竹棚架
工作安全守則

勞工處分區職業安全主任(技術支援組)
謝俊明先生

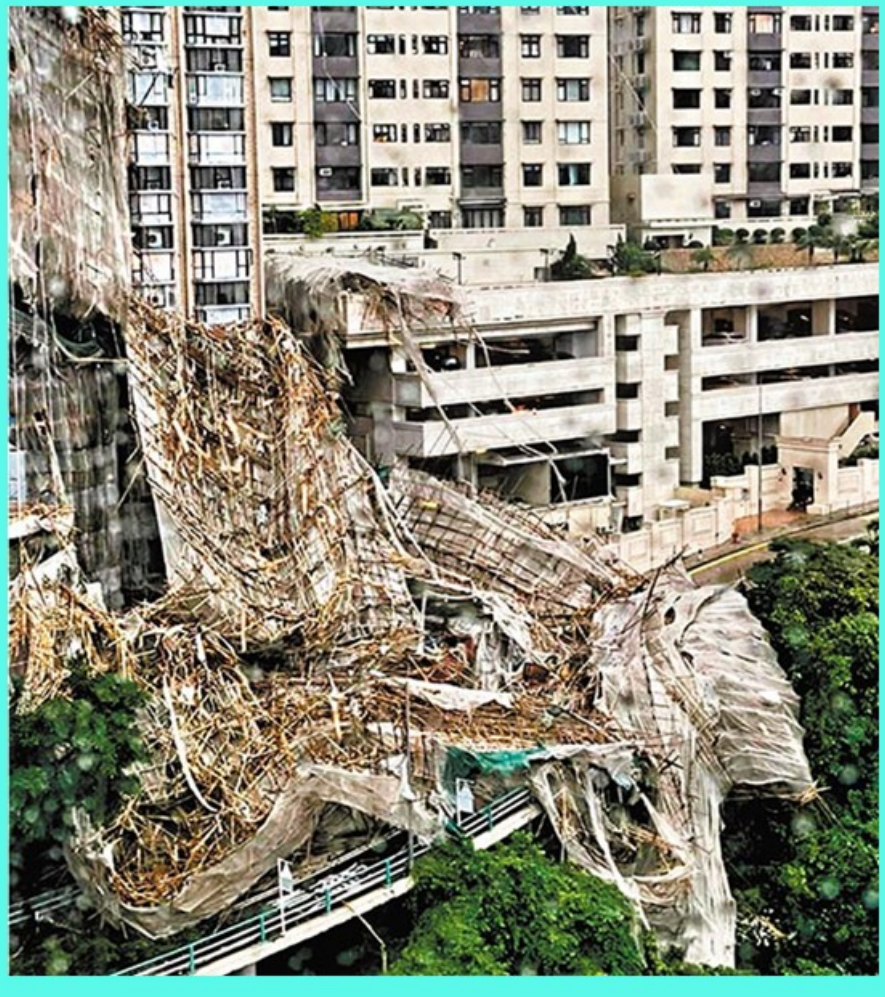
地盤建造中樓宇所搭建的竹棚架

樓宇維修使用的竹棚架

竹棚架之工業意外

在一幢興建中樓宇的一幅竹棚架突然塌下

引致二死三傷



在惡劣天氣下

一幅100米乘150米巨型
維修棚架在狂風暴雨中
倒塌

引致一死一傷

懸空式竹棚架（吊棚）之工業意外

一名工人在外牆搭建懸空式竹棚架

在狗臂架上搭工作台時，其中一個狗臂架從外牆鬆脫

懸空式竹棚架之工業意外

懸空式竹棚架之工業意外

牆身材質
外牆灰泥

沒有足夠承載力

竹棚架工作安全守則

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中文

https://www.labour.gov.hk/tc/public/content2_8.htm

https://www.labour.gov.hk/chs/public/content2_8b.htm

英文

https://www.labour.gov.hk/eng/public/content2_8.htm

最新修訂內容

- a)修訂竹棚架“進出口”、“支撐”和“連牆器”的要求
- b)訂明就懸空式竹棚架曾受訓練的工人的要求及其工作範圍
- c)加入懸空式竹棚架的技術要求
- d)加入合資格的人的工作及在惡劣天氣前進行檢查的要求

目錄

1. 引言

本竹棚架工作安全守則乃由勞工處處長根據**香港法例第59章《工廠及工業經營條例》第7A條**規定所發出，為《工廠及工業經營條例》第6A及 6B條及《建築地盤（安全）規例》的各項規定就搭建架設、相當程度上的擴建、更改、拆卸及使用**竹棚架的安全提出實務指引**。

本工作守則具有**特殊的法律地位**。雖然**不遵從**本守則所載的任何條文本身**並不是罪行**，但在**刑事訴訟中**，法庭可接納這種行徑為**有關因素**，用以**裁定**某人**是否觸犯**《工廠及工業經營條例》下**有關的安全及健康法例**。

2. 釋義

主要講述本工作守則內的詞語涵義，其中包括關於“合資格的人”同“曾受訓練的工人”的資格及資歷要求等。

3. 本港有關安全搭建竹棚架的主要安全及健康法例

有關竹棚架安全的法定條文摘要。例如《工廠及工業經營條例》、《建築地盤（安全）規例》等。

對於所提述的法定條文詳情，請參閱有關的條例及規例。

電子版香港法例網頁
https://www.elegislation.gov.hk

4. 竹棚架的架設、相當程度上的擴建搭建、更改、拆卸及使用的安全及健康管理

主要講述要實施和維持一個**安全管理制度和安全工作系統**去確保有關竹棚架安全。大至上包括就做工程前考慮竹棚架的設計及施工計劃，進行風險評估，制定安全施工方案，甄選次承建商，監管制度，訓練等等方面作出考慮及安排。

參考《工廠及工業經營（安全管理）規例》及由勞工處發出的《安全管理工作守則》內的要求。

5. 確保竹棚架安全的技術要求

主要講述竹棚架安全的技術要求。

6. 竹棚架的檢查、維修及拆卸

主要講述竹棚架的檢查、維修及拆卸安全注意事項。例如竹棚架須每14日或在惡劣天氣後由合資格的人檢查及簽發表格五等。拆卸時要註意棚架穩固性，要由合資格的人監督下進行。

最新版本，增加在惡劣天氣情況如颱風或強烈季候風等吹襲前的安排及採取所需的預防措施，例如“合資格的人”應進行徹底檢查，並作出所需的改善或加固、確保竹棚架的保護幕降低及綁扎或拆除，並移除竹棚架上存放的物料等。

3. 有關安全搭建竹棚架的主要安全及健康法例

守則章節	法定條文摘要
3.2	《建築地盤（安全）規例》
3.2.1	第38A條及38AA條 這些規例訂明工作地方的安全及其安全進出口的一般規定，並確保沒有人得以進入該地盤內任何有危險的地方。
3.2.2	第38B條 這條規例要求採取足夠的步驟，包括設置、使用及維修工作平台等，以防止有任何人從高度不少於2 米之處墮下。

3.2.5	第38E條 這條規例規定只有具足夠經驗並曾受訓練的工人及在合資格的人的直接監督下才可架設、相當程度上的擴建、更改或拆卸棚架。
3.2.6	第38F條 這條規例規定任何棚架都不能使用，除非： (a) 在首次使用前已經由合資格的人檢查 (b) 定期地在緊接每次使用前的14 天內，已經由合資格的人檢查； (c) 擴建後，或部分拆卸後，或更改後，以及經歷惡劣天氣情況之後，已經由合資格的人檢查；及 檢查該棚架的人已按**表格五**作出報告，述明該棚架處於安全操作狀態。

僱主或承建商姓名或名稱
Name or Title of Employer or Contractor .....
.....
.....
建築地盤地址
Address of Site .....
.....
.....
開始施工日期
Work Commenced Date
.....

表 格 五
FORM 5

[規例第 38F(1)條]
[reg. 38F(1)]

建築地盤(安全)規例
棚 架
每十四日一次或在其他場合執行的檢查結果報告
本表格乃由勞工處處長爲施行建築地盤(安全)規例第 38F(1)條而認可

Construction Sites (Safety) Regulations

SCAFFOLDS
REPORTS OF RESULTS OF FORTNIGHTLY OR OTHER INSPECTIONS

Form approved by the Commissioner for Labour for the purposes of regulation 38F(1) of the Construction Sites (Safety) Regulations

有關棚架的說明或所在地點 Description or location	檢查日期 Date of inspection	檢查結果 註明該座棚架是否處於安全操作狀態 Result of inspection State whether the scaffold is in safe working order	檢查者簽署及職階 Signature and designation of person who made the inspection
(1)	(2)	(3)	(4)

任何合資格檢驗員或合資格的人，如向承建商交付他明知有任何要項屬虛假的證明書或報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。
Any competent examiner or competent person who delivers to a contractor a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of $200,000 and to imprisonment for 12 months.

CSSR-F5

2. 釋義

守則章節	詞語涵義
2.3.2	(a) 合資格的人，是指該人 (i) 已圓滿地完成正式的竹棚工作訓練，例如根據第47 章《學徒制度條例》第28 條所規定的**竹棚工學徒訓練**，或香港建造學院（包括前建造業議會訓練學院）舉辦的**一年全日制建造棚架科基本工藝課程**，或其他類似的竹棚訓練課程／計劃，或已在建造業議會舉辦的**竹棚工技能測試中取得合格的成績**； (ii) 具備**十年**或以上的竹棚架工作經驗；及 (iii) 能閱讀理解棚架計劃書、設計圖、規格及棚架施工方法說明書，使其能有足夠能力監督棚架工程及證實棚架的安全性。他亦應能找出在周圍現存及可預見的潛在危險或能影響僱員衛生或危害僱員的工作環境。 (b) 合資格的人應由承建商以**書面指定**及應獲授權可採取即時措施去消減上述現存及可預見的潛在危險。

2.4	“曾受訓練的工人”
2.4.1	“曾受訓練的工人”是指: ● 在合資格的人的直接監督下工作 ● 已圓滿地**完成**相等於上述為“合資格的人”而舉辦的正式**竹棚工作訓練**，或 ● 已在建造業議會建造業議會訓練學院舉辦的**竹棚工中級工藝測試**中取得合格的成積，以及 ● 具備**一年**或以上的竹棚架工作經驗（包括在正式訓練期間所得的經驗）。 ● 根據香港法例第**583 章《建造業工人註冊條例》註冊為**竹棚業註冊熟練、半熟練、熟練（臨時）和半熟練技工（臨時）的**竹棚工**，亦獲本工作守則認可為曾受訓練的工人。

2.4.2	進行懸空式竹棚架工作的“曾受訓練的工人”是指 ● **2.4.1要求** ● 由建造業議會發出有效 ➢ “高級懸空式棚架安全訓練”證明書；或 ➢ “中級懸空式棚架安全訓練”證明書

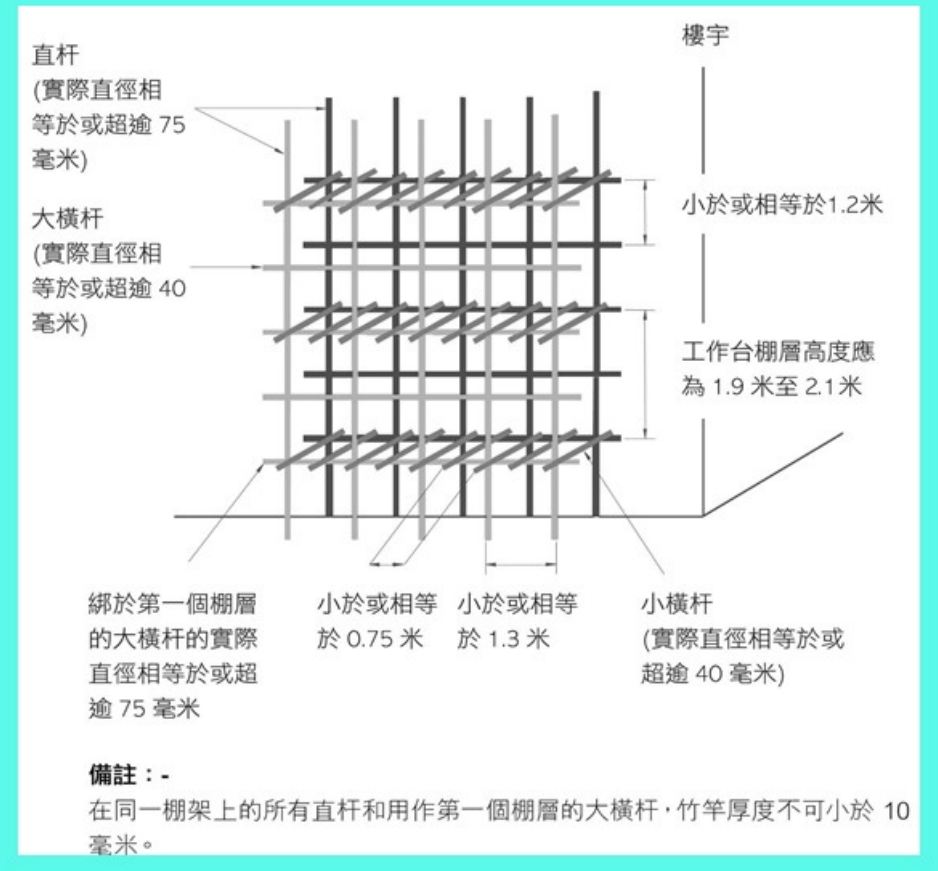
5. 確保竹棚架安全的技術要求

5.1 物料

- 構造良好，有足夠強度，且無明顯欠妥之處
- 竹竿應筆直、堅固，而且沒有裂痕、竹節、不規則的節疤、乾枯、蟲蛀點及其他可能影響竹竿強度的欠妥之處

直杆	毛竹 *實際直徑 ≥ 75mm 厚度 ≥ 10mm
第一個棚層的大橫杆	毛竹 *實際直徑 ≥ 75mm 厚度 ≥ 10mm
其餘的大橫杆 小橫杆 斜杆 斜撐	篙竹 *實際直徑 ≥ 40mm
*實際直徑是指整條竹竿中最窄處的外圍直徑	

雙行竹棚架及建議之架設標準



5.2 竹棚架的承托物

- 地面或構築物應堅固平坦和經砸實而有堅硬的面層，且有足夠強度保持棚架直立
- 如提供堅固地基不屬切實可行，應使用金屬托架(俗稱"狗臂架")或其他設計合適的設施作為承托物，以承托棚架的每根直杆。承托棚架的金屬托架應使用優質繫穩螺絲牢固地安裝在建築物的結構構件上。

承托棚架的金屬托架(俗稱"狗臂架")

- **以優質緊穩螺絲牢固地安裝在建築物的結構構件上**
- **S275 的等長角鐵**
- **5 毫米填角焊焊接**
- **鍍鋅或髹上兩層紅色鉛料底漆**

所繫於的結構構件

- **混凝土強度不少於 25 N/mm^2**

安裝金屬托架的繫穩螺絲

- **抗拉力 > 7千牛頓(kN)**
- **荷載測試:**
  - 工作荷載的 1.5 倍
  - 測試時間最短為 3 分鐘(混凝土及繫穩螺絲之間不應有分離或斷裂跡象)
  - 測試儀器拉出的任何一個“反力支柱”與繫穩螺絲中央的距離 ≥ 繫穩螺絲直徑的 8 倍
  - 應從不同位置的金屬托架選取
  - 測試的比率：10% 或不少於 5 個(以較多者為準)

5.3 竹棚架的架設 / 相當程度上的擴建 / 更改的技術要求

- 曾受訓練的工人及在合資格的人的**直接監督**下才可進行竹棚架工作

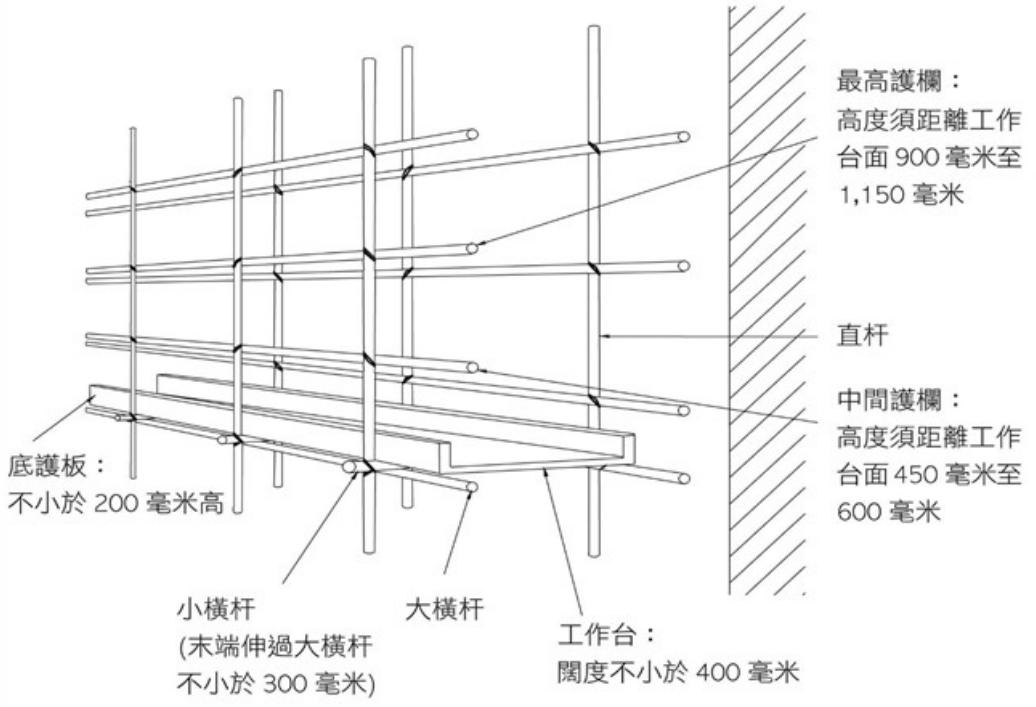
  - **直接監督**——該合資格的人專注於監督棚架及曾受訓練的工人的安全，他不可同時參與相關竹棚架工作。

工作平台（《建築地盤（安全）規例》附表3）

- 工作平台的闊度 ≥ 400 毫米
- 搭建工作平台的夾板或木板
  - 闊度 ≥ 200 毫米，厚度 ≥ 25 毫米
  - 如厚度超逾 > 50 毫米，闊度 ≥ 150 毫米
  - 不得伸出其末端支持物之外超逾 150 毫米，否則該須充分穩固
  - 須擱在至少 3 個支持物上。

- 護欄
  - 高度須於工作台 900 毫米至 1,150 毫米的位置上
  - 中間的護欄，高度須於工作台 450 毫米至 600 毫米的位置上
  - 如工作台須受 2 枝或多於 2 枝的橫竹保護，而橫竹之間的距離須在 750 毫米與 900 毫米之間，護欄的高度規定則**可寬免**。
- 底護板
  - 高度≥ 200 毫米
- 工作平台與樓宇或構築物的牆壁之間的距離應盡可能小。
- 小橫杆
  - 伸出大橫杆外≥ 300 毫米

雙行竹棚架的適當工作台



備註：-

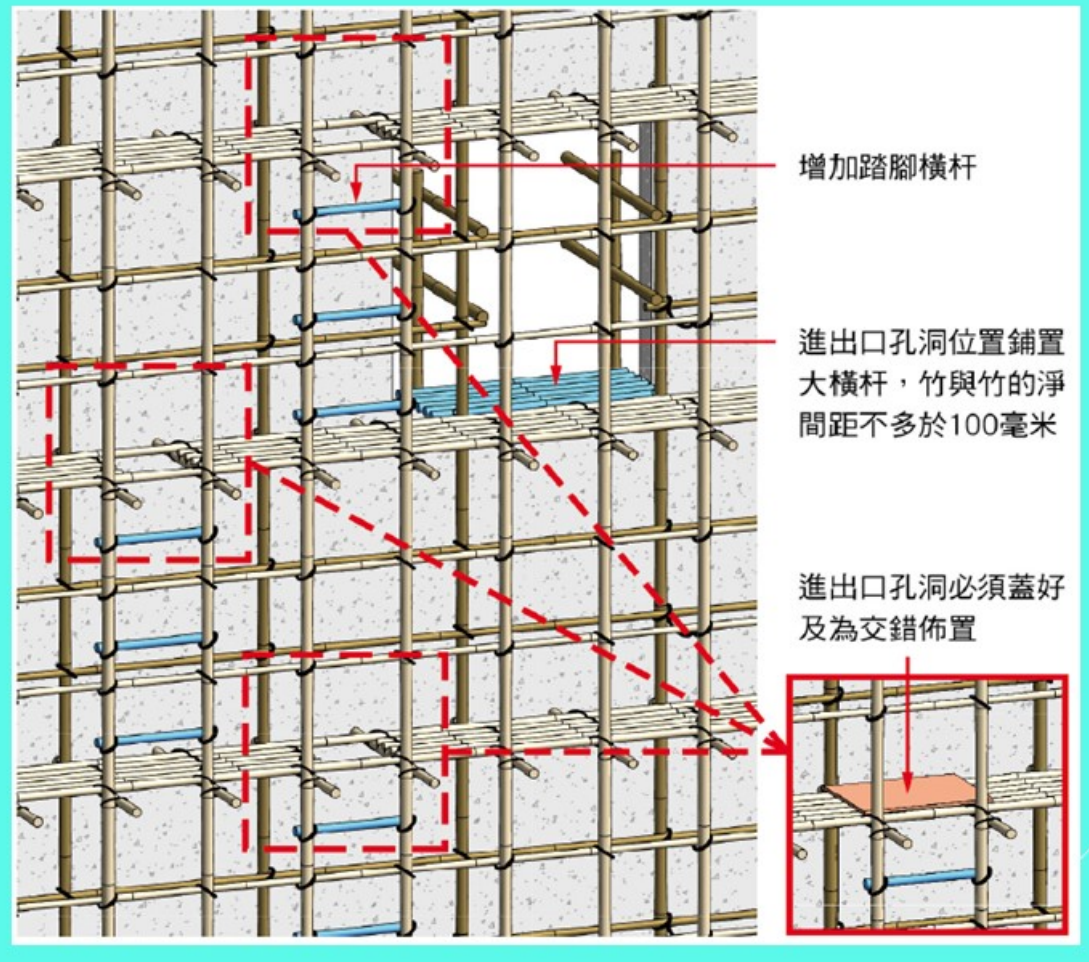
(i) 棚架的夾板闊度不得小於 200 毫米而厚度不得小於 25 毫米；或如夾板厚度超逾 50 毫米，則其闊度不小於 150 毫米。

(ii) 在竹棚架上的工作平台，如受棚架上2枝或多於2枝的橫竹保護，而橫竹之間的距離在 750 毫米與 900 毫米之間，護欄的高度規定則可寬免。

安全進出口

- 設置於連續棚層的進出口孔洞必須為交錯佈置
- 設置合適數量的進出口孔洞。
- 不使用時必須蓋好進出口孔洞。
- 須以粗體字清晰地標明，以顯示其用途，或穩固地固定於適當位置。
- 額外架設的踏腳橫杆("橫檔")的距離應符合其他國家或國際標準或規定，例如英國標準BS EN 131-1:2015+A1:2019，其距離應為不小於250 毫米和不多於300 毫米。

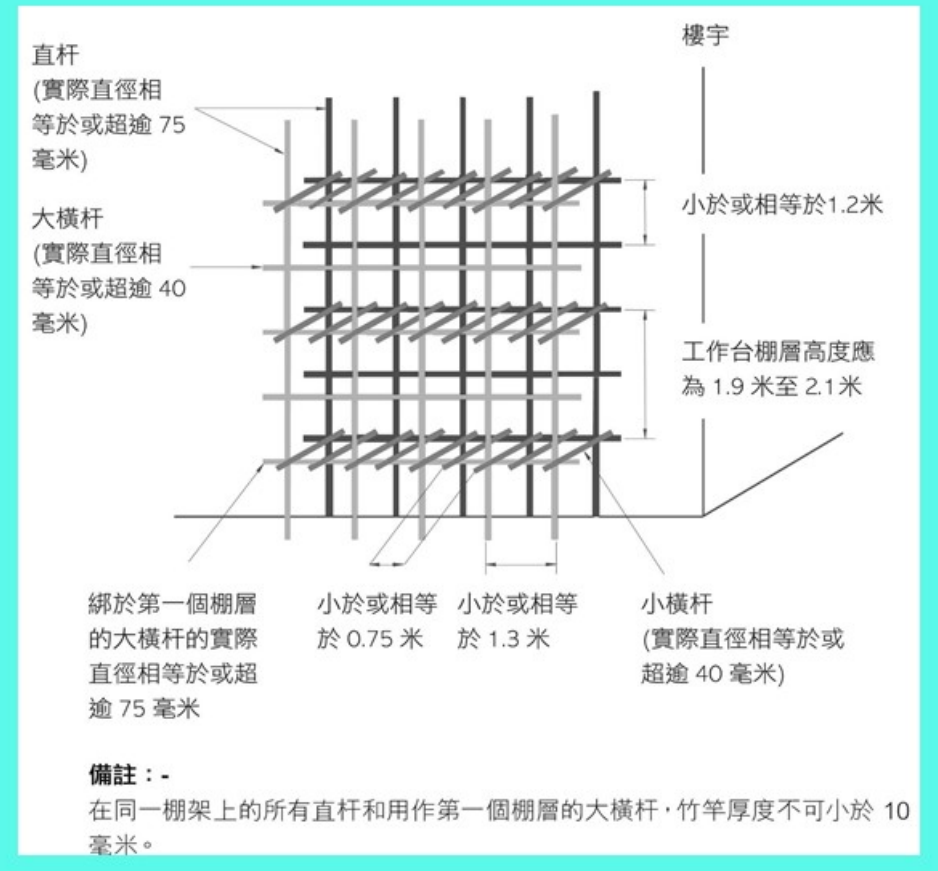
竹棚之進出口位置、踏腳橫杆及棚層進出口孔洞的交錯佈置示意圖



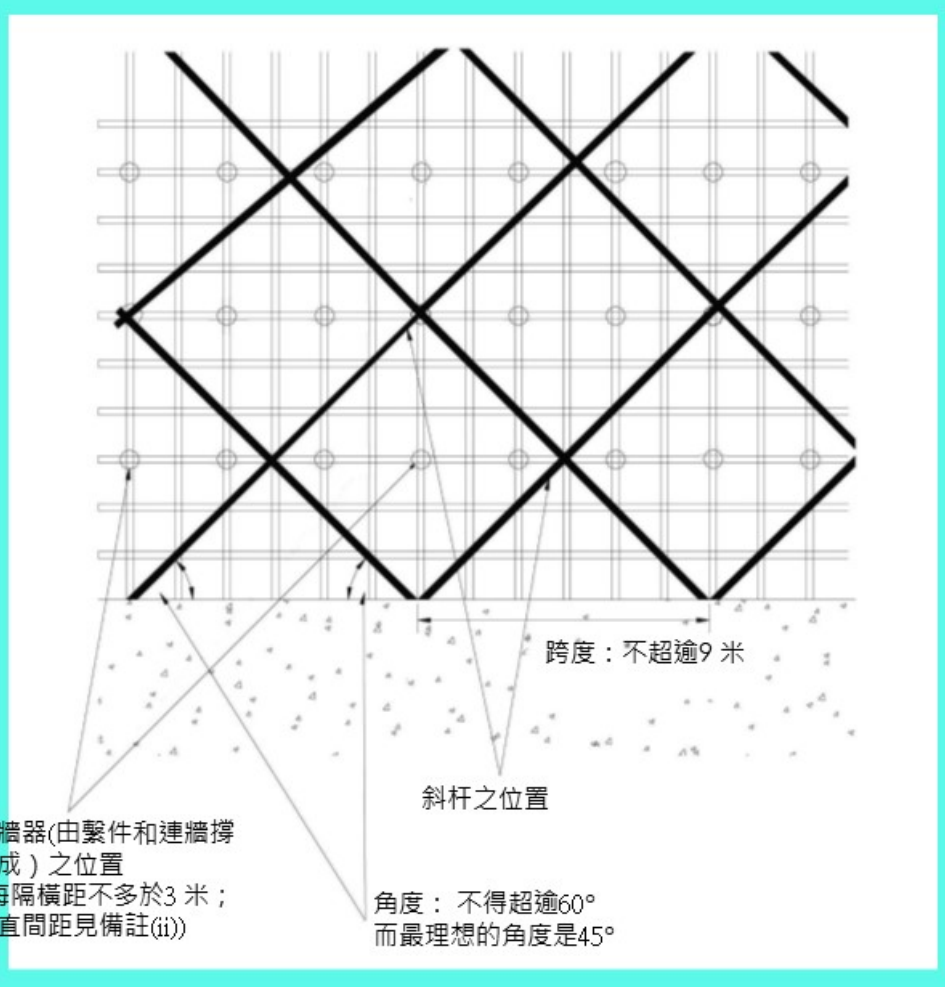
竹棚架的技術要求

- 直杆之間的距離不得超逾 1.3 米
- 兩條小橫杆之間的距離則不得超逾 0.75 米
- 兩條大橫杆（即上下大橫杆之間的距離）不得超逾 1.2 米
- 工作平台棚層的高度應在 1.9 米與 2.1 米之間
- 每個「X」形斜杆的橫距不得超逾 9 米，角度從水平起計不得超逾60°而最理想的角度是45°

雙行竹棚架及建議之架設標準



斜杆


跨度：不超逾9 米
斜杆之位置
連牆器(由繫件和連牆撐組成）之位置
(每隔橫距不多於3 米；垂直間距見備註(ii))
角度： 不得超逾60°
而最理想的角度是45°

連牆器

- 金屬繫件和連牆撐組成
- 金屬繫件一端連接大橫杆 / 直杆，另一端用繫穩螺絲安置於樓宇外牆結構良好的構件上。

竹棚架離地面	橫向間距	垂直間距
<100米	≤ 3米	≤ 6.3米
≥100米	≤ 3米	≤ 4.2米

金屬繫件

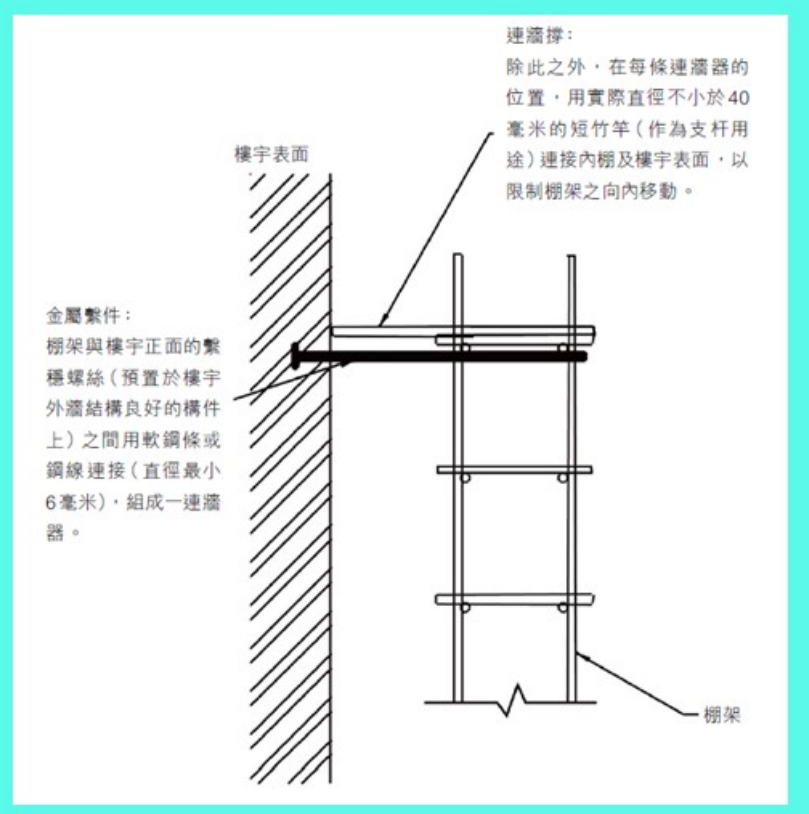
- 軟鋼條 (一捆鋼線或其他物料能抵禦相同的拉力及具備相同的機械性能也可使用)
- 直徑 ≥ 6 毫米
- 抵禦強度: 250 N/mm^2
- 最少可伸長15%

連牆器的繫穩螺絲

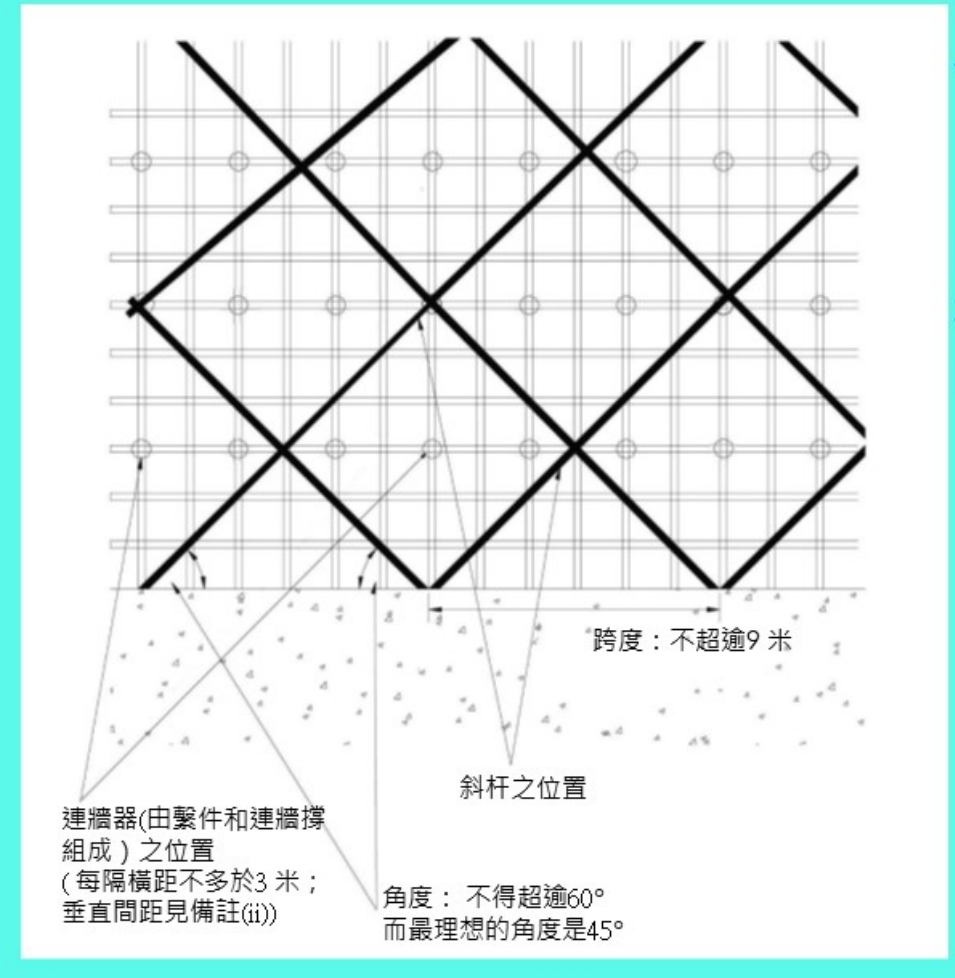
- **抗拉力 > 7 千牛頓(kN)**
- **荷載測試:**
  - 工作荷載的 1.5 倍
  - 測試時間最短為 3 分鐘(混凝土及繫穩螺絲之間不應有分離或斷裂跡象)
  - 測試儀器拉出的任何一個“反力支柱”與繫穩螺絲中央的距離 ≥ 繫穩螺絲直徑的 8 倍
  - 應從棚架的不同位置選取
  - 測試的比率：5% 或不少於 5 個(以較多者為準)

- **每條繫件的位置都應以一條短小及實際直徑不小於 40 毫米的竹竿（作為連牆撐用途）連接內棚及樓宇外牆**

雙行竹棚架連牆器(金屬繫件 / 連牆撐支杆)的構造細則



竹棚架連牆器位置



備註：-

(i) 小橫杆的位置沒有在此顯示。

(ii) 竹棚架離地面少於100 米的高度，連牆器的垂直間距不得多於6.3 米； 竹棚架在離地面100 米或以上的高度，連牆器的垂直間距不得多於 4.2 米。

尼龍篾

- 闊 5.5 至 6 毫米
- 長 2 米
- 拉力強度應超逾 50 公斤
- 伸長率則少於20%

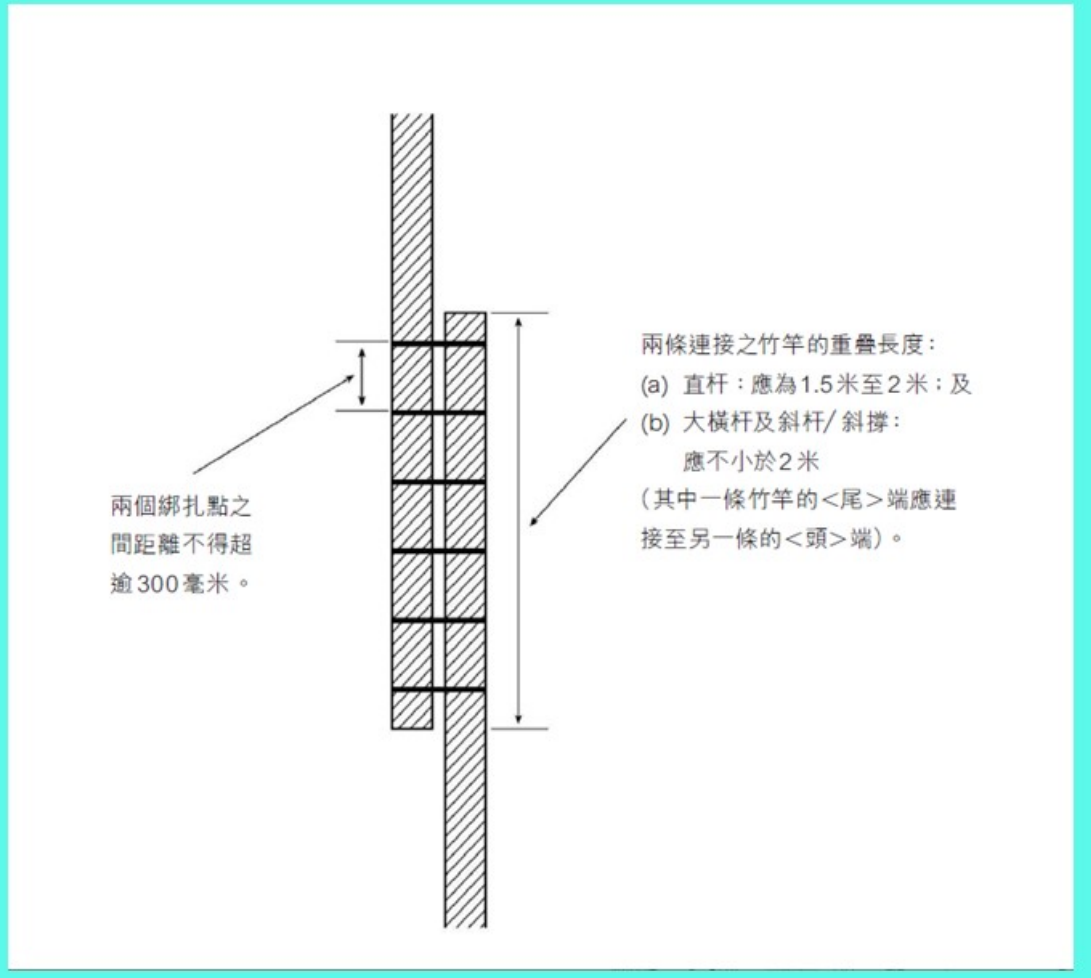
兩條竹竿連接的技術要求

- 直杆：應在 1.5 至 2 米之間
- 大橫杆及斜杆 / 斜撐：至少 2 米
- 兩個綁扎點的距離不應超逾 300 毫米

須由專業工程師設計和批准

- 棚架高度如超逾 15 米

竹竿的正確連接方法


兩條連接之竹竿的重疊長度：
(a) 直杆：應為1.5米至2米；及
(b) 大橫杆及斜杆/斜撐：
應不小於2米
（其中一條竹竿的<尾>端應連接至另一條的<頭>端）。
兩個綁扎點之間距離不得超逾300毫米。

5.3.3 懸空式竹棚架（單棚層式）

- 大廈外牆進行小型維修、修葺、翻新及裝修工程
- 結構一般是整體高度不超逾 6 米及單層形式

懸空式竹棚架曾受訓練的工人可進行的工作

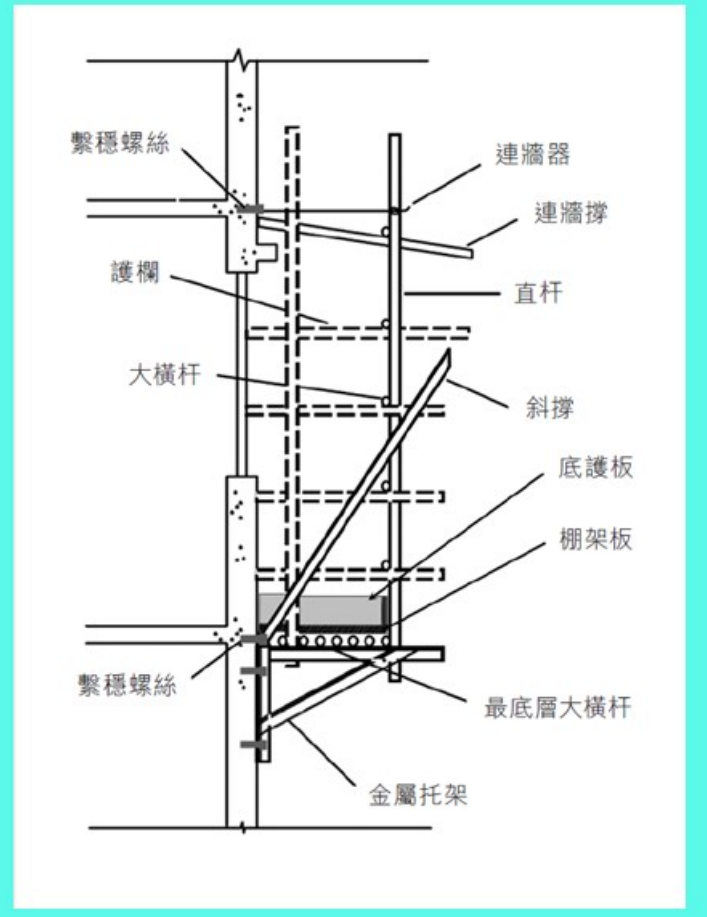
中級懸空式棚架安全訓練		可進行懸空式竹棚架的架設、相當程度上的擴建、更改和拆卸工作，但不包括懸空式竹棚架底層的金屬托架及其上的大橫杆及小橫杆
高級懸空式棚架安全訓練		可進行整個懸空式竹棚架的架設、相當程度上的擴建、更改和拆卸工作
中級懸空式棚架安全訓練 及	1) 持有建造業議會舉辦的“搭建及拆卸《懸空式竹棚架》安全增修證書”課程的有效證書； 2) 在持有“中級懸空式棚架安全訓練”證明書後，具備一年或以上架設、相當程度上的擴建、更改及拆卸懸空式竹棚架的實質工作經驗；以及 3) 由持有“高級懸空式棚架安全訓練”證明書的曾受訓練的工人的在場監督下進行	

金屬托架

- 選用標號 S275 的等長角鐵或圓通
- 使用 5 毫米填角焊焊接
- 鍍鋅或髹上兩層紅色鉛料底漆
- 必須裝上 3 顆或以上的繫穩螺絲
- 繫穩螺絲的抗拉力應大於 7 千牛頓(kN)
- 金屬托架的橫向間距不應超逾 1.3 米
- 金屬托架所繫於的結構構件的混凝土強度不少於 25 N/mm^2。

- 斜撐與樓宇 / 構築物外牆之間的角度不應超逾 30°
- 連牆器的橫向及垂直間距均不得超逾 3 米

懸空式竹棚架



完

建造業議會查詢

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網址:

高級懸空式棚架安全訓練 / 中級懸空式棚架安全訓練
https://www.cic.hk/chi/main/trade_test_list/others_assessment/TOS_safety_training/

搭建及拆卸《懸空式竹棚架》安全增修證書
https://www.hkic.edu.hk/zh-hk/programmes/skill-upgrade/ftos

This is a clip from the 26 April 2024 recording of the

Hong Kong Housing Authority

"Site Safety Seminar for Capital Works New Works Contracts"

The speaker on stage is Mr TSE Chun-ming

Divisional Occupational Safety Officer (Technical Support)

of Labour Department

His topic is "Safe Use of Bamboo Scaffolding"

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(00:21)

Good afternoon everyone

Today I am going to talk about the safe use of bamboo scaffolding

In line with this topic

the Labour Department has published a Code of Practice for Bamboo Scaffolding Safety

The latest revision of this Code was released last Friday, April 19

Today I will give you a brief introduction to this new Code of Practice

Let's talk about bamboo scaffolds

We usually see them on construction sites, especially on high-rise building sites

and also during external wall repair work for buildings

These bamboo scaffolds are erected

to allow workers to carry out high-level external wall work

If an accident occurs, it may result in serious injuries or fatalities

Let's look at some past accidents involving bamboo scaffolds

This one happened at a construction site

The building was nearly completed

when a bamboo scaffold suddenly collapsed

causing two deaths and three injuries

Another accident occurred during a large scale repair and maintenance works in a private residential project

A scaffold measuring 100 metres by 150 metres

was blown down by strong winds during severe weather

resulting in one death and one injury

Accidents also happen during external wall repair

using truss-out bamboo scaffolds

as shown in this photo

You can see the scaffold has come loose

and on the angle bracket

There were only two anchor bolts

The Labour Department requires at least three anchor bolts

In addition, these anchor bolts

were installed on plaster wall surfaces

not on the structural components of the building

so they lacked sufficient load-bearing capacity

To support the industry

with a Code of Practice for Bamboo Scaffolding Safety and practical guidance

the Labour Department released this Code in 2001

and on April 11, the new version of the Code of Practice was gazetted

This new Code has a six-month grace period

and will take effect on October 19

If you want to learn the contents of the new Code in detail

you can visit the Labour Department's website

So what has been revised in this new version?

There are four main changes

Revisions to the access and egress of bamboo scaffolds

requirements for supports and wall ties

requirements for trained workers for truss-out bamboo scaffolds

and their scope of work

inclusion of technical requirements for truss-out bamboo scaffolds

inclusion of duties for competent persons

and inspection requirements before adverse weather

The blue text in this presentation

highlights the newly revised content

This Code is mainly divided into six chapters

Due to time constraints

I will briefly introduce the contents of each chapter

and then explain key points from individual chapters

in more detail

Chapter 1

The Code of Practice is issued by the Commissioner for Labour

under section 7 of the Factories and Industrial Undertakings Ordinance

Chapter 59 of the Laws of Hong Kong

Its main purpose is

to provide practical safety guidance

on the erection, dismantling, alteration and use of bamboo scaffolds

This Code has a special legal status

Failure to comply with this Code

is not in itself a criminal offence

but in criminal prosecutions

a court may consider relevant factors

in determining whether safety and health regulations were breached

Chapter 2 mainly defines

the terminology used in this Code

Later I will explain in detail

what is meant by "competent person"

and what is meant by "trained worker"

Chapter 3 is a summary of

safety legislation related to bamboo scaffolding

such as the Factories and Industrial Undertakings Ordinance

and the Construction Sites (Safety) Regulations

For details of the legislation

you can visit the Hong Kong e-Legislation website

Chapter 4 mainly explains

the need to implement and maintain a safe management system

and a safe working system

Before the construction, it is important to

consider the design and work plan of the bamboo scaffold

The construction plan is actually very important

because in many cases

workers cut the wall ties for exterior wall work

After these wall ties are cut

the safety of the scaffold is affected

Risk assessments must also be conducted

to develop safe work procedures

A supervision system should be in place

as well as further considerations and arrangements for training

As for the safety management system and safe system of work

reference can be made to

the Factories and Industrial Undertakings (Safety Management) Regulation

and the Code of Practice on Safety Management issued by the Labour Department

Chapter 5 mainly discusses the technical safety requirements for bamboo scaffolds

I will explain some of these in more detail later

Chapter 6 covers inspection

maintenance and dismantling of bamboo scaffolds

Bamboo scaffolds must be inspected every 14 days

or after adverse weather

by a competent person who must sign Form 5

When dismantling scaffolds

their stability must be ensured

The dismantling must be carried out under the supervision of a competent person

In the latest revised version

a new requirement has been added

for the competent person to conduct a thorough inspection before adverse weather

and to carry out any necessary improvements or reinforcement

As for the protective nets on bamboo scaffolds

they must be lowered, tied or removed

and materials stored on the scaffolds must also be cleared

Next I will explain the main legal provisions

related to bamboo scaffold safety

mainly from the Construction Sites (Safety) Regulations

In Chapter 3.2.1 of the Code

Sections 38A and 38AA of the Regulations

stipulate that safe access and egress must be provided

for workers to reach their work locations

Section 38B states that

if there is a risk of falling from a height of two metres or more

a working platform must be provided

Who should erect these working platforms?

Section 38E specifies that

only workers who are experienced and adequately trained can carry out such work

and it must be done under the immediate supervision of a competent person

Section 38F addresses whether a scaffold

can be used immediately after erection

Before use, it must first be inspected by a competent person

During use

it must be inspected every 14 days

by a competent person

If the scaffold has been extended, dismantled or altered

or after being exposed in adverse weather

it must also be inspected by a competent person

After inspection, they must sign Form 5

to certify that the scaffold is safe for use

before it can be used

Let's take a look at Form 5

This Form 5 is recognised by the Commissioner for Labour

On the left side is the site information

The first column shows the location of the scaffold

The second column is the inspection date

The third column is the result of the inspection

whether it is safe for use

The fourth column is the signature and position of the competent person

As mentioned earlier

the law states that

scaffolds must be erected by trained workers

under the supervision of a competent person

What is a competent person?

What is a trained worker?

These are not defined in the law

but are explained in Section 2.3.2 of the Code

A competent person refers to someone

who has completed bamboo scaffolder training

such as a bamboo scaffolder apprenticeship under the Apprenticeship Ordinance

or a one-year full-time basic craft course on construction scaffolding works

offered by the Construction Industry Council Training Academy

or passed the bamboo scaffolder trade test

held by the Construction Industry Council

This refers to what we call a "Skilled Workers"

These senior scaffolders must also have more than ten years of working experience

They need to understand scaffold design drawings

and construction methods

and be capable of supervising others

Besides these qualifications and capabilities

they must be endorsed by the contractor

and officially designated in writing

before they can be considered a competent person

So what is a trained worker?

They must have completed formal bamboo scaffolder training

equivalent to that required of a competent person

or passed the intermediate trade test for bamboo scaffolders

organised by the Construction Industry Council Training Academy

This is what we refer to as an “Semi-skilled Workers”
They must also have one year of bamboo scaffolding experience
or be registered as a bamboo scaffolder
under the Construction Workers Registration Ordinance (Cap. 583)

In addition, bamboo scaffolders
who carry out truss-out scaffold work
must not only meet the above requirements in Section 2.4.1
they must also possess
an intermediate or advanced-level safety training certificate
for truss-out bamboo scaffolds issued by the Construction Industry Council
Next, I will explain the technical safety requirements
for bamboo scaffolds listed in Chapter 5

First, the materials must be of good quality and adequate strength
with no obvious defects
All bamboo should be straight
without cracks, dry rot and wormholes
As you can see in the photo on the right
the bamboo is green
it should have just been harvested
and not dry, cracked
mouldy or deteriorated from storage for long time
Does that mean such green bamboo is ideal?

Actually, it is not
because the bamboo has not yet dried
If used for scaffold erection
it will shrink over time

and compromise scaffold stability

So if you see such green bamboo

please do not use them

There are upright and horizontal bamboo poles

What are the requirements of bamboo poles with different uses?

For vertical standards or main horizontal ledgers

the Code requires

the use of Mao Jue

with a diameter over 75 mm

and thickness over 10 mm

The rest of the ledgers, and all the transoms, putlogs, bracings and rakers must be made of Kao Jue

with a diameter over 45 mm

How to measure the actual diameter?

Since bamboo poles vary in thickness

we must measure the smallest diameter

How to differentiate Mao Jue and Kao Jue?

You can observe scaffolds in use

Mao bamboo is thicker and has a greater variation in diameter from the two ends

Kao bamboo is thinner

with a more consistent diameter

As just mentioned

the image helps illustrate the vertical and horizontal members clearly

The vertical poles are upright

At the bottom

you can see the main horizontal ledger

which must be made of Mao Jue

All the others are to be made of Kao Jue

Scaffolds are usually built from the ground upwards

The ground must be firm and strong enough

However, sometimes

scaffolds cannot be built directly from the ground

so metal brackets, commonly called angle brackets, are used

What are the requirements for angle brackets?

They must use high-quality anchor bolts

fixed to structural elements of the building

Use grade S275 steel angle

with 5 mm fillet welds

They also need to undergo corrosion protection

such as galvanising or two coats of rust-proof primer

These metal brackets are fixed to concrete

The requirement for concrete strength

must not be less than 25 N/mm²

As for anchor bolts

their tensile capacity must exceed 7000 N

They must be tested

to ascertain their quality

with a test load equal to 1.5 times the working load

Each test must last at least 3 minutes

There must be no sign of separation or failure in concrete and the bolt

The distance between the reaction legs of the pull-out test equipment and the bolt centre

should be at least 8 times the bolt diameter

How to select samples for testing?

They must be selected from various positions

The testing ratio is 10% or at least five samples

whichever is greater

As mentioned earlier

trained workers must work under the direct supervision of a competent person

to work with scaffolds

What does direct supervision mean?

Mainly

It means that the competent person

must not be involved in any scaffold erection work at the same time

They must focus solely on supervising the scaffold and the safety of trained workers

Working platforms are erected on the bamboo scaffolds

The requirements for working platforms

follow Schedule 3 of the Construction Sites (Safety) Regulations

These cover platform width, timber planks, guard-rails, toe-boards, and transoms

Let's take a look at this picture

In the image, the platform width

must not be less than 400 mm

If a plank

is less than 200 mm wide

its thickness must be at least 25 mm

If a plank is over 50 mm thick

its width must not be less than 150 mm

Each plank must be rest on at least 3 supports

It must not be placed between only two supports

There must also be a toe-board

Its height must be at least 200 mm

Guard-rails are required

The top guard-rail should be 900 to 1150 mm high

The intermediate guard-rail should be 450 to 600 mm

If the guard-rail is made up of two or more main ledgers

and the spacing between ledgers is 750 to 900 mm

then the standard guard-rail height requirement can be waived

The law also requires safe access and egress

for workers to reach the work area

If there is a continuous scaffold platform

What does that mean?

It means several working platforms within a large scaffold

These are considered continuous platforms

Access openings must be staggered

There must be an adequate number of access points

Unused openings must be covered

and clearly labelled to show their purpose

There must also be footstep transoms

with spacing of no less than 250 mm

and no more than 300 mm

What does staggered arrangement mean?

This picture shows it clearly

The access openings are not aligned vertically

You go up one platform

then move sideways before going up to the next

Unused access openings

must be properly covered with boards

The gap between the access opening and the scaffold

must be bridged with closely spaced bamboo poles

The spacing between bamboo poles must not exceed 100 mm

Scaffolds have vertical and horizontal members

What are the spacing requirements?

This picture makes it clearer

The spacing between two main ledgers

must be less or equal to 1.2 m

The height of the working platform is between 1.9 m and 2.1 m

This is the bottom main ledger

For the vertical members

the spacing must be no more than 1.3 m

These transoms

which support the working platform

must be spaced no more than 0.75 m apart

Now that we have covered main and secondary ledgers

let's look at the diagonal braces

Diagonal braces must not span more than 9 m

Their angle must be between 45 and 60 degrees

You can also see circles in the diagram

What are these circles?

These represent wall ties

Let's look at the requirements for wall ties

Let's look at the next slide

The horizontal spacing of wall ties

must not exceed 3 m

Vertical spacing depends on the height of the scaffolding

If the scaffold is less than 100 m tall

vertical spacing should be 6.3 m

If it is over 100 m

then vertical spacing must be 4.5 m

A putlog consists of two components

a metal tie and a bamboo strut

What are the requirements for the metal tie?

It should be made of mild steel bar

or a bundle of steel wires

with a diameter not less than 6 mm

a tensile strength of 250 N/mm²

and minimum elongation of 15%

As for the anchor bolts of the wall ties

they follow the same requirements as angle bracket bolts

but the test sample ratio changes from 10% to 5%

As mentioned, a wall tie consists of two parts

the metal tie

and the bamboo strut

The bamboo strut is typically made of Kao Jue

with a diameter not less than 40 mm

Let's look at this picture

It shows the structure of the wall tie

The black part is the metal tie

One end is fixed to the building surface

The other end is connected to a vertical bamboo pole or main ledger

One end of the bamboo strut rests on the wall

The other end connects to the scaffold's vertical pole or main ledger

The main purpose of the bamboo strut is to keep the bamboo scaffold stable

and prevent it from swaying

This part explains the spacing

so I won't repeat it here

In the past, bamboo strips were used to lash bamboo poles

Now we use nylon strips

The required width is 5.5 to 6 mm

Length is 2 m

Tensile strength should be greater than 50 kg

Rate of elongation must be at less than 20%

As for the bamboo jointing technique

it will be clearer when we look at the picture later

If the scaffold height exceeds 15 m

it must be designed and approved by a professional engineer

This diagram shows how bamboo poles are connected

The distance between two fastenings must not exceed 300 mm

For vertical standards

the overlap length must be 1.5 to 2 metres

For main ledgers or diagonal bracings

the overlap must be at least 2 m

As for truss-out bamboo scaffolds

they are usually single-layered with a total height not exceeding 6 metres

As mentioned earlier

workers who construct truss-out bamboo scaffolds

must hold an intermediate or advanced training certificate in such scaffolds

Holders of the advanced certificate

can carry out all scaffold work

Those with only an intermediate certificate

are not allowed to work below the base level

including metal brackets, bottom main ledgers, and transoms

If someone with an intermediate certificate

wants to work below the base level

they must meet three conditions

They must hold a valid certificate

Certificate in Safety Enhancement to Erection & Dismantling of Truss-out Bamboo Scaffolds from the Construction Industry Council

and obtaining a certificate of Intermediate Level Truss-out Scaffolder Safety Training

then have at least one year of practical experiencein truss-out bamboo scaffolding

Finally, they must work under the supervision of a worker with an advanced certificate

then they can start working

As for the metal brackets of truss-out scaffolds and the anchor bolts

their requirements are mostly the same as mentioned earlier

but no testing is required

Each metal bracket must be fixed with at least three anchor bolts

The spacing between metal brackets must not exceed 1.3 metres

The rakers of truss-out scaffolds

must not form an angle of more than 30 degrees with the wall

The vertical and horizontal spacing of putlogs must not exceed 3 m

Now let's look at the structure of the truss-out scaffold

These are the metal ties

One end is anchored to the wall with bolts

The other is tied to a vertical pole or main ledger

This is the bamboo strut

and this is the raker

The raker must not exceed 30 degrees

As mentioned earlier, those with intermediate certificates must not carry out work below the base level

That concludes today's sharing

Thank you

Thank you for watching

(26:52)