



Safe Lifting Works Management System

Speaker : Kelvin, W.C LEUNG
Hip Hing Engineering Co.,Ltd

Incident



九龍灣地盤發生一宗吊運事故，報導指出天秤正吊運一碼3呎乘6呎之木板到樓面途中，部份木板從高處下墮到拆板位置的工人，導致多名工人被多塊木板擊中而受傷送院。

Source: 香港經濟日報

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Fatal Accident

鋼架飛墮擊斃工人



觀塘一個地盤發生一宗天秤吊運死亡事故，報導指出一部天秤在吊運鋼架俗稱「通架」期間，懷疑綑綁的鋼纜鬆脫，80件通架如仙女散花般飛墮地面，一名工人途經走避不及，被其中一個鋼架擊中頭部，安全帽飛脫，頭顱爆裂，當場死亡。



Source: 蘋果日報

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Fatal Accident



AA



九龍城地盤發生一宗吊運死亡事故，報導指出天秤正吊運一碼組件約3至4層樓高時，懷疑天秤鋼纜絲斷，組件從高處墮下擊中一名工人。工人送院搶救後不治。

Source: 蘋果日報

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協興工程有限公司
HIP HING ENGINEERING CO LTD
新加坡專業成員 Member of NWS Holdings

Unsafe Lifting Operation Investigation

Possible Causes of Incident:



1. Improper Lifting Operation

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Unsafe Lifting Operation Investigation

Possible Causes of Incident:



2. Poor Condition of Lifting Gears

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Unsafe Lifting Operation Investigation

Possible Causes of Incident:



3. Overloading

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Unsafe Lifting Operation Investigation

Possible Causes of Incident:



4. Broken Wire Ropes

Unsafe Lifting Operation Investigation

Possible Causes of Incident:



5. No Independent Signaler and Banksman

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Unsafe Lifting Operation Investigation

Possible Causes of Incident:



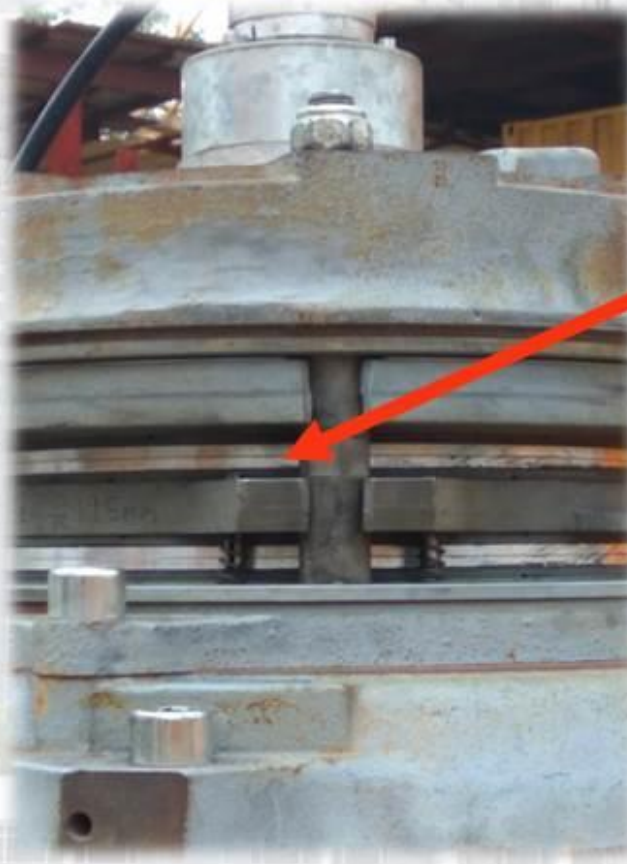
Tower Crane Inverter in Control Panel



6. Tower Crane Inverter Malfunction

Unsafe Lifting Operation Investigation

Possible Causes of Incident:



Brake was not released completely when the wire rope was moving upward or downward

Tower Crane Motor Brake

Preventive Measures - People

Enhancement Safety Training

- Ensure lifting works should be carried out by competent lifting operator only
- Provide Specific Trade & Refresh Trainings for all Signalman, Rigger, Tower Crane operators and Lifting Supervisors regularly
- Provide the Practical Lifting Training on site



The Area Lifting Supervisors to supervise all lifting process:-

- Check & Verify the material load to be lifted against Loading Capacity of Cranes
- Rigging methods and lifting conditions
- Stop all unsafe lifting acts and report to Site Management immediately.

指定行業安全訓練證明書
Specified Trade Safety Training Certificate

持證人姓名 Holder's Name :
(中文 Chinese) : 梁桂堂
(英文 English) : LEUNG, Kwai Tong
請參閱背頁
Please turn overleaf to read the information

姓名 Name : 陳大文

工程 Trade : 工地建材工具工 Construction Materials Rigger
編號 Reference no. : A1200002822 發證日期 Date of issue : 05/01/2015
有效期限 Validity : 13/01/2015 - 12/01/2018

Preventive Measures - Machine

Checking, Testing & Trial Run The Town Crane Components



Checking the Inventor Function



Trial Test the Inventor

Preventive Measures - Machine

Checking, Testing & Trial Run The Tower Crane Components



Checking the Tower Crane Motor and Brake



Trial Run the Brake

Preventive Measures - Machine

Brake Disc Thickness Sensor

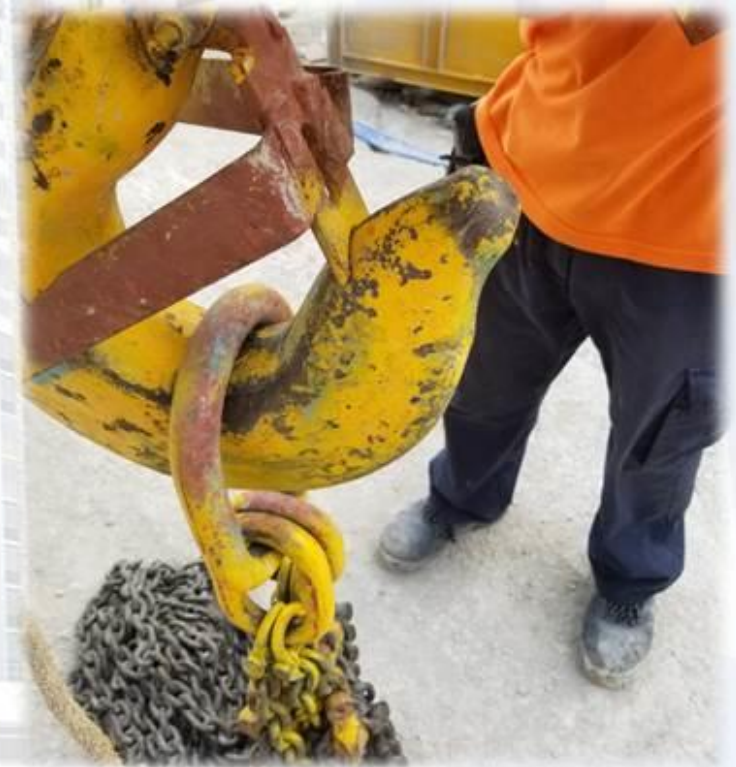


Brake Disc Thickness Sensor for Checking Brake Disc Thickness

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Preventive Measures - Machine

Interlocking Device



Interlocking Device for The Lifting Hook

Preventive Measures - Material

Wire Ropes Replacement

Replace all wires ropes for remaining town cranes immediately

- **Europe / Japan Wire Ropes Preferable**



New Wire Ropes for Tie bars and Lifting Section



New Wire Ropes installation in the Tower Crane Hoisting

Preventive Measures – Material

Wire Ropes Replacement

Replace and adopt all wire ropes from Europe / Japan preferable

1 Absender - Consignor - Expéditeur - Expedidor	
VORNBAUMEN STAHLSEILE GMBH AND CO., KG, MUNSTERSTRASSE 41, D-49186 BAD IBURG, GERMANY	
2 Empfänger - Consignee - Destinataire - Destinatario	
SHAN HEE INTERNATIONAL S.K. LTD. FLAT A/207 BLOCK 1, GOLDEN BRIDGE BLD. CENTRAL, 180-182 104 LEE PAO RD. HONG KONG	
EUROPÄISCHE GESELLSCHAFT EUROPEAN COMPANY, ANONYMUS GESELLSCHAFT UNSPURSZEGNIS WIRTSCHAFTS- UND VERKEHRSGESAMTUNION DEUTSCHER VERBAND VERBAND DEUTSCHER INDUSTRIE- UND HANDELSKAMMERN FEDERAL REPUBLIC OF GERMANY (European Union)	
LIT No. 001 70782776 of HONGKONG AND SHANGHAI FREEPORT CORPORATION LIMITED HONG KONG Island 01.08.2018 Invoice No. 000104 dated 22.06.2018	
GOODS OF HONG KONG INCOTERMS 2010 5 REEL STEEL WIRE ROPES AS PER FC-04224	
No. and content of packages: 5 reels	
1. 10 000 kg 10 x 6 C 2000 M 3 1 REEL 2. 10 000 kg 10 x 6 C 2000 M 3 1 REEL 3. 10 000 kg 10 x 6 C 2000 M 3 1 REEL 4. 10 000 kg 10 x 6 C 2000 M 3 1 REEL 5. 10 000 kg 10 x 6 C 2000 M 3 1 REEL	
Industrie- und Handelskammer Bundeskammern - Bundes - Handelskammern	

Mill Certificate
Origin : **GERMANY**

The cost of European Wire Ropes 60% more

Preventive Measures – Material

List of Tower Crane Components MUST be replaced before erection

	Section	Components
1	Wire Rope	Hoisting wire 鋼纜 (大科/變幅)
2	Wire Rope	Trolley Wire 鋼纜 (車仔/安全)
3	Trolley	Pulley 滑輪 (賽鋼)
4	Bearing	Bearing (Pulley) 軸承 (滑輪)
5	Bearing	Bearing (Motor) 軸承 (摩打)
6	Bearing	Bearing (Trolley/ Sleeping Gear Box 軸承 (車仔/轉盤牙箱)
7	Trolley	Guide Wheel (Trolley) 車仔導輪(賽鋼)
8	Others	Brake Discs 迫力碟
9	Trolley	Carbon Brush 摩打碳刷

Preventive Measures – Material

Lifting Gears Lending Station and Lifting Gears Double Marking



Provision of Lifting Gears Lending Station



Provision of Double Marking of Lifting Gears & Nylon Webbing Slings
(Prohibition of re-examining the used nylon webbing slings) 20

Preventive Measures - Method

Independent Duty



Rigger



Signalman

Independent Duty in Rigger and Signalman listed in **Subcontractor Contractual Requirement**

Preventive Measures – Environment

Environment: Enhancement of Tower Cranes & Lifting system

1. Addition **Automatic Safe load indicator (ASLI-安全負荷顯示系統)** and audible warning buzzer to all tower Cranes (overloading later)
 - Displayed Designated lifting areas , Rebar Bending Yards or Building Prominent Location

Loading Capacity of Tower Crane	Colour Signal
< 80 %	Green
80 % ≤ Loadings < 90%	Yellow
≥90 %	Red Alert

2. Surveillance Cameras with recording to monitor on all tower crane lifting operation



Audio Visual Lifting Alarm System & Automatic Safe Load Indicator



Multi-Angles Surveillance Cameras With Recording in Tower Crane & Lifting Zone

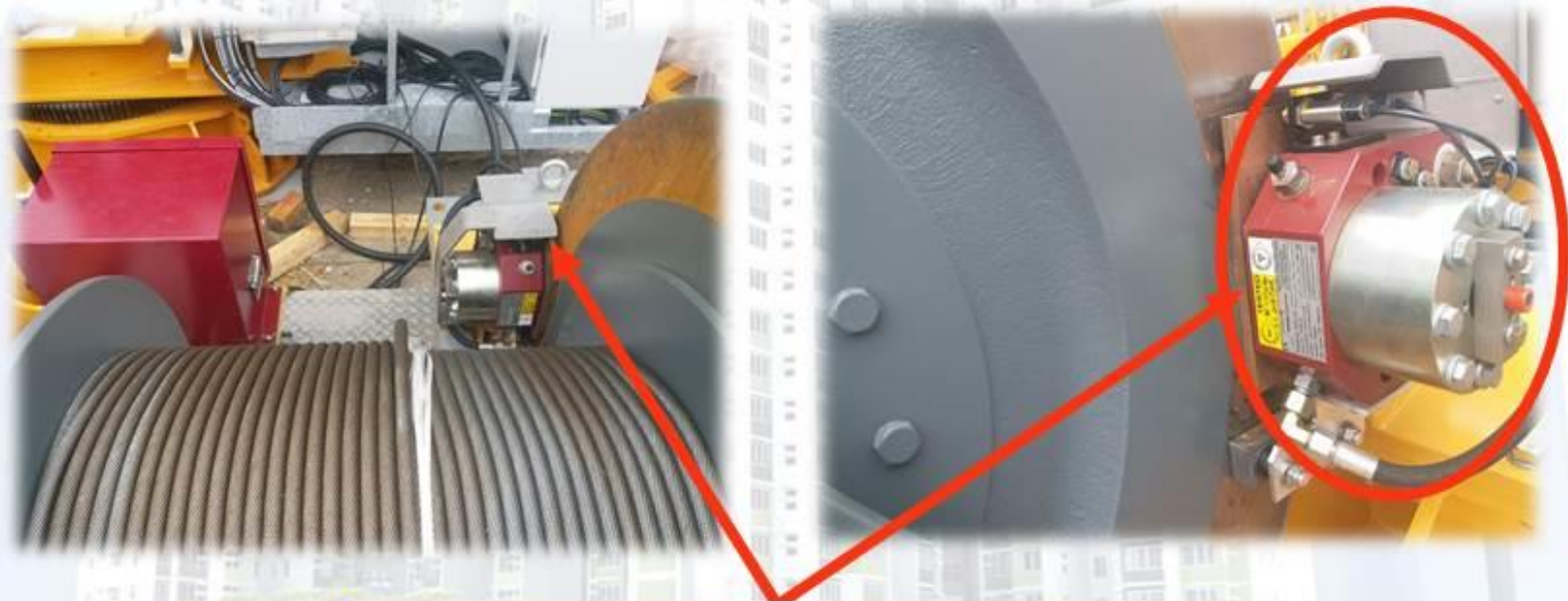
Safety Performance Review

Statistic of Lifting Operation Incident

2016	2017	2018 (Cut off Date : 31 May 2018)
3	2	<u>0</u>

Step Forward

Sustainable Improvement (Trial Test)



Secondary Brake System on Wire Drum



End of Presentation
Thank you!

Here is the footage of
Site Safety Forum 2018 for Works Contracts and Property Services
Contracts
which was held on 3 July 2018
The speaker comes from
Hip Hing Engineering Company Ltd
Mr. Kelvin, W.C Leung
His topic is “Safe Lifting Works Management System”

(00:23)
Ladies and gentlemen, good afternoon
I am Kelvin Leung
of Hip Hing Engineering Company Ltd
I would like to share about
the Safe Lifting Works Management System today
Safe Lifting Works Management System
covers a wide scope
Let’s narrow down today
and focus on lifting operation by tower crane

Before talking about tower crane lifting
I would like to share some incidents relating to
lifting operation of tower crane in recent years
This lifting accident occurred at the Kowloon Bay site
At that time, the workers were lifting timber boards
In the process, the board fell and hit several workers
Fortunately the workers were injured only
Another incident occurred at a Kwun Tong site
also in Kowloon East
At that time, the workers were lifting steel frames
Unfortunately, the frames scattered down
causing one fatal accident
Another accident also involved tower crane lifting

Accident occurred at Kowloon Tong
At that time, the workers were lifting
some objects up to the working floor
It was suspected that the lifting wires broke
leading to death of one worker

After these accidents
we studied the major problem in the tower crane lifting
or any area for review
We summarized a few points
which might be the causes of the accidents
The first reason is improper rigging method
Take this picture as an example
you will note that there were long and short steel bars
rigged together by worker and hung on the hook
This increased the risk of collision with the building edge
causing the falling of steel bars
resulting in a serious accident

Another possible cause of incident
was about the lifting gear
Two common irregularities of lifting gear
would be expiry of the service life and so poor condition
Even it was not expired, it might be mis-handled
causing accidents during rigging
The third cause would be more common, overloading
Theoretically, overloading could be avoided
As mentioned by Hanison's representative just now
the operator might have by-passed the system
Hence, not knowing when it was overloaded
This aspect should be noted
Fourth, it also happened on our site
The steel wires formed knots or even broken
in two to three months' time
(a short period of time)

This would all lead to an accident

The fifth cause was very common
that the signalman also taking up the rigger's role
i.e. one person with two roles

This would be very dangerous
the person who did the rigging
might consider himself safe after rigging
he was not aware that he was standing
at a very unfavourable position
it might cause another accident

The other one was relatively rare
but if it occurred, it could cause a fatal accident
the brake system

This brake system controlled
the tower crane lifting operation

The situation would be like when we drive a car
If we always pull the hand brake accidentally during driving

The brake system would wear out continuously

This situation was the same

If the brake system was activated inappropriately

The brake disc in the brake system

would wear out continuously

until certain point that the brake fails

and the whole batch of loads would fall

In conclusion, how do we deal with
the problems just mentioned?

We will analyze according to the basic rule of
man, machine, material, method and environment
and some other preventive measures

First, in terms of man

We will employ competent people for lifting work

Whether the said competent people
can start work on site immediately?

The answer is no
We will conduct a test
and require him to perform routine lifting work
such as the rigging method and lifting operation
He can commence work on site
only after passing the test
If his methodology is inappropriate
or involved minor unsafe behaviour
We will not let him work

The second is about the tower crane
Basically, the brake system will
have certain influence on the lifting operation
We all understand the tight schedule of the 6-day cycle
in the Housing Department works contracts
How can we have such a long period to carry out
a detailed inspection?
For Hip Hing, we will apply for a CMP
that is, the noise permit
We will do a comprehensive check on Sunday
We will add one more test
which is to check whether there is any delay
between the brake system
and the stoppage of lifting operation
Let's share it here
We did find irregularity in past projects
In fact, the replacement is very simple
Replacing the circuit board can solve the problem
Just like replacing a malfunctioning phone with a new one
The key is to identify the irregularity
and find it at an early stage
If not, it will lead to a very serious incident
Another way, we will add one more sensor
This sensor is attached to the tower crane brake system
What is the purpose?

To monitor the thickness of the brake disc
and give a warning when the thickness
is less than half of the original
The brake disc thickness deviated
for different models or manufacturers
For example, a 20 mm thick brake disc
the sensor will alert
when the brake disc thickness is less than 10 mm
The driver will be alerted
and notify the mechanical department
to repair and replace the brake disc

We mentioned about falling objects
due to inadequate rigging
That is, "loosen hook"
Our company has specially developed an interlock device
to prevent falling objects from the hook
We also mentioned the wire ropes
What is wrong with the wire ropes?
According to our own experience
we found that the problem occurrence rate
of certain countries' wire ropes were higher
except Europe and Japan
Hence, from the middle of last year onwards
our company would only order
wire ropes manufactured from Europe or Japan
The advantage was their good quality
In fact, I would like to share a bit more
Taking the Kwai Chung site as an example
we noted that the wire ropes
from other countries in the past
would easily get tangling up or deformed
As the crane would be dismantled in one month
I struggled whether the wire ropes
need to be replaced or not?

After second thought, I chose not to take risk because of the high risk involved therefore we changed the wire rope at that moment and spent over hundred thousand dollars

How to calculate the cost?

The material cost increased by 60% over the conventional wire rope Fortunately, our top management of the company agreed that accidents should be avoided So we were willing to pay money for safety

In addition, the common practice was that we would not install a brand new tower crane on site

We did the same

However what was the difference between ours and others?

A tower crane might have been used on-site for three, five or even seven years

We had to replace some components when it was delivered to the site

All the wire ropes, brake discs bearings for all rotating parts, even the pulleys

All would be replaced with new ones to achieve the safety level

As mentioned earlier

For some lorry-mounted cranes entering the site the quality of their lifting gear vary significantly

We must use safe lifting gear

We set up a lifting gear lending station for lending lifting gear to them

In particular, the photo on the right hand side

We provided double markings on nylon webbing slings

Why?

The markings can be easily wear out in two or three months and can't be read

This method let the marking last longer
Moreover, we will not reuse nylon webbing slings
because it is easily affected by the weather
and it may require replacement after a few months
Avoid reuse, no re-examination is required
We will discard it right away
In terms of management
we have effective contract management
with our own sub-contractors
It is stated in the subcontracts
that the rigger and the signal man
have to perform separately and independently
They can't be performed by the same person
to avoid disputes
It allows clear execution by our frontline colleagues
Besides the alarm system in the lifting zone
we also install one more overload indicator visual alarm
You can see it on the right
that lamp with red, yellow and green
giving immediate alert to the signal man for the overload
To allow contingency, we have lowered the overload alarm
to 90% from full loading capacity of the tower crane
to allow pre-warning, alert early
and hence reduce overload problem

To comply with the requirements of the Housing Department
we install surveillance cameras with recording function
to monitor all tower crane lifting operations
After doing so many things
From 2018 till now, our company maintains
a zero accident record in lifting operation
Next, what is the way forward
We are planning with the supplier
to provide a secondary brake system on wire drum
This allow us to brake the objects being lifted

when main brake system fails

We expect this can be completed

in one to two years and introduced to Hong Kong

This is the end of my sharing

Thank you

Thank you, Mr. Leung

Please ask a question before leaving

Ok, I want to ask

in addition to checking tower crane motor and brake

what would be installed to check the brake disc condition?

These two ladies there

Thank you, please give them a microphone

Sensor

Correct

Congratulations

Thank you, Mr. Leung

Thank you for watching

(11:35)