



# From Concept to Practice

Case Study on Application of the  
C-SMART Smart Site Safety System

Presenter: Chris Guan

19/06/2024

# CONTENT

- **C-SMART Blueprint** | System Development Course...
- **4S Functions Application** | CMP\E-PERMIT\Access Control...
- **Case Study**



# C-SMART's Development



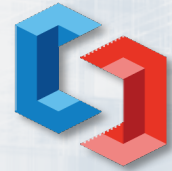
2020  
AUG

- 初次測試第三方工人定位技術
- 實現智慧工地 Dashboard
- 臨時醫院項目只提供少量功能



2020  
DEC

- 智慧工地平台 1.0 正式上線，並為黃麻角道地盤採用了大量功能



C-SMART

2021  
JUN

- C-SMART 品牌正式成立



2023  
AUG

- SSSS
- C-SMART 4.0

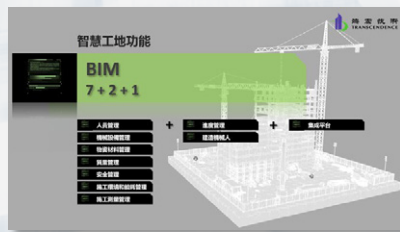


2024  
AUG

- C-SMART 5.0  
SSSS PLUS  
數據價值

2020  
OCT

- 正式定義中建香港智慧工地方案，以7+2+1+BIM 為研發重心



2021  
MAR

- 平台及其他功能已漸漸成熟，成功為多個地盤投入服務
- 平台 2.0 正式啟用



2022  
JUL

- C-SMART 平台3.0 正式啟用
- Smart Safety 數字化方案



# C-SMART System Introduction Blueprint & Vision



- **7+2+1+BIM**

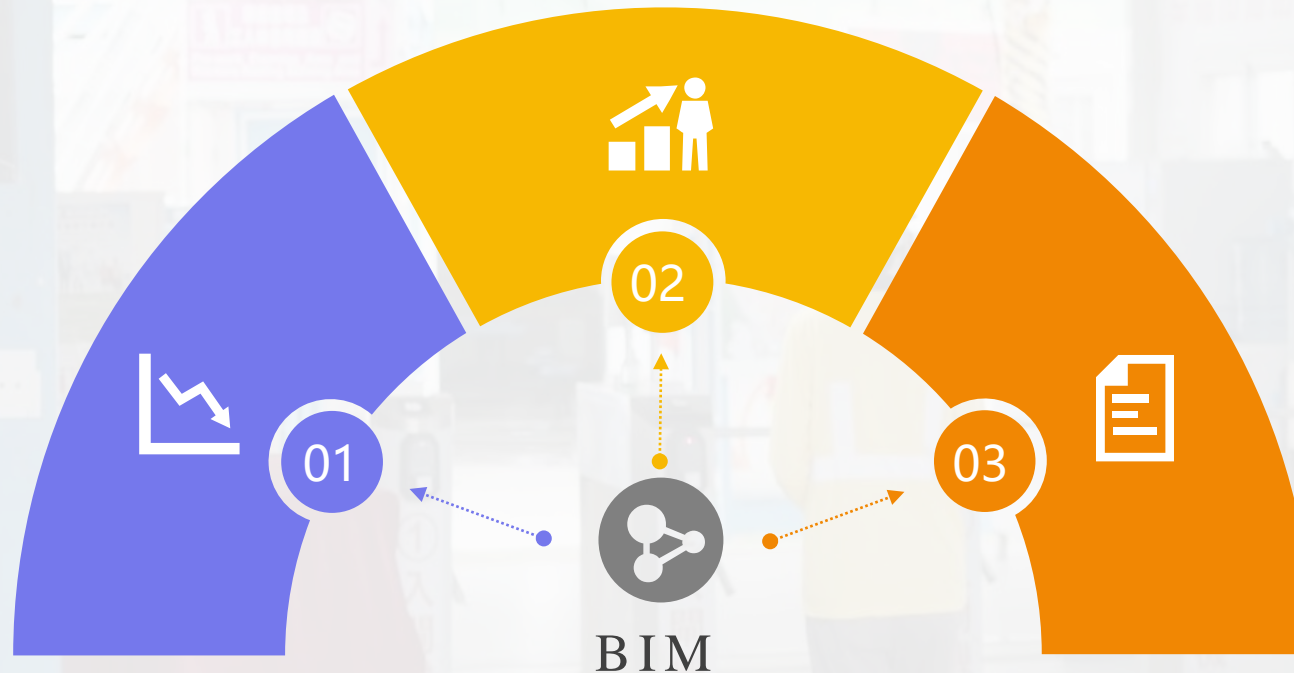
The platform is based on Internet of Things (**IoT**), artificial intelligence (**AI**), cloud computing, and **BIM** technologies. It integrates data from various sources, enabling managers to conduct integrated supervision and achieve intelligent, digital, and informational management of the construction sites.

## 2 localized management enhancements

progress management + construction robotics

## 7 fundamental elements of smart worksites

people, machinery, materials, Survey, environment, **safety**, and quality



## 1 central management platform

integrate and analyze all collected data in real time.

display relevant data in conjunction with the BIM models



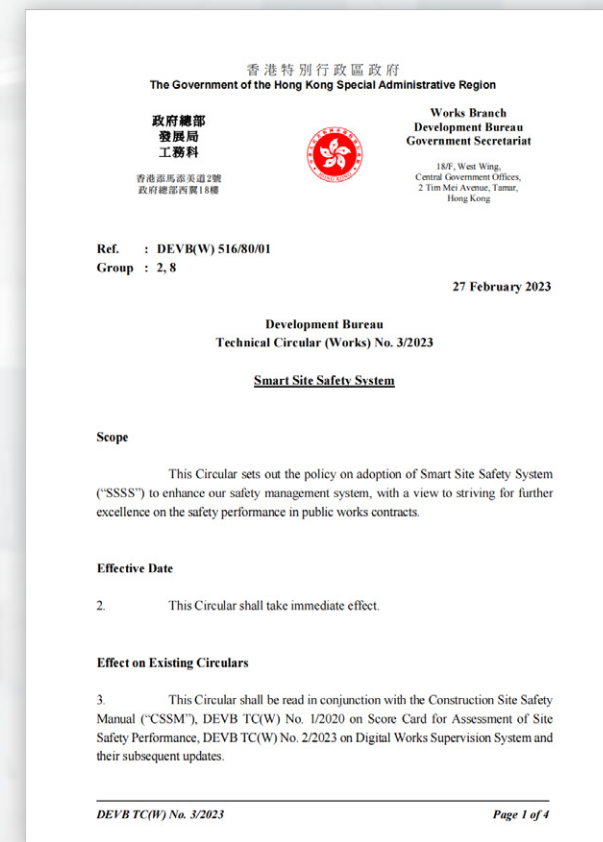
# C-SMART System Introduction 4S Function



- **Scope of Smart Site Safety System (DEVB)**

The Smart Site Safety System shall provide and maintain but not limited to, the following features for daily site safety management during the contract period.

Item	Digital Initiatives
1	Smart Site Safety Centralized Management Platform (C-Smart)
2	Digitized Tracking System for site plants, powered tools and ladders (LALG System)
3	Digitalized Permit-To-Work system for high risk activities (E-PERMIT)
4	Hazardous areas access control by Electronic Lock and Key System (Smart Lock System)
5	Unsafe acts/ dangerous situation alert for Mobile Plant Operation Danger Zone (360 Anti-Collision)
6	Unsafe acts/ dangerous situation alert for Tower Crane Lifting Zone
7	Smart Monitoring Device for Workers and Frontline Site Personnel (Worker Management System)
8	Safety Monitoring System using Artificial Intelligence (AI CAM)
9	Confined Spaces Monitoring System (UWB)
10	Safety training with Virtual Reality technology



# C-SMART System Introduction 4S Function



- Requirement of Housing and BD

Item	Digital Initiatives
1	Smart Site Safety Centralized Management Platform (C-Smart)
2	Digitized Tracking System for site plants, powered tools and ladders (LALG System)
3	Electronic processing of permit to work for more high-risk activities
4	Hazardous areas access control by Electronic Lock and Key System (Smart Lock System)
5	<b>Unsafe acts/ dangerous situation alert for Mobile Plant Operation Danger Zone (360 Anti-Collision)</b>
6	<b>Unsafe acts/ dangerous situation alert for Tower Crane Lifting Zone</b>
7	Smart Monitoring Device for Workers and Contractor's Superintendent
8	Safety Monitoring System using Artificial Intelligence
9	Confined Spaces Monitoring System
10	Safety training with Virtual Reality technology
11	<b>Authenticating authorized operation of plants and equipment</b>
12	<b>Revised Specification of resolution of camera and display unit for tower crane and contractor's site office</b>
13	<b>Sensor and alert system to detect the proper application of handbrake for site vehicles</b>



## Development and Construction Management Board Instruction P06/23

From: AD(P)3 To: All Project Teams and Contract Managers  
 Date: 22 December 2023 Total Pages: 3 + 36 (Annex)  
 + 5 (supplementary information for internal use only)

### Wider Application of Smart Technology for Site Safety Management

#### PURPOSE

To promulgate of smart technology Contracts.

#### ACTION & STATUS

2. This Instruction on 15 Dec

3. With immediate Works New Works C

(a) For Pre Tenders Incorporate tender documents



YOUR REF: 中文編號: BD-GRJ-115/12  
 OUR REF: 英文編號: 2624 4061  
 FAX: 中文傳真: 2626 1138  
 TEL: 電話: 2626 1138  
 WEBSITE: 網址: www.hk.gov.hk

30 March 2023

To: ALL Authorized Persons  
 Registered Structural Engineers  
 Registered Geotechnical Engineers  
 Registered Inspectors  
 Registered General Building Contractors  
 Registered Specialist Contractors  
 Registered Minor Works Contractors

Dear Sir/Madam,

#### Smart Site Safety System

The Government has been promoting the wider adoption of advanced technology and innovation in construction industry for enhancing site safety. I write to appeal to you to adopt a Smart Site Safety System (SSSS) in your contracts to uplift site safety performance.

2. SSSS generally comprises three components, namely smart safety devices for monitoring activities and identifying safety hazards; a communication network for transmitting data collected from smart safety devices; and a centralised management platform for providing a one-stop hub for data analysis and alerts generation, as well as facilitating follow-up actions. The system enables the project team to grasp the safety situation of the entire construction site by collecting and transferring real-time data to a centralised management platform. Whenever a potential hazard is detected, the system will immediately alert the safety management staff and workers on site. Suitable items of smart safety devices include:

- (a) Digitised tracking system for site plants, powered tools and ladders;
- (b) Digitalised permit-to-work system for high risk activities;
- (c) Hazardous areas access control by electronic lock and key system;
- (d) Unsafe acts / dangerous situation alert system for mobile plant operation danger zone;
- (e) Unsafe acts / dangerous situation alert system for tower crane lifting zone;
- (f) Smart monitoring devices for workers and frontline site personnel;
- (g) Safety monitoring system using artificial intelligence;
- (h) Confined space monitoring system; and
- (i) Safety training with virtual reality technology.

- **C-Smart 4S Function: CMP**

## CMP (Centralized Management Platform)



- **Digitized Tracking System for site plants, powered tools and ladders(LALG)**

By using Internet of Things technology and wireless network, real-time dynamic tracking of each mobile machinery in different working areas can be achieved.

An overview, including the **real-time location, usage status, machine safety data and inspection reminders** of any machine or equipment can be reviewed on the platform, strengthen and improve the efficiency of resources allocation.





# C-SMART System Introduction 4S Function



- **Digitalized Permit-To-Work system for high risk activities (E-PERMIT)**

A digitized permit-to-work for the following high risk activities:

- Work in confined spaces
- Work with electrical hazard
- Work in lift shaft
- Mobile crane, heavy machinery and piling rig operating or moving on the Site
- Hot work
- Use of ladder for work above ground for work purpose
- Lifting operations by tower cranes, mobile cranes, crawler cranes, or cranes alike or lifting operation by mechanical means

Allow electronic application, issuance and tracking of permit to work/permit to move and operate in the Site

Alert message if the corresponding permit-to-work/permit to move and operate has expired



# C-SMART System Introduction 4S Function



- Digitalized Permit-To-Work system for high risk activities (E-PERMIT)

The screenshot displays the C-SMART E-Permit system interface. The top navigation bar includes the company logo (中國建築 C-SMART), user profile, and location information (第一期公屋發展計劃 BLN 宏照). The main content area features a 3D BIM model of a building complex with three buildings highlighted in different colors (blue, yellow, and orange). Each building has a corresponding permit status overlay: "第三座大樓 有效許可證: 0", "第二座大樓 有效許可證: 0", and "第一座大樓 有效許可證: 0". A central overlay for "外圍+地庫" also shows "有效許可證: 0". The left sidebar contains a search bar and a summary of permit statistics:

Category	Count	Change
有效許可證	2	較昨日 ↑ 2
批核中	24	較昨日 ↑ 24
已申請	603	較昨日 ↑ 78
已註銷	577	較昨日 ↑ 52

Below the statistics, there are sections for "有效許可證 E-Permit", "已申請 E-Permit", "批核中 E-Permit", and "已註銷 E-Permit". The "已申請 E-Permit" section includes a progress bar for "HWP - 熱工序許可證" (587), "WILS - 升降機槽內工作許可證" (5), and "ESW - 外牆棚工作許可證" (11).



# C-SMART System Introduction 4S Function



- **Hazardous areas access control by Electronic Lock and Key System (Smart Lock System)**

C-Smart Lock will be deployed for Access Control for such as temporary/restricted working area, electrical box opening management, etc.

Only authorized worker can unlock the padlock with his own worker registration card. When an unauthorized person forcibly unlocks the door, alarm will be triggered and displayed directly on the C-Smart platform. All the history of authorization details and padlock lock/unlock status can also be reviewed on the platform.



TRANSCENDENCE C-SMART

100% 符合4S要求  
100% compliance with 4S requirements

## C-SMART LOCK 4S智能鎖 (4G版)

多重實時報警功能 低功耗多功能 打造符合4S標準智能鎖  
Multiple real-time alarm functions. Low power consumption and multi-function. Create a smart lock that meets the 4S standard

CITF 認證

安全管理 | 升降機鎖 | BIM 二維平面 | 搜尋 | Block D

鎖位數量: 728  
已綁鎖數量: 98

13.46% 綁鎖率

Floor	DS1-R	DP1-10	DP2-10	DP3-10	DP4-10	DP5-10	DP6-10	DP7-10	DP8-10	DP9-10	DP10-10	DP11-10	DP12-10	DP13-10	DP14-10
L2F	DS1-10	DP1-10	DP2-10	DP3-9	DP4-9	DP5-9	DP6-9	DP7-9	DP8-9	DP9-9	DP10-9	DP11-9	DP12-9	DP13-9	DP14-9
L1F	DS1-9	DP1-9	DP2-9	DP3-9	DP4-9	DP5-9	DP6-9	DP7-9	DP8-9	DP9-9	DP10-9	DP11-9	DP12-9	DP13-9	DP14-9
L0F	DS1-8	DP1-8	DP2-8	DP3-8	DP4-8	DP5-8	DP6-8	DP7-8	DP8-8	DP9-8	DP10-8	DP11-8	DP12-8	DP13-8	DP14-8
9F	DS1-7	DP1-7	DP2-7	DP3-7	DP4-7	DP5-7	DP6-7	DP7-7	DP8-7	DP9-7	DP10-7	DP11-7	DP12-7	DP13-7	DP14-7
8F	DS1-6	DP1-6	DP2-6	DP3-6	DP4-6	DP5-6	DP6-6	DP7-6	DP8-6	DP9-6	DP10-6	DP11-6	DP12-6	DP13-6	DP14-6
7F	DS1-5	DP1-5	DP2-5	DP3-5	DP4-5	DP5-5	DP6-5	DP7-5	DP8-5	DP9-5	DP10-5	DP11-5	DP12-5	DP13-5	DP14-5
6F	DS1-4	DP1-4	DP2-4	DP3-4	DP4-4	DP5-4	DP6-4	DP7-4	DP8-4	DP9-4	DP10-4	DP11-4	DP12-4	DP13-4	DP14-4
5F	DS1-3	DP1-3	DP2-3	DP3-3	DP4-3	DP5-3	DP6-3	DP7-3	DP8-3	DP9-3	DP10-3	DP11-3	DP12-3	DP13-3	DP14-3
4F	DS1-2	DP1-2	DP2-2	DP3-2	DP4-2	DP5-2	DP6-2	DP7-2	DP8-2	DP9-2	DP10-2	DP11-2	DP12-2	DP13-2	DP14-2

警報統計

時間	鎖位	描述
2024-03-24 14:15:08	B.JZ 啓德新急症醫院(Site B)Block E...	長時間未開鎖
2024-03-24 13:49:42	B.JZ 啓德新急症醫院(Site B)Block E...	長時間未開鎖
2024-03-21 09:59:22	B.JZ 啓德新急症醫院(Site B)Block ...	長時間未開鎖
2024-03-21 09:34:33	B.JZ 啓德新急症醫院(Site B)Block ...	長時間未開鎖
2024-03-21 09:30:41	B.JZ 啓德新急症醫院(Site B)Block ...	長時間未開鎖
2024-03-21 09:20:38	B.JZ 啓德新急症醫院(Site B)Block ...	長時間未開鎖
2024-03-02 13:07:53	B.JZ 啓德新急症醫院(Site B)Block ...	長時間未開鎖

警報統計

- 設備未閉合: 85.72%
- 低電量報警: 9.52%
- 設備損壞: 4.76%

事件記錄

日期	單位(台)
2024-04-17	17
2024-04-18	50
2024-04-19	15
2024-04-20	15
2024-04-21	10
2024-04-22	10
2024-04-23	5



Electrical box opening management



# C-SMART System Introduction 4S Function



- **Unsafe acts/ dangerous situation alert for Mobile Plant Operation Danger Zone (360 Anti-Collision)**

- **360° car camera**

The 360° vehicle camera has four-azimuth imaging capabilities and can capture panoramic images. By utilizing advanced 360° panoramic stitching techniques, this camera empowers operators with a heightened understanding of their surroundings, thereby minimizing the presence of blind spots and dead angles.

- **Sound/Light alerts for instant reminder**

The camera is outfitted with a dual alert system, combining audible and visual alarms. In the event of detecting a potential collision risk, the camera promptly triggers an alarm to promptly notify the operator. This immediate alert serves as a crucial reminder to the operator, prompting them to undertake appropriate measures and thereby enhancing overall safety protection in a comprehensive manner.



- **AI prompts assisted driving**

The vehicle camera incorporates an AI function that offers valuable features such as reversing assistance, collision prevention, and early warning capabilities, thereby augmenting driving safety. This allows managers to remotely monitor the vehicle's driving conditions and camera status via the management background system, facilitating efficient oversight and management.

- **Unsafe acts/ dangerous situation alert for Tower Crane Lifting Zone**

The system plays a crucial role in mitigating on-site crane collisions, encompassing both crane-to-crane and crane-to-structure scenarios. Various sensors, including wind speed sensors, will be strategically installed on the tower crane to facilitate real-time monitoring. The collected data will be prominently displayed on the platform, accompanied by warning alerts promptly notifying operators of any potential collision risks. This comprehensive approach enhances safety measures and minimizes the likelihood of crane-related incidents on the construction site.





# C-SMART System Introduction 4S Function



## • Smart Monitoring Device for Workers and Frontline Site Personnel (Worker Management System)

With 3 kinds of simple devices, we can accurately monitor the movement of workers in different designated zones, so that the real-time number and location of workforce, distribution performance of subcontractors can all be captured and visualized on the platform.

- A total solution for worker management
- Details including number of workers distribution by age, gender, subcontractors, and work trades are available in each pre-defined zone
- Long range passive RFID tag is used to pair each worker with their helmet
- No additional procedure for using the smart helmet comparing to normal helmet

### 硬件及規格 SYSTEM HARDWARES

藍牙信標	藍牙網關	人臉識別機
		
將藍牙定位標籤粘貼在安全帽後方	在區域內安裝網關,用以接收藍牙標籤的信號	NFC讀卡器集成在人面識別機中,用於入閘時讀取并識別粘貼在安全帽上的藍牙標籤
藍牙特性: Nordic nRF52 Series, BT4.2兼容BT5.1 廣播距離: 長達 150 米 (空曠無遮擋測試環境) NFC: 13.56MHZ; ISO/IEC14443A	支持3路藍牙並發掃描,最大支持300個信標/秒 支持POE供電與USB供電,工作電壓DC5-12V 無線距離: 空曠地最遠距離約300米	通訊接口: RS485 或 RS232 或 UART TTL 工作模式: 自動讀卡模式, 命令模式 (可設置)
定位廣播間隔: 2000ms 發射功率: 0dBm 告警廣播間隔: 500ms 發射功率: 4dBm 安裝方式: 3M膠粘貼 防水等級: IP67	藍牙通訊方式: BLE 5.0 工作溫度: -20°C到60°C 傳輸方式: 有限網絡RJ45、無線WiFi、4G、LoRa 傳輸協議: TCP/HTTP/MQTT/UDP	支持協議: ISO14443A, 13.56Mhz 電壓電流: 5V供電, 工作電流小於100mA 讀寫距離: 大於 5CM LED
電池類型: 可更換的CR3032鋰鈕扣電池   550 mAh 尺寸重量: 57.4mm*41.4mm*18.7mm, 32g 工作溫度: -20°C / +60°C	支持通過APP進行配置,支持RSSI、廣播名過濾 尺寸外觀: 260mm*190mm*80mm, 重量約1000g, 鋁壳	工作環境: -25~80 °C 尺寸: 115mm*75mm*15mm



# C-SMART System Introduction 4S Function



- **Smart Monitoring Device for Workers and Frontline Site Personnel (Smart Chip/Watch)**

With 3 kinds of simple devices, we can accurately monitor the movement of workers in different designated zones, so that the real-time number and location of workforce, distribution performance of subcontractors can all be captured and visualized on the platform.

- A total solution for worker management
- Details including number of workers distribution by age, gender, subcontractors, and work trades are available in each pre-defined zone
- Long range passive BLE chip is used to pair each worker with their helmet
- No additional procedure for using the smart helmet comparing to normal helmet



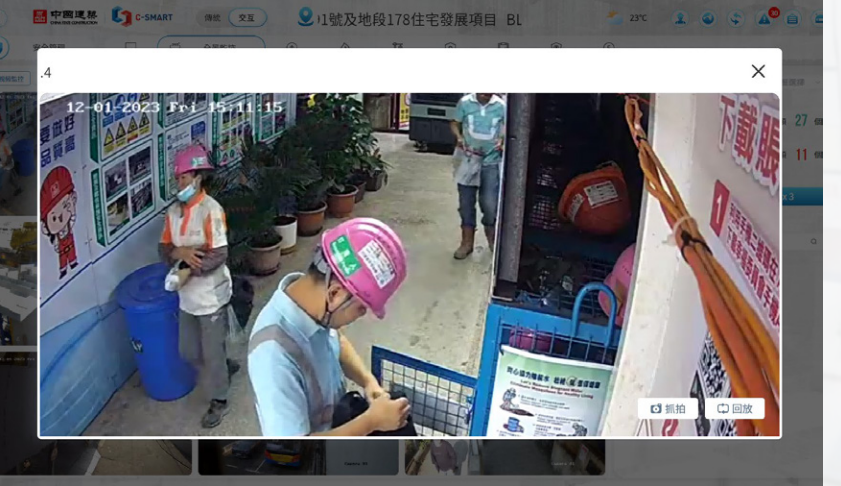
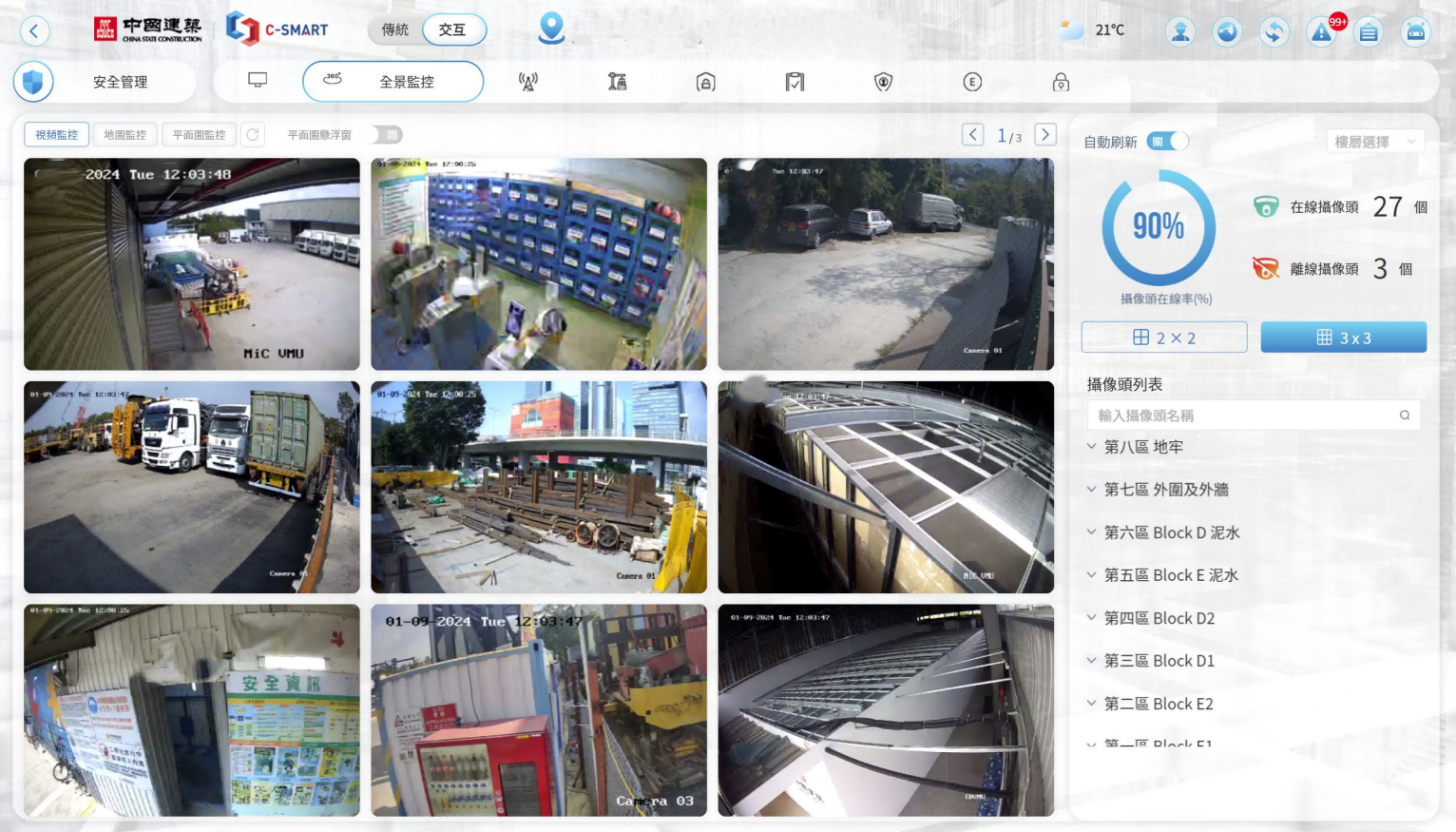


# C-SMART System Introduction 4S Function



## • CCTV Surveillance

All images captured by the CCTV cameras will be seamlessly integrated into the C-SMART Safety platform. This integration enables the safety manager to conveniently access and monitor the live site situation in its entirety, providing a comprehensive overview of security conditions.





# C-SMART System Introduction 4S Function



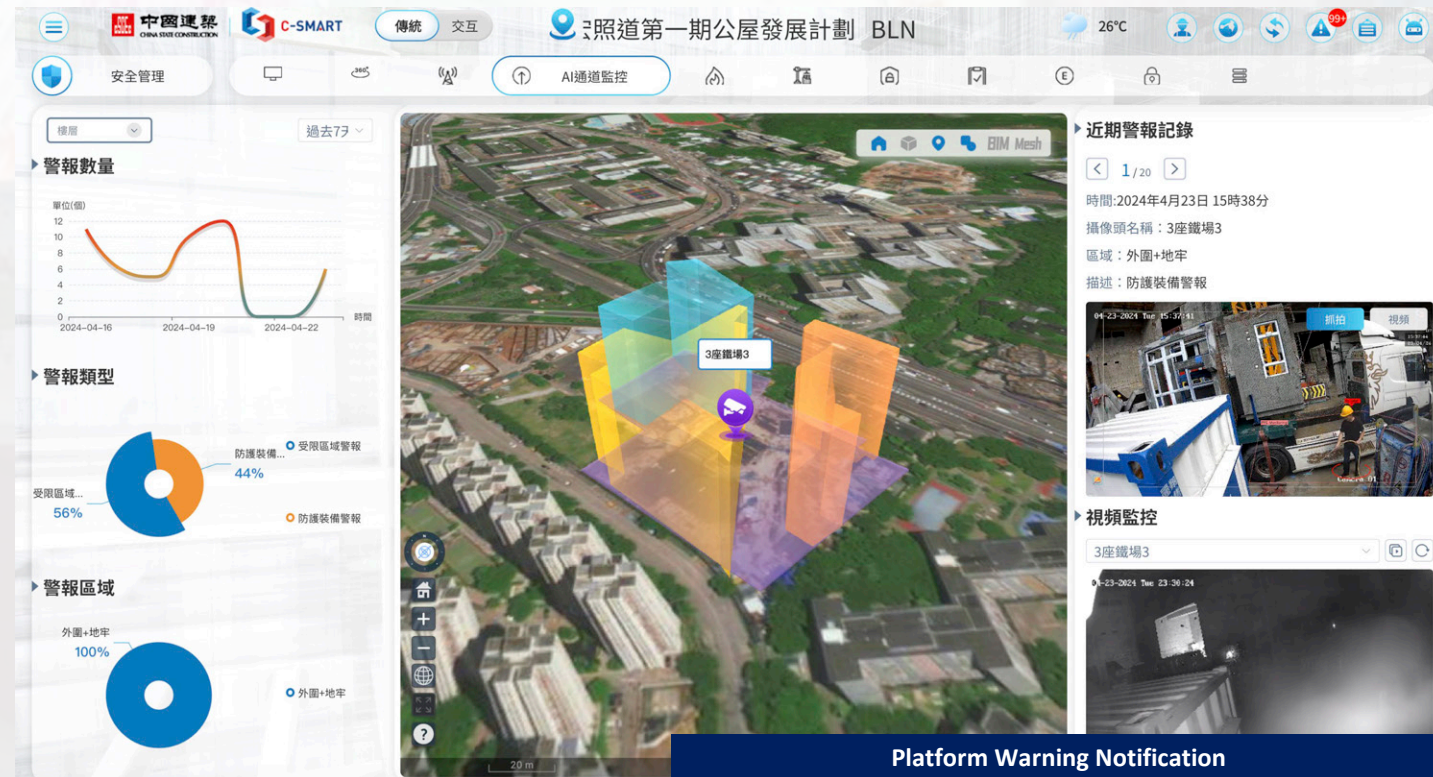
## • Safety Monitoring System using Artificial Intelligence

### • Worker's Unsafe Behavior

With the aid of high-resolution CCTV camera and artificial intelligence (AI) model, our system is able to monitor the general safety practices in construction sites, such as whether worker wearing safety helmet, safety vest, etc. If any violation is detected, real-time alert will be generated automatically on the platform, while the data and images will be stored at the back-end system for further analysis.

### • Current AI Algorithm

1. Unauthorized access to restricted zones
2. Workers near site vehicles or plant;
3. Under Lifting
4. PPE Detection
5. Monitoring of fatigue, distraction,
6. Open Edge
7. Over Speeding
8. People Counting





# C-SMART System Introduction 4S Function



## • Confined Spaces Monitoring System (AMS)

The enclosed space gas system monitors air quality through a gas detection control box. This control box supports air quality tests with ten types of sensors, detecting oxygen (O<sub>2</sub>), PM<sub>2.5</sub>, PM<sub>10</sub>, carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), methane (CH<sub>4</sub>), combustible gases (EX), temperature, and humidity. When gas concentrations reach predefined warning levels, an audio and visual alarm is triggered in the control box.



## • BI Dashboard

The detection data, warning, and alarm information are transmitted in real-time to the IoT platform and integrated into C-Smart. Users can add devices in C-Smart, set warning and alarm thresholds for various gases, and monitor detection, warning, and alarm data through a BI dashboard.

### 產品優勢 PRODUCT FEATURES

- 支持離線使用, 超過設定閾值即時觸發聲光報警
- 吸入式氣路設計, 更適合密閉空間環境
- 採用過濾網備件、背扣等設計, 方便安裝保養
- 監測、預警及報警資料集成 CSMART大屏展示
- CSMART監測大屏兩種頁面樣式可選
- 檢測的氣體類型可擴展

### 可檢測的氣體類型 DETECTABLE GAS TYPE

- 1 氧氣O<sub>2</sub>
- 2 PM<sub>2.5</sub>
- 3 PM<sub>10</sub>
- 4 硫化氫H<sub>2</sub>S
- 5 一氧化碳CO
- 6 二氧化碳CO<sub>2</sub>
- 7 甲烷CH<sub>4</sub>
- 8 可燃氣體EX
- 9 濕度
- 10 溫度

### 產品規格 PRODUCT SPECIFICATION

類型	量程	解析度	精度	使用壽命	類型	量程	解析度	精度	使用壽命
氧氣O <sub>2</sub>	0~30%Vol	0.1	0.5%	2年	一氧化碳CO	0~1000ppm	1ppm	±3%讀數	2年
溫度	-40°C~100°C	0.1	±0.5°C	10年	二氧化碳CO <sub>2</sub>	400~5000ppm	1ppm	±(50ppm+3%)	10年
濕度	0~100%RH	0.1	±0.3%RH	10年	硫化氫H <sub>2</sub> S	0~100ppm	0.1ppm	±5%讀數	2年
PM <sub>2.5</sub>	0~1000µg/m <sup>3</sup>	1µg/m <sup>3</sup>	±10%讀數	≥40000小時	甲烷CH <sub>4</sub>	0~100%LEL	1%LEL	±5%讀數	3年
PM <sub>10</sub>	0~1000µg/m <sup>3</sup>	1µg/m <sup>3</sup>	±10%讀數	≥40000小時	可燃氣體EX	0~100%LEL	1%LEL	±5%讀數	2年

### 平台界面 PLATFORM INTERFACE





# C-SMART System Introduction 4S Function



- **Safety training with Virtual Reality technology**

- Combining Virtual Reality, interactive technology, IoT and cloud based integrated platform to create scene models and animation
- Provide trainings to workers to adopt suitable measures in different situations
- Greatly optimize the safety level and efficiency of employee training



On-site VR training Center

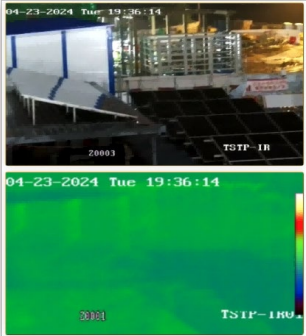
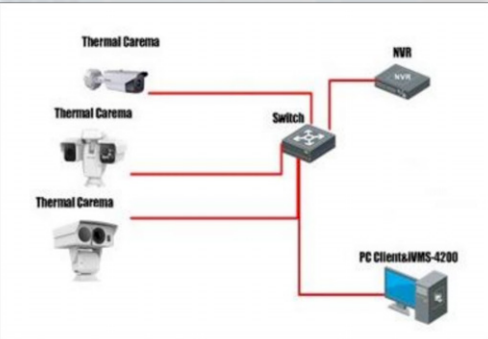
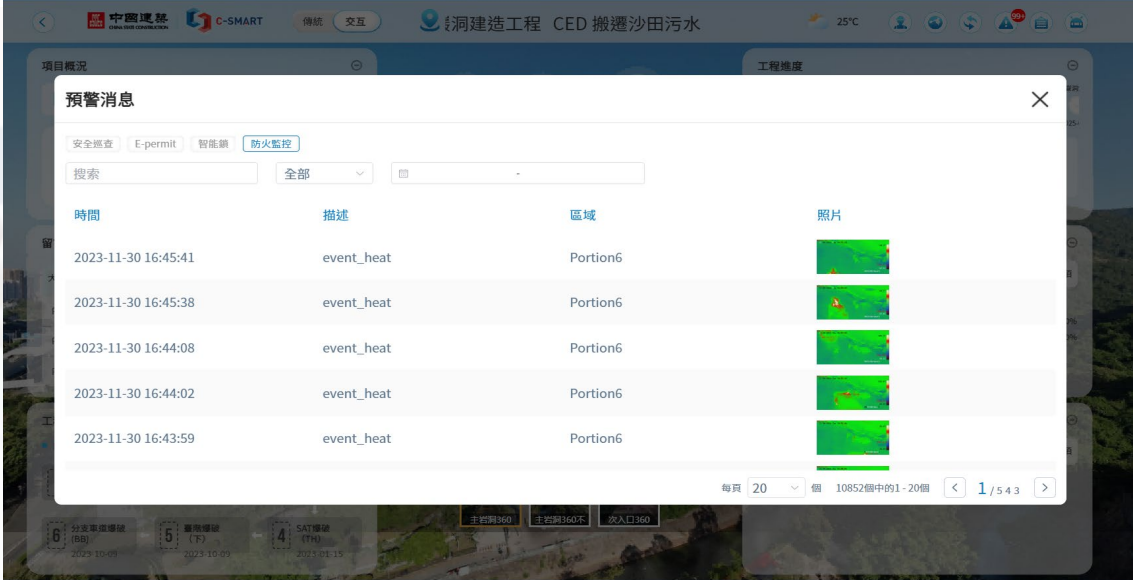




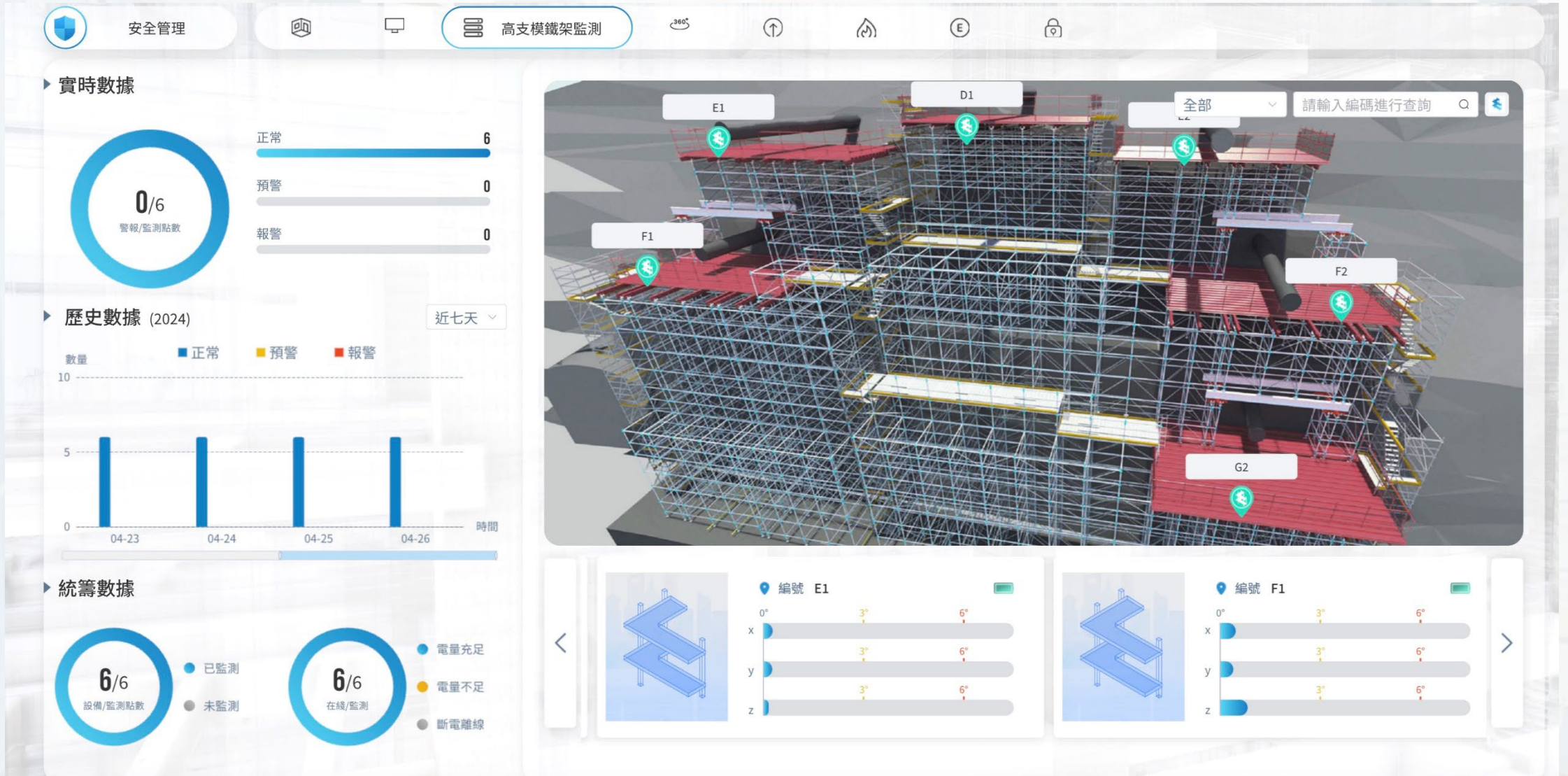
- **AI FIRE PROTECTION**

- **AI Fire/Smoke Detection**

Both visible light and infrared cameras are installed for CCTV surveillance. The CCTV system is integrated with AI algorithm and deep machine learning technology, fire and smoke can be detected through both computer vision and infrared cameras, which greatly enhances the accuracy and capability of early fire detection 24/7. Upon detection, alerts with location are immediately sent to responders through the system and mobile application.

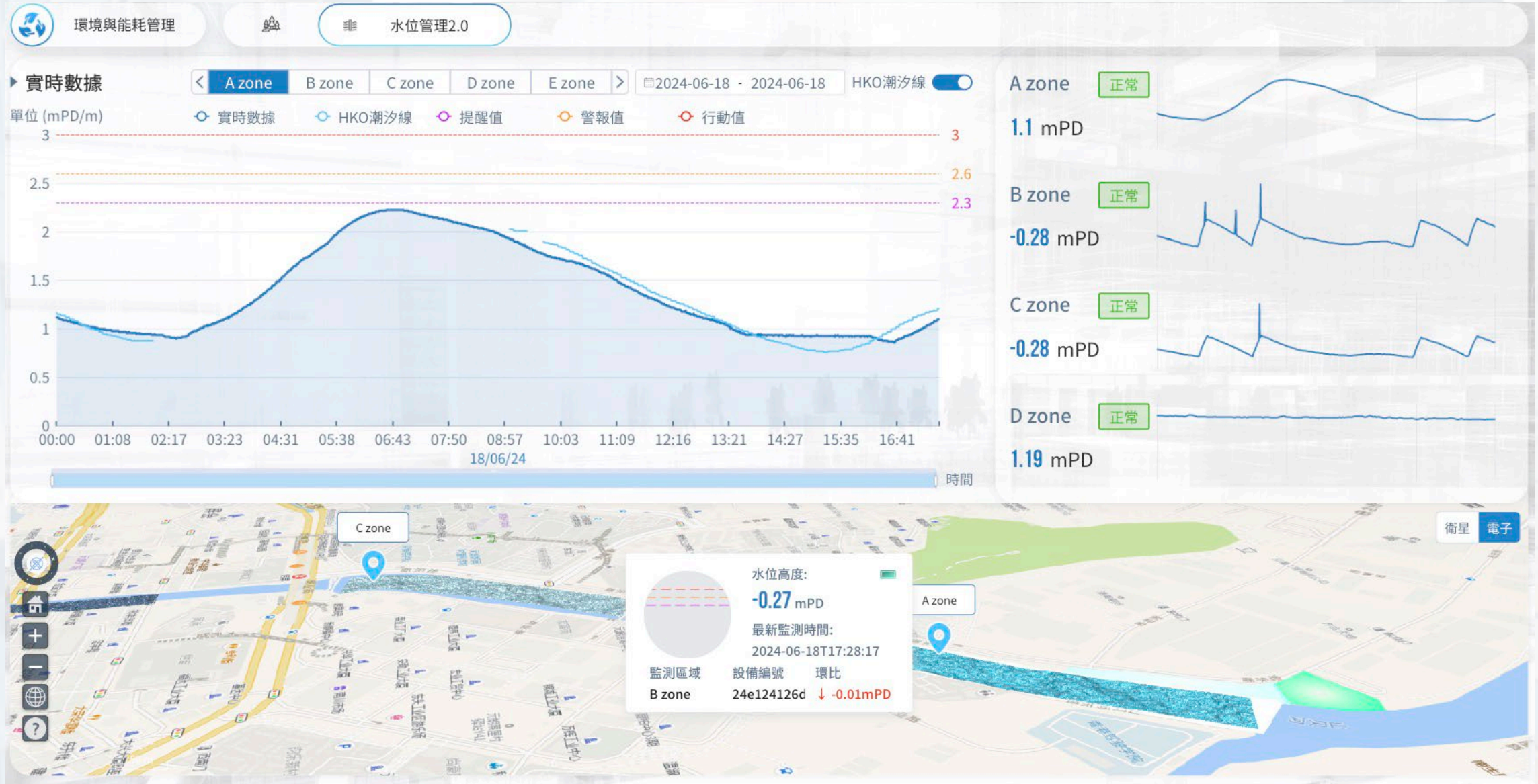


- Falsework/Scaffolding Monitoring





- Water Level Monitoring for Working in River



## Application of Building Robot in construction industry



- New AMR hardware integrated industrial design and assembly
- Self developed Robot control system
- Self developed Interactive system
- 360 panoramic camera, PTZ binocular camera, sterilization device control and data collection
- Return and charging system

**產品簡介 PRODUCT INTRODUCTION**

建築巡檢機器人，是一款具有自動定位巡檢、可躲避障礙物，具有自主返航充電、模組化設計可拓展的巡檢機器人。主要功能為360度全方位視頻監控日夜巡邏，並將數據實時上傳至系統。通過集成AI算法可以自動識別地盤施工過程中的不安全行為，如：禁區管理、安全防護裝備佩戴情況。做到日夜守護工地安全，對於危險且不方便巡檢的工地死角由機器人代替，守護人員安全，杜絕巡檢死角。

The Construction Site Inspection Robot is designed with automatic positioning and inspection, obstacle avoidance, autonomous return for recharging, and expandable modular design. Its main function is 360-degree all-around video surveillance for day and night patrols, with real-time data uploading to the system. Through integrated AI algorithms, it can automatically identify unsafe behaviors during construction, such as restricted area management and safety equipment compliance. It ensures the safety of the construction site day and night, replacing personnel to inspect dangerous and inconvenient corners, thus safeguarding personnel and eliminating blind spots in patrols.

**產品亮點 PRODUCT FEATURES**

 <b>360度全方位視頻監控,日夜巡邏</b> 360-degree all-around video surveillance for day and night patrols	 <b>自主返航進行充電</b> Autonomous return for recharging	 <b>自主研發的後台管理系統</b> Independently developed backend management system
 <b>自動定位,躲避障礙</b> Automatic positioning and obstacle avoidance	 <b>模組化設計,實現多場景應用</b> Modular design for multiple scenario applications	 <b>消毒設備控制及數據采集</b> sterilization device control and data collection
 <b>全新的硬件集成工業設計</b> New hardware integration with industrial design	 <b>可集成AI算法,識別不安全行為</b> Integrating AI algorithms to identify unsafe behaviors	



# C-SMART Other Smart Safety Application

- Application of Building Robot in construction industry



Transport Robot

- Automatic following navigation system, more flexible and safe
- One click start, route memory function
- Automatic obstacle avoidance function
- Man-machine collaboration to improve work efficiency, max safety work load 250kg



## Follow-me



- Target tracking navigation activated by one-click
- With obstacle avoidance

## Plug & Go



- Operate with simple push-buttons, minimal training required
- Short setup time with no initial cost

## Autonomous



- Run in the loop for a continuous route
- Memorize up to 5 routes
- One-click automatically playback

## Adaptative



- Operate 24/7
- Climb slope up to 6°
- Able to steer over uneven surface, gravel, grating, gap and even water paddle
- IPX2 rating - withstand light rain

## Pallet Towing



- Can be attached to a hand-pallet jack to tow up to 600 kg

## Enhance Safety Level



- Carry heavy loads for worker, to prevent worker from being injured by manual handling

**THANKS!**