. Location the deceased had fallen from.
2. Horizontal lifeline.

Background

Type of industry	• Construction
Type of work	• Formwork
Type of trade activity	• Erection of soffit formwork
Occupation of deceased	• Construction worker

Findings

Mission

- The deceased was working near the edge of formwork structure.

Man

- A wire rope lifeline had been installed at the accident location. The deceased was also wearing a full body safety harness. However, it was likely that the deceased was not anchored to the wire rope lifeline. The fall was therefore not arrested.

Management

- No formwork supervisors were around the accident location.
- The risk assessment (RA) conducted highlighted the need for securing safety harness to the lifeline however that was not being enforced by any supervision.

Medium

- Surface of formwork was wet as it rained before the accident.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Falling from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Worker fell from formwork.
Basic cause(s)	<ul style="list-style-type: none">• Wet formwork surface; harness not anchored to lifeline.
Failure of WSH management system	<ul style="list-style-type: none">• Failure to ensure effective implementation of control measures.• Failure to provide adequate supervision.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity.• The RA should take weather conditions into consideration when conducting outdoor works.
Planning and coordination	<ul style="list-style-type: none">• Ensure that sufficient formwork supervisors are appointed and provided for all formwork-related activities.• Ensure good housekeeping to prevent slips, trips and falls.• Ensure that floor surface of all working and walking areas are clean and dry before starting work.• Provide each worker with slip-resistant safety boots as outdoor surfaces are prone to become slippery especially when wet.• Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.

Safe Work Procedure	<ul style="list-style-type: none"> • Where appropriate, ensure that edge protection is provided at edges where a person could fall. The edge protection must be able to withstand the impact of a person falling against it. • Develop and implement safe work procedure (SWP) for formwork-related activities. Highlight need for workers to anchor their fall arrest safety harnesses to secured lifeline or anchor points at all times when working at height. Whenever appropriate, consider use of twin lanyard harnesses and 100% tie-off (i.e., at least one lanyard is to be anchored to a lifeline at any time).
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including formwork supervisors and workers) involved in formwork activities have received adequate safety and health training with regards to hazards associated with construction, erection, alteration or dismantling of formwork structures.
Legislative requirements	<ul style="list-style-type: none"> • Assess all lifeline and anchor points for suitability and security before use. Ensure that all lifeline and anchor points are installed and tested in accordance to SS 570: 2011 Personal protective equipment for protection against falls from height – Single point anchor devices and flexible horizontal lifeline systems.

CASE 3

FALL FROM FORMWORK STRUCTURE DURING DISMANTLING

Description of Incident

The deceased was tasked to dismantle a timber formwork at the edge of a building. While the deceased was dismantling a piece of timber formwork with a hammer and crowbar, he had most likely lost his balance, fell through a gap and landed on the ground level. He was pronounced dead at the scene by attending paramedics.



1. Location the deceased had fallen from.



2. Gap deceased fell through.

Background

Type of industry	• Construction
Type of work	• Formwork
Type of trade activity	• Dismantling timber formwork
Occupation of deceased	• Construction worker

Findings

Mission

- The deceased was dismantling timber formwork at the edge of a building.

Man

- The deceased was not wearing his safety harness which was later found in the interior of the building.

Management

- The deceased was working alone before the accident.
- The formwork was designed by a Professional Engineer (PE) and had catered for guardrails. However, the guardrails were not erected in accordance with the PE's design. Thus, effectiveness of the guardrail system has not been ensured.
- Risk assessment (RA) with regards to formwork activities were developed, however, risk control

measures recommended were not properly implemented and adhered to. Some risk control measures included installation of barricades and provision of workers with safety harness.

Medium

- The gap in between the guardrails and edge of building is about 55 cm. The guardrails were therefore not effective in this case.

Causal Analysis

Evaluation of loss	• One worker killed.
Type of contact	• Fall from heights.
Immediate cause(s)	• Worker fell from formwork.
Basic cause(s)	• Ineffective guardrail system.
Failure of WSH management system	• Failure to ensure effectiveness of control measures. • Failure to provide adequate supervision.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is dismantling formwork near the edge of building. Ensure that risk control measures recommended in the RA are properly implemented and strictly adhered to.• When conducting RA, the effectiveness of existing risk control measures must be taken into consideration. In this case, it should be identified that the guardrails were not installed effectively.
-----------------	---

Planning and coordination	<ul style="list-style-type: none"> • Ensure that sufficient formwork supervisors are appointed and provided for all formwork-related activities. • Where applicable, establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.
Safe Work Procedure	<ul style="list-style-type: none"> • Provide secured anchorages or lifelines at areas where safety harnesses are to be used. • Ensure that workers are educated on the importance of anchoring their safety harnesses to appropriate anchorages or lifeline at all times when working at heights.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including formwork supervisors and workers) involved in formwork activities have received adequate safety and health training with regards to hazards associated with construction, erection, alteration or dismantling of formwork structures.
Legislative requirements	<ul style="list-style-type: none"> • Ensure that guardrails are provided at all open edges where a person could fall. Guardrails must be constructed in accordance with Singapore Standards SS 567:2011 (Code of Practice for Factory Layout – Safety, Health and Welfare Consideration). • Where applicable, ensure that formwork structures (including guardrails) are constructed in accordance with PE's design and complies with requirements stated in Regulation 9 of the WSH (Construction) Regulations and SS580:2012 (Code of Practice for Formwork).



FALL FROM LADDERS

CASE 4

FALL FROM VERTICAL ACCESS LADDER

Description of Incident

The deceased was inspecting the second level corridor of a dormitory under construction, which was scheduled to be concreted. After his inspection, while descending to the ground floor via an extension ladder, he fell with the ladder and landed on the ground. The deceased suffered head injuries and was hospitalised; he eventually passed away more than 6 months after the accident.



1. Deceased was found lying unconscious beside the ladder.
2. Height between the second level and ground is about 3.1 m.

Background

Type of industry	• Construction
Type of work	• Inspection
Type of trade activity	• Civil and structural
Occupation of deceased	• Residential technical officer

Findings

Mission

- The construction of the steel staircase was not completed, thus the deceased utilised an extension ladder to access the second level.

Man

- The deceased had climbed the extension ladder to the dormitory's second level to inspect the corridor slab.
- The deceased was climbing down the extension ladder after his inspection when he fell together

with the ladder which was not adequately secured to prevent slipping.

Management

- The risk assessment (RA) covered only the use of A-frame ladders but not the use of extension ladders as access to another level.

Machine

- The base of the extension ladder was not secured.

Medium

- It was likely that the deceased fell together with the extension ladder which was not adequately secured to prevent slipping.

Causal Analysis

Evaluation of loss	• One worker killed.
Type of contact	• Fall from heights.
Immediate cause(s)	• Slipping of vertical access ladder.
Basic cause(s)	• Inadequate securing of access ladder.
Failure of WSH management system	• Inadequate RA and safe work procedure (SWP) to address this specific work activity.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is accessing the second level using an extension ladder.• Other than identifying hazards and control measures for each work activity, the RA process must also recognise the presence of incompatible work.
Planning and coordination	<ul style="list-style-type: none">• Ensure that suitable means of communication and monitoring are in place so that work processes are carried out in the appropriate sequence.• Where applicable, establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.
Safe Work Procedure	<ul style="list-style-type: none">• Ensure that an appropriate ladder is provided and used for the intended task.• Ladders used for access to another level should have at least 1 m above landing point to provide a secure handhold.• Ensure that base of ladder is secured appropriately when in use.

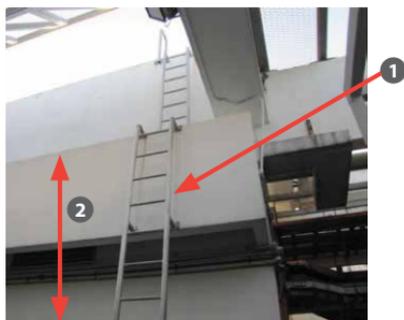
- | | |
|--------------------------|---|
| Training and awareness | <ul style="list-style-type: none">• Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.• Ensure that workers understand the importance of following recommended risk control measures with regards to use of ladders. |
| Legislative requirements | <ul style="list-style-type: none">• Ensure that all ladders and their use meet requirements stipulated in Regulation 18 of the WSH (WAH) Regulations. |

CASE 5

FALL FROM FIXED LADDER

Description of Incident

The deceased and his co-worker were tasked to install filters at existing air-conditioning units on the rooftop of a building. Upon reaching the rooftop, the co-worker climbed two fixed ladders to access the upper level of the rooftop and waited for the deceased. After waiting for about 5 minutes, the co-worker walked back to look for the deceased. He found the deceased lying on the rooftop about 1m away from the fixed ladder with a trash bag of filters beside him. The deceased was pronounced dead at the scene.



1. The first of two fixed access ladders that workers use to access the upper levels of the rooftop.
2. Height of the first vertical fixed access ladder is about 4.3 m.

Background

Type of industry	• Facilities management
Type of work	• Replacement of carbon filter
Type of trade activity	• Maintenance of air-conditioner
Occupation of deceased	• Senior technician

Findings

Mission

- It was the first time the deceased and his co-worker attempted to carry out the installation of filters.

Man

- A trash bag with six pieces of filters, about 4.7 kg, was found close to the deceased.

- The deceased had probably carried the trash bag of filters and lost his footing while climbing the first fixed vertical ladder.

Management

- The Occupational Safety and Health Management System (OSHMS) did not cover maintenance works at the rooftop.

- The risk assessment (RA) conducted did not address the installation of filters at the upper level of the roof top that could only be accessed by use of fixed vertical ladders.
- The RA and safe work procedure (SWP) conducted were not relevant to the ad-hoc work activities carried out by the deceased and his co-worker.
- The first fixed ladder did not extend sufficiently at the intermediate landing to allow users sufficient handhold.

Medium

- The edges of the intermediate landing were not protected to prevent persons from falling over the edge.

Machine

- The first fixed ladder was 4.31 m in length and was not installed with any fall prevention measures.

Causal Analysis

Evaluation of loss	• One worker killed.
Type of contact	• Fall from heights.
Immediate cause(s)	• Lost footing while climbing vertical access ladder.
Basic cause(s)	• Lack of additional control measures for fixed ladders that rise a vertical distance of more than 3 m.
Failure of WSH management system	• OSHMS failed to cover maintenance activities on rooftop.

Recommendations

Risk Assessment	<ul style="list-style-type: none"> • Conduct proper RA before start of any work activity to ensure that all work activities are covered and any foreseeable risks mitigated. In this case, the work activity is climbing fixed vertical ladder with materials. • The RA should provide measures to mitigate risks involved such as carrying filters up in proper bags, splitting them into smaller loads or using hoist to bring them up.
-----------------	---

Planning and coordination

- Where applicable, establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.
- Provide workers with suitable Personal Protective Equipment (PPE) for WAH and training if additional control measures involve its usage, such as a anchoring to a vertical lifeline.
- Install guardrails on open sides to prevent persons from falling over edge of a building or roof.

Safe Work Procedure

- The design of fixed ladder should be improved through provision of safety cages, extending the ladder to provide sufficient handhold or equipping it with lifelines with fall arresting devices.
- Develop SWP for safe use of ladder, such as maintaining three-point contact when climbing a ladder.

Training and awareness

- Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.
- Ensure that workers understand the importance of following recommended risk control measures with regards to use of fixed ladders.

Legislative requirements

- Ensure that fixed ladder complies with requirements stated in Regulation 18 of the WSH (WAH) Regulations.



FALL FROM ROOFS

CASE 6

FALL THROUGH ROOF OPENING

Description of Incident

A group of workers was tasked to install glass panels on top of a car porch canopy roof. While the deceased was trying to reposition himself, he suddenly fell through an opening on the canopy roof. He was sent to the hospital and subsequently succumbed to his injuries on the same day.



1. Car porch canopy roof.
2. Opening deceased fell through.
3. Location deceased landed.

Background

Type of industry	• Construction
Type of work	• Roof panel installation
Type of trade activity	• Glass and glazing works
Occupation of deceased	• Construction worker

Findings

Mission

- The car porch canopy roof required installation of 12 pieces of glass panels. Installation of 11 pieces of glass panels had been completed. The last piece of glass panel had not been installed due to some defects.

Man

- The deceased was not wearing safety helmet, safety belt or harness at the time of accident.

Management

- Risk assessment (RA) with regards to the installation of glass panels were developed. However, risk control measures recommended were not implemented. Some risk control measures included provision and anchoring of safety harness.
- Investigations revealed that none of the workers were wearing safety harness and no suitable and secured anchorage points were provided.
- A Permit-to-Work (PTW) system for working at heights was established but not implemented at the worksite.
- A worker assigned as the team leader took on the supervisory role for the group of workers on site. However, investigations revealed that the company did not assign any competent supervisor to supervise the workers on the day of accident.

Medium

- Opening on canopy roof, due to incomplete installation of glass panels, was not guarded.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Worker fell from roof opening.
Basic cause(s)	<ul style="list-style-type: none">• Inadequate fall prevention or protection measures.• Inadequate supervision.
Failure of WSH management system	<ul style="list-style-type: none">• Failure to implement risk control measures.• Failure to ensure adherence to risk control measures.• Failure to implement PTW system for working at heights.

Recommendations

Risk Assessment

- Conduct proper RA before start of any work activity. In this case, the work activity is installation of glass panels on canopy roof. Ensure that risk control measures recommended in the RA are properly implemented and strictly adhered to.

Planning and coordination

- Check for existence and suitability of all lifeline and anchor points before start of relevant work activity.
- Assess all lifeline and anchor points for suitability and security before use. Ensure that all lifeline and anchor points are installed and tested in accordance to SS 570: 2011 Personal protective equipment for protection against falls from height – Single point anchor devices and flexible horizontal lifeline systems.
- Ensure that adequate and suitable supervision is provided for all WAH activities.
- If working on top of a roof is unavoidable, careful planning is required to provide safe and proper means (e.g., by erecting scaffold access) for workers to get to and exit from rooftop work location.
- Ensure that a proper safe work method is established for working on roofs with consideration of the roof's characteristics (e.g., roof material, profile, slope and height) as well as the duration and frequency of work.
- Where applicable, establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.

Safe Work Procedure	<ul style="list-style-type: none"> • Where applicable, ensure that all openings are effectively guarded to prevent persons from falling through. In addition, a warning sign can be displayed to warn people of the hazard. • Where appropriate, if there is a risk of a worker falling through the roof, install a safety mesh or safety net (capable of preventing a person from falling through) either directly on top of or underneath the fragile roof area.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with WAH. • Ensure that workers understand the importance of following recommended risk control measures. Highlight need for workers to anchor their fall arrest safety harnesses to secured lifeline or anchor points at all times when working at heights. Whenever appropriate, consider use of twin lanyard harnesses and 100% tie-off (i.e., at least one lanyard is anchored to a lifeline at any time).
Legislative requirements	<ul style="list-style-type: none"> • Ensure that all WAH activities are carried out in accordance with requirements stipulated in the WSH (WAH) Regulations.

CASE 7

FALL THROUGH ROOF SKYLIGHT

Description of Incident

The deceased had accessed the roof of a warehouse using a tower scaffold. While walking on the roof he had most likely stepped on a fibreglass skylight panel, which gave way under his weight, and fell to the ground. He was pronounced dead at the scene by attending paramedics.



1. Roof skylight deceased had fallen through.
2. Location deceased landed.

Background

Type of industry	• Logistics and transportation
Type of work	• Roof sheet installation
Type of trade activity	• Roofing works
Occupation of deceased	• General worker

Findings

Mission

- Access the roof via a tower scaffold and survey roof for subsequent roof works.

Man

- The deceased was not wearing any fall arresting device while he was on the roof.

Management

- No risk assessment (RA) or safe work procedures (SWPs) with regards to roof survey works were developed.
- Investigations revealed that no suitable and secured anchorage points were provided for roof survey works.

- No workers or supervisors were found to have attended any form of WAH and roof works related safety and health training.

Medium

- The roof contains various strips of fragile skylight panels which are not clearly labelled.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none"> • One worker killed.
Type of contact	<ul style="list-style-type: none"> • Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none"> • Worker fell through roof skylight opening.
Basic cause(s)	<ul style="list-style-type: none"> • Lack of WSH-related training while working at heights and proper identification of hazards in the vicinity.
Failure of WSH management system	<ul style="list-style-type: none"> • Failure to provide adequate training so that workers may perform their work safely. • Failure to ensure that only competent persons were engaged to carry out roof survey works. • Failure to provide any form of fall prevention or protection control measures.

Recommendations

Risk Assessment	<ul style="list-style-type: none"> • Conduct proper RA before start of any work activity. In this case, the work activity is roof survey works. Ensure that risk control measures recommended in the RA are properly implemented and strictly adhered to.
Planning and coordination	<ul style="list-style-type: none"> • Ensure that a proper safe work method is established for working on roofs with consideration of the roof's characteristics (e.g., roof material, profile, slope and height) as well as the duration and frequency of work. • If fall arrest system is to be used, check for existence and suitability of all lifeline and anchor points prior to the start of relevant work activity.

- Ensure that all lifeline and anchor points are installed and tested in accordance to SS 570: 2011 Personal protective equipment for protection against falls from height – Single point anchor devices and flexible horizontal lifeline systems.
- Ensure that adequate and suitable supervision is provided for all WAH activities.
- Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.

Safe access and egress

- If work on top of a roof is unavoidable, careful planning is required to provide safe and proper means (e.g., by erecting scaffold access) for workers to get to and exit from the rooftop work location.
- For safer access and work on fragile roofs, the use of crawl boards and roof ladders should be deployed to prevent workers from stepping directly on the surface of fragile roof.

Safe Work Procedure

- Where applicable, ensure that all openings are effectively guarded to prevent persons from falling through. In addition, a warning sign can be displayed to warn people of the hazard.
- Where appropriate, if there is a risk of a worker falling through the roof, install a safety mesh or safety net (capable of preventing a person from falling through) either directly on top of or underneath fragile roof area.

- Training and awareness
- Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.
 - Ensure that workers understand the importance of following recommended risk control measures. Highlight need for workers to anchor their fall arrest safety harnesses to secured lifeline or anchor points at all times when working at heights. Whenever appropriate, consider use of twin lanyard harnesses and 100% tie-off (i.e., at least one lanyard is anchored to a lifeline at any time).
- Legislative requirements
- Ensure that all WAH activities are carried out in accordance with requirements stipulated in the WSH (WAH) Regulations.

CASE 8

FALL OFF SLOPING ROOF

Description of Incident

The deceased and four other workers were tasked to carry out roof works for a building under construction. The deceased was laying aluminium sheets over a sloping roof when he suddenly lost his footing and fell to the ground. He was sent to the hospital and subsequently succumbed to his injuries.



1. Location the deceased most likely fell from.
2. Bent Z-angle bracket.

Background

Type of industry	• Construction
Type of work	• Roof installation
Type of trade activity	• Roofing works
Occupation of deceased	• General worker

Findings

Mission

- Roof installation works and lay aluminium sheets over sloping roof (estimated to be 45 degrees).

Man

- The workers working on top of the roof were issued and had worn full body harnesses when carrying out roof installation works. However, investigations revealed that the workers would remove

their lanyard attachment from the full body harness for ease of movement while working on the roof.

Management

- Risk assessment (RA) was conducted and safe work procedures (SWP) were developed for roof installation works. The risk of falling from height was identified and risk control measures includes providing proper personal protective equipment such as safety belts, lifeline and secure anchorage and supervision by supervisor. However, on the day of accident, investigation revealed that there was no lifeline or secure anchorage found on the roof and no supervisor was present on site when roofing works were being carried out.

- A Fall Prevention Plan (FPP) and Permit-to-Work (PTW) were developed for WAH activities at the worksite. However, the recommended control measures stated in the FPP and PTW were not fully and effectively implemented.

Medium

- At the location where the deceased had most likely fallen from, a bent Z-angle bracket (see picture on left) was observed to be not bolted to the roof sheets. It was probable that the deceased had lost his balance when he stepped on the unsecured Z-angle bracket while laying the aluminium sheet.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none"> • One worker killed.
Type of contact	<ul style="list-style-type: none"> • Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none"> • Worker fell off sloping roof.
Basic cause(s)	<ul style="list-style-type: none"> • Failure to implement fall prevention risk control measures effectively.
Failure of WSH management system	<ul style="list-style-type: none"> • Failure to ensure effective implementation of fall prevention risk control measures so that workers may perform their work safely. • Failure to provide adequate supervision.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is roof installation works. Ensure that risk control measures recommended in the RA are properly implemented and strictly adhered to.
Planning and coordination	<ul style="list-style-type: none">• If fall arrest system is to be used, check for existence and suitability of all lifeline and anchor points prior to the start of roof works.• Ensure that a proper safe work method is established for working on roofs with consideration of the roof's characteristics (e.g., roof material, profile, slope and height) as well as the duration and frequency of work.• Ensure that all lifeline and anchor points are installed and tested in accordance to SS 570: 2011 Personal protective equipment for protection against falls from height – Single point anchor devices and flexible horizontal lifeline systems.• Ensure that adequate and suitable supervision is provided for all WAH activities.• Ensure effective implementation of the Fall Prevention Plan (FPP) and PTW systems.
Edge protection	<ul style="list-style-type: none">• Ensure that edge protection is provided wherever a person is at risk of falling from open sides.• In the case of guardrails system, they must be of good construction, in good condition and be able to withstand the weight of a person (at least 100kg, SS 567:2011 – Code of Practice for factory layout – Safety, health and welfare considerations) applied in any direction at any point.

Safe access and egress	<ul style="list-style-type: none"> • If work on top of a roof is unavoidable, careful planning is required to provide safe and proper means (e.g., by erecting scaffold access) for workers to get to and exit from rooftop work location. • For safer access and work on fragile roofs, the use of crawl boards and roof ladders should be deployed to prevent workers from stepping directly on surface of fragile roof.
Training and awareness	<ul style="list-style-type: none"> • Ensure that workers understand the importance of following recommended risk control measures. Highlight need for workers to anchor their fall arrest safety harnesses to secured lifelines or anchor points at all times when working at heights. Whenever appropriate, consider use of twin lanyard harnesses and 100% tie-off (i.e., at least one lanyard is to be anchored to the lifeline at any time). • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.
Legislative requirements	<ul style="list-style-type: none"> • Ensure that all WAH activities are carried out in accordance with requirements stipulated in the WSH (WAH) Regulations.



FALL FROM SCAFFOLD

CASE 9

FALL FROM SCAFFOLD DURING DISMANTLING

Description of Incident

Two workers erected a tower scaffold on top of a wooden crate to replace faulty overhead light bulbs. After replacing an overhead light bulb, the deceased proceeded to dismantle the scaffold when one of the scaffold member got stuck. He started to kick the stuck scaffold member and in the process lost his balance, fell and struck his head against a steel pipe structure on the ground. He was sent to the hospital and subsequently succumbed to his injuries.



1. Wooden crate tower scaffold was erected on.
2. Steel pipe structure deceased head struck against.

Background

Type of industry	• Construction
Type of work	• Electrical works
Type of trade activity	• Replacement of light bulbs
Occupation of deceased	• Supervisor

Findings

Mission

- The tower scaffold was erected on top on a wooden crate.

Man

- Prior to the fall, the deceased was observed to have removed his safety harness and helmet.

Management

- Although the deceased had previously claimed that he was a qualified scaffold supervisor, no documentation could be produced to substantiate this fact.
- The risk assessment (RA) conducted was generic and did not address the work of erecting and dismantling of scaffold.

Medium

- The area beneath the high bay light was observed to be congested with wooden crates and equipment.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Adopting unsafe work method of dismantling scaffold.• Scaffold was erected on unstable surface.
Basic cause(s)	<ul style="list-style-type: none">• Unsafe and congested work environment.
Failure of WSH management system	<ul style="list-style-type: none">• Failure to provide relevant scaffold-related training.• Failure to conduct effective RA .

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is erecting and dismantling of scaffold for changing of high bay lights.
Planning and coordination	<ul style="list-style-type: none">• Ensure good housekeeping to prevent obstruction and create a safe environment. In this case, good housekeeping should be ensured before erecting the tower scaffold for changing of high bay lights.• Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.

	<ul style="list-style-type: none"> • Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.
Safe Work Procedure	<ul style="list-style-type: none"> • Ensure that all scaffolds are erected on a firm and stable ground to prevent toppling.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights. • Ensure that scaffolds are only erected and dismantled by a trained, competent and authorised personnel. • Ensure that workers understand the importance of using the relevant Personal Protective Equipment (PPE).
Legislative requirements	<ul style="list-style-type: none"> • Ensure that all scaffolds and their components meet requirements stipulated in the WSH (Scaffolds) Regulations.

CASE 10

FALL FROM SCAFFOLD

Description of Incident

The deceased was making preparations to extend a work platform. Another worker witnessed that he removed the anchorage of his safety harness from the scaffold frame, and walked towards the open edge where he lost his balance and fell over the edge of the scaffold. He fell from a height of about 10m and landed on the ground below. He succumbed to his injuries on the spot.



1. Location deceased worker was found after the accident.
2. Platform deceased worker was last seen before the accident.

Background

Type of industry	• Construction
Type of work	• Scaffolding works
Type of trade activity	• Installation and dismantling of scaffold
Occupation of deceased	• Construction worker

Findings

Mission

- While preparing to extend the work platform, the deceased removed the guardrails from the scaffold.

Man

- The deceased was trained as a scaffold erector, he had also completed the Building Construction Supervisors Safety Course and Work at Height Course

for Supervisor, and thus he was supposed to be aware of the 100% tie-off concept and use of safety harness.

- Another worker witnessed the deceased removed the anchorage of his safety harness from the scaffold frame and walked towards the open edge, therefore the body harness and its shock absorber were not deployed.

Management

- Risk assessment (RA) and safe work procedure (SWP) were general and did not specially

address the work of extending work platform carried out by the deceased.

- Permit-to-Work (PTW) system for working at heights was not implemented on the day of accident.
- Safety assessor and authorised manager were not present on site on the day of accident.

Medium

- An open side was observed on transverse side of the external scaffold, after the deceased removed the guardrail.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none"> • One worker killed.
Type of contact	<ul style="list-style-type: none"> • Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none"> • Worker fell from an open side at the transverse side of the external scaffold.
Basic cause(s)	<ul style="list-style-type: none"> • Failure to provide adequate SWP. • Failure to ensure safety harness is anchored.
Failure of WSH management system	<ul style="list-style-type: none"> • Failure to ensure effective implementation of PTW system.

Recommendations

Risk Assessment	<ul style="list-style-type: none"> • Conduct proper RA before start of any work activity. In this case, the work activity is installation of extended work platform on transverse side of the external scaffold. The RA should also identify hazards associated with scaffold modification process.
Planning and coordination	<ul style="list-style-type: none"> • Where applicable, it is recommended to establish and implement PTW system for all WAH activities where a worker is liable to fall.

Safe Work Procedure	<ul style="list-style-type: none"> • When guardrails need to be removed for modification of scaffold, the erector must maintain a 100% tie-off while working. • Safety harnesses must be anchored at all times while working at heights. • All scaffold works must be supervised by a competent scaffold supervisor at all times.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights. • Ensure that workers understand the importance of deploying 100% tie-off when working near open edge.
Legislative requirements	<ul style="list-style-type: none"> • Assess all lifeline and anchor points for suitability and security before use. Ensure that all lifeline and anchor points are installed and tested in accordance with SS 570: 2011 Personal protective equipment for protection against falls from height – Single point anchor devices and flexible horizontal lifeline systems. • Ensure that all scaffolds and related activities meet requirements stipulated in the WSH (Scaffolds) Regulations.



FALL FROM STRUCTURE

CASE 11

FALL FROM OPENING OF A HOPPER

Description of Incident

The deceased and his co-worker were carrying out maintenance work at a concrete batching plant's discharge hopper area in the morning. At about noon, the deceased was found lying motionless on the ground directly below one of the two square openings at the mixer platform of the discharge hopper. The deceased was subsequently pronounced dead by responding paramedics.



1. Close-up view of square opening (grating cover was removed during the accident).
2. Location the deceased fell.

Background

Type of industry	• Manufacturing
Type of work	• Maintenance
Type of trade activity	• Removal of hardened concrete
Occupation of deceased	• Concrete mixing plant operator

Findings

Mission

- The deceased was hacking big blocks of concrete into smaller pieces.

Man

- The supervisor acknowledged that although the deceased had been instructed on the proper method, he had deviated from it and used

the openings as discharge to speed up the process.

- The deceased may have removed the grating with the intention to discharge a piece of concrete debris through it, but fell through the opening in the process.

Management

- Risk assessment (RA) was conducted for the concrete production operations and safe work procedure (SWP) had addressed various risks identified during RA. The SWPs were further supplemented with a maintenance checklist for worker's adherence and supervisor's verification prior to and upon work completion.
- The company had instructed workers to allow the hardened concrete to be collected within the discharge hopper as they were hacked off.

Medium

- Two square openings measuring about 0.6 m x 0.6 m were found on the mixer platform.
- The square opening on the mixer platform should be utilised to hoist equipment parts.
- The square opening also functioned as an inspection window, and normally, operators would remove the steel plate covering the opening and leave the grating intact during visual checks.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Fall through opening.
Basic cause(s)	<ul style="list-style-type: none">• Opening not guarded.• Inadequate supervision.
Failure of WSH management system	<ul style="list-style-type: none">• Failure to ensure adherence to SWP.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• The RA should take into consideration the removal steel plates that workers tend to dislodge for ease of dropping hardened concrete.• If work needs to be done near an opening, additional control measures, such as portable guardrails, must be implemented to prevent a person falling through the opening.
-----------------	---

Planning and coordination	<ul style="list-style-type: none"> • Ensure that all openings that a person may fall through from heights or into depth, are covered and secured with material of adequate strength to prevent accidental dislodging.
Safe Work Procedure	<ul style="list-style-type: none"> • Ensure that all removal of covers for openings are authorised and adequate supervision is provided. • Where applicable, implement a Permit-to-Work (PTW) system. The PTW system helps ensure proper authorisation of hazardous WAH activities, and that a thorough assessment of the effectiveness of control measures implemented.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights. • Ensure that all personnel are trained to use Personal Protective Equipment (PPE) for work at heights and any travel restraint or fall protection system correctly, if identified as part of control measures of your RA.
Legislative requirements	<ul style="list-style-type: none"> • Under the WSH Act, section 15(2), employees should co-operate with employer by adhering to instructions provided, to enable employer to comply with provisions of the WSH Act.

CASE 12

FALL FROM TOP OF ISO TANK

Description of Incident

The deceased was preparing an ISO tank ("Tank A") for testing at the designated periodic test area. Tank A was placed next to another ISO tank ("Tank B"). The deceased was working on top of Tank A and then jumped across to Tank B. Upon landing on the top of Tank B, the deceased lost his balance and fell to the ground. The deceased was sent to the hospital where he later succumbed to his injuries.



1. Deceased jumped from the top of Tank A to the top of Tank B.
2. Position of deceased after he lost his balance and fell from the top of Tank B.

Background

Type of industry	• Logistics and transportation
Type of work	• Container maintenance
Type of trade activity	• Inspection and testing
Occupation of deceased	• Engineering technician

Findings

Mission

- The deceased was doing preparatory work on top of ISO Tank A.

Man

- A co-worker witnessed the deceased jumping across from ISO Tank A to ISO Tank B, lost his balance and fell to the ground.

Management

- The risk assessment (RA) failed to address working on top of ISO tanks at the periodic testing area, where permanent lifelines and access platforms were not available.
- The Occupier had provided all workers with body harnesses and a single 1.5 m lanyard which was inadequate in ensuring 100% tie-off at the periodic testing area.

- The management have failed to provide lifelines at the accident scene.

Medium

- The height from the top of ISO Tank A to the ground was approximately 3.3 m.
- The periodic testing area was an open area without shelter. There were no lifelines and or guardrails provided for working at heights on top of a tank.

- The ISO tanks are equipped with built-in ladders for workers to climb to the top of the tanks. To get from the top of one ISO tank to another, workers have to climb down the ladder and move to the next tank and use its built-in ladder.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none"> • One worker killed.
Type of contact	<ul style="list-style-type: none"> • Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none"> • Fall from top of an ISO tank.
Basic cause(s)	<ul style="list-style-type: none"> • Unguarded open sides. • Fall not arrested. • Unsafe act.
Failure of WSH management system	<ul style="list-style-type: none"> • Inadequate RA.

Recommendations

Risk Assessment	<ul style="list-style-type: none"> • Ensure that RA are conducted for all work activities, including infrequent and/or ad hoc work activities. For this case, working at heights at outdoor work area, falling risks must be mitigated with suitable and adequate control measures, such as proper work platform or portable or fixed overhead anchorage.
Planning and coordination	<ul style="list-style-type: none"> • Where applicable, implement a Permit-to-Work (PTW) system if a person is liable to fall a distance of more than 3 m. The PTW provides a systematic review and authorisation of all hazardous WAH activities to ensure that they can be performed safely.

Safe Work Procedure	<ul style="list-style-type: none"> • Ensure that control measures are put in place to address the risk of workers falling from ISO tanks at the periodic testing area.
Training and awareness	<ul style="list-style-type: none"> • Develop a behavioural safety initiative, such as the WSH Council's "Behavioural Observation and Intervention (BO&I)" to implement safe work procedure (SWPs) and reduce incidence of at-risk work behaviours. • Ensure that all workers are trained to work at heights and adequate supervision is provided.
Legislative requirements	<ul style="list-style-type: none"> • Ensure that lifelines are provided for work that are done at the open sides of ISO tanks and comply with Regulation 8(5) of the WSH (WAH) Regulations.

CASE 13

FALL FROM LIFT LANDING OF A BUILDING

Description of Incident

Two workers were tasked to weld some steel hollow sections at a lift landing on the fifth floor of a building. The deceased was lowering an electrical cable from the eighth floor when he fell over the edge of the lift landing and landed on the first floor. The two guardrails which were used to guard the open side at the lift landing on the eighth floor were also found on the first floor. He was pronounced dead at the scene by attending paramedics.



1. Eighth storey lift landing the deceased fell from.
2. Open side of eighth storey lift landing (guardrails were found at the first storey after the accident).

Background

Type of industry	• Construction
Type of work	• Steel railing installation
Type of trade activity	• Welding
Occupation of deceased	• Construction worker

Findings

Mission

- It was observed that the guardrails were adjusted from its original position using hammers, in order to facilitate installation of steel hollow sections.
- Steel hollow sections installed on both sides of every lift landing are acting as vertical stiffeners.

Management

- A supervisor had allowed for the guardrails to be shifted but requested workers to reinstate the guardrails after installation of steel hollow sections.
- The risk assessment (RA) conducted was general and did not address hazards associated with shifting of guardrails during installation of steel hollow sections.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Worker fell against a pair of unsecured guardrails.
Basic cause(s)	<ul style="list-style-type: none">• Improper work method disturbed integrity of the guardrails.
Failure of WSH management system	<ul style="list-style-type: none">• Improper work method, WSH practices and procedures.• Inadequate RA to address specific work activity.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is installation of steel hollow sections. The RA should also identify hazards associated with adjustment of guardrails.
Planning and coordination	<ul style="list-style-type: none">• Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.

Risk Assessment	<ul style="list-style-type: none"> • Conduct proper RA before start of any work activity. In this case, the work activity is installation of steel hollow sections. The RA should also identify hazards associated with adjustment of guardrails.
Planning and coordination	<ul style="list-style-type: none"> • Where applicable, it is recommended to establish and implement a Fall Prevention Plan (FPP) and Permit-to-Work (PTW) system for all WAH activities where a worker is liable to fall.
Safe Work Procedure	<ul style="list-style-type: none"> • Ensure that guardrails are provided at all open edges where a person could fall. • If guardrails need to be adjusted from its original position, integrity of guardrails must not be compromised after adjustments. Guardrails that are not properly installed may give rise to a false sense of security. • Ensure good housekeeping at all times to prevent slips, trips and falls incidents at all work areas.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.
Legislative requirements	<ul style="list-style-type: none"> • The guardrail system must be of good construction, in good condition and be able to withstand the weight of a person (at least 100kg, see Singapore Standards SS 567: 2011– Code of practice for factory layout–Safety, health and welfare considerations) applied in any direction at any point.

CASE 14

FALL OFF STORAGE RACK

Description of Incident

The deceased was standing on the second tier of a storage rack in a warehouse. He was likely to be reaching out to an A-frame ladder to descend from the second tier of a storage rack to the warehouse floor when he lost his balance and fell off the edge of the rack. He succumbed to his injuries on the same day.



1. Location deceased was last seen.

2. Location deceased had landed.

Background

Type of industry	• Logistics and transportation
Type of work	• Electrical works
Type of trade activity	• Installation of lighting systems
Occupation of deceased	• Partner of company

Findings

Man

- Three A-frame ladders of height 2.4 m, 2.9 m and 5.5 m were found near the accident scene. It was likely that the deceased chose to use the 2.9 m A-frame ladder to access and egress from the second tier of the storage rack.

Management

- Risk assessment (RA) with regards to the use of ladders were developed however, risk control measures recommended were not followed. Some risk control measures included ensuring that ladder was in good working condition, ladder must be held by

another worker and worker should not stand on the last two rungs of a ladder.

Machine

- This 2.9 m A-frame ladder only extended about 0.4 m above the second tier rack, which is insufficient for a handhold.

- The 2.9 m A-frame ladder was not secured while the deceased was using the ladder.
- The 2.9 m A-frame ladder appeared worn out.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Deceased fell from an A-frame ladder.
Basic cause(s)	<ul style="list-style-type: none">• Wrong choice of ladder.• Inappropriate use of ladder (ladder not secured).
Failure of WSH management system	<ul style="list-style-type: none">• Improper work method.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is use of ladders. Ensure that risk control measures recommended in the RA are properly implemented and strictly adhered to.
Safe Work Procedure	<ul style="list-style-type: none">• Ensure that an appropriate ladder is provided and used for the intended task. For example, ladder must be high enough for a worker to reach his work area without having to stretch and stand on its top rung.• Ladders used for access to another level should have at least 1 meter above landing point to provide a secured handhold.• Ensure that base of ladder must be appropriately secured when in use.

	<ul style="list-style-type: none"> • Ensure that all ladders are maintained and stored in accordance with manufacturer's instructions. Damaged ladders must not be used. • Ensure that all ladders are used on firm and stable ground to prevent toppling.
Training and awareness	<ul style="list-style-type: none"> • Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights. • Ensure that workers understand the importance of following recommended risk control measures with regards to use of ladders.
Legislative requirements	<ul style="list-style-type: none"> • Ensure that all ladders and their use meet requirements stipulated in the WSH (WAH) Regulations.



FALL FROM VEHICLE

CASE 15

FALL FROM LORRY BED

Description of Incident

The deceased was using foot support located at the back of lorry to climb down from lorry bed while holding onto the back tailboard as support leverage when the tailboard gave way. He fell backwards onto the ground and hit the back of his head. The lorry driver succumbed to his injuries on the same day.



1. Back tailboard of the lorry.
2. Right panel board of the lorry that was in unlock position.

Background

Type of industry	• Metalworking and manufacturing
Type of work	• Delivery
Type of trade activity	• Loading and unloading of goods
Occupation of deceased	• Lorry driver

Findings

Mission

- The back tailboard was used as a support leverage to climb up and down the lorry.

Man

- The deceased held onto the back tailboard as support leverage when it gave way, causing him to fall backwards onto the ground hitting the back of his head.

Management

- The risk assessment (RA) conducted did not cover work activity of drivers climbing up and down the lorry bed and risks of drivers falling from the lorry bed.
- Safe work procedures (SWPs) were not established for the work activity as well.

Medium

- The right panel board was unlocked and opened to facilitate unloading, it was observed that the left securing lever could have been unlocked and left in upright position, giving a false impression that the back tailboard was locked with the left panel board securing lever when it was not.

Causal Analysis

Evaluation of loss	<ul style="list-style-type: none">• One worker killed.
Type of contact	<ul style="list-style-type: none">• Fall from heights.
Immediate cause(s)	<ul style="list-style-type: none">• Back tailboard not secured.
Basic cause(s)	<ul style="list-style-type: none">• Failure to ensure safe access and egress onto lorry bed.• Failure to provide adequate handhold as support leverage for boarding or getting off lorry bed.
Failure of WSH management system	<ul style="list-style-type: none">• Failure to conduct adequate RA.

Recommendations

Risk Assessment	<ul style="list-style-type: none">• Conduct proper RA before start of any work activity. In this case, the work activity is drivers climbing up and down lorry bed and driver falling from lorry bed.
Safe Work Procedure	<ul style="list-style-type: none">• Ensure that tailboard is securely fastened before workers use it to support ascend and descent from lorry bed.• Open all lorry boards (i.e., back tailboard and side panel boards) whenever possible, when loading and unloading.

- | | |
|--------------------------|---|
| Training and awareness | <ul style="list-style-type: none">• Ensure that all personnel (including workers and supervisors) involved in WAH activities have received adequate safety and health training with regards to hazards associated with working at heights.• Ensure that worker has been briefed on the safe ascend and descent from lorry bed using foot support at the sides and back of lorry and using secured back tailboard or metal bars at the back of driver's seat as hand support. |
| Legislative requirements | <ul style="list-style-type: none">• Ensure that all loading and unloading activities from lorry complies with requirements stated in Regulation 14 of the WSH (WAH) Regulations on safe means of access and egress between different working levels in building or structures. |

Published in April 2017 by the Workplace Safety and Health Council in collaboration with the Ministry of Manpower.

All rights reserved. This publication may not be reproduced or transmitted in any form or by any means, in whole or in part, without prior written permission. The information provided in this publication is accurate as at time of printing. All cases shared in this publication are meant for learning purposes only. The learning points for each case are not exhaustive and should not be taken to encapsulate all the responsibilities and obligations of the user of this publication under the law. The Workplace Safety and Health Council does not accept any liability or responsibility to any party losses or damage arising from following this publication.



