



Construction Industry Council Seminar

External Work Safety

Design for Safety in Maintenance The Hong Kong Housing Authority's Experience

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1. Introduction
2. Design for Workers' Safety, Maintainability and Safety in Use and Operation
3. Three-pronged Approach to Work Safety
4. Conclusion

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Introduction

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- Caring
- Customer-focused
- Committed
- Creative



HA's Vision, Mission & Core Values

Vision

理想

People-centric approach

To help low-income families with housing need to gain access to affordable housing

Mission

工作目標

To provide affordable quality housing, management, maintenance and other housing related services in a proactive and caring manner
Cost-effective and rational use of public resources

Competent, dedicated and performance-oriented **team**

We work in **partnership with Contractors** towards a Common Project Goal

Core Values : 4Cs



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Introduction



- HA develops and implements a public housing programme to meet the housing needs of people who cannot afford private housing
- The HA has an existing stock of about 750,000 public rental flats. Approximately 30% of the Hong Kong population is now living in public rental housing units
- We don't want to have the operation, maintenance and repair of our buildings done at the expense of the safety and health of management, maintenance and repair workers in the maintenance period of the development
- Measures are devised to eliminate, reduce and control the possible risks from planning, design, specification provisions to the operation and maintenance.



2

Design for Workers' Safety, Maintainability and Safe in Use and Operation

Responsibility for assuring safety rests with those who create the risks and those who work with the risks.

2.0 Design for Safety



- Through design for safety, we can **eliminate hazards and minimize the risks throughout the life cycle** of a development including construction, use, maintenance and demolition
- **Getting the design right the first time** is an effective approach to risk management of safety and health
- **Designers** include parties who have **influence in the design decision making of procurement, permanent works, temporary works and maintenance works**, e.g. developer, architect, engineer, maintenance surveyor, facility manager and contractor
- Besides designing out the hazards, designers can **specify control measures to reduce the risks to acceptable levels**



Who is "designer"?

- **Procurement Designer**
 - Client, Project Owner, Developer, Project Manager
- **Designer for permanent works and facility management**
 - Architect, Engineer, Maintenance Surveyor, Facility Manager
- **Designer for temporary works and works execution during construction or maintenance**
 - Contractor, Subcontractor, Expert Builder, Duty Holder for Construction Safety,

2.0 Design for Safety

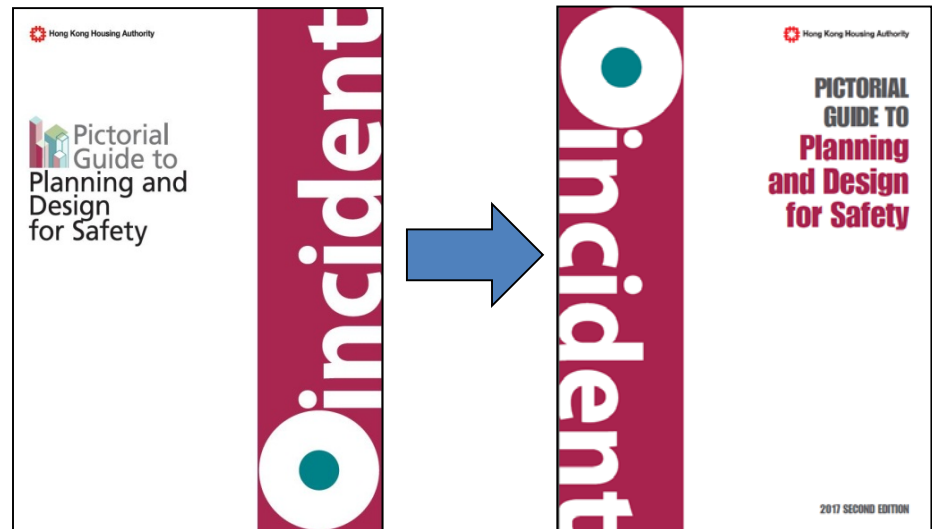


“Prevention is better than cure. **TOTAL SAFETY MANAGEMENT** relies on **teamwork** and the establishment of a **safety culture**. It calls for all designers to consider early the safety aspects of facilities throughout their **life cycle**, and to **design out** potential hazards.



31 March 2010 forum entitled “**From Cradle to Cradle – Workshop on Planning and Design for Safety in Project Life Cycle for Public Housing Developments**”.

Charter signed by stakeholders pledging commitment to observe and drive planning and design for safety.



Pictorial Guide to Planning and Design for Safety published in 2010 was revised to 2nd Edition in 2017. Can be downloaded from <http://www.housingauthority.gov.hk/sitesafety>

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2.1 Total Safety Management



We exercise **TOTAL SAFETY MANAGEMENT** for end users, maintenance and cleansing personnel, and construction workers

- We'll consider the design for **both temporary and permanent elements** to minimize hazards.

Safety and quality go hand in hand

- Carefully plan **execution method** for construction or maintenance works to eliminate, reduce and manage risks to workers.

Prevention is better than cure

- Consider safety aspects for construction, operation, maintenance and management in **planning, design and implementation** stages.

Safety is everybody's business

- Planning and design for safety is a shared responsibility, **TEAMWORK** is important!

2.2 Fostering Safety for Workers in Maintenance Stage



To achieve **TOTAL SAFETY MANAGEMENT** on workplace, both **permanent** and **temporary** works must be carefully designed for **buildability, maintainability and safety in use and operation** through –

1. Eliminating or reducing the exposure to risk of working at height

- a) Air conditioners
- b) Green roof
- c) Vertical greening

2. Designing feature to reduce relying on human behaviour

- a) Access to upper roof
- b) Canopies
- c) Roof of covered walkway and roof top
- d) Roof of footbridge
- e) Building services installations on roof

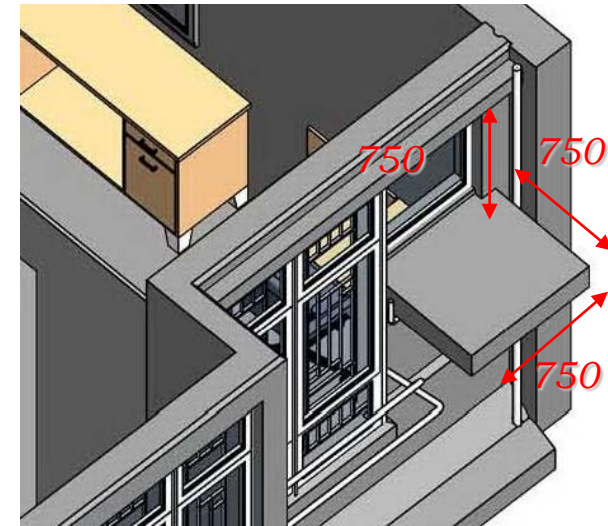


2.2.1 Eliminating/ Reducing the Exposure to Risk of Working at Height

a) Air Conditioners

A/C installation from inside flats –

- Provide A/C hood in living areas and bedrooms;
- Enlarge A/C window and A/C hood to allow choice of units (window type or split type);



2.2.1 Eliminating/ Reducing the Exposure to Risk of Working at Height

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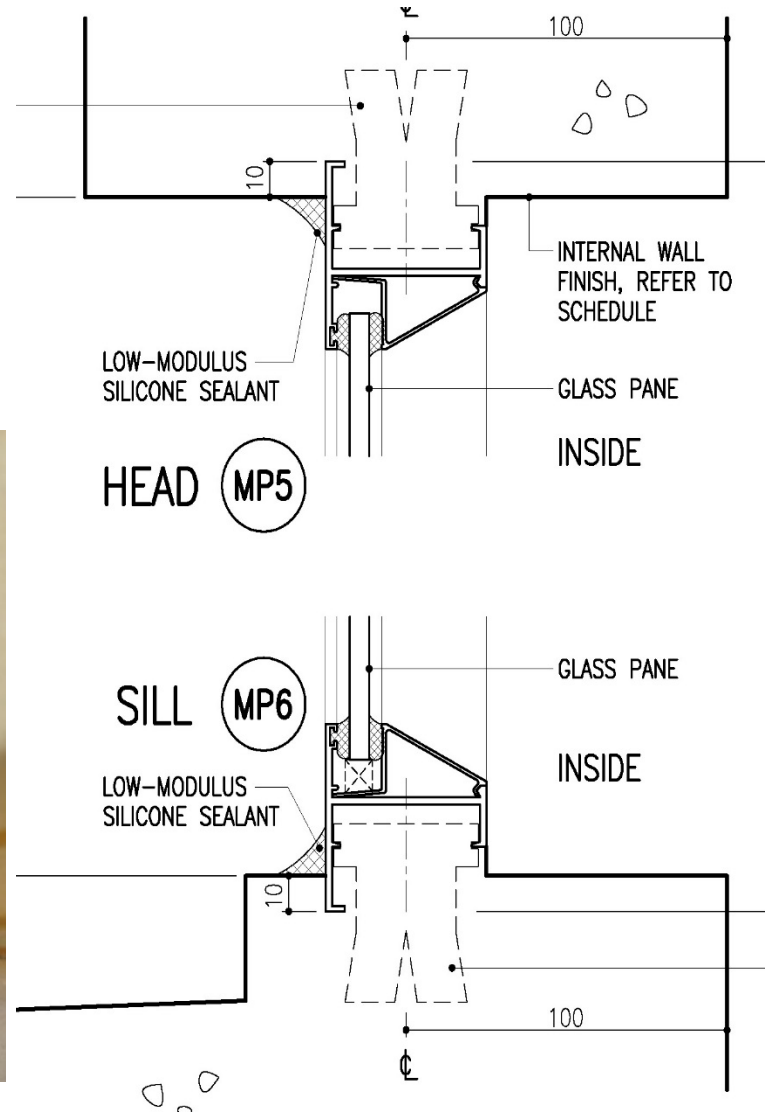
a) Air Conditioners (cont'd)

A/C installation from inside flats –

- Locate condensation pipe close to openable window.

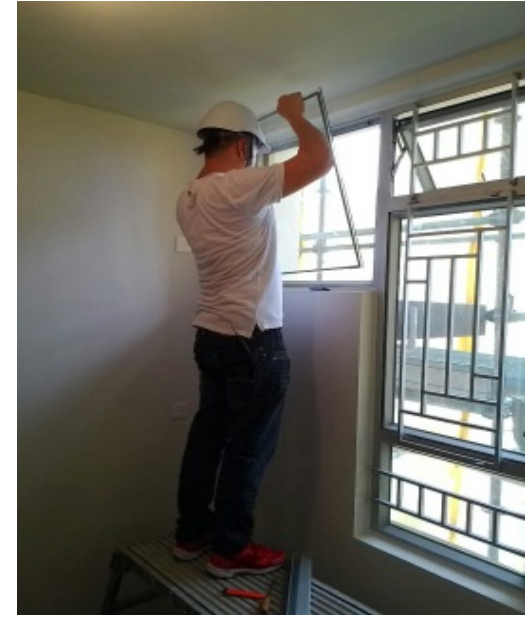
Glazing from inside –

- Glazing bead and glass panel easily dismantled from inside.



2.2.1 Eliminating/ Reducing the Exposure to Risk of Working at Height

a) Air Conditioners (cont'd)



Glazing from inside –

- Facilitate installation and maintenance work of air conditioners from inside.
- Obviate the need of truss-out scaffolding
- Reduce risk of working at height
- Reduce manpower and material for work platform erection
- Improve work efficiency
- Save cost of installation and maintenance work

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2.2.1 Eliminating/ Reducing the Exposure to Risk of Working at Height

a) Air Conditioners (cont'd)

That is why HA can refrain from installing the anchors on external walls

- Both window type and split type air conditioners can be accessed from indoor for installation and maintenance work
- Openable window on one side of the A/C opening also facilitates the installation and maintenance of air conditioners



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2.2.1 Eliminating/ Reducing the Exposure to Risk of Working at Height

b) Green Roof

4 ways for access & reduce need of working at height

- Choice of plant material with low maintenance species, e.g. drought tolerant type
- Automatic irrigation system
- Metal scaffolding
- Fall arrest system



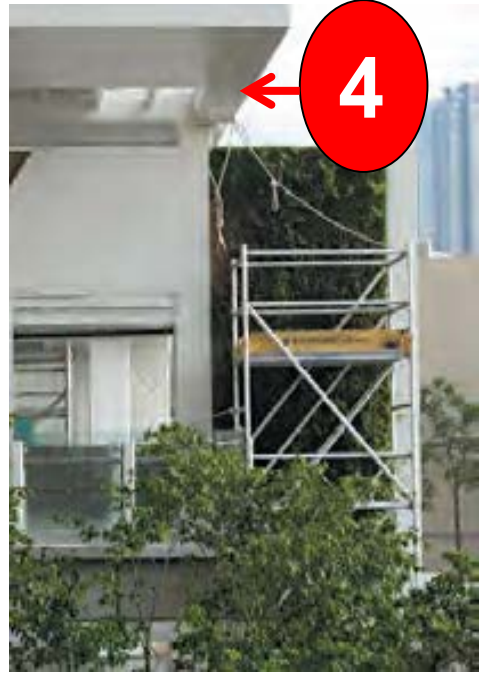
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c) Vertical Greening



Ways for access & reduce need of access

- 1. Automatic irrigation system
- 2. Steel scaffolding with working platform
- 3. Concrete plinth for setting of the scaffolding
- 4. Hoisting beam for vertical transportation of material





a) Access to Upper Roof

Stairs with railing are provided to top of roof structure wherever possible



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a) Access to Upper Roof (cont'd)

Cat ladder

- Use cat ladders only where stairs are impractical
- Locate cat ladder away from the building periphery to prevent accidental fall of equipment
- For cat ladder exceeding 2.5m, provide safety loops at spacing of 0.9m to protect workers from falling down

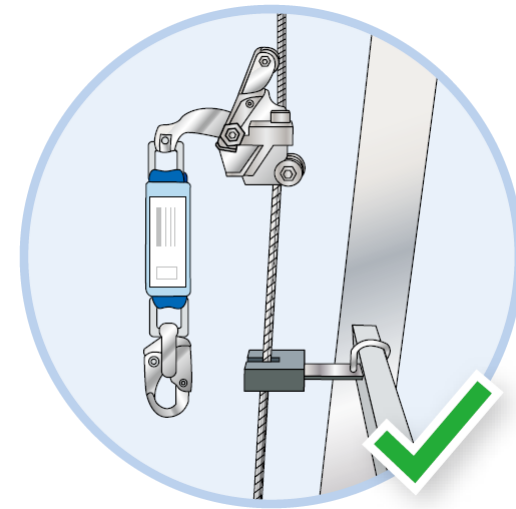
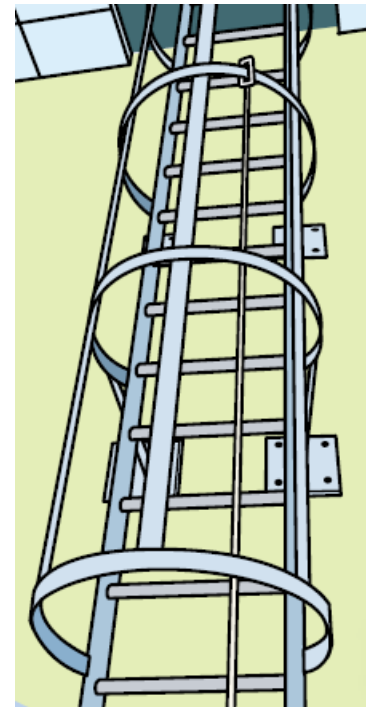




a) Access to Upper Roof (cont'd)

Cat ladder

- Access to cat ladder to be free from obstacles, e.g. water pipes
- Provide metal cover plate to the bottom steps to avoid unauthorized use
- First step of cat ladder to be not too high from finished floor level
- Intermediate resting platform for cat ladder with excessive height
- Vertical fall arresting device for cat ladder exceeding 3m in height





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a) Access to Upper Roof (cont'd)

Cat ladder

- Provide railing of adequate height at the top landing





a) Access to Upper Roof (cont'd)

Provide **suspended steel platform** for safe access to services for operation and maintenance of the services



Provide **steps** and **platform** over services to prevent slipping or tripping. They should be removable for maintenance





b) Canopies

Railing and Locked Access

- Provide **railing** to floor edges of canopy to prevent accidental fall.
- Provide **locked access** from inside the building **at the same level** to the flat roof and then the canopy



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b) Canopies (cont'd)

Where **level access** and **railing** are not possible, provide effective alternatives such as cat ladder and fall arrest system



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b) Canopies (cont'd)



Fall arrest system

- **cannot be close to the edge** as the fall arrest distance will be inadequate
- To comply with relevant BS EN **standard 795**
- Rely heavily on **human behaviour** of worker to attach lanyard to lifeline
- Demand **close supervision** of contractor for strict compliance of workers with safety rule
- Requires **examination** of the system
- Requires **replacement of components** if the system has been subject to impact load



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c) Roof of Covered Walkways and Roof Top

Provide **railing** to prevent accidental fall.



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d) Roof of Footbridge



Provide **railing** to prevent accidental fall



Where railing is not possible, **fall arrest system** is provided as alternative



Fall arrest system is provided at planter on both sides of the footbridge

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e) Building Services Installations on Roof

Permanent working platform

- Provided with railings, toe-boards and access ladder for repair / maintenance of chillers on roof



Safe Access

- Safe and easy access for repair / maintenance of cooling towers on the roof



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Three-pronged Approach to Work Safety

Good practice for reducing risks in site operations and assuring safety of workers

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Overview of Measures

Three-pronged approach promoting site safety

1. Procurement strategy and performance monitoring mechanisms with incentives and sanctions
2. Strengthening contract requirements and administration
3. Research, training and promotion

Through our routine channels :
Affect input of resources of
contractors /
service providers

Employer :
Contractors /
Service
Providers

Workers in
Supply Chain

(1) Procurement Strategy and Performance Monitoring Mechanisms with Incentives and Sanctions



Contractors are driven to achieve **high standard of site safety** under stringent safety performance monitoring mechanism and regulatory action in HA's Procurement System -

- (a) Adopt **list management** to assess qualifications and performance of contractors
- (b) Require contractors to **comply with OHSAS 18001**
- (c) **Quarantine contractors** in tender evaluation if they are involved in serious accidents
- (d) Consider contractor's **PASS performance and corporate score** in tender evaluation
- (e) Implement **Housing Authority Safety Auditing System (M&I)**
- (f) Implement **Surprise Safety Inspection System** [focusing on truss-out scaffold]
- (g) Incorporate **safety audit performance into MASS**
- (h) Take **regulatory action** against contractors on account of unsatisfactory site safety performance
- (i) Link **MASS with Pay for Safety Scheme**





- Design contract requirements to promote best practices, **over and above** legal requirements

Enhance safety awareness
提升行業的安全意識

Improve physical conditions on site
優化工地的工作環境

Strengthen site and safety management
鞏固工地和安全管理





a) Light Duty Working Platform

Light duty working platforms are specified in New Works and Maintenance Works Contracts to provide **safe workplace for workers to work at height**.

- Step platform



- Hop-up platform



- Tower working platform



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b) Mobile Elevating Work Platform

- Check validity of **statutory form** (Form 1, 4 & 5)
- Only operated by **trained and experienced personnel**
- Wear safety **helmet with chin strap**
- **Fencing off** the works area
- Attach **safety harness** to designated anchor point
- Check the **emergency brake**





b) Mobile Elevating Work Platform (cont'd)

MEWP are used by tree risk assessment consultants and soft landscape contractors to conduct tree assessment, tree surgery or tree removal works.



3.1 Providing Safe Working Platform and Access



c) Bamboo Scaffolding Working Platform

- Closely planked working platform with top and mid rails, toe board and protective net to prevent fall of person and object
- Safe access to scaffold
- Anchor bolt for independent lifeline with safe working load indicated for bamboo scaffolder
- Steel brackets of truss out scaffolding fixed to external wall with 3 bolts

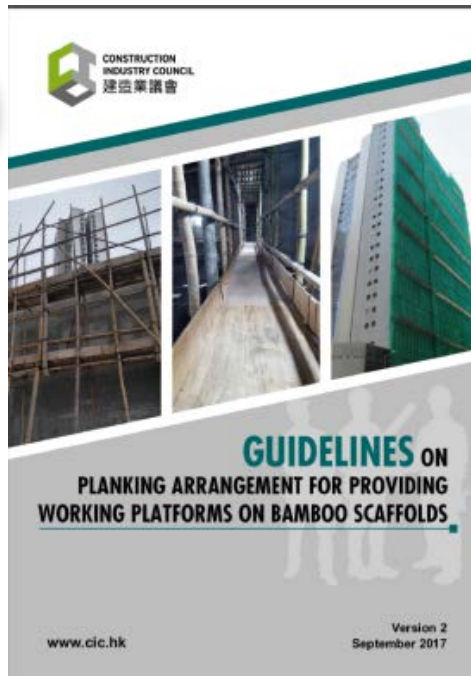


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c) Bamboo Scaffolding Working Platform (cont'd)

- In line with **CIC's Guidelines on Planking Arrangement for Providing Working Platforms on Bamboo Scaffolds**
- CIC is promoting on use of **closely boarded bamboo scaffold**
- Bamboo scaffolding companies with less than 50 employees to undertake bamboo scaffolding works in new works are to be **certified under OSH Star Enterprise – RMAA Safety Accreditation Scheme** with a grace period up to 31 December 2017

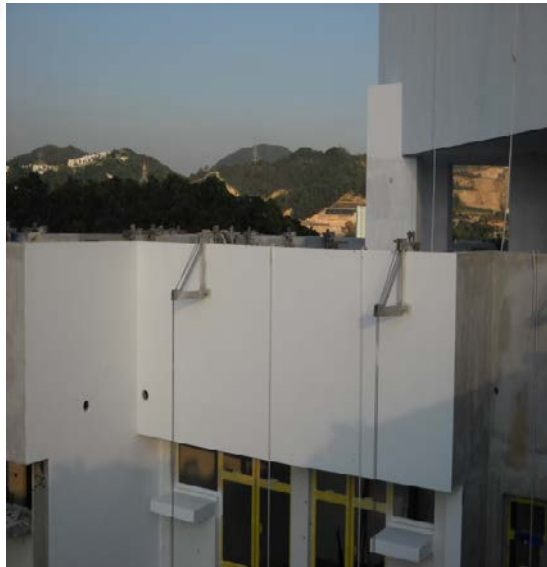




d) Gondola Anchorage, support and wire ropes

- **Roof parapet** is **designed** to provide adequate structural strength for fixing the clamp and support gondola installation
- **Safe access** to parapet for installation of gondola
- One **waterproofing 32A 3-phases socket outlet** for power supply to gondola
- Require contractor to attach **weight** to keep safety rope in taut condition

outriggers, davit arm, parapet wall clamp



Protection to independent lifeline over parapet edge



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3.2 Preventive Measures Against Falling Objects



Precautionary measures to prevent falling objects are specified in New Works and Maintenance Works Contracts. Here are some examples:

a) Chin Strap

- prevent falling of safety helmet



b) Waist Tool Belt and Hand Strap

- For proper storage of hand tools and prevent falling object



c) Catch Fan and Safety Net



d) Protective Screen



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3.2 Preventive Measures Against Falling Objects



e) Covered Walkway



f) Fencing off the works area



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(3) Research, training and promotion

Organise Safety Forums, Seminars, Workshops & Awards for **promotion of site safety measures and awareness**



Foster stakeholders engagement and safety awareness through safety forum, workshop and charter

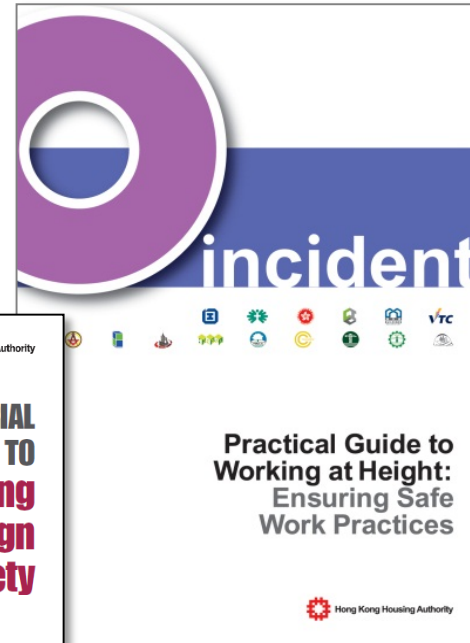
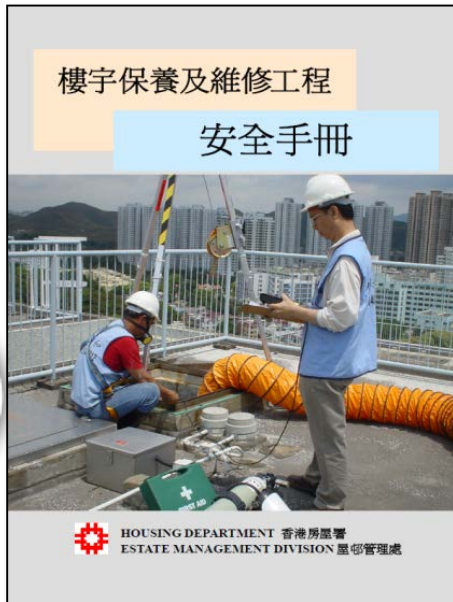
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(3) Research, training and promotion

Publish Safety Handbooks, Pictorial Guide, Good Practice Promotion Kit, Safety Guidelines for **enhancement of safety awareness of frontline personnel for working at height in works contracts**



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Conclusion

We **protect lives** and **prevent injuries**.

We exercise **TOTAL SAFETY MANAGEMENT** for end users, maintenance and cleansing personnel, and construction workers.

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Prevention is better than Cure

Control the risk at Source effectively
will improve work performance at height

Safety is not an act; it is a habit and, it is
a culture....it takes time to nurture.

Thank You!



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