

# **Hong Kong Housing Authority**

**Site Safety Seminar for Capital Works  
New Works Contracts  
Lesson Learnt from Accidents and  
Incidents**

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# Precast Façade Toppled Over Accident



Accident Scene

Accident Date : 13 February 2012

A precast façade toppled over and hit the rigger who was performing preparation works to hoist up this façade.

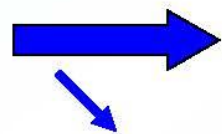




# Learning from Accident



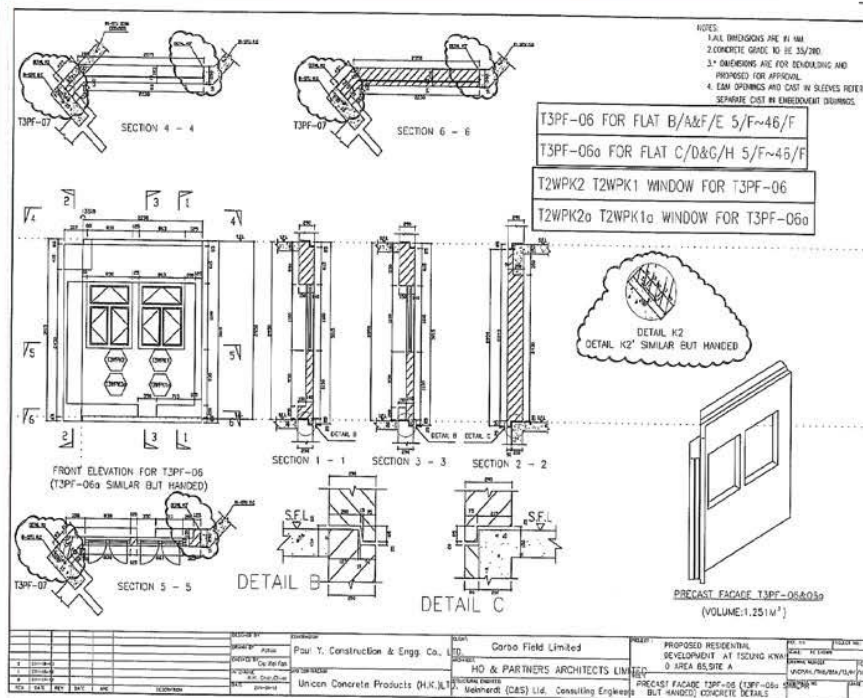
Façade Yards



The Construction Site



# Learning from Accident



Damaged Window

Configuration and size of the façade:

- Dimension: 2358 mm (length) x 290 mm (width) x 3015 mm (height)
- Weight: 3.13 tons
- Asymmetrical



# Learning from Accident



Tightening Screw-Bolt

Two Metal Base Frames

Anchor Bolts

- Two identical metal base frames used for ensuring that the façade could stand upright stably on the concrete flooring
- Base plate of the metal base frame was a U-shape channel of size 140 mm x 55 mm x 920 mm (length) onto which two same size vertical U-shape channels, each of size 140 mm x 55 mm x 910 mm (length), were welded
- Originally fixed on each metal base frame by the following arrangement: on the interior face walls by four fixing bolts whilst on the exterior side by two tightening screw-bolts

# Learning from Accident



## ❑ Toppled façade:

- four fixing bolts had been completely removed and these bolts could be found nearby



# Learning from Accident



Partly withdrawn tightening screw-bolts

Fully retracted tightening screw-bolts

# Learning from Accident

## Hazard management and communication

- Relevant risk control measures (Full Wealth safety representative and Block Foremen were responsible):
  - RAR/TK085A/012 - “Façade transportation and storage”  
“ 3.8 佛沙儲存區地面需平坦，確保佛沙平穩擺放。”
  - RAR-TKO85A/013 – “Façade installation and hoisting”  
“ 1.7 吊運佛沙前，必須確保佛沙已扣好方可拆去螺絲及鐵架。  
  
1.8 在地下掛佛沙吊鉤前，先檢查存放之佛沙是否牢固存放。”  
  
“ 3.2 在未肯定天秤已可獨立吊起佛沙前，不可將牢固佛沙之螺絲，碼仔等拆除。”
  - “4.7 吊起佛沙時埋碼員在地面檢查及確保所有螺絲及固定栓已上穩方可吊運。”



# Learning from Accident

## Safety Working Procedures

### 鐵模板施工程序說明書

## Risk Assessment

SITE 地點: 將軍澳 TK085A

Subject 工種: 佛沙預製件裝載及吊運  
Ref. No. 檔案編號: RAR/TK085A/013

### RISK RATING RECORD (危機評估紀錄)

Likelihood rating (可能發生級)		Severity rating (嚴重性等級)		Risk Rating (危險等級)	
5. Frequently 頻常	5. Catastrophic 災難 (Death, toxic release, huge financial loss) 引致死亡、釋放毒氣、巨大財政損失	20-25	Extreme priority action 緊急優先跟進行動		
4. Probable 經常	4. Major 嚴重 (Extensive injury, loss of production capability, major financial loss) 嚴重受傷、失去工作能力、重大財政損失	10-15	High priority action 高度優先行動		
3. Occasional 間中	3. Moderate 重大 (Medical treatment, most outside assistance, high financial loss) 需要意外、較高財政損失	5-9	Medium priority action 中等優先跟進行動		
2. Remote 罕見	2. Minor 輕微 (First Aid treatment, medium financial loss) 急救治療、中等財政損失	1-4	Low priority 低優先跟進行動		
1. Improbable 幾乎不可能	1. Insignificant 無損 (No injury, low financial loss) 沒有人受傷、低財政損失				

HAZARD 危害	CIRCUMSTANCES 情況	(L) 可能性	(S) 嚴重性	RISK 危險等級		CONTROL MEASURES 控制措施	RESIDUAL RISK (RR) RATING 剩餘危險等級			ACTION BY 負責人	FOLLOW UP 跟進
				RATING 危險等級	PRIORITY 次序		L	S	RR		
	鬆脫。					2.5 進行吊運前把施工範圍對下層如白蠟圍起,防止其他人擅自闖入; 2.6 並由看守員負責,用哨子或大聲公禁止進入一切勿靠近; 2.7 吊勾及佛沙預製件由專人出廠前檢查,並在佛沙預製件上表明掛各件佛沙的正確位置; 2.8 7字碼及C字掛架需按設計安裝,上足螺絲。					
3.佛沙預製件倒側	吊上樓面安裝的佛沙,因承托不足及未有妥善固定引致倒側;在固定預製件期間未有暫時支	2	5	10	4 <sup>th</sup>	3.1 如控制措施+1.1; 3.2 在未肯定天秤已可獨立吊起佛沙前,不可將牢固佛沙之螺絲,兩件等拆除; 3.3 石夾預製件吊運至大樓樓面之指定位置安裝後,工人需即時戴上拉桿及“七字碼”,並依照特定設計圖則	1	4	4	當當卸模負責人 跟隨卸模負責人 保護各處管工	

Precaution and Action Required:  
所需預防行動

- (1) 在緊急情況下使用吊機機1台或發電機2623 9893。
- (2) 各行當負責人、工程師及安全部須在佛沙預製件裝載及吊運時密切監察,已確保施工安全。
- (3) 使用個人防護裝備安全帽(標準 EN397)、安全帶(標準 JIS-M-7624)、全身式安全帶(標準 EN361)及防護盾(標準 EN333)等。
- (4) 十六毫米直接獨立教生施(附廠證書/護方證明) (5)工人須接受有關高風險施工安全訓練。

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HS 3 / 6

### 4.3 安裝預製佛沙之安全措施

4.3.1 在地下掛佛沙吊鉤前,先檢查存放之佛沙是否牢固存放;

4.3.2 掛吊鉤時要站立適當位置,吊鉤要按佛沙之款式,掛在吊重工字之正確位置;

4.3.3 在未肯定天秤已可獨立吊起佛沙前,不可將牢固佛沙之螺絲,兩件等拆除;

4.3.4 吊起佛沙時,要給予適當訊號予天秤司機及樓面安裝佛沙之工友;

4.3.5 於樓面安裝預製佛沙之工友,一定要配戴安全帶;

4.3.6 在天秤未除吊鉤前,保證斜撐及角碼已安裝及牢固,並收緊所有螺絲固定;

4.3.7 安裝佛沙頂欄河時,不要站立於佛沙頂或腰部高過佛沙頂之水平;

4.3.8 安裝欄河時,保證螺絲已收緊及牢固,才可將欄河放手,以免高空墮物;

4.3.9 拆除欄河時,一定要配戴安全帶。

第八頁



# Learning from Accident

## In-house Safety Rules

### 佛沙吊運安全守則

1. 佛沙擺放位置必須平坦, 確保佛沙穩固放於地上;
2. 使用穩固上落鋁梯進行解鈎及扣上佛沙吊架; 另用粗繩或掛鈎將爬梯綁好;
3. 嚴禁攀爬佛沙, 埋碼員使用安全帶扣在留鐵上;
4. 提供足夠之個人防護裝備, 並監督工人在工作期間使用。
5. 吊運佛沙預製件時要使用特別設計之吊杆(Lifting Beam), 吊杆每對吊鈎位置必須接受檢驗, 吊杆鍊索要能垂直吊起佛沙;
6. 嚴禁任何物料附近於預製件上一起吊運; 吊運時, 吊運的佛沙下嚴禁有人站立。;
7. 吊起佛沙時埋碼員在地面檢查及確保所有螺絲及固定栓已上穩方可吊運; 吊運前, 佛沙必須已扣好方可拆去特定鐵架;
8. 天秤埋碼員必須密切留意天秤的運行方向同秤手保持聯絡。



# Learning from Accident

Upon successful lifting of the first and second façades, D/P began to cut corner to speed up the operation by dislodgement of the “screws” for fixing the facades to the metal base frames prior to proper suspension from the crane



- Tower Crane operator with the aid of CCTV system could see clearly the “at risk act” before the accident
- His declaration given to LD affirmed that during the 1<sup>st</sup> and 2<sup>nd</sup> lifting, D/P abided by the hoisting rules, i.e. loosening the fixing screws only after ensuring proper suspension by the tower crane
- He also described in details D/P's cut-corner act during the 3<sup>rd</sup> to 6<sup>th</sup> hoisting

# Learning from Accident

## Safety Measures Taken Before the Incident

Design and method statement for temporary supports (steel brackets) of precast façade submitted by the subcontractor Union	✓
Method statement for precast façade hoisting and assembling submitted by the subcontractor Full Wealth	✓
Two risk assessments for precast façade activities including <ul style="list-style-type: none"><li>- transportation and stacking</li><li>- assembling and hoisting</li></ul>	✓
In-house safety rules for precast façade hoisting	✓
Safety training on the developed in-house safety rules for precast façade hoisting been given to the workers who are assigned to perform such activity	✓
Monitor precast façade activities by the appointed front-line supervisors	✓



# Learning from Accident

## Safety Measures Taken Before the Incident

The Sub-agent Tommy Cheung and the Foreman K C Lee of Paul Y. are assigned to oversee precast façade transportation, stacking, storage, hoisting and assembling works as well as the designated precast façade storage yards	✓
The questioned precast façade yard hard-paved with concrete	✓
The used tower cranes examined and tested by a RPE	✓
The used lifting gears examined and tested by a RPE	✓
Tower crane operators holding valid licenses	✓
Appointed riggers / banksmen holding valid green card and silver card	✓

# Learning from Accident

## Immediate Improvements

- Re-design and construct temporary supports at the designated precast façade storage yards
- Re-surface the designated precast façade storage yards to ensure flat and even
- Erect rigid fencing to instead of movable barrier to fence off the designated precast façade storage yards
- Display notice to remind workers not to enter into the designated precast façade storage yards except authorized persons
- Use a ladder with hand-rail to replace the current one
- Review risk assessment for precast façade transportation, stacking, hoisting and assembling
- Review in-house safety rules for precast façade transportation, stacking, hoisting and assembling



# Learning from Accident

## Immediate Improvements

- Appoint front-line supervisors to oversee the designated precast façade storage yards by written
- Conduct refresher training by adopting the reviewed and revised in-house safety rules developed from risk assessment to the concerned supervisory staff and workers in particular the appointed riggers / banksmen
- Conduct practice training to ensure relevant front-line supervisors and workers are familiar with the newly enforced precast façade transportation, stacking, hoisting and assembling method
- Deploy experienced safety supervisors to monitor the mentioned safety measures are in place

# Learning from Accident

## Sustainable Improvements

- Design and method statement for precast façade transportation, stacking, storage, hoisting and assembling shall be reviewed and endorsed by Project-in-charges
- Precast façade stacked and stored free standing without rigid anchors is strictly prohibited unless prior approval obtained from Directors
- Precast façade activities shall be one of the crucial items to check and inspect in each management safety walk
- Conduct workshops to communicate the accident as well as risks of precast façade activities to site management and supervisory staff



# Learning from Accident





# Learning from Accident

## Improvements by Adopting Engineering Control Measure





# Learning from Accident

## Metal-base Frame



# Learning from Accident

## Access and working platform





# Learning from Accident



Well Organized Façade  
Storage Yard

Metal Base-frame with Holding  
Down Bolts on Plinths



**Thank you!**

**Q & A**