

Summary of Site Safety Enhancement measures proposed by HA New Works Contractors:

1. Use of Metal Scaffolding

外牆金屬棚架



上落通道金屬棚架



提供安全出入通道，張貼檢查表格五。



出入通道



特別注意樓邊及危險區圍封，提供**特制圍欄**及適當位置加裝隔網。



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2. Safety in Close Vicinity of Mobile Plant by AI monitoring system

鷹網360智能監測系統

最新



全景偵測2米內範圍障礙物。



360°

當操作中的挖掘機周邊有障礙物/人體接近時，操作員可即時透過屏幕看出障礙物/人體的位置，而屏幕亦能清晰看到影像，給操作員作出適當反應，避免意外發生。

配置四個180度高清廣角鏡頭，實時收集四周影像，合成為360度全景鳥瞰圖。





人工智能鏡頭 - 人像偵測功能可偵測1-2米距離的移動障礙物：
黃色區域為2米距離
紅色區域為1米距離



Rear Cam





配置四個180度高清廣角鏡頭，合為360度全景鳥瞰圖。


挖掘機機尾設有閃燈及警報器，當有人接近機械2米內，警報器發出【吡吡吡】警號及閃燈亦會不斷運作。



鏟車尾部警示燈



1.1 有關人員及責任

	監督人員 (前線分區管理人員)	監督人員 (打理人)	工人
1. 開工前	確保棚架符合所負責工序使用的要求 及 已由合資格人士定期檢查及簽發表格五(CSSR-F5)		-
2. 開工前檢查	確保沒有交叉作業(即沒有其他人於同一位置 但兩個不同層面同時工作) 確保外牆棚架適合工作 (包括消除可預見危害及設置足夠安全措施) · 並做好相片記錄及匯報		於現場配合前線分區管理人員指示 
3. 安全培訓	確保工人已接受「外牆棚架工作」及「外牆棚工作許可證制度」培訓		每月參與相關培訓並佩戴 粉紅色安全帽以作識別
4. 簽發許可證 (只限當日申請)	核對工人資料並簽發許可證	填報工人資料並接受許可證	-
5. 開工前安全交底	與工人進行開工前交底及保留記錄，確定工人清楚外牆棚工作注意事項， 了解安全工作步驟		出席開工前交底並清楚外牆棚安全 工作流程及注意事項
6. 工作期間	每天進行不少於四次巡查並進行拍照記錄及匯報 確保現場展示工作許可證及「外牆棚架工作安全警示」 如發現施工期間有嚴重不安全情況，須停止工人施工，並安排整改		確保工作期間持續佩戴防護設備 並扣於穩固點；如發現嚴重不安全 情況(如救生繩不足、棚架架設 不當或交叉作業等)，可拒絕施工， 並聯絡監督人員要求整改
7. 撤銷許可證	完成工作後，確保全部工人、工具及物料等已撤離，方可撤銷許可證		完成工作後，將現場工具、物料等 清理，並通知打理撤銷許可證

1.2 申報流程

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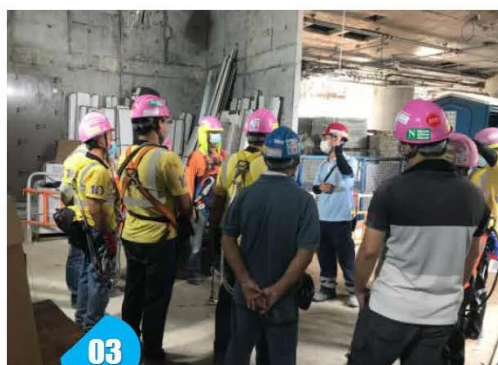
安排外牆棚工作前，必須向負責監督人員申請「外牆棚工作許可證」

1. 如需要出外類工作，必須填妥派員負責工申請「外勞工作許可證」，並按申請內容施工；
2. 必須由指定安全通道遷出外類，嚴禁攀援；
3. 必須穿著及使用全身式安全帶及雙尾繩連接防墮扣，並繫於獨立救生繩上；
4. 如發現工作地點存在安全隱患，或未能配備合適個人防護裝備，應立即停工，並向打工人匯報；
5. 不可擅自更改鎖扣裝置；
6. 使用手工工具時需加上手繩，鬆軟材料要妥善儲存，防止物料下落；
7. 每日收工前必須清理樓架上之垃圾及廢料，防止物料下落。

前線分區管理人員須**確定**

現場棚架狀況良好、有法定檢查表格、及
足夠安全措施，並張貼棚架工作安全告示





03

開工前做好安全交底，明確當日
安全施工內容



04

簽發「外牆棚工作許可證」
(只接受當天申請)



05

每日收集的許可證須做好匯總
(填寫在外牆棚架工作告示板及
通訊群組內匯報)



06

完成工作後，確保全部工人、工具、
及物料等已撤離工作地點，
並撤銷許可證。

1.3 外牆棚工作許可證(模板)

外牆棚工作許可證
Permit to Work (External Scaffold Work)

許可證號碼: 20230310-1

Project Name: 住宅發展 (1) 期

Location: 工作地點: 11 177 44 樓位

Work Description: 裝修

Company: 鴻發 日期: 2023 年 3 月 10 日

Permit valid from: 許可工作由: 0800 hrs 至: 1200 hrs

由地盤自行編制

工作地點填報清楚 確保沒有交叉作業

工作性質填報清楚 有助做好開工前安全措施準備

做好危害分析 有助做好開工前安全措施準備

確保妥善執行有關安全工作步驟

只接受當日申請

確保清楚許可證內容要求

打理人簽署確保清楚許可證內容要求

確保清楚許可證內容要求 須填妥姓名及簽署

監督人員 (前線分區管理人員)

監督人員 (打理人)

工人

前線分區管理人員簽署 須確保沒有交叉作業情況

前線分區管理人員簽署 須確保做好完工後檢查

確保現場及工人安全並撤離

必須即日完成完工後檢查

Acceptance of the Permit: 接受有關許可證
I have read and understood this Permit and shall undertake to work in accordance with all the conditions laid down in it.
本人已讀明及明白許可證內容, 並承諾於工作期間遵照有關條款。

Signature: 簽署: (打理人) (前線分區管理人員)

Time: 時間: 08:00 12:00

Permit Cancellation: 撤銷許可證
I certify that the work under this permit is completed. All works, tools, equipment and material are cleared from the work area.
特此證明此許可證所屬之工作經已完成, 全部工人、工具、物料及材料已撤離工作地點。

Signature: 簽署: (打理人) (前線分區管理人員)

Time: 時間: 12:00 13:00

Remarks: 備註: Supervisor of Contractor for the certification of the Permit-work should be at the location specified above. 監督人員必須於外牆棚工作完成以上之人, 方可簽署。

1.4 監管及檢查工作要點



01

負責監督人員和安全主任
每天進行不少於四次巡查,
並進行拍照記錄及匯報



02

巡查時需檢查竹棚架狀況,
並確認工人已佩戴粉紅色安全帽
-表示已接受外牆棚工作安全培訓



03

定期清理外牆棚架雜物,
如混凝土廢料、垃圾等

1.4 監管及檢查工作要點



- 如發現不安全情況應立即**停工整改**
- 工人在棚架進行不安全工作, 必須**立即阻止**



- 如有人(除棚架分判外)擅自更改或拆卸棚架, 必須趕離地盤
- 如對棚架有意見/要求, 應與當區**管工協商處理**

1.5 網絡實時監控系統協助管理

- 為加強監察地盤**高危工序施工位置**(如外棚暗通天位), 公司要求地盤於相關位置**安裝網絡實時監控系統**, 並將有關CCTV 影像設置於地盤當眼位置, 以**加強監察效果**。



外棚工作實時CCTV直播間



4. Safety of Lifting Operation

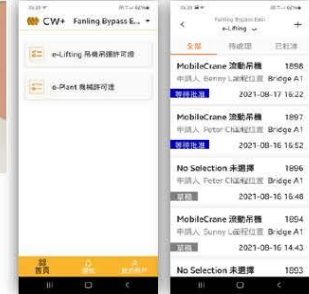
管工

- 安排分區內工作，防止交叉作業
- 簽發吊運許可證 (電子版)



訊號員(俊和)

- 獲授權拒絕進行任何違反吊運守則的操作
- 起吊前確保所有人離開危險區域後，才可發出吊運訊號
- 配備哨子、通訊器，穿著藍色配有LED燈的反光衣及佩帶藍色安全帽



埋碼員(俊和/ 分判商/ 供應商)

- 穿著注明埋碼員的藍色反光衣、注明埋碼員的黃色安全帽。



圍封危險區

地面硬度測試

- 各種吊機之可吊重量達**70噸或以上**，必須安排測試
- 測試亦可應用於70噸或以下，或鬆土地面



5. Use of BIM for Planning, Construction and Safety

BIM application

- **BIM uses**
 1. Design Reviews
 2. Phase planning (4D Modelling)
 3. Spatial Coordination
 4. Drawing Production
 5. Cost Estimation (QTO)
 6. Site Utilization Planning
 7. 3D Construction Coordination
 8. Construction System Design
 9. As-Built Site Condition Survey by 3D Laser Scanning
 10. As-Built & Asset Information Modelling

- **Planning Stage 4D simulation**

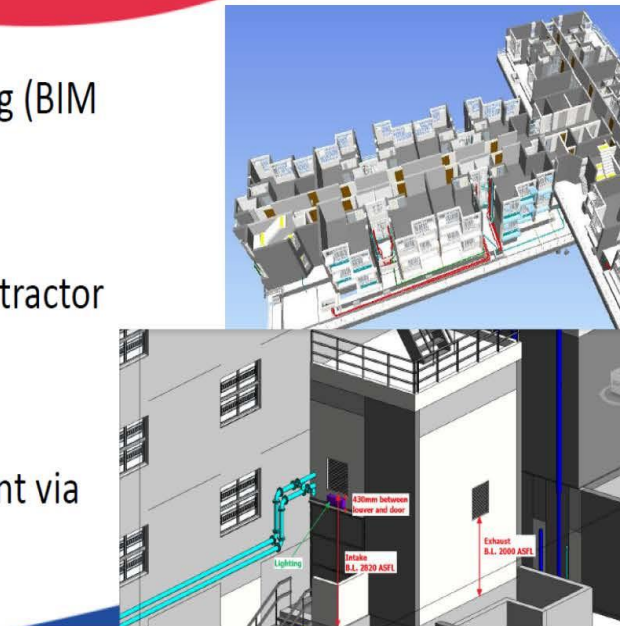
BIM Software

- Revit - Modelling
- Navisworks - Review
- Fuzor - 4D animation



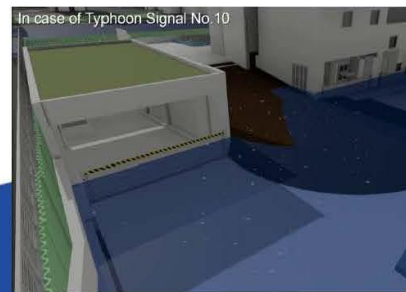
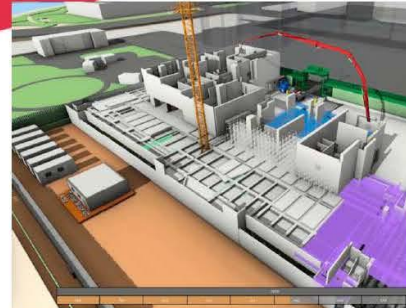
1. Design Review

- Weekly Technical Meeting (BIM Workshop)
- Architect, Engineers, Contractor participate
- Review, report & comment via E-mail and meeting



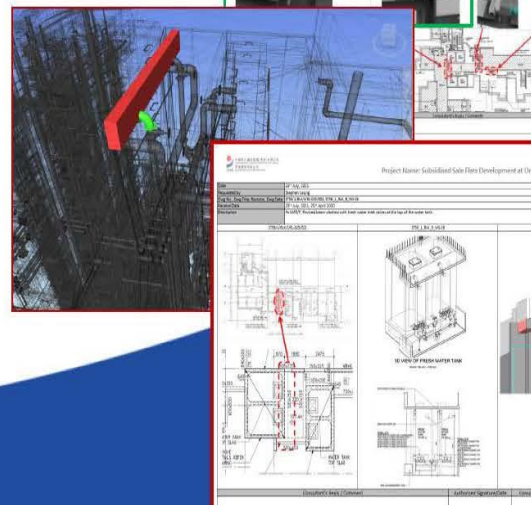
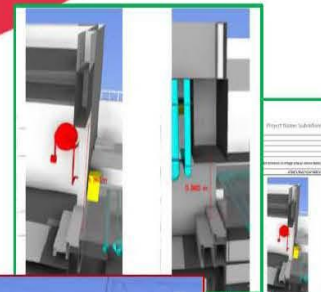
2. Phase planning

- Site layout planning
- Construction sequence
- Planning for Typhoon No.10 incident

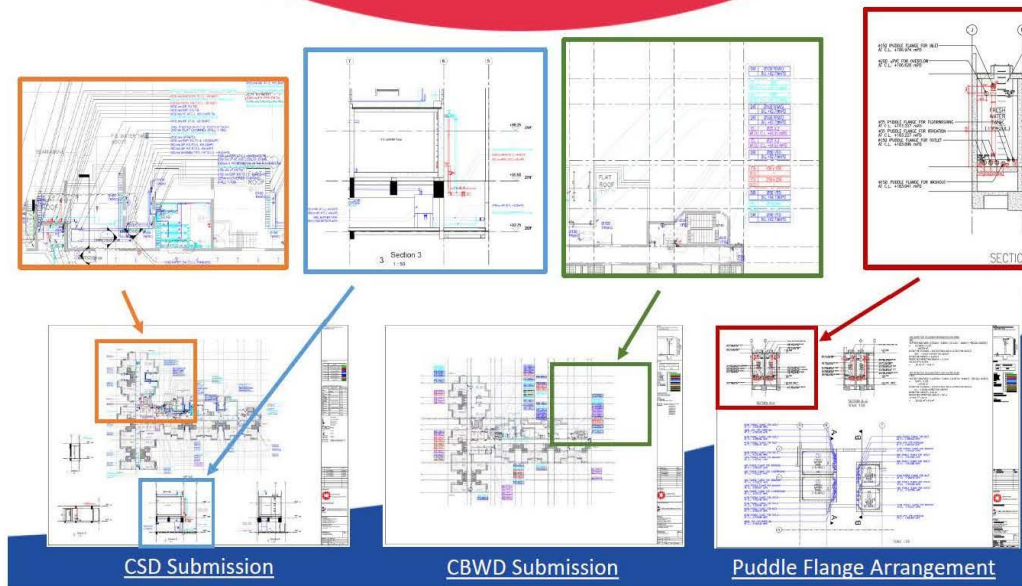


3. Spatial Coordination

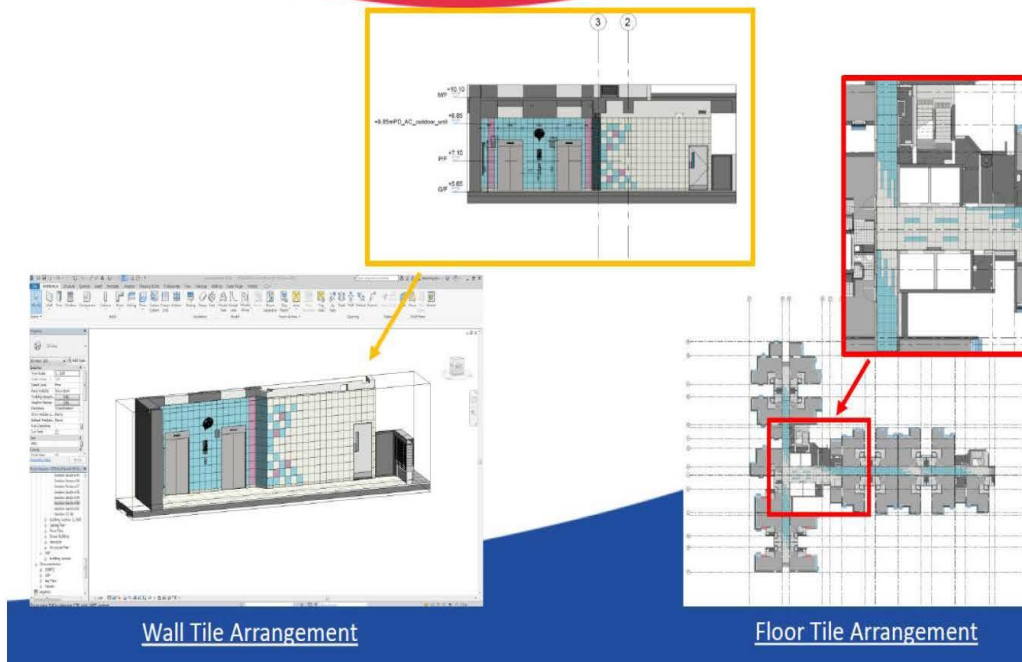
- Automatic Clash Detection
- Minimize abortive works



4. Drawing Production (1)



4. Drawing Production (2)



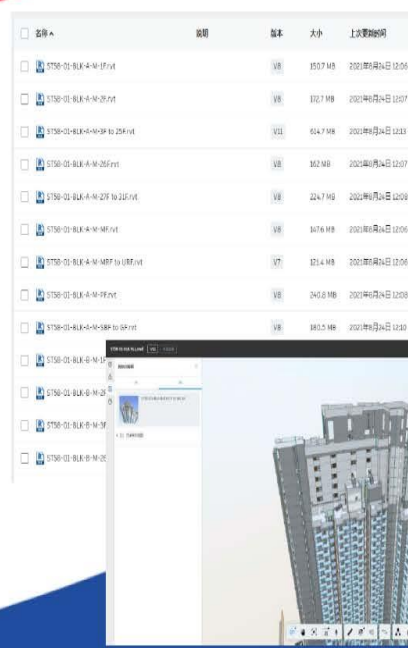
3D Laser Scanning

- 3D laser scanning for validation of as-built model
- Site survey
 - More efficiently
 - More accurate
 - More safely
 - Time saving



CDE

- Common Data Environment (CDE) BIM360
- Single source of truth for Model, Drawing & Document transmission
- Review model and drawing without software



Construction sequence

- ELS work for Construction sequence and safety monitoring
- To simulate the site condition/safety provisions
- Ensure the feasibility before construction work



6. Implementation of Fatal Zone



Accident Brief 事故簡介

The I/P was preparing hot work permit for welding operation near bored pile. A nearby crawler crane oscillated and led by a banksman. 工友正在準備為鑽孔樁附近的燒焊填寫熱工序許可證。附近的履帶式起重機同時由訊號員帶領。

- The counterweight of the crawler crane slew and knocked onto the staircase of a RCD platform. 履帶式起重機的平衡錘此時旋轉並撞倒 RCD 平台的樓梯。
- The staircase detached, hung on the RCD platform, then hit on the welding machine and subsequently hurt the worker. 樓梯被撞擊掉落，懸掛在 RCD 平台，再跌落到焊機上，隨後導致工人受傷。

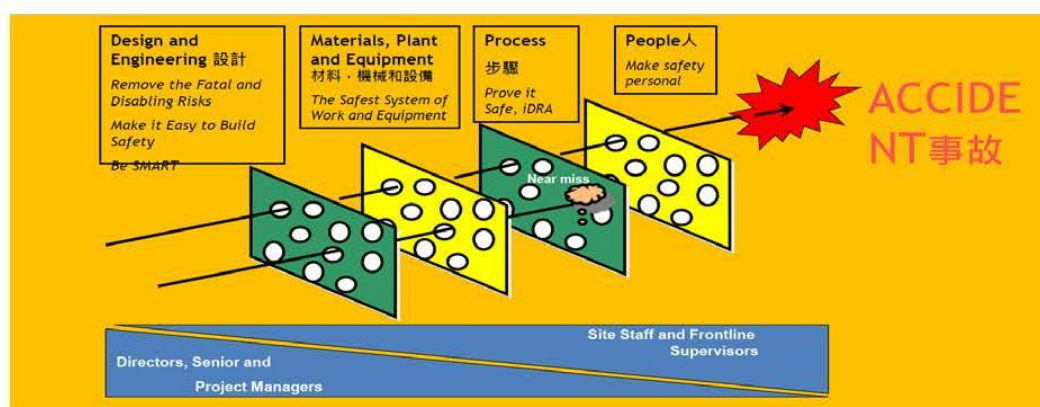
Fatal Zone was not always maintained 調查發現致命區域並沒有時刻保持圍封。

Findings:

- Inadequate Planning to arrange the site logistics for the plant movement in limited space
- Insufficient checking the condition of workplace before commencement of work by frontline staff and area in charge

RECOMMENDED ACTIONS:

1. Establish site planning to staff, review layout and logistic plan on daily basis, especially highlighted the congested area.
2. Assign area supervisor to check fatal zone of these areas before commencement of work.
3. Project in Charge carry out site inspection and monitoring on every shift to check the implementation.



4 Layers of Protection 四層保護 - SWISS CHEESE MODEL 芝士理論

開工大吉四式

ZERO HARM
MAKE SAFETY PERSONAL

第一式	精神夠， 身體好，開！
第二式	聽簡報， 收足料，開！
第三式	不安全， 不正確，停！
第四式	有變化， 未解決，停！

7. Safe Lifting Procedures of Crane Truck

貨車式起重機安全八戒 不遵守 不作業



1. 確保出示貨車起重機法定有效檢驗表格
2. 確保出示起重機械及起重裝置法定有效檢驗表格
3. 確保出示有效之貨車起重機操作員證、平安卡、工人註冊證予本地盤之車閘保安員登記
4. 確保借用及安裝可拆式安全上落貨斗爬梯
5. 確保完全伸出所有腳撐並用合適鐵板/木枕墊好
6. 確保設立吊運區，將吊運工作範圍用圍欄圍封及貼上有關警告字句
7. 確保使用合適的盛器及採用正確的縛結方法作吊運
8. 明瞭起重機的安全操作負荷(特定情況下起重機能夠吊起的最高負荷)



4. 確保借用及安裝可拆式安全上落貨斗爬梯





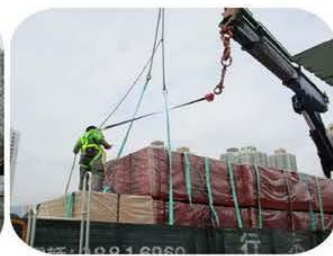
Permit-to-lift system for Crane Truck

Site Engineer and Appointed Foreman to:

- ✓ Check the setting up of the lifting appliance including ground conditions
- ✓ Check that the outriggers are fully extended
- ✓ Check the lifting appliance capable of lifting the load
- ✓ Check that the mats are at least three times larger in area than the float and completely support the float.
- ✓ Check that measures are in place (e.g. barriers and warning signs) to prevent workers from entering into the maneuvering area of the lifting appliance



Provide Fall Arrest Block (Sala block) for rigger working at height on Crane Truck



Provide Fall Arrest Block (Sala block) for rigger and signaler working at height on Crane Truck



8. Safety of Work Near Window Opening**Working near wall opening**

Safe System of Work for glazing installation works

- 1) Well Planning
- 2) Safe System of Works
- 3) Permit-to-Work

1) Well Planning

Organization:

Project Management

- ◆ Overall monitoring of the safe working procedures.
- ◆ Endorse "Permit for glazing installation".

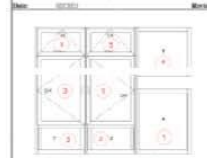
Safety Officer

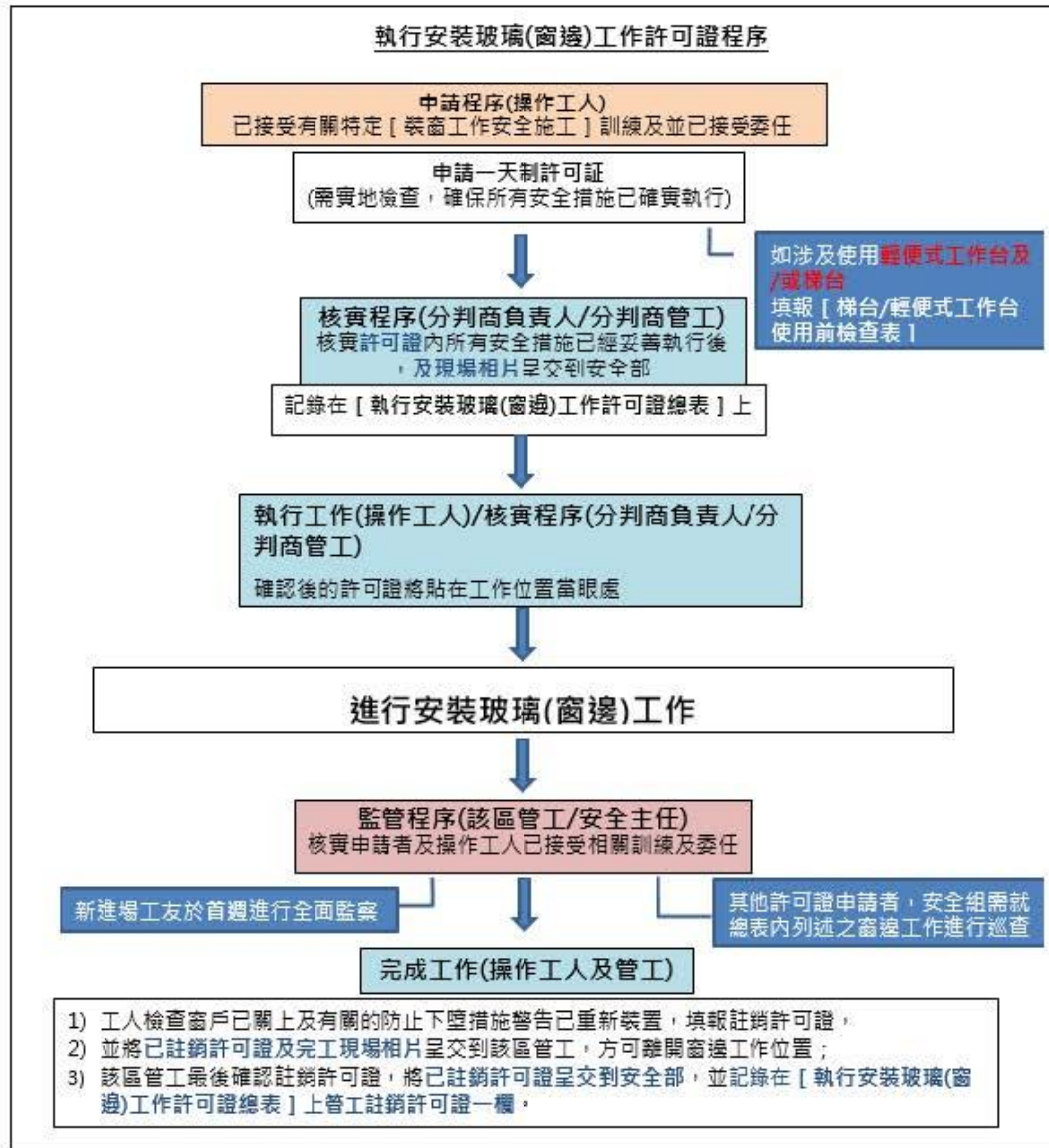
- ◆ Coordinate and monitor safe working procedures are in place.
- ◆ Conduct risk assessment to identify potential hazards and precaution measures to eliminate the hazard or reduce the risks.
- ◆ Arrange and conduct special training of safe working procedures.

Site Agent and Front-line Supervisor

- ◆ To ensure trained workers are assigned for the task.
- ◆ To closely monitor the works on spot are conducted in safe manner.

•METHOD STATEMENT OF GLAZING INSTALLATION**1) Well Planning**

HONG KONG ENGINEERING CO. LTD.		HONG KONG ENGINEERING CO. LTD.	
<p>Document No.: 001/2020</p> <p>Project: Construction of Public Transport Interchange at Shek O, 1st Phase, 1st Period of Phase 1</p> <p>Subject: Method Statement for Glazing Installation</p> <p>Date: 08/03/2020</p> <p>Revision: 1</p>		<p>Document at Shek O, 1st Phase, 1st Period of Phase 1</p> <p>Version: 1</p> <p>Project for Glazing Installation</p> <p>File 1 Phase 1</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p> <p>26</p> <p>27</p> <p>28</p> <p>29</p> <p>30</p> <p>31</p> <p>32</p> <p>33</p> <p>34</p> <p>35</p> <p>36</p> <p>37</p> <p>38</p> <p>39</p> <p>40</p> <p>41</p> <p>42</p> <p>43</p> <p>44</p> <p>45</p> <p>46</p> <p>47</p> <p>48</p> <p>49</p> <p>50</p> <p>51</p> <p>52</p> <p>53</p> <p>54</p> <p>55</p> <p>56</p> <p>57</p> <p>58</p> <p>59</p> <p>60</p> <p>61</p> <p>62</p> <p>63</p> <p>64</p> <p>65</p> <p>66</p> <p>67</p> <p>68</p> <p>69</p> <p>70</p> <p>71</p> <p>72</p> <p>73</p> <p>74</p> <p>75</p> <p>76</p> <p>77</p> <p>78</p> <p>79</p> <p>80</p> <p>81</p> <p>82</p> <p>83</p> <p>84</p> <p>85</p> <p>86</p> <p>87</p> <p>88</p> <p>89</p> <p>90</p> <p>91</p> <p>92</p> <p>93</p> <p>94</p> <p>95</p> <p>96</p> <p>97</p> <p>98</p> <p>99</p> <p>100</p>	
<p>Typical installation sequence of glazing</p> 		<p>Statement for Glazing Installation</p>	
<p>II. Safety Precautions:</p> <ol style="list-style-type: none"> The safety officer must conduct risk assessment for hazardous procedures based on the method statement. All workers shall possess valid Mandatory Basic Safety Training Card (Green Card). All workers shall attend training about glazing installation before on-site working. All workers shall attend site safety induction training. Raise PPE required: safety helmet & safety strap, reflective vest, anti-slip shoes. Manual handling: use one person for long distance material transportation. Good housekeeping must be maintained on working platforms to avoid of falling objects. For induction the supervisor work, site foreman will in charge one block, and foreman will address the supervisor report on safety work to ensure the workers following the method statement glazing installation. Warning of worker first violation the installation procedure of method statement, as per from the site if worker second violation. 		<p>III. Appendix:</p> <p>I. Risk Assessment</p> <p>II. Listing of Working Platforms</p>	



窗邊離地工作時 須用有圍欄之功夫檯



鋁窗工作安全施工程序



1 裝設工作平台至工作位置

2 安全網上工作時

3 由同工搬運玻璃至安裝工

4 安裝玻璃

5 安裝玻璃線

Supervision and Monitoring System



鐵圍欄



此圍欄於

(一) 裝窗工作完成

及

(二) 工作許可證正式註銷前

禁止移離

2) Safe System of Works

- Tools & Equipment (Step Platform)

協興工程有限公司
HIPHING ENGINEERING CO. LTD.
專業建築工程 專業工程顧問

梯台及輕便工作台記錄

層高	分判商	登記編號	梯台種類	分判商簽名	檢閱日期	檢閱日期	檢閱狀態	檢閱人姓名	檢閱人職稱
1	大華(股)	TW-1	輕便工作台	張國強	2023/01/01	2023/01/01	合格	張國強	工程師
2									
3									
4									
5									
6									
7									
8									
9									
10									

第1頁



No Hop up Platform & Ladder Platform Except with a Permit

- Work at height should be **planned in advance**
- Use of ladder platform for working purpose must be **justified by task-specific risk assessment**
- Ladder Platforms should **NEVER** be allowed for working purpose if the **falling height is 2m or more**
- Ladder Platforms could only be used after fulfilling the conditions imposed under a **permit-to-use system**



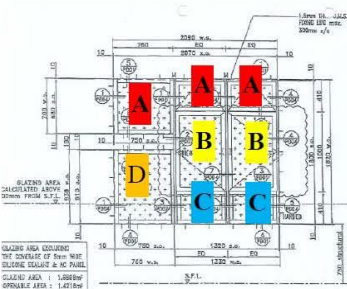
2) Safe System of Works

- Tools & Equipment (Suction Lifter with Priming Pump)

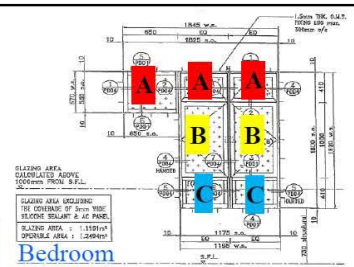
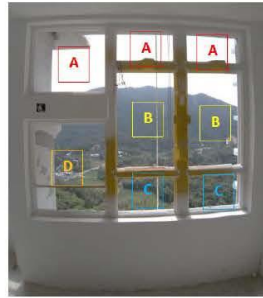


1) Well Planning

- ◆ Type of Window
- ◆ Sequence of installation



Living Room



Bedroom



SAFE WORK PROCEDURE FOR GLAZING INSTALLATION WORKS (ON GROUND)



Barricading working area



Shifting the panel to the position



3



4

SAFE WORK PROCEDURE FOR GLAZING INSTALLATION WORKS (USING PLATFORM)



Shifting the platform



Climbing up the platform



3

Deliver the panel



4

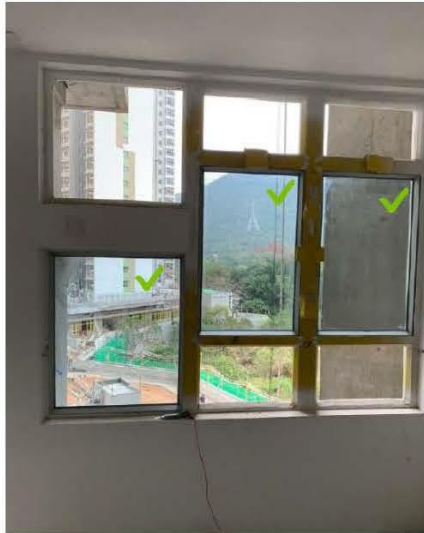
Installing the panel



5

Installing the glazing beads

ENHANCEMENT ACTIONS FOR FUTURE



•PRE-GLAZE IN FACADE FACTORY

Enhancement actions

新創建築團成員 Member of NWS

1. Assign a team of 2 workers for carrying out the glazing installation works.
2. Implement Safe System of Works for glazing installation works.
3. Assign frontline supervisors to conduct the inspection 2 times per day.
4. HH purchases and supplies appropriate platforms.
5. Display safe work procedure and warning notice at working areas.
6. Provide specific daily safety morning briefing to workers before commencement of works.

9. Use of Information Technology for Site Safety

Safety Innovations in the Past Years

AR, VR, AI

Immersive VR Training



A.I. Site Monitoring & AR Assist



360° Mobile Safety Information System



Virtual Reality (VR) Cave (applied at Queen Mary Hospital)

Safety of Working at Height



VR Cave to provide innovative and interactive safety training to the workers.

What's New - CRANE ROPE MONITORING

A.I. Powered Monitoring



Data livestream

The camera(s) continuously record the rope condition which it is monitored in real-time and equipped with an alert system. Data is streamed to the cloud server for processing.



Defects to be identified



01 Broken wires



02 Rusting



03 Peeling



04 Reduction in diameter



05 Heat damage



06 Rope deformation

What's New - XensePath UWB Safety Management System

Asset Location Tracking, Behaviour Monitoring and Anti-Collision



IoT Sensors and System (applied at Queen Mary Hospital)



IoT Sensor is developed and applied on **Safety Harness**, in order to ensure the worker has fixed his harness onto the designated anchorage point during **work-at-height**.



What's New - 5G-BIM-MR

For Excavation Safety



Before BIM-MR

After BIM-MR



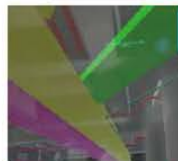
Temporary labeling



Manual marking & measurement by tape



2D-based illustration



Visualize layout & markings



Instant depth display & digital tape measurement



3D-based visualization



POWER

Less alignment error, safer excavation

- Precise alignments
- "Seeing through" underground utilities
- Markings NOT affected by working environment change

Boost general safety performance

- Immediate and deeper understanding of working environment, installation sequences
- code of practice

10. Safe Operation of Mobile Crane

一般吊運工序 – 操作流動式起重機的管理要求

- 工序參與人員的資格
- 流動式起重機的架設地點選擇
- 操作流動式起重機配套

Safety of Operation of Mobile Crane – General Lifting

(安全操作流動式起重機 – 一般吊運工序)



大型吊運工序 – 操作流動式起重機的管理要求

- 策劃
- 工序參與人員的資格
- 流動式起重機的架設地點選擇
- 流動式起重機架設、拆卸及測試

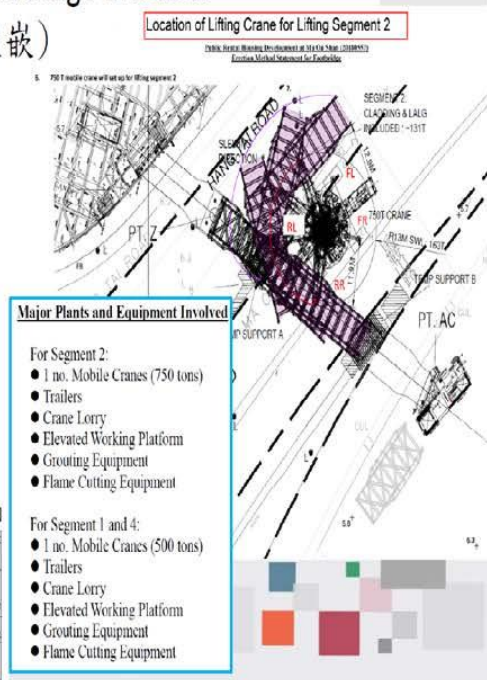
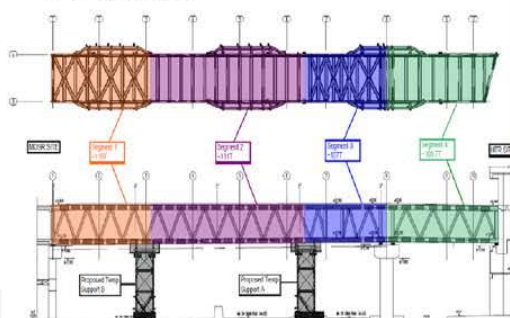
(安全操作流動式起重機 - 行人天橋裝嵌)



(安全操作流動式起重機 - 行人天橋裝嵌)

Location of Lifting Crane for Lifting Segment 2

- 負荷物
- 安全操作負荷
- 工作半徑
- 承重力
- 物料存放位置



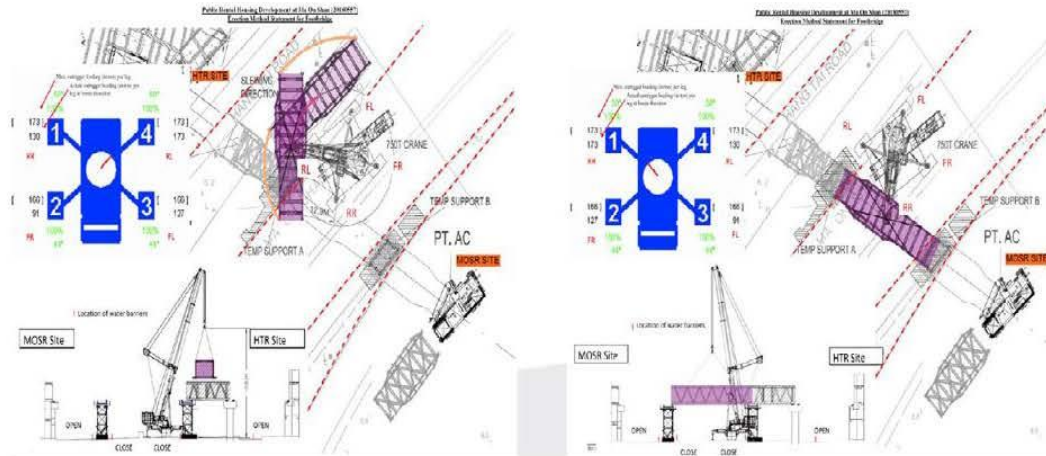
策劃

— 施工方案

流動起重機安全操作負荷為 163噸

負荷物 (橋) 及吊具重量為 <133噸

負載量為 ~81.5%



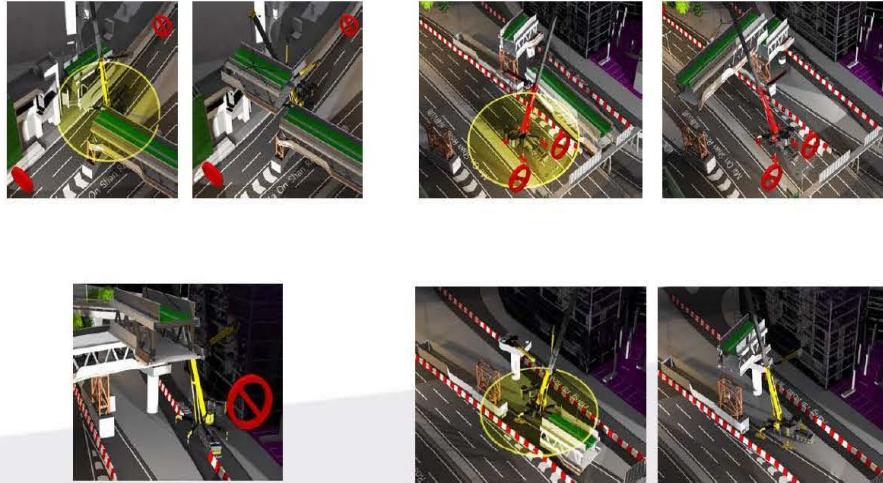
策劃

— 使用BIM模型



策劃

- 使用BIM模型



工序參與人員的資格

- 認可起重機操作員訓練證書
- 認可訊號員及索具工訓練證書



流動式起重機架設、拆卸及測試



行人天橋裝嵌



11. Safe Use of Compressed Air Receiver for Piling Works

Common Use of Air Receiver for Piling Works



- Compressed Air Receivers are mainly used to flush out water and soil from boring for Piling Works
- For examples:
 - Drill machine for soil nail; and
 - Boring machine for socketed H-Pile, Mini-Pile Pipe Pile etc.

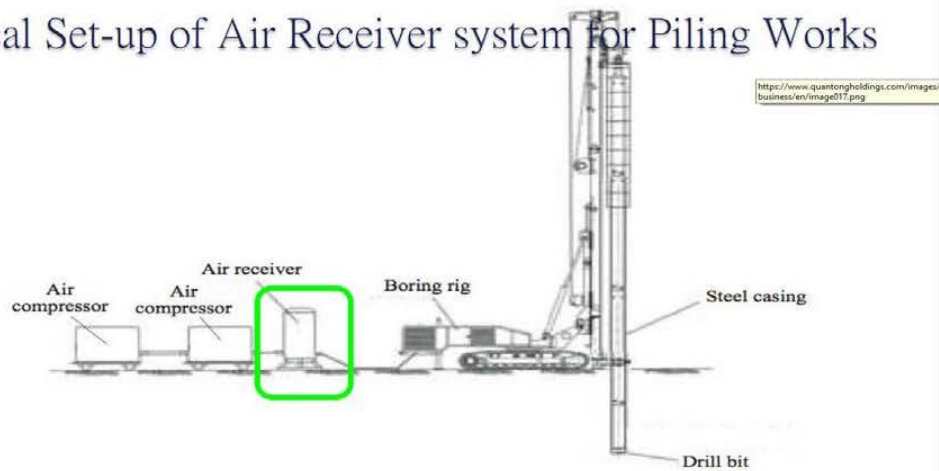


Drill machine for soil nail

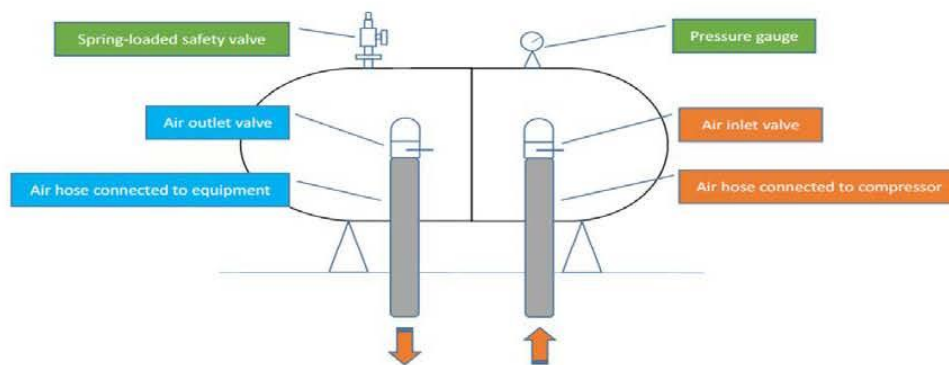


Boring machine for socketed H pile, mini pile, pipe pile etc.

Typical Set-up of Air Receiver system for Piling Works



Typical Compressed Air Receiver



Incident Case Sharing

- At the time of incident, an idling air receiver (for Socket H-Pile located next to the bored pile operation) connected with the air hose with the free-end connection.
- When the airlifting of bored pile was in progress, the vibration of water hose connected to the airlifting pipe causing the air receiver valve accidentally turned on.
- Subsequently, it caused the free-end of connected air hose being swung and eventually hit and damaged three vehicles in the adjacent car parking.



Possible Causes of the incident

- The valve of air receiver was interfered and opened accidentally;
- Along the way, the air hose connected to the air receiver was not securely fixed.

Recommendations

- Both ends of air hose should be securely fixed;
- Air hose should be disconnected from air receiver after use every time so as to prevent from any free-end of air hose but connected;
- Use of handle locking device for the valve to prevent from accidentally turn on.

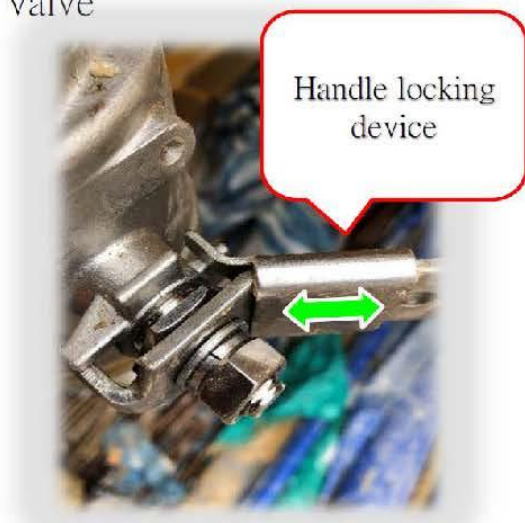
Recommendations

- Both ends of air hose should be securely fixed;
- Air hose shall be fixed by whip check.



Recommendations

- Handle locking device for the valve





The valve is closed and locked in normal situation.



It is required to pull up the steel ring and turn the handle for turn on the valve.

12. Safety of Material Hoist Operation with Enhancement

非接觸式紅外線互鎖系統開發原因

簡單優化原理



*** 至於是否紅外線或RFID不是重點
只要是非接觸式即可

非接觸式紅外線互鎖系統操作原理



1. 當閘門被關上，發射器與接收器對準，系統判定門已被關上，讓開士機安全操作運行；
2. 當閘門被打開，兩邊感應器無法對準時，系統會判定門被打開，禁止運行內籠升降；
3. 原有互鎖系統及新加入的裝置，更加有效防止人為干擾

**坊間有多種非接觸式裝置，靈敏度迥異，有點對點對準，亦有可調節感應範圍

優點及研發過程經驗分享

1. **維修容易** 預備足夠配件，如遇故障，地盤機房能即時更換，避免長時間等候專業承辦商遠道來搶修；



◀ 成品式
連保護罩



半成品式 ▲ 自製保護罩

2. **快速檢測** 建議新舊檢查燈箱分開，縮短診斷時間；



3. **通用性** 無論雙掩門或上下趟門均可安裝；
4. **保留原廠互鎖系統** 建議保留原廠系統，運行雙互鎖系統，以新互鎖系統彌補傳統接觸式的不足；
5. **污水保護** 為免上層落石矢英泥水弄污感應器，建議在頂部裝上護罩抗污；降低維護頻率。



保護罩抗污

； 感應器安裝位置之影響

