

Here is the footage of "Site Safety Forum for Works Contracts and Property Services Contracts 2017" which was held on 6 July 2017.

The speaker is deputy general manager of safety and environmental protection department of China State Construction Engineering (Hong Kong) Ltd.

Dr. Ho Chi-wai.

His presentation topic is the use of radio frequency identification (RFID) technology to enhance tower crane safety management system.

Distinguished guests, fellow peers, ladies and gentlemen, good afternoon. First of all, thank you for the organisers for inviting China State Construction Engineering (Hong Kong) Ltd. to share with you all at this session.

Today we are going to share the RFID technology used at the Housing Authority site which optimised the existing crane lifting safety management system.

First, I will explain the hardware and software of the system and how they were implemented on the site. There will be a summary at the end.

Let me explain to you the current safety management hardware in the tower crane lifting zone.

It included two major parts, the first part is the on-site installation of the flashing warning system and the CCTV provided in site office for monitoring the crane operation.

Earlier, the site management implemented the radio frequency identification (RFID) technology to reduce human errors in order to reduce lifting accidents. This table summarises the requirements of hardware and software.

First of all, using two readers, one for reading the workers' registration certificates and the other for reading the helmets. I will explain it later.

Besides, RFID tags are also used.

And of course, there are also workers' registration certificates, and safety helmets with Y-type chin straps.

The restricted area authorisation sensor with built-in flash function will emit radio frequency signals and has wireless internet access (Wifi) for connection.

Also, an outdoor 3G router.

Here is a summary for the cost and the technical considerations of the system at the beginning of the design phase.

We can see the price and connection system of various hardware and software devices.

From the perspective of the cost effectiveness, the site management staff

hope to have a system which is low in cost and high in effectiveness as a reference for the industry.

Moreover, we enhanced the safety management system of the tower crane by developing software with the assistance of the university, which included web pages, mobile applications and cloud database for storing relevant data.

The original considerations of the hardware application need to be careful about the limitations of each hardware. If we apply certain technologies or equipment without considering the hardware limitations, problems will occur when applying it. Therefore, we consider the relevant restrictions when formulating the hardware system. Including the angle of the radio frequency (RF), the signal distance, and when applying RFID, the signal loss due to reflection. We need to consider all such factors mentioned. In addition, we should consider the range of receiving data of 3G routers and related packages for the readers which include computers connected to the Internet.

For the safety helmets, during the trial phase, sticking four (RFID) stickers on the helmet at four positions from front to back, from right to left, they will not affect workers in terms of wearing helmets. We place two readers at the entrance of the construction site to read workers' registration certificates and helmets when the workers enter the site. For the hardware layout on site, we set up the lifting safety system in the bar bending yard, which is also in the crane lifting zone, We place two restricted area authorisation sensors on both sides of the lifting zone.

When sending signals, the objects are just at the access point of the bar bending yard or the crane lifting zone. There is a 3G router in the middle. After receiving the relevant signals, the router will transfer the relevant data to the cloud database. This is the setting on site. Using a visualised way to make it easier for everyone to understand. Generally, the restricted area authorisation sensors send the signals to the designated access point. If there are unauthorised workers or site personnel entering the crane lifting area, the restricted area authorisation sensors will issue an alarm signal to alert the workers. The alarm will not stop until the worker leaves the lifting zone. This is the basic operating principle.

About software installation, computer systems and mobile phone operation systems must meet certain requirements, we also need the university to provide mobile applications and websites in order to meet our requirements for data processing.

For the on-site execution process, first, when each worker enters the site, they need to show their workers' registration certificates at the gate and put it on the appropriate reader. Also attach the radio frequency identification system (RFID) sticker on the safety helmet and put the safety helmet on the relevant reader.

Two readers are connected to the computer and display the related data of the worker immediately. Also there will be a daily check on the computer through the software. For example, the bar benders mentioned earlier, need to be authorised to enter the lifting zone.

This graphic can explain more clearly, when a worker who is wearing the safety helmet with a radio frequency identification system (RFID) sticker enters the fatal zone.

When a restricted area authorisation sensor receives the data of the safety helmet with radio frequency identification system (RFID) sticker worn by the worker, the data will be delivered through the wireless network instantly to the cloud system in the university via a router.

Then the cloud system will analyze it immediately,

check if the worker is authorised to enter the lifting zone.

If not, the cloud system will send a message through the router

to the restricted area authorisation sensors to trigger an alarm.

If it is authorised, no alarm will be triggered and you can enter the lifting zone to work.

If not, an alarm will be triggered immediately.

Statistics of the alarm system will also be released on the website,

including the number of alerts triggered every day,

the daily number of workers who entered the site with safety helmets,

the number of lifting zone authorisation sensors,

the number of alerts triggered will be analyzed every day.

The number of workers who are unauthorized to enter will also be listed,

which enables specific follow-up action on workers concerned.

At the same time, the site supervisors' mobile phone

will receive the information of unauthorised workers who entered the lifting zone.

The mobile phone will immediately remind the site supervisor to take action

to stop the unauthorised workers to enter the lifting zone.

To conclude, first, during the application of the relevant system on the site of Housing Authority, there were no accidents in the lifting zone.

Simultaneously, this system is simple and cost effective.

It can also be applied to other places

including certain high risk areas,

such as switch rooms, confined spaces and lift shafts,

and companies may develop for other uses in the future.

This is the end of the sharing. The following part is the audience answering the questions asked by the speaker.

Thank you Dr. Ho, may Dr. Ho please stay.

First of all, you can ask the audience a question. Please answer the question enthusiastically and vouchers will be given.

This is a difficult question, please listen carefully.

Look at this difficult question, who can answer it?

The question is: In the construction site, what technology did China State Construction Engineering (Hong Kong) Ltd.

use to enhance the tower crane safety management system.?

This difficult question has hints,

it can be answered in English.

The hint is four letters in English and six characters in Chinese.

This friend raised his hand immediately.

The one at the back, please hand the microphone to him please, thank you.

Audience is answering question

RFID.

Guest response

Dr. Ho, is that right?

RFID. That's a difficult question but you are still able to answer it, you are worthy for reward.

Congratulations.

Thank you Dr. Ho.

## Safe Work· Zero Incident

Site Safety Forum 2017 for Works Contracts and Property Services Contracts

"Careful design can reduce accidents and ensure smooth and safe execution of works"

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