

地盤車輛流動防撞警報裝置

Mobile anti-collision system for site vehicles

安全環保部副總經理
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1.1 建造業涉及遭移動中的車輛撞倒意外統計

根據勞工處統計數字，由2008年至2017年10年間，建造業共有**16**宗涉及遭移動中的車輛撞倒的**致命**意外（見圖表）。



1.1 建造業涉及遭移動中的車輛撞倒意外統計 (續)

發生日期	倒車意外的報導
2020-01-13	鯽魚涌太古坊一個重建地盤，一名57歲男工人，被起重機 尾部 與附近圍欄之間夾到，昏迷送東區醫院後證實 死亡 。
2019-12-19	太子道西一名地盤工被挖泥車撞倒並輾過，送院搶救後證實 不治 。
2019-11-21	航天城東路發生一宗交通事故，一名年約60歲的地盤女工，被洗街車撞倒，並輾過頭部，當場證實 死亡 。
2019-04-04	屯門內河碼頭，一名女工人在工作期間，突被貨櫃起卸機 輾斃 。
2018-12-06	上水沙頭角一地盤，一名男雜工被 溜後的貨車撞斃 。
2018-04-03	葵涌貨櫃碼頭亞洲貨櫃物流中心，一名58歲男工人，遭一輛鏟車 倒後 時撞倒，致腳部受傷，受傷工人清醒，事後由工友陪同送院治理。
2018-04-19	港珠澳大橋香港段地盤發生工業意外，一名姓黃(31歲)女工在人工島地盤工作期間，姓鄧(56歲)男子駕駛一輛泥頭車突然駛至，疑收掣不及，將她撞倒，女事主腰部、腳部受傷，在場工友見狀立即報警。



2.1 目的

減少因疏忽而導致交通意外事故

1



提升地盤交通安全管理

2



主要目的

2.2 地盤車輛流動防撞警報裝置之介紹



安裝「地盤車輛流動防撞警報裝置」之介紹

防撞警報裝置採用超聲波測距原理，駕駛者在倒車遇到障礙物時，傳感器發出及接收到回波信號後經控制器進行數據處理，判斷出障礙物的距離，並發出警示信號，從而警覺駕駛者，預防事故的發生，保障行車安全。

2.3 防撞警報裝置規格



2.3 防撞警報裝置規格

規格	裝置內容	
尺寸	感應器 長：24厘米 闊：12厘米 高：7.5厘米	閃燈警報器 長：20厘米 闊：16厘米 高：20厘米
電量	DC 5V, 充電式電池 (4hrs充電時間可用8hrs)	
感應距離	0.3 – 5.0米	
感應角度	水平80度 垂直75度	
工作溫度	-20 – +80度	
無線感應器與警報器距離	<10米 (利用WiFi頻段 2.4GHz band)	
防水等級	IP67	
準確度誤差		
距離	<3厘米	
時間誤差	<1秒	
角度誤差	<3度	
反射時間	<1/3秒	



2.4 地盤車輛流動防撞警報裝置工作原理



流動式倒車雷達裝置由兩組超聲波傳感器、警報器等三個部分組成

2.5 防撞警報裝置安裝程序



2.6 使用防撞警報裝置現場測試

(測試車輛 A：外租小型裝載搬土機)



01

假人測試

利用假人放置 5 米外位置，開啟感應器，然後開始進行倒車



結果

假人測試

大約 1.5 米位置警報器發出聲響



2.6 使用防撞警報裝置現場測試(續)

(測試車輛 A：外租小型裝載搬土機)



02

行人經過測試(1)

行人於車輛後方 1.5 米位置，由右面走到左邊，測試感應器角度



結果

行人經過測試(1)

大約車後100度位置警報器發出聲響



2.6 使用防撞警報裝置現場測試 (續) (測試車輛 A：外租小型裝載搬土機)



03

行人經過測試(2)
於靜止車輛後向前行，測試感應器距離

結果

行人經過測試(2)
大約 1.5 米位置警報器發出聲響

結果

行人經過測試(2)
大約 1 米位置警報器所發出聲響更大及頻密

噪音
測試
結果



第一段警報聲：76 dB



第二段警報聲：80 dB



機件啟動後，再加上警報器發出聲響，結果為110.7dB

2.7 使用防撞警報裝置現場測試

(測試車輛 B：外租吊機車)



外租吊機車

吊機車感應測試
裝置安裝在多輛吊機車上，然後倒車測試感應器距離

結果

吊機車感應測試
警報器可在預設距離啟動



2.8 優點和缺點

優點

- ✓ 容易裝拆
利用磁石吸盤吸附於車輛尾部
- ✓ 分段警報信號
愈接近障礙物警報聲量越大
- ✓ 充電式設計
省卻了拉電線及供電問題
- ✓ 防水設計
不需擔心天雨問題，全天候使用

缺點

- ✗ 刮花車身
固定吸盤的螺絲有機會刮花車身
- ✗ 感應距離及角度需改善
感應距離及角度覆蓋範圍稍為狹窄

2.9 改善方案

改善方案



2.9 改善方案(續)

改善方案

改善前



改善後



警報聲調至 90 - 100 dB

加大警報聲量及更改裝置位置

- 加大警報聲量，以免被機械操作聲遮蓋倒車裝置提示警報聲，現場操作員表示相比之前更有效提高警覺。
- 警報器之前設置在駕駛室側邊，改善後裝設在上方，效果更佳。

2.10 總結



經過多日測試，防撞警報裝置安裝容易，駕駛員亦反映安裝此裝置後更有效提高警覺，特別在倒車操作時可更安心及安全。

其實任何地盤意外事故一宗都嫌多，就今次「地盤車輛流動防撞警報裝置」的介紹，地盤安裝及使用後，不但可減少因疏忽而導致交通意外事故，亦有效提升地盤的安全管理，雙得益彰。





問答及分享環節

**Thank
You!**

多謝



Title: Site Safety Seminar for Capital Works New Works Contracts

Super Site Safety Seminar for
Capital Works New Works Contracts
16 July 2020

VO: Here is the footage from
Site Safety Seminar for Capital Works New Works Contracts
which was held on 16 July 2020

Super Deputy General Manager, Safety & Environmental Protection Department,
China State Construction Engineering (Hong Kong) Ltd.
Dr. Ben HO Chi Wai
His presentation topic is
“Mobile anti-collision system for site vehicles”

VO: The speaker is Dr. Ben Ho Chi Wai
Deputy General Manager, Safety & Environmental Protection Department
China State Construction Engineering (Hong Kong) Ltd
His presentation topic is “Mobile anti-collision system for site vehicles”

Dr. Ho: Hello, everyone
On behalf of the
China State Construction Engineering (Hong Kong) Limited
I will share the use of an ordinary device on construction sites
That is the mobile anti-collision system for site vehicles
My sharing today is simple
First, we will focus on some incidents involving
site vehicles in the construction industry
Then, I will introduce the mobile anti-collision system
for site vehicles invented by our company
According to statistic figures from the Labour Department
For construction industry in the decade from 2008 to 2017
there were 16 industrial fatal accidents
involving being struck by moving vehicles
And there were also numerous injuries
Look at the data again
From 2018 to now, there were 7 related accidents
in construction industry
For example, on a site on Hong Kong Island in January 2020
a worker was trapped between the rear part of a crane
and the railings nearby
This was an industrial fatal accident
There were also 3 industrial fatalities in 2019
which involved site workers being struck by an excavator
a street washing vehicle and a container handling crane (貨櫃的起卸機)

You may know that there are various kinds of anti-collision system for site vehicles in construction industry

Why do we need to develop a new mobile anti-collision system?

I would share the answer with you later

In the second part of my sharing

I would like to focus on the achievement of the mobile anti-collision system for site vehicles

Obviously, we wish to reduce the number of traffic accidents caused by negligence

We hope to enhance safety management on site traffic by technology

Look at this picture. Anti-collision device is common for private cars

However, it is not commonly found on construction sites

Let us see this mobile anti-collision system for site vehicles

Basically, it used ultrasonic wave to measure distance

When a driver drove or reversed the vehicle on site and met obstacles

the sensor emitting ultrasonic wave would detect a return signal

A processor would process the data to gauge the distance of the obstacles and send a warning signal to the driver for preventing accidents and ensuring safety traffic of site vehicles

The configuration of this system was quite simple

The sensor was a box of 24 cm long, 12 cm wide, and 7.5 cm high

There was also an alarm with flash light which could produce warning sound and flash light with dimension of 20 x 16 x 20 cm

A special feature of this device was that no wiring was needed by the sensor or the alarm for power supply

It used rechargeable batteries

After 4-hour charging, the system could work for 8 hours which was enough for working in one day on site

The sensor could detect distances from 0.3 to 5 metres and the sensing distances was adjustable

It covered 80 degrees in horizontal plane and 75 degrees in vertical plane

Its working temperature and waterproofing property was very suitable for use on construction sites

The detection range of the sensor and alarm was within 10 metres so it could cover from the driver's compartment to the rear part of the vehicle

It used a Wi-Fi frequency rate of 2.4GHz for transmission

You could see the obvious outcome of the accuracy in the data

I have mentioned a special feature of this sensor and alarm

that wiring for power supply was not needed
For the case of installation on a site vehicle
when two sensors were installed at the back of the vehicle
and an alarm was installed in the driver's compartment
the system was ready for use
The installation was simple
First, two sensors were attached to the metal part
at the back of the vehicle by magnets
Installation or removal was easy
Second, activated the sensors
attached the alarm with flash lights by magnets
to a metal surface in the driver's compartment
After activating the alarm
the system could be used at once
Afterwards, some field tests were carried out
This sensor and alarm system were used on two of our HA sites
and they were recognised as innovative and functional
safety installation or safety measures by the OSHC
Let us see the findings from the field tests
In the first study, we used a rented skid-steer loader
also known as a 'Bobcat'
We placed a mannequin at a distance
of around 5 m away from the rear part of the Bobcat
Then, we switched on the system
and started reversing the Bobcat to a pre-set distance
The initial pre-set distance was 1.5 m
and the alarm was buzzed automatically
In the second study, a bobcat was stopped at a position
and we asked a worker to walk from right to left
around 1.5 m away from the back of the Bobcat
as seen from the left photo on this slide
The worker entered the detection zone at about 100 degrees
of the back of the vehicle as shown in the protractor
the alarm buzzed
Then, other case studies were carried out
including a worker walked towards the bobcat from a distance
The alarm buzzed as he stepped into the preset distance zone
of 1.5 m from the rear of the bobcat
When he continued to walk closer to 1m from the bobcat
the alarm would buzz louder to alert the driver
From pictures on the bottom of the slide
when the worker was closer to the bobcat
the alarm buzzed louder
Then we also installed this mobile anti-collision system

on a lorry mounted crane on site

The installation was simple too

Two sensors were installed at the rear part of the lorry and the alarm with flash light was installed

in the driver's compartment

Then we activated the sensors and the alarm

We set different testing ranges for this lorry mounted crane the alarm could also alert the driver

We did tests on obstacles at distances of 1.5m and 3m from the lorry and the results were good

In conclusion, the advantages of

this mobile anti-collision system were as follows:

The devices could be attached easily by magnets to the metal parts of the vehicle's rear part

The warning signals could gradually increase when the obstacles got closer, the alarm buzzed louder

This system did not require electric cables for power supply to the sensors and the alarm

It was not only rechargeable but also waterproof so that it could be used on rainy days or on construction sites

Any disadvantages of this mobile anti-collision system?

There were some disadvantages as follows:

We found that the magnets were too powerful they could scratch the vehicle surface or crush our fingers

We found that the sensors would work better if the detection distances and angles were fine-tuned

Therefore, we had made some improvements

First, we finetuned the detection angles of the two sensors so that the detection angles at the back could be wider

We also added sponge cushions to the magnets so that they would not scratch the vehicle or crush installer's hands

We also adjusted the alarm volume by making it louder because construction sites were quite noisy

If the alarm volume was not loud enough it could not alert the driver or the operator

Therefore, we adjusted the alarm volume louder

We installed the alarm beside the operator previously

Now we placed it before the operator inside the compartment if there were any obstacles in the detection zone of the vehicle

the alarm with flash light could alert the operator

on the site environment and people around the vehicle

hence providing a safe protection

I was approaching the end of my presentation and this was the last slide

After many tests

we found that this mobile anti-collision system was easy to install
The feedback from the user, i.e. the operators
mentioned that it was effective
While driving or reversing the vehicle on site
especially during reversing, they felt more safe
As I said, this kind of 'parking sensor'
was commonly installed for private cars
However in the construction industry
when a site vehicle is being driven or reversed on site
what was used to protect the people around the vehicle?
Things come up in mind would be the rear camera
flashlights and rear mirrors on site vehicles
Up to now, I believed that every mobile vehicle on sites
had the three anti-collision provisions
But we should take into account if
the drivers who drove or reversed a site vehicle on site
did not look at the rear camera or mirror
this might be dangerous to the people around the vehicle
So this system could actively give a warning signal
to drivers who were not paying attention
Even the operators did not look at the rear camera or mirror
the anti-collision system could actively alert them
where there were people around the vehicle
maybe within 3 m or 1.5 m detection distance
Apart from ensuring the safety of site workers
this also helped to manage site traffic
and gave active alerts to operators
I believed that this mobile anti-collision system could help
the enhancement of safety management on site
This is the end of my sharing today

VO: Thank You For Watching