Here is the footage from “Site Safety Seminar for Capital Works New Works Contracts”, which was held on May 12, 2014

The speakers are
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Mr. Au Ming-cheong, Project Manager of Able Engineering Company Limited

Their presentation topic is “Proactive Construction Management System”

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Thanks for coming. I am AU Ming-cheong from Able Engineering Company. This is my colleague, Dr. LUO from the Hong Kong Polytechnic University. We would like to introduce a proactive construction management system. It was built through a long-time development. The system is an extension of Building Information Modeling. We will soon see the model.

Frankly speaking, we have gone through a great deal of discussion, research and work to build this system from nothing, that we can now see these two things on the table. This is an emitter, and this is a receiver. Later you will see how big the receiver originally was and that was intended to be put on the forehead. We have spent so much time in finding manufacturers to research and do experiments to make it this small. Now let me pass the time to Dr. LUO to introduce you the intelligent system for construction management.

Thank you Raymond. Hello everybody.
I am Eric Luo from the Hong Kong Polytechnic University.
I am introducing a new technology which may be different from the safety technology that other speakers introduced. The technology is related to BIM and IT. Our University intends to develop something useful to enhance safety. These are the statistics on safety incidents from 2008 to 2011 obtained from Census and Statistics Department. As you can see, there were many fatal incidents from 2008 to 2011.

The three main kinds of incidents are namely fall from height, knock-downs by moving objects and by vehicles. We were thinking if there any solutions offered by information technology. This is the solution we developed with information technology.

The first step is to give workers and machines this positioning device. With the real-time positioning device, both the positions of workers and vehicles will be transmitted to our server operating with BIM which will locate dangerous locations and give audio warnings such as “Beware of Workers” or “Beware of Electric Shock” when workers and machines are getting close to the dangerous locations. This is the overall concept of the solution.

Specifically, the first function of the system is giving safety warnings.
There are two kinds of warning sounds: one is for workers; the other for drivers. As you know, workers may be aware of danger while the drivers may not be aware of the dangers. The system thus reminds not only workers but also drivers, telling drivers that workers are about to be hurt.

There are two kinds of sounds, one is for workers and the other is for drivers.

The second function is a basic one, i.e. real-time positioning. Look at this interface. It is accessible via the Internet. No matter where you are, at office or on site, you are able to know the location of workers who bring along this positioning device once you access to the Internet.

The third function is process replay. As I said before, the whole process could be recorded in the server, you can replay the record if incidents happened, including the time of warnings and the people’s reactions. We hope we don’t need to read the data. It is like a flight recorder which you can replay anytime.

The fourth function is statistics analysis. It resembles the four kinds of analysis we are doing now. The first category is about the number of warnings of the day, week or month and dangerous locations ranked in priority. Then, safety officers will know which locations on site are more dangerous because of frequent warnings. The third statistics function is to rank the dangerous acts, i.e. knowing which workers are warned more frequently because of rash acts. The fourth statistics is the number of

workers and machines at work of the day. These are the four basic functions of the system.

Here are some examples. Just like this dange zone, I demarcated the danger zone, if a worker reaches this location, he will receive a warning. The second example is related to these machines. Positioning devices are set on both car tops and workers' heads. When a worker reaches the location, both workers and drivers will be warned. The third example is positioning for these lifting hooks. The positioning system for these lifting hooks is three-dimensional, instead of two-dimensional. Then, workers, lifting hooks and operators will be warned when there is a possible danger. Warning the operator to pay extra care when controlling the machine. Workers need to beware of what is above.

This is the whole structure of the system. The first part is that positioning devices are fixed on the vehicles, workers and lifting hooks. Positioning data of the locations of worker and machine will be transmitted to our server. The server will determine if there is any possible danger. If yes, warnings will be delivered to these hardware devices. The user client will be able to know the locations of workers and machines in office or on site via the Internet anytime.
The positioning theory is like what Raymond has just introduced.
This is what we call an "anchor".
It is rather large in size. On average there are 5-6 anchors placed at the building edges of construction site. We call those at the center "tags". By finding the distances between the tags and the fixed anchors, we can locate the position of the tags.

This is the setting layout of our positioning system. If a machine is moving on site, its remote control will show this data. The red one is the anchor and the blue one is the tag.
All the identified locations will be transmitted
to the server which analyses the possibility of danger
of the tag locations.
If it is within the danger area,
the server will give warnings to these "tags".

Here is Tung Tau Estate. Since last year, we had the opportunity to arrange test in this estate. Testing at a real site was essential to check if the device functioned well because it was a new technology, but at the same time not to affect construction work progress.

As shown in the video,
this is the interface of the real-time positioning system.
You can see the people and the machines.
The test is purposed for workers.
When the workers walk, their locations are identified. Thanks to Raymond's support, we even developed a two-dimensional system. What you see just now in the video is a three-dimensional system. The two-dimensional system is more convenient than the three-dimensional one, it can be updated more easily as you only need to provide computer drawingsfor my upload, and the location of danger zones can be demarcated and updated more easily. It can be accessed whenever you want. You can know workers' locations when you are at office. Now thanks Raymond for putting on the device at the site for testing. Lastly, we can see the whole system interface, there are two colours, the green one indicated the worker
was at a safe location
and the red one indicated he was in a danger zone.
For example, there were four workers in the danger zone, they would receive audio warnings of "Beware of Electric Shock" or "Beware of Falling from Height".

Lastly the technology of positioning is similar to WIFI that we use usually. Its name is not WIFI, but CSS which belongs to a German company called Nanotron. This technology was used in kindergartens and nursing homes for positioning children, so this technology is safe to apply. Lastly, this is the link for you to know more details about the whole project on the Internet. Since it is required to log on the web system, I am not sure if we have any Internet access here. If yes, you can learn more about the TCM technology via the link yourself. Thank you.

To supplement, we did carry out a simple experiment on a site. This is the receiver. We set dangerous zones and marked them on the computer drawing to place a few receivers like this. Then we had a few colleagues putting on the device and walking to the danger zones. When they reached the zone, audio warnings were emitted there, warning that they have reached the danger zone and should not enter. Simply speaking, if a tower crane opening is made on the floor at site, the safety measure can be carried out with a simple device instead of making fences to warn workers about the dange zones.
The measure can be set up quickly.
The device was installed and could be used in 15 to 30 minutes that day. I believe there are many possibilities where the device can be used for site safety, but that of

course depends on the resource allocation of property developers. We also applied for funding from the Advisory Committee on Innovation and Technology for development funds. Thank you.