大樓外牆防止物料下墮措施-外牆掛籠斜擋

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We Build, We Serve, We Create

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每日清掃

外牆掛籠斜擋－設計–考慮能承接下墮物料方案

承接下墮物料方案-
方案1：外牆竹棚斜擋

優勢：
- 靈活，可按需要而將棚架作出增減
- 能作出有效防墮

不足：
- 需不斷增搭，持續成本上升
- 棚架比較易受風力影響
- 竹棚上積聚的垃圾比較難清走

外牆掛籠斜擋－設計–考慮能承接下墮物料方案

承接下墮物料方案-
方案2：保護簷蓬

房署合約要求 既有保護

優勢：
- 堅固耐用
- 容易清理簷蓬上之垃圾

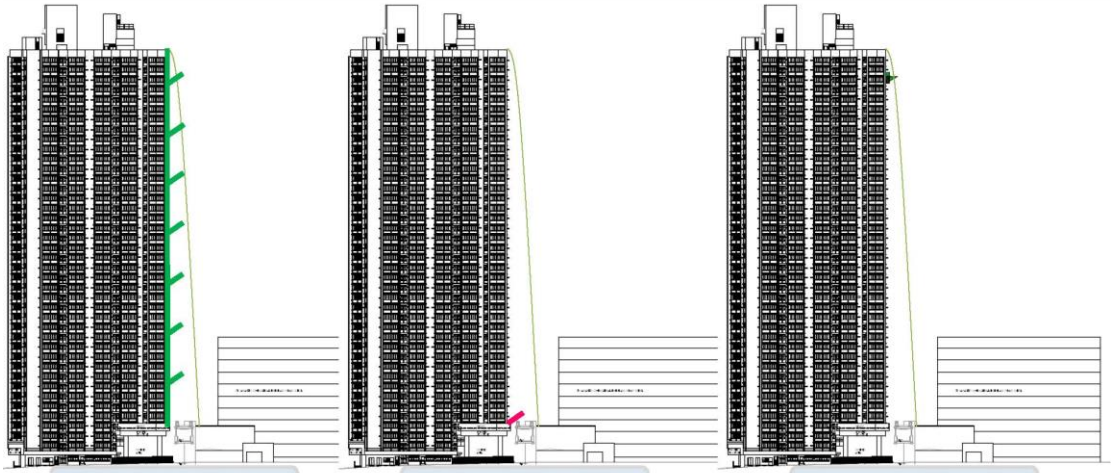
用法：
- 集中於保護簷蓬對下位置員工的安全

外牆掛籠斜擋－設計－考慮能承接下墮物料方法案

承接下墮物料方案-
方案3：掛籠斜擋

在綜合實用性、有效程度、方便程度、清理雜物方法等各方面都可行
可跟隨大樓進度爬升

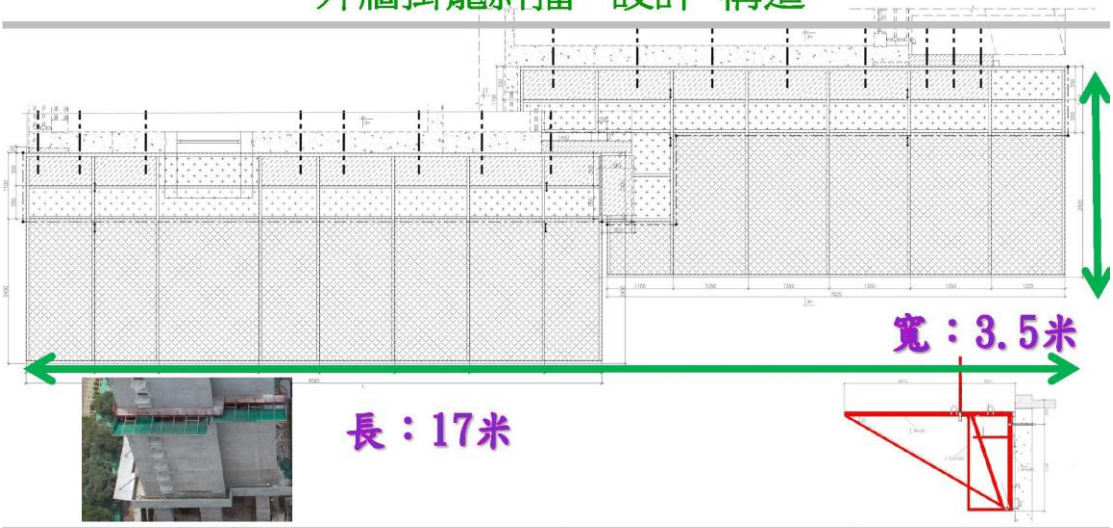
外牆掛籠斜擋－設計－三個措施性能參考



措施1:竹棚斜擋　措施2:保護簷蓬　措施3:掛籠斜擋

外牆掛籠斜擋－設計－決議採取以下措施

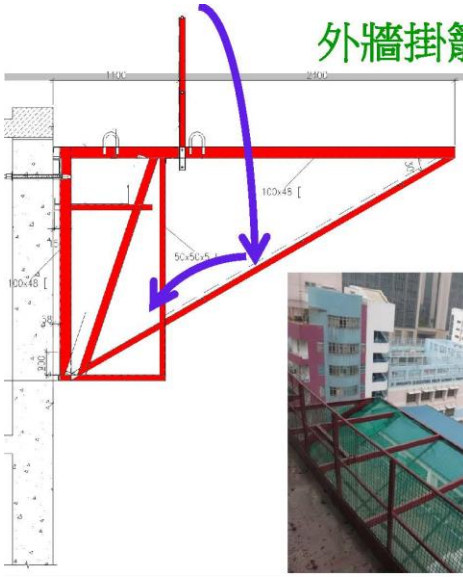
外牆掛籠斜擋－設計－構造



外牆掛籠斜擋－設計–構造

- 構造與外牆掛籠相同
- 以同款掛籠螺絲安裝上牆，掛籠螺絲位置與上層外牆掛籠位置一樣，掛籠安裝埋碼員可以輕鬆安裝
- 斜擋上設有圍欄方便工人登上掛籠清垃圾
- 伸出的3.5米支架，鋪設有鐵網及綠網，用以接收下墮物料

外牆掛籠斜擋－設計–構造



- 以設計方式將下墮物料彈回下層底籠內，以便清理。
- 可用附帶手繩工具清理遠端位置垃圾，若有需要，亦可拆下掛籠清理或更換棚網後再安裝上去使用。
- 此款掛籠通過計算能抵禦強風

附帶手繩工具清理垃圾

外牆掛籠斜擋－運作–安裝方法

安裝、爬升時只要將對上的掛籠拆下，將掛籠斜擋吊至指定位置，用螺絲穿好，再裝回外牆掛籠。

步驟1：先移走對上外牆掛籠

步驟2：再將掛斜擋爬升，最後裝回外牆掛籠

外牆掛籠斜擋－運作–安裝方法

掛籠斜擋安裝方法與一般外牆掛籠無異，且使用外牆掛籠同一組螺絲洞

樓面外牆掛籠

掛籠斜擋

外牆掛籠斜擋－衍生危害及管理–使用準則

- 掛籠斜擋設計目的：防止掛籠上下墮物料掉落地面。承接下墮物料，護保對下學校內的學生。
- 掛籠斜擋設計將物料承着並彈回掛籠內，故須定期安排工友於掛籠下層清理和檢查。
- 為能夠將掛籠斜擋發揮最大功能，須跟隨外牆掛籠攀升，而於5層範圍內也能發揮效果，即可每隔5次爬升掛籠，需升一次掛籠斜擋，故增加工程的工作量不多。

外牆掛籠斜擋–總結–好處

- 掛籠斜擋為防止物下墮的第2重防線。
- 掛籠斜擋全長約17米，比尾牆總寬度長，向外伸展3.5米，能承接由樓面以角度15度向外跌下之物料。
- 在安全、環保、保養、時間方面，掛籠斜擋比竹棚斜擋更為優越。
- 斜擋可計風載、安全負重等。
- 安裝方方法與外牆掛籠一樣，安裝工人容易上手。
- 以創新設計方法能有效地阻止下墮物料危及公眾和學校學生。

外牆掛籠斜擋–總結

- 掛籠斜擋以新穎的方式將物料下墮對地面工作的工友及附近學校有多一重的保障。
- 增進陸鄰關係。
- 職安局安全審核員向職安局推介掛籠斜擋，並獲得職安局認同為創新安全措施。

Thank You

Here is the footage from
Site Safety Seminar for Capital Works New Works Contracts
which was held on 11 December 2020
The speaker is Mr. Arnold HUI
Safety Officer of Yau Lee Construction Company Limited

His presentation topic is

Experience Sharing on the Design and Application of
External Wall Mounted Working Platform with Wall Mounted Catch Fan
Good afternoon everyone. My surname is Hui
I am a safety officer of Yau Lee Construction Company for the
Subsidised Sale Flats Development project at Fat Tseung Street
I will be sharing our measures for preventing falling objects
which I hope will be of use and I will cover
firstly our motivation: the reason for reinforcing protection
then our design and how our system is actually operated
finally how we manage this system and the project
This was our construction site
Our building was very close to the adjacent school
One of the walls actually touched the edge of the school
If our workers were working at height and any objects fell down
this could be a considerable risk to the students below
Hence we had to prevent falling objects or rubbish at its source
Including what we see on the right hand side of the picture
We cleaned the external wall mounted working platform daily
We cleared all the rubbish to ensure that no rubbish was left
A piece of tarpaulin was added to the facade facing the school
to catch anything that fell from height
Or prevent any sewage from affecting the students nearby
Apart from tackling these problems at their source
we also tried hard to think of other solutions
For example in the case of falling objects
what other ways could we catch them?
This was one of the methods
This was what our company Yau Lee used to do
At certain high-risk places where falling objects posed risks
or even places where serious accidents could occur
We built a bamboo scaffolding at the edge of the external wall
and we installed catch fans every 15 m
which would catch any falling rubbish
There was a certain flexibility to this solution
you could install more catch-fans as you extended the scaffolding
But as the building got taller its surface area increased
the scaffold could be affected with greater wind resistance
Another solution is the Protective Canopy

I am sure everyone here is familiar with it
because it is specified on the Housing Authority (HA) contracts
It was good due to its strength and durability as it is metallic
We erected a sheet of metal 3.6m long outside the first floor
with fences so that workers could clear the rubbish safely
Function of the canopy was to protect workers below
so that they do not have to worry about their own safety
Consolidating these two advantages
our management designed a fall arresting measure
called a wall mounted catch fan which was based on
the design of external wall mounted working platform
It combined the flexibility of bamboo scaffolding with
the design of the protective canopy
so that it could be moved upwards as the building got taller
These three images were the three protective measures mentioned
No doubt when an object fell from height
there would be a catch-fan every 15 m on the bamboo scaffolding
so protection would be offered at all positions
As for the protective canopy
it protected the workers working underneath it
they were protected from objects falling from first floor or above
The third one was the wall mounted catch fan in our talk today
It protected workers on working floors if an object fell from height
it could be caught on the catch-fan immediately underneath
After analyses our management team determine the following
Sweep and clean regularly to reduce the chance of falling objects
Implement the wall mounted catch fan the focus of our talk today
so that any fallen rubbish can be collected at once
Besides we consulted the school and got their approval
to add a sloping net on the school's external wall facing our site
This helped prevent the dust from our site from affecting them
Apart from these measures provide protective canopies
to protect our workers working underneath and
we also installed catch-fans beyond hoarding above footpath
As you can see there were two parts to the wall mounted catch fan
This was to ensure the safety of lifting operation
It was designed to fit the shape of our external wall
so that was why it formed the shape of the letter Z

Its total length was 17m
and it had a 3.5m long net sticking out to collect rubbish
The wall mounted catch fan was similar to normal catch fans
both were made by welding metal together and
they were fixed to the wall with the same working platform screw
the rigger who erected the external wall mounted working platform
could install this new set-up very easily
As you can see we installed barriers on top of the catch fans
so if workers need to go up to work
or if they need to do cleaning it would be more convenient
Simultaneously we fixed a green net over the 3.5 m outrigger
as well as a metal net to help collect falling objects
Design-wise if rubbish did fall from the building and landed on
our wall mounted catch fan. As the catch-fan were installed
at an angle so objects slid to the bottom of the cage
So when our workers went up to clear the rubbish
they could do it very easily
Of course we also had equipment with hand straps for use
when they had to collect soft pieces of rubbish from a safe position
If necessary we could detach the cage completely to the ground
and then we can clear the rubbish and change the nets
before hanging it back up again
The engineers had designed the fan to withstand strong winds
As for how it was installed
its installation and elevation processes
were similar to a normal mounted working platform
But when we elevated the wall mounted catch fan
we needed to first uninstall the corresponding
external wall mounted working platform
and set it inside a designated storage area for panel formwork
before securing it and fencing it off
The wall mounted catch fan was then lifted to its designated floor
and secured in place using screws
Afterwards we would just need to restore
the corresponding working platform back to its place
All these steps should be completed in one go
and in fact they could be completed quite quickly
Naturally when going through these steps

we should pay attention to certain things including
risks of lifting operations working at height safety harnesses
and protecting the building edges and fencing off the venue etc.
We should consider all these things carefully
These two images showed the positions of some cage screws
The left one was the position of the wall mounted working platform
and the right one showed the position of the wall mounted catch fan
The parts in purple were the positions of the cage screws
The positions of screws were the same on both sides
In fact the screws were in the exact same positions
so workers could complete the installation very easily
On the working floor
we see that the canvas was cleaned and cleared by workers
but we were afraid that they might miss out some of the objects
There might be some things that we could not see
but might fall off during elevation. What should we do then?
The purpose of the wall mounted catch fan design was to catch
any falling objects to ensure the safety of the students below
It was designed to bounce the objects back into the cage
so it was necessary to clean and check the cage regularly
Cleaning and check-ups were very important
We mainly checked whether any rubbish had fallen into the fan
And if so we needed to see what kind of rubbish it was
where it fell from and what part of the process it came from
We needed to review areas above
to figure out what we could do better
so as to maximise the function of the wall mounted catch fan
The wall mounted catch fan was elevated
along with the external wall mounted working platform
and it could collect falling objects from up to five floors above
so the external wall mounted working platform is elevated 5 times
before we had to elevate the wall mounted catch fan
Therefore not a lot of work was needed
The wall mounted catch fan was effectively
our second line of defence against falling objects
Why do I say ‘second line of defence’?
Because we did not want to rely on it entirely
We wanted to reduce and clear out the rubbish at its source

so that the second line of defence was just for peace of mind
It was 17 m in length and longer than the width of the wall
It covered the edge of the wall and extended for 3.5 m
It could catch objects
falling from an angle of 15 degrees from the working floors
Also in terms of safety environment and maintenance
it would be better than bamboo scaffolding
As the building got taller the bamboo catch-fans got bigger
and wind resistance would increase too
With the wall mounted catch fan
we required only one fan since it could be moved up or down
One wall mounted catch fan would not create great wind resistance
Furthermore because it used working platform screws
it was better than the ties used for bamboo catch-fans
At the end of the process we would just detach the catch-fan
whereas we need to dismantle the entire scaffold if we use bamboo
This was another reason that it was better than bamboo scaffold
OK as a final note our construction work had finished
And throughout the process
we did not receive any reports or complaints from the school
We did not have reports of any falling objects
This reflected the effectiveness of the wall mounted catch fan
It has helped us enhance our relationship with our neighbours
The wall mounted catch fan was not our contractual obligation
but because we felt that it was a necessary arrangement
for the sake of the school
They really appreciated what we did for them
that we tried not to let our work process affect them
their students and their school life
Lastly in October 2017
it was recognised as a safety innovation
I hope everyone will find it useful
This bring to the end of my talk
Thank you