Construction Industry is not only a major industry, but also an industry with many serious industrial accidents in Hong Kong. Although the number of accidents in the industry was reduced when compared with that in early 1990s, the number is still significant. Most of the fatal industrial accidents in Hong Kong were happened in the construction industry, and fall of person from height is the major cause of these accidents.

高聳工作實踐安全措施的優先次序 Priority of Safety Measures for Working at Height

I. 棧架安全 Scaffold Safety

竹棚 Bamboo Scaffold

香港建造業普遍使用竹棚，棚架穩固有賴搭棚工人的技術和經驗，所採用材料之力度、表面狀況和可用壽命等都會對棚架的安全構成重要的影響。另一方面每年從棚架跌下，或被從棚架墜下的物件所擊中之傷亡意外為數不少。傷亡者不單是搭棚工人，也包括棚架使用者，如：泥水匠、裝窗工、油漆匠、水喉匠及金屬工等。

Bamboo scaffolds are used commonly in HK Construction Industry. Scaffolders' skills and experience and the strength, patent situation, useful life, etc. of the materials used will affect the stability and safety of the scaffold. There is significant number of cases of fall of person from scaffold and struck by object fall from scaffold. Victims are not only the scaffolders but also the scaffold users, e.g. cementers, window installation workers, painters, plumbers, metal workers, etc.
為了減低意外，用竹棚時應注意以下的安全事項：
Measures below should be implemented to reduce accidents:

- 搭棚工人須曾經接受安全訓練及指導，包括竹棚的安全搭建及拆除方法；
  Provide training and instruction to scaffolders, including the safe erection and dismantling of scaffold;

- 評估竹棚 / 工作台的最高負重額；
  Determine the maximum loading of the scaffold / working platform;

- 以堅韌之竹支為支杆使棚架稳固地連繫於建築物；
  Use tough bamboo as strut to securely connect the scaffold to the structure;

- 棚架須設置安全進出口的設備；
  Provide safe means of access and egress;

- 經常檢查竹枝及尼龍繩或竹繩，確保良好，沒有破裂或鬆脫。
  Regular inspection on bamboo and nylon / bamboo strips to check for any defects and loosen situation.

金屬棚架 Metal Scaffold

使用直角聯結器把圍欄的角位連接
Use right angle coupler to fix ledgers to standard

使用雙向聯結器把企鵝連接在框架上
Use sleeve couplers to fix standard to the scaffold

圍欄 Guard-rail
轉繩聯結器用在圍欄的邊位上
Use swivel couplers at the joint

直掛樑 Longitudinal brace

獨立式的雙行金屬棚架
Free-standing double-row metal scaffold

使用金屬棚架作為高空施工措施越來越受歡迎。主要是它的質量可以控制及其壽命較竹棚長。搭建金屬通欄方面較竹棚的技術較為容易掌握，但它在檢查方面亦有一定的標準。

Metal Scaffold becomes more popular in the industry because of its controllable quality and longer useful life than bamboo scaffold. Creation of metal scaffold is more easy to control than bamboo scaffold and there are standards of inspection to follow.
使用棚架的安全要點 Safe Use of Scaffold

- 如工人須要在棚架上工作，一定要在雙行棚架上搭起適當的工作台；
  Suitable working platform constructed on double-row scaffold should be provided for
  workers if they need to work on the scaffold;
- 架設、擴建、更改或拆除棚架須由經驗充足的
  The erection, addition, alternation and
dismantling of scaffold should be done
  by the trained workmen with adequate
  experience and under the supervision of a
  competent person;
- 只有樓宇或建築物的堅固及穩定部份才可用作
  Only the solid and steady point of the building
  or structure should be used for supporting the
  scaffold and the related facilities;
- 在下列情況下，棚架須由合資格人士檢查：
  The scaffold must be inspected by the
  competent person under the following
  situations:
  - 首次使用前；
    before use for the first time;
  - 擴建、拆卸或更改後；
    after addition, dismantling and alteration;
  - 經天氣影響其強度或穩定性或移位後
    after weather conditions likely to
    have affected its strength or stability
    or to have displaced any part;
  - 使用前14天之內
    14 days immediately preceding each use.

須安裝900至1150mm高的護欄及450至600mm高的中護欄
Install a top guard-rail height from 900 to 1150mm and an intermediate guard-rail height from 450 to 600mm

須加設最少高200mm之底護板（踢腳板），以防人體或物件墜下
Toe-boards of not less than 200mm shall be installed to prevent falling of persons and materials

木板末端伸出支承點之距離應少於150mm
Boards should not protrude beyond its end support to more than 150mm;

寬度最少400mm（如須運輸物料，應最少650mm）
Width of platform should be
at least 400mm (or 650mm for
transportation of materials)
搭建棧架的安全事宜 Safe Erection of Scaffold

- 所有棧架應垂直地建在堅固的地基上；
  All scaffolds should be vertically erected on solid ground;
- 除非在堅固之石屎地面，否則必須使用腳枕以增加承托面積；
  Use sole plates to spread the load unless the scaffold is erected on solid concrete ground;
- 底掌必定要裝上，並座在腳枕中央位置上；
  Base plates should be used and each plate should rest on the center of a sole plate;
- 如棧架搭建在傾斜的地面，應防止其滑移。
  Prevent displacement of scaffold if it is erected on inclined surface.

安全的例子 Safe Practices

安全的例子 Safe Practices

- 足夠強度的直杆以支撐負重
  Standard with adequate strength to support the load
- 加添腳枕
  Use sole plate

不安全的例子 Unsafe Practices

- 破壞木料
  Broken wooden plate
- 石屎磚頭
  Concrete brick
- 跨在溝渠上
  Over the drain
- 沒有底掌
  Without base plate

安全的例子 Safe Practices

安全的例子 Safe Practices

- 傾斜的橫杆
  Inclined ledger
- 直角聯結器
  Right angle coupler
- 直杆裝上底掌並座
  Base plate equipped at standard and rested on the center of sole plate

不安全的例子 Unsafe Practices

- 腳枕沒有完全嵌入斜坡上
  Sole plate not completely embedded into the slope
- 直杆沒有完全裝上底掌
  Standard not equipped with base plate
- 底掌沒有座在
  Base plate not rested on the center of sole plate
II. 工作台安全 Working Platform Safety

活動搭式通架 Mobile Metal Scaffold

- 通架的高度與最小底邊長度比率應限於3.5(室內)或3.0(室外)；
The height to least base ratio of the mobile metal scaffold should be not more than 3.5 (indoor) or 3.0 (outdoor);
- 在強風及惡劣天氣時不宜在室外使用；
Scaffold should not be used outdoor in strong wind and adverse weather condition;
- 通架腳部之滑輪必須鎖好以防止該通架在使用時移動；
Castors should be locked to prevent displacement when the scaffold is in use;
- 當有人在通架工作台上時，切勿移動該通架；
Never move the scaffold if someone is on the platform;
- 斜撐必須依照計劃所定下之程序使用，以確保該通架穩固。
Rakers should be used in accordance with the planned procedure to ensure the stability of the scaffold.

電動升降的工作台 Mobile Elevated Working Platform

- 工作台必須由註冊工程師設計及檢驗；
Platform should be designed and examined by registered engineer;
- 工作台在使用時之負重，不得超過所檢驗之安全操作負荷；
The actual load on the platform during work must not exceeds the certified safe working load;
- 操作員應根據製造商之書寫指引操作工作台的升降；
Operator should follows the written instructions from the manufacturer to operate the platform;
- 須在工作台裝置護欄及踢腳板(參考“使用鋼架的安全要點”)；
Install guard-rails and toe-boards at working platform (refer to "Safe Use of Scaffold")
- 任何工作台之豎立、拆卸或更改均必須由合資格人員監督才可進行。
Competent person to supervise the erection, dismantling and alteration of platform
懸空工作台 - 吊船 Suspended Working Platform - Gondola

懸空工作台是吊機之一種，通常用以承載員工於多層建築物的窗戶進行清潔工作、外牆建造或維修工程。大部分涉及吊船的意外原因可以歸納如下：

Suspended Working Platform is a lifting appliance for carrying worker to facade of building to conduct cleaning, construction or maintenance work. Accidents involving it are basically caused by:

- 吊船發動機失靈
  Failure of lifting appliance
- 懸吊升降台的鋼纜出現問題
  Failure of suspension ropes
- 吊船超載
  Overload
- 繫定點不穩
  Unsecured anchorage point
- 吊船護欄不當
  Inappropriate guard-rail
- 操作吊船時出現人為錯誤
  Human error during operation of platform

吊船之四纜索系統 Four-rope System

四纜索系統共有四條鋼纜，除兩纜索系統所具備的兩條吊索外，還有兩條後備的安全纜，各附防墜制動器，防止吊船下墜或傾斜。

Four-rope system includes two suspension ropes and two extra safety ropes. Fall arrester is equipped at each safety rope to prevent falling or tilting of suspended working platform.

使用吊船的安全要點 Safe Use of Suspended Working Platform

- 懸吊工作台之結構須牢固；
  Platform must have solid construction;
- 須裝置護欄及踢腳板 (參考「使用棚架的安全要點」)；
  Platform must have guard-rails and toe-boards (refer to "Safe Use of Scaffold")
- 懸吊設備應箱固於天台之上；
  Lifting appliance should be securely fixed at the roof to ensure the stability of the platform;
- 吊船上的人員須配戴安全帶並繫於獨立救生繩上；
  Each person on platform must wear safety belt that attached to an independent lifeline;
- 按期執行規定之測試、檢驗及每週檢查。
  Conduct the mandatory test, examination and weekly inspection.
工作台的進出路 Means for Access and Egress of Working Platform

- 必須設梯子或其他適當設備，使工人可沿梯上落工作台；
  Provide ladder or other suitable facilities to enable workers to access the working platform;
- 梯子的角度，即垂直線與水平線的比例，應不大於4比1；
  The angle of rest (ratio of vertical plane to horizontal plane) of ladder should not exceed 4:1;
- 梯子應設最頂的著地點高出最少1米作為扶手；
  Ladder should rise at least 1m above the step-off point as handhold;
- 梯架的進出梯子，應穩固地固定於梯架結構上；
  Scaffolds with ladders as a mean of access and egress should have the ladders securely fixed to the scaffold structure;
- 扶梯架和樓梯架的著地點須完全舖滿木板，並設有合適的踢腳板和圍欄。
  The landing places of ladder and staircase must be completely and closely planked and with suitable toe-boards and guardrails.

木斜梯 Wooden ramp

通往梯架內的梯子 Ladders for accessing to scaffold

轉鎖國結器 Swivel coupler

裝上自動開閉設備的門 Door with self-closing device

通往梯架內的梯子並裝上自掩門 Ladder for accessing to scaffold with self-closing cover

通往梯架內的梯子並裝上自掩門 Ladder for accessing to scaffold with self-closing cover

最多開600mm Maximum width is 600mm
III. 梯的安全使用 Safe Use of Ladders

使用直梯的安全要點 Safe Use of Straight Ladder

- 直梯必須以適當的角度靠向承托物，角度太大或太小，都會影響梯子的平穩性；
  Straight ladder should have an appropriate angle of rest to the supporting material, or its stability will be affected;
- 直梯必須牢固於承托物上，若無法將梯子綁牢，應有人在梯下參扶；
  Ladder should be fixed on the supporting material, or if impracticable, secured by a second person at the bottom;
- 直梯的頂部應伸高於目的高度約一米作為扶手之用；
  Ladder should rise at least 1m above the targeted height as handhold;
- 使用直梯前必須檢查梯邊及梯橫檔有否爆裂、梯檔有否折斷及防滑梯腳踏有否鬆脱或失去等。
  Before use, check to ensure the side rails and rungs have no crack and damage and the anti-slip caps at bottom are present and firmly attached to the ladder.

使用人字梯的安全要點 Safe Use of Step Ladder

- 使用人字梯前應檢查人字梯的接合是否太鬆或有損壞，拉桿是否充份張開等；
  Before use, check the hinge to ensure no loose or damage, check the spreaders to ensure they are fully extended, etc;
- 人字梯頂不應擺放太多工具雜物，工具應整齊地放於工具箱或盤內；
  Avoid placing many tools on the top of step ladder. Toolbox or tray should be used to contain the tools;
- 不應站於人字梯之頂上工作，頂部應留出最少兩級的高度。
  Don’t stand on the top of the step ladder, i.e. at least two steps should be reserved.
IV. 防止人體下墮措施 Prevent Fall of Person

安全網 Safety Net

在高空工作時，如果環境不容許工作地點安裝稳固的工作台及圍欄，負責該工地之承建商必須搭建及維持合適之安全網，以防止人體墜下而受傷。但應記著設置及拆除安全網的工作，本身已是一項有潛在危險的操作。因此這項工作必須小心策劃及監督，並由曾受適當訓練的員工進行。

For working at height, the contractor responsible for the site must provide and maintain a suitable safety net when the provision of secure working platform and guard-rails are impracticable, to prevent injury by fall of person. The installation and dismantling of the safety net are hazardous. Therefore these processes should be carefully planned and supervised, and should be conducted by workers with adequate training.
安全帶 Safety Belt
在高空工作時，若因特殊環境下不能夠在工作地點安裝穩固的工作台及圍欄，配戴安全帶可作最後考慮的防止人體下墜措施。
For working at height, the use of safety belt should be the last resort to prevent fall of person when the provision of secure working platform and guard-rails are impracticable.

背套式安全帶 Safety Harness
背套式安全帶有帶、套、扣等，適當地安排結合起來承托著個人的身體。因此當人體下墜時能將下墜力分佈於整個身體上，使用者所受的傷害將會大大減低。
Safety harness is composed of straps, buckles, etc, with appropriate combination to support the body of worker. When a person is falling, safety harness can distribute the resulting force to whole body, in order to reduce the impact to its user.

1 肩膊帶 Shoulder Strap
2 輔助帶 Secondary Strap
3 坐帶(主帶) Sit strap
4 大腿帶 Thigh Strap
5 限制工作範圍的背部支撐 Back support for work positioning
6 調較零件 Adjustment element
7 抗墜環 Fall arrest attachment element
8 扣 Buckle
9 印字 Marking

背套式安全帶的其他附件 - 防墜緩沖器 Component of Safety Harness - Fall Arrester
防墜緩沖器專門與獨立救生縄並用，當配帶者失足下墜時，利用跌速產生磨擦打開鎖掣將配戴者的跌速減慢，繼而鎖停在獨立救生縄上。
Fall arrester is used with the independent lifeline. When the harness user is falling from height, the friction between the arrester and the lifeline resulting from falling will trigger the lock of the arrester. As a result, the falling speed of the harness user will be greatly retarded and then the fall arrester will be locked firmly on the lifeline.
懸掛、攀登安全帶 Suspension Safety Belt & Climbing Safety Belt

懸掛、攀登安全帶主要是採用一種可動的安全帶裝置，這種装置主要採用一種特別之活動連接器，將安全帶連接於一條獨立救生繩上，通常由上方垂下，或有固定垂直的軌道或鋼纜配合防止下墜器的使用。

Suspension and climbing safety belts are a kind of the mobilized safety belt device. The device has a special linkage for connecting the safety belt to an independent lifeline mounted at an anchorage above the working surface, or to a vertical rail or sling. The device is used together with the fall arrester.

安全帶之正確使用 Correct Use of Safety Harness

- 安全帶吊應扣在用者上方以確保下墜時為最短距離(高掛低用)；
  The hook of the safety belt should be attached to an anchorage above the user to reduce the falling distance;

- 安全帶吊應扣在一堅固的繫點上；
  The hook of the safety belt should be attached to a secure anchorage;

- 救生繩：須繫於堅固的地方
  Lifeline - should be anchored on secure anchorage

- 連接安全帶與救生繩之裝置；當人體下墜時，此裝置能立即將救生繩夾緊
  Device for connecting safety belt and lifeline - will be triggered immediately to lock firmly on the lifeline when a person is falling

- 適用於大範圍工作的特別安全帶裝置
  Safety belt device suitable for large working area

- 安全帶的防墜器應扣在一獨立救生繩上；
  Fall arrester of the belt should be attached to an independent lifeline;

- 安全帶上的各種配件不得任意拆除；
  Don't remove any components of the safety belt;

- 安全帶要有定期及使用前檢查，檢查時應著重有否磨損及破裂等。
  Inspection on safety belt should be conducted regularly and before use. Any wears and tears, etc., of the belt should be identified.
減少踏著或碰著物件的意外
Reduce Accident of Stepping on or Struck by Object

安全鞋 Safety Shoes

根據每年建造業的意外分析顯示，工人常會因為踏著或碰著物件及滑倒而受傷，
穿著安全鞋是其中一種有效的保護方法。
Indicated by the annual analysis on construction accidents, stepping on or
struck by objects and slip are major causes of injuries. The use of safety shoes is
one of the effective measures to protect the workers.

鞋頭鋼帽 Steel Toecap
保護腳趾免被撞傷或壓傷，有耐蝕性能及可抵抗達到200焦耳的撞擊
Protect toes against striking or pressing, resist to
corrosion and have at least 200J impact resistant
capacity

鞋底鋼片夾層 Steel Midsole
防止鞋底被釘或硬物刺穿，有耐蝕性能。
不能有多於三個3mm直徑的鑽孔，而鑽
孔的位置是不能在鞋頭範圍內。
Prevent penetration of sole by nail or
sharp object, and resist to corrosion.
There should be no more than three
3mm diameter holes, and holes cannot
be made at the front half of the sole.

防滑膠底 Slip Resistant Sole
防滑膠的闊度設計及直角邊緣使鞋
底更貼近地面
Adequate surface width and right
angle edge of slip resistant materials
increase the contacting area between
the sole and the ground

防滑膠之間的槽位是可以將液體
散開產生防滑作用
Intervals of the sole can split the
liquid to achieve slip resistance

防滑膠的角落保持少許弧度以防止塵土的積聚
Prevent the accumulation of dust by round
angle at the bottom of the slip resistant
materials