



**RAYNET XPERT**  
Build · Sell · Scale

# CONSTRUCTION INDUSTRY

\$1.8T

amount of money contractors lost due to bad data, which is also responsible for 14% of avoidable reworks

11%

average time lost during every construction project in the world, predominantly due to lack of on-site data

15%

of construction cost is found to be wasted due to rework of defective components detected late during the construction

40%

of all site defects have their roots in errors arising during the construction phase





# CONSTRUCTION INDUSTRY NEEDS

01

## EXACT SITE DATA

- current "measurable" completion status
- exact 3D models (not point clouds or as-built 3D/2D drawings)
- current BIM deviations

02

## EARLY DEFECT IDENTIFICATION

- identification of defects as they happen
- automated system to identify defects and confirmation of defect resolution
- resolution assignment work-flow

03

## OVER-RUN ESTIMATION

- estimation of exact current time over-run
- estimation of exact current cost over-run
- breakdown of reasons behind these over-runs



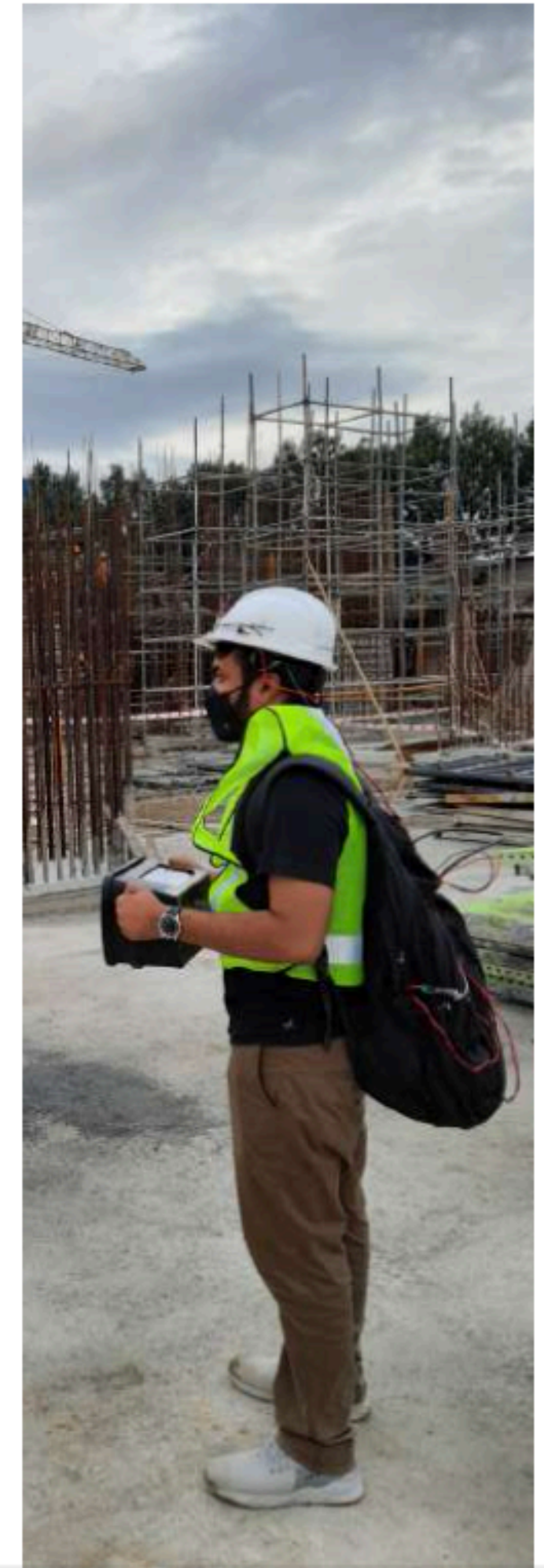
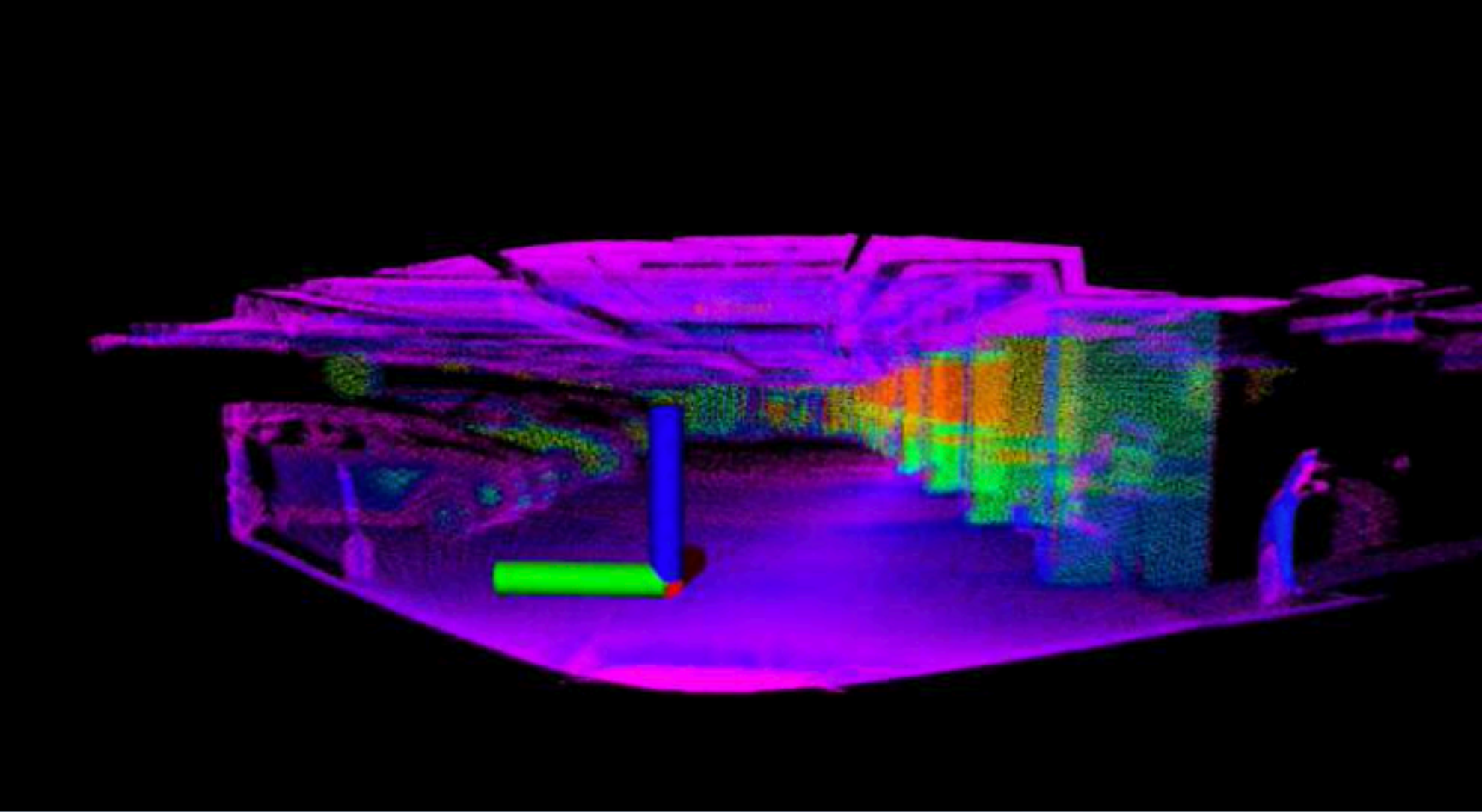


# Building the 3D model Scan process

- Data for the 3D model is captured using a proprietary scanning device (LITHIC).
- Engineer carries the hand held scanner or use drone to scan the entire area.

## Technical aspect

- Each point on site gets captured as data point
- Working on an algorithm that calculates the optimal scan route and shows the same to the engineer on his scanner screen as he prepares to scan the site







## Building the 3D model Hardware Details

- Scanner includes components like LiDAR, IMU sensors, RGB camera, Thermal Camera.



### Technical specifications of Scanning device

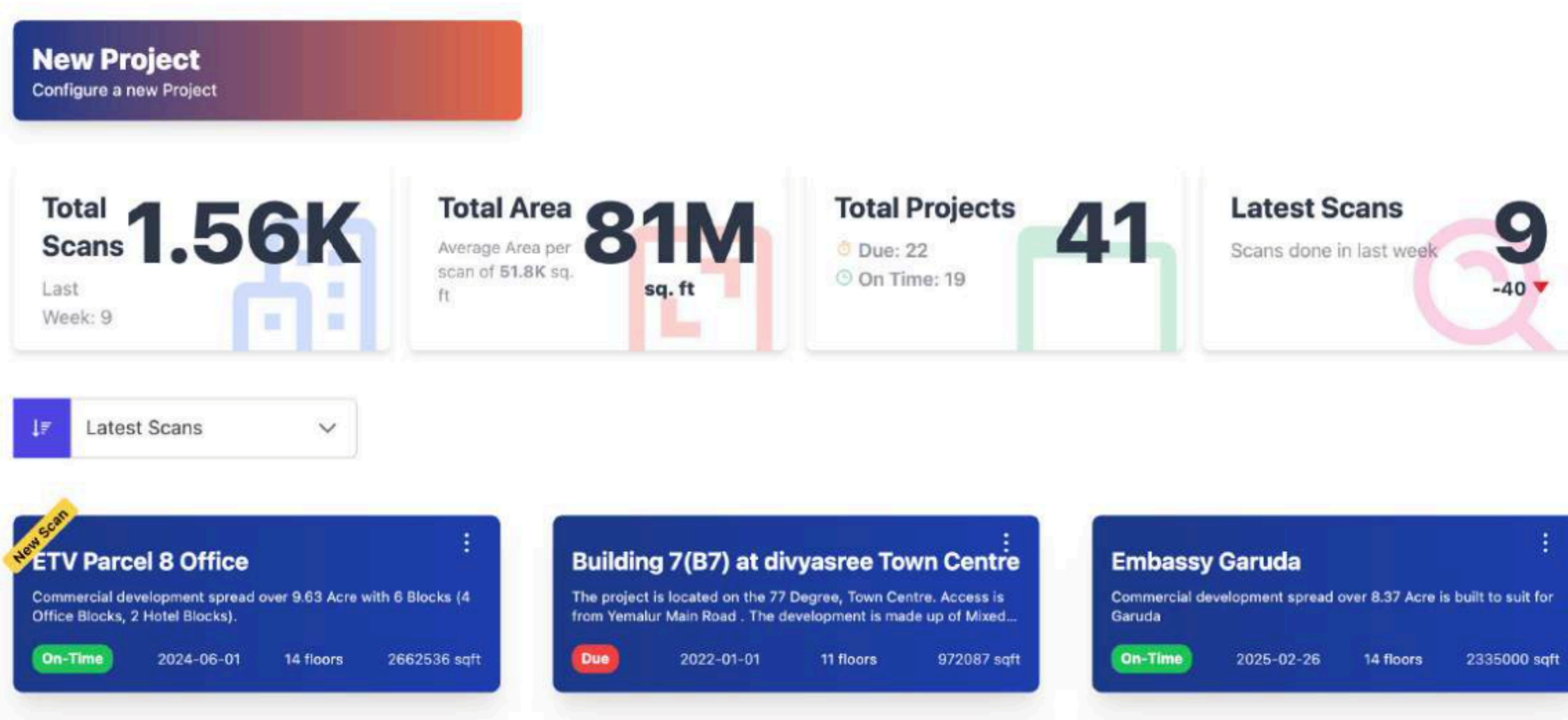
- 905nm Laser Scanner
- 200m Detection Range
- 24M combined RGB/LIDAR fused points per second
- 1mm STD at 1m Precision
- 500m thermal detection range
- -4degC to 33degC Temp. range
- Global/Rolling Shutter Camera Options
- 5TB onboard storage
- 6 hr battery backup.
- 2.5KG weight (battery backpack weighs 3 KG)





## Building the 3D model

# Our Cloud Platform



- All scans will be provided in a secure cloud architecture platform.
- Single window access for all sites.
- Platform has 3D model view, with side by side RGB and Thermal videos
- Option to snap, measure length, area, volume and volume under plane.
- Create multiple session planes with orbital tool for vertical and horizontal 2 D plans.
- 3D walk thru of Entire site.
- Multiple users access.
- Inbuild project management and task management tools for ease of work flow with in the organization.
- Geo Tagged 3D data on Google Maps.





# Building the 3D model

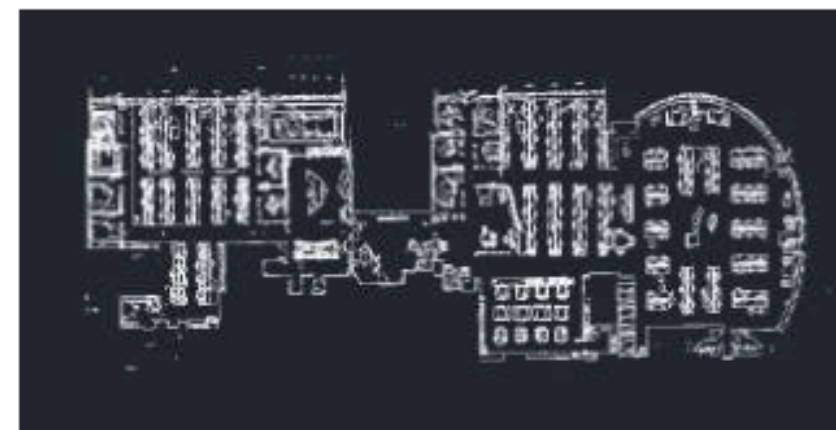
## Output – The 3D model

- The 3D as built engineering model is freely navigable, downloadable and viewable on a web based open source viewer
- An interactive inset 2D plan enables easier navigation
- Cleaned, vectorised, scaled as built AutoCAD drawings can be downloaded



### Results of each scan are:

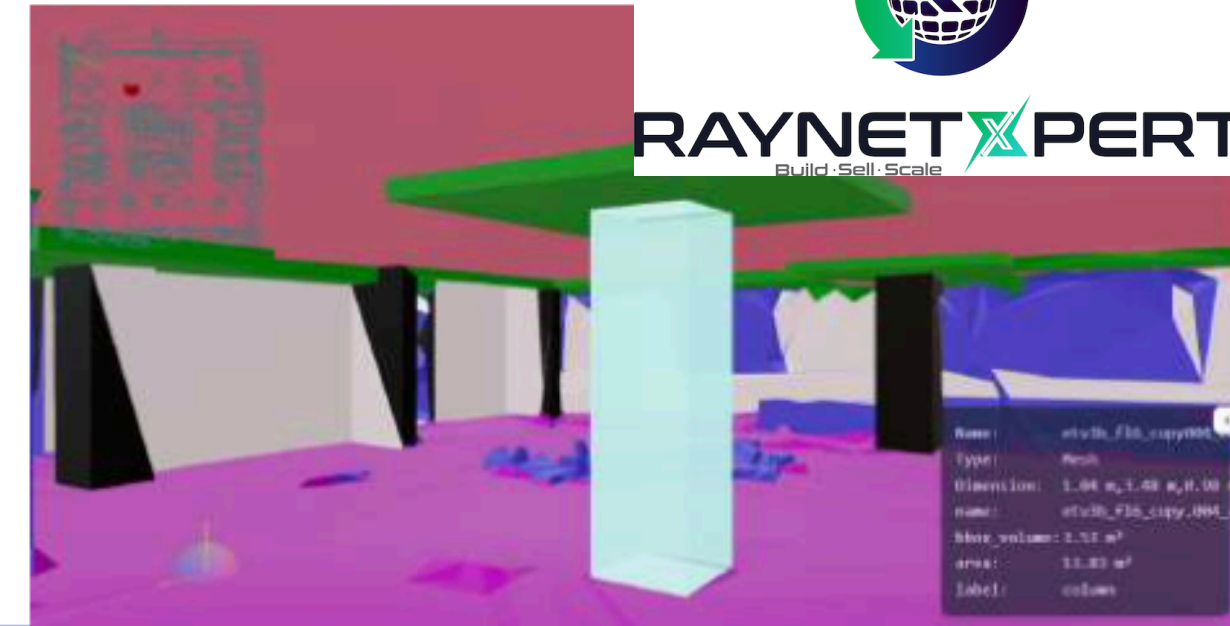
- 3D Model with Colour and Thermal Video
- 2D As build drawing for constructed area.







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# Features the 3D model Measurement - Regular



- Linear, Angular, Area (any polygon), Volume (any cuboid) – regular and irregular
- Platform recognises the elements in the structure
- The AI algorithm is being trained to perform automatic segmentation for all construction elements
- This is the world's first Transformer (GPT) based model for model segmentation
- This is the first step towards automatic BIM conversion from scanned models





## Features of the model

# Measurement - Irregular volumes

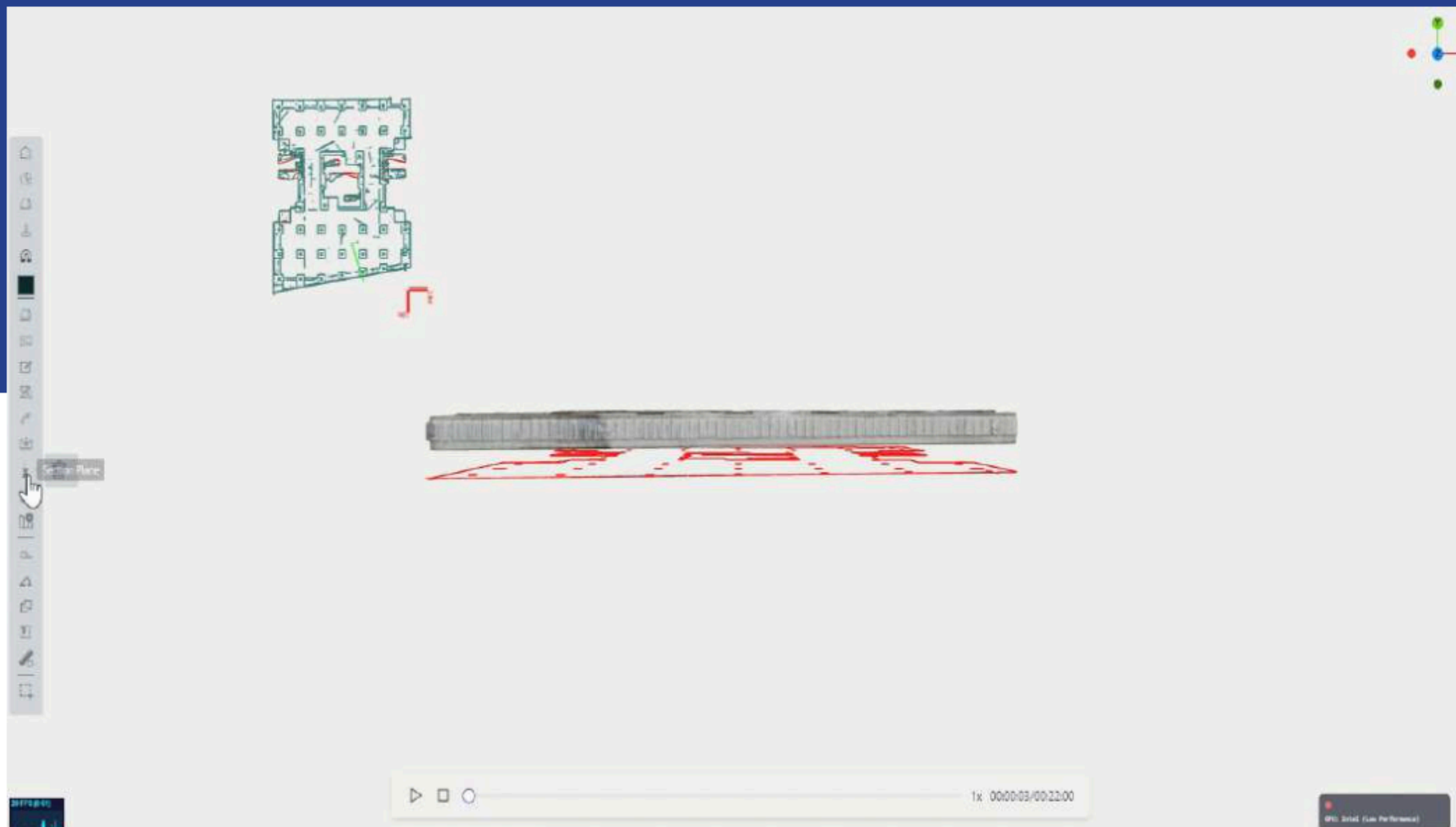


- Irregular volumes tool help ascertain cut and fill volumes at desired levels
  - Used during preconstruction and excavation for quantification of works
  - The alignment and angle of cutting plane can be modulated on the platform
- 
- The platform allows for increasing or decreasing the scale for precision of volume calculation
  - Drone functionality is specially being enabled to improve this measurement further





# Features of the 3D model Section



- Flexible section tool
  - Sections at any plane, angle
  - Multiple section planes can be added
  - Sectioned views can be saved for future reference
- 
- The platform is already integrated with Autodesk Developer network, where people can seamlessly sync data between Autodesk platform, BIM 360 to our System and vice-versa!
  - Inter-logins are also made possible

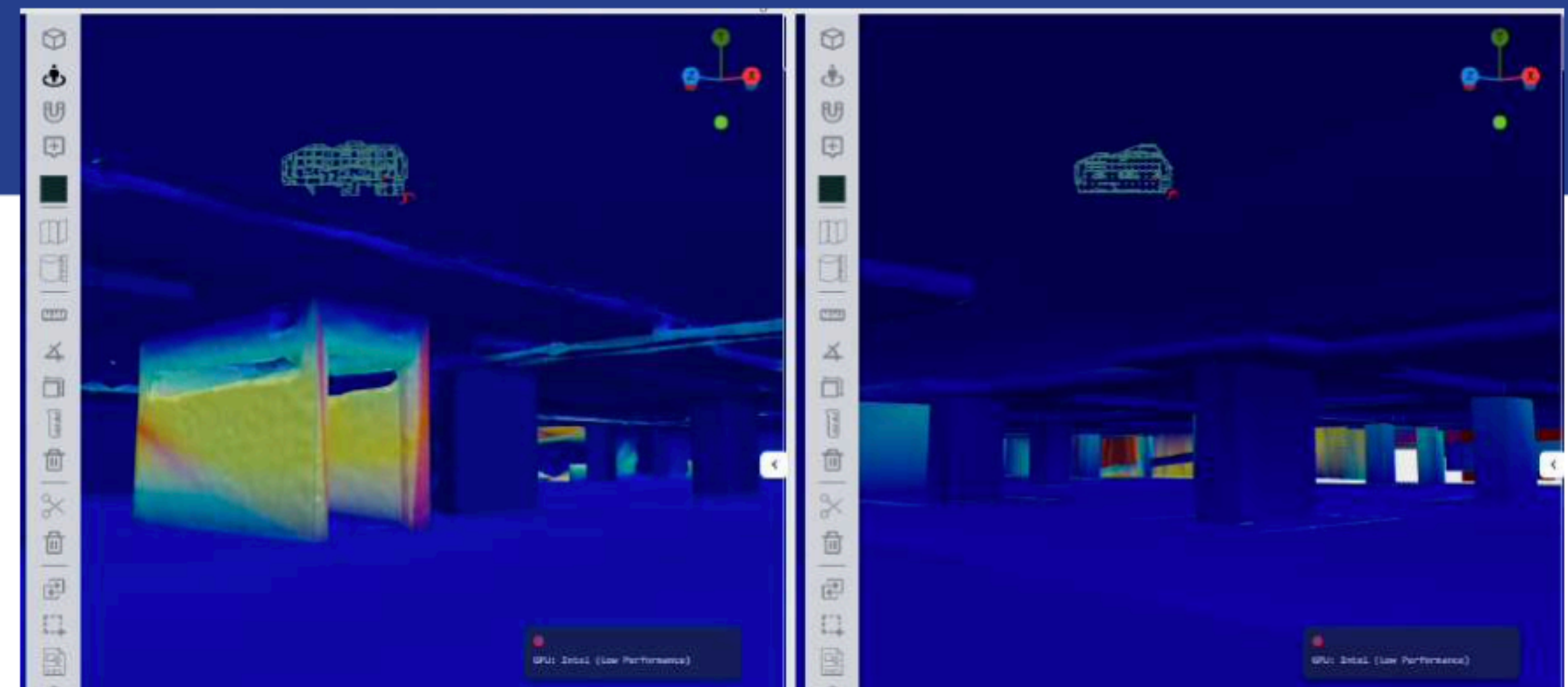
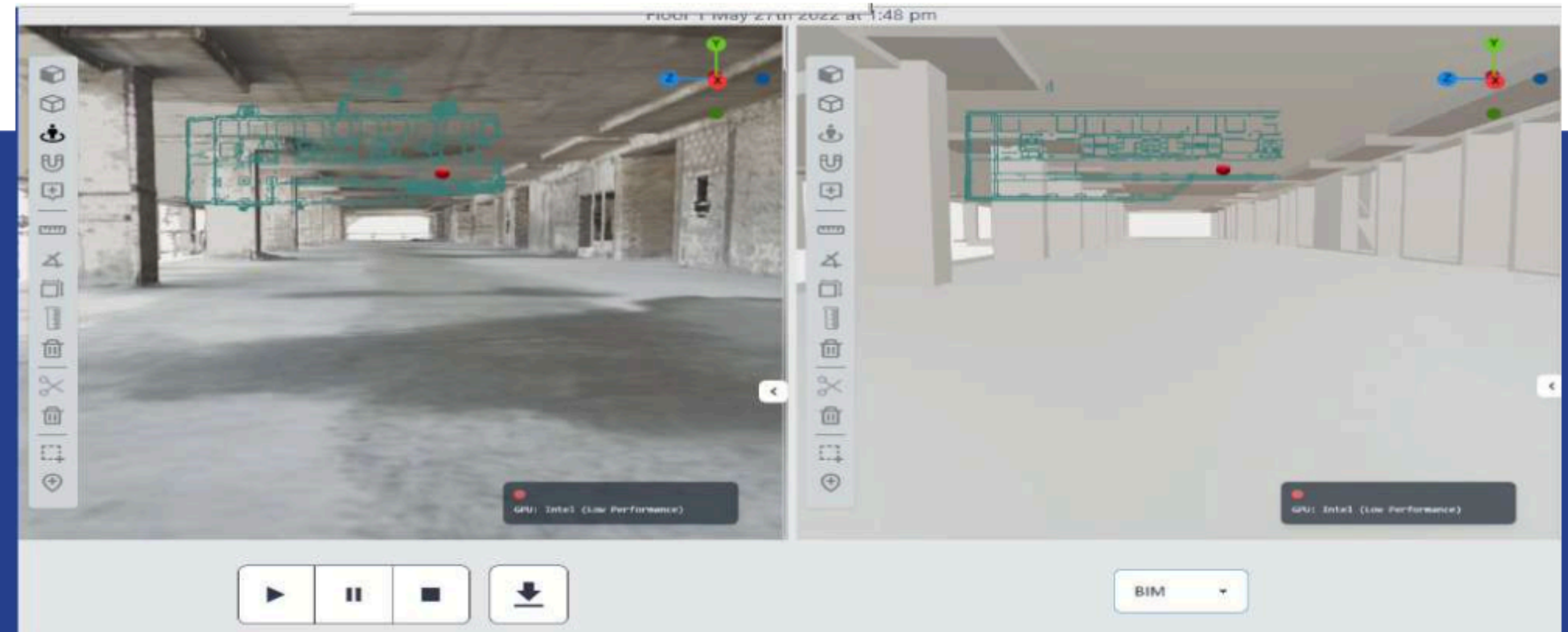




# Features of the model

## Side by side view

- 3D model can be compared with BIM. Both views are synchronised in sync and sync transverse
  - Deviations from BIM highlighted in a coloured texture
  - 3D model can be viewed side by side with normal video and thermal video – nearest best camera angle seen corresponding to each point on the model
- 
- As the segmentation models and scan to BIM conversion improves, it would be possible to ascertain 3D deviation, just from the 2D plans!





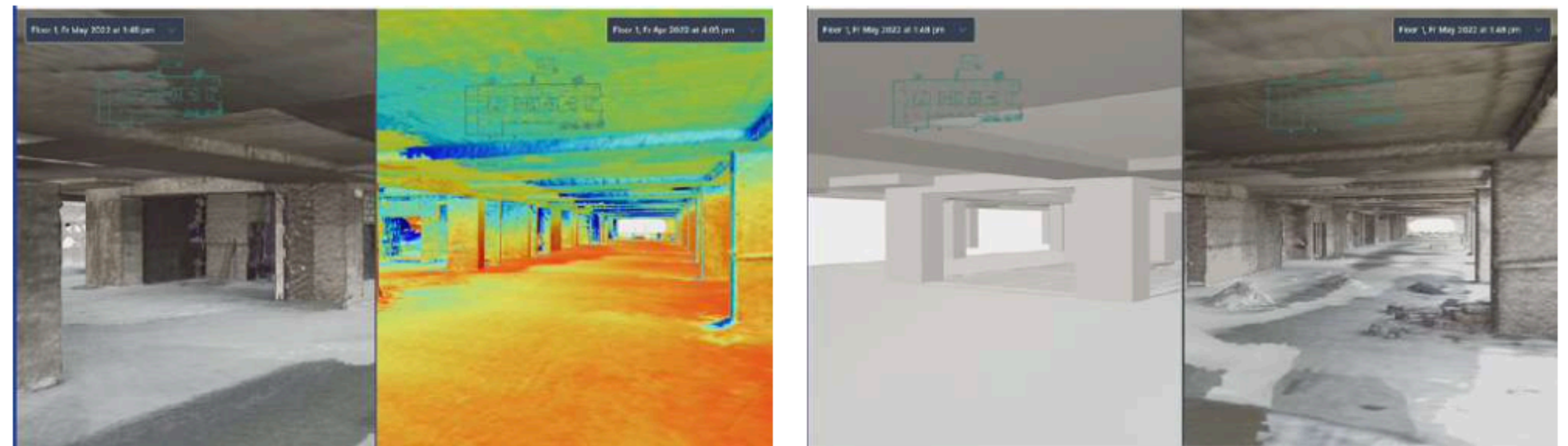


# Features of the model Slider view

- Any two models can be loaded on the slider view
- View synced to reveal the elements at the same location
- Slider bar can be slid across the view to visually see the difference
- Enables visual understanding of work progress



- We are also building “Peel-Off” features with precise alignment with historical models to see perfect construction time-lapse.
- This allows us to “peer” into the several layers of construction history.







# Features of the model Defect Analytics



- Common visible defects like cracks, honeycombs, chipped edges automatically recognised and notified
- Workmanship issues like uneven surfaces, cement slurry also detected
- All defects listed out on sidebar for easy access.
- Future developments include expanding the range of defects identified

- More than 400000 defects images are currently used to train the AI model on 30 Cement/Concrete defects.
- The complicated process of mapping the defects captured from camera, and overlaying on 3D model is already live

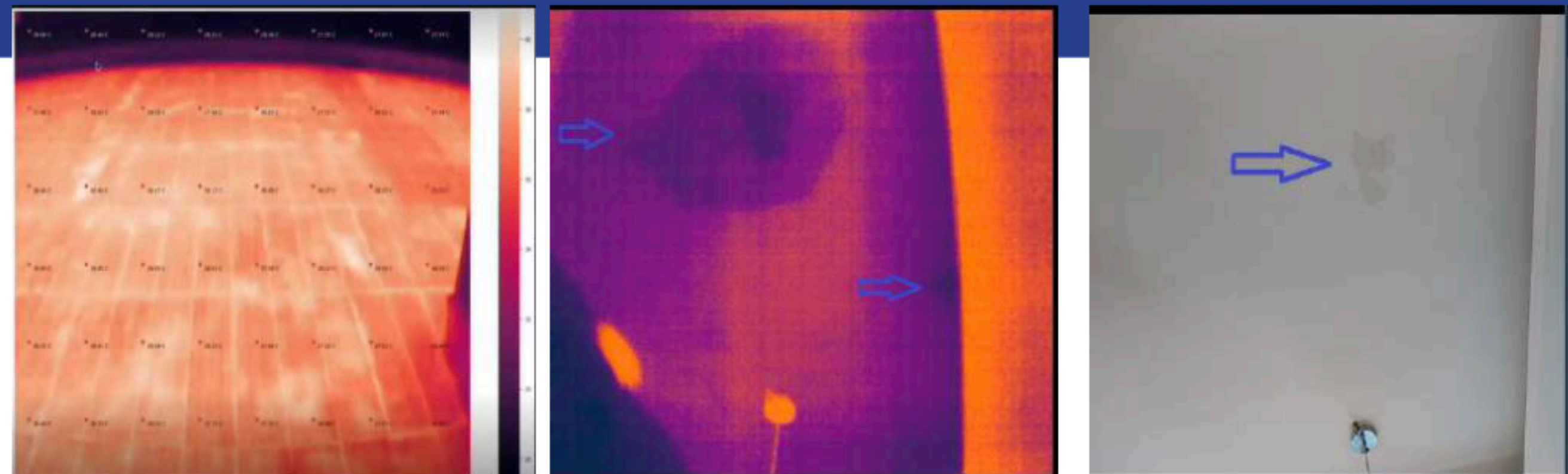




# Features of the model

## Thermal Analytics

- Thermal data collected is used to generate a thermal overlay model
- The view can be modulated to reveal moisture patterns – enables early detection of leaks
- Absolute temperatures seen across surfaces – enable quality checks like sufficient curing
- Future developments include utilizing this analytic for MEP installations integrity check and automated leak profiling

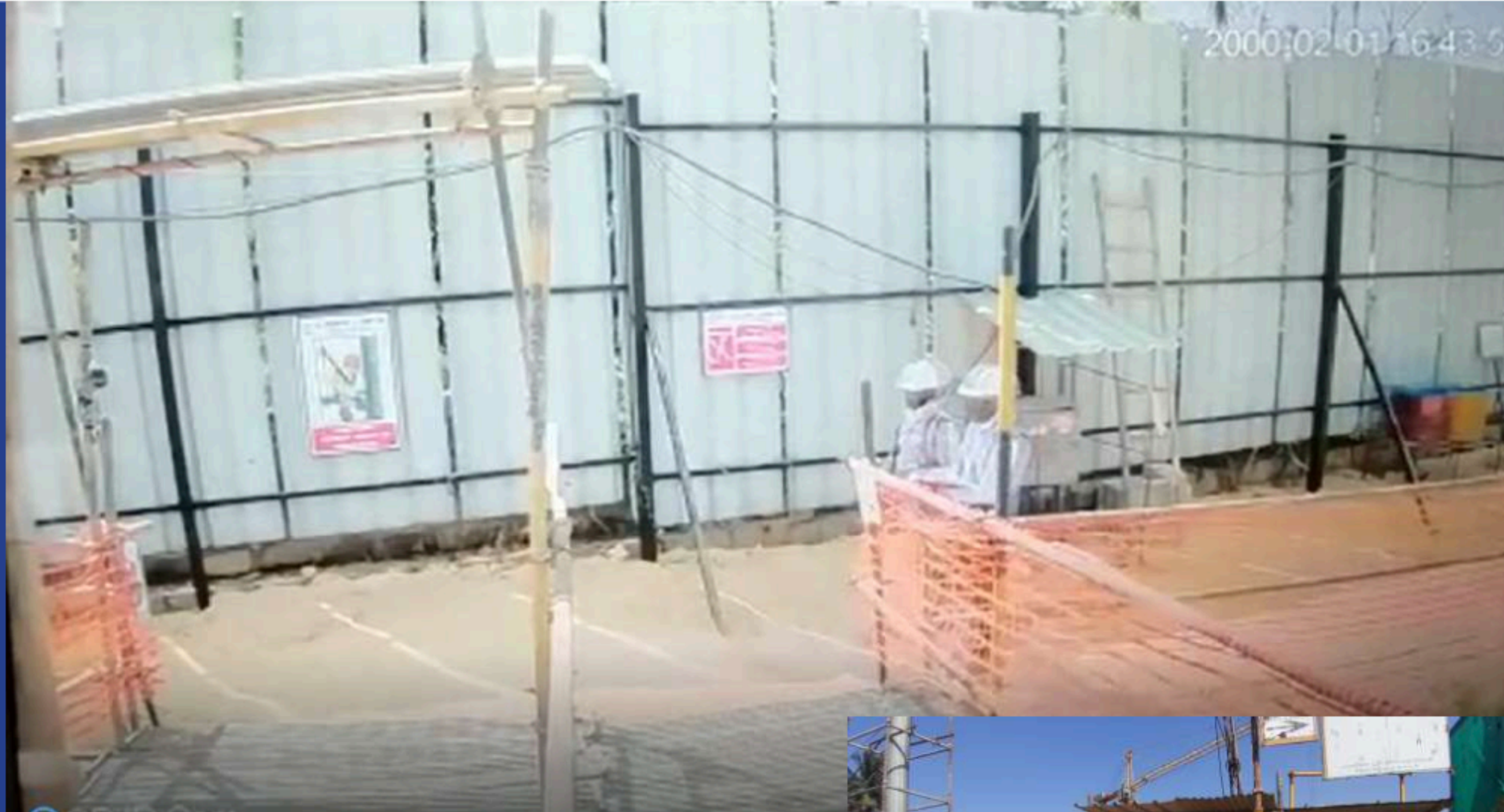






# Data capture – Mode 2

## Live Camera - Fixed



- Bullet cameras are fixed at entry and exit, configuration is 4MP with Varifocal lens
- Picks and provides the data for facial recognition of workers entering and exiting the site
- Also checks for PPE violations
- Onsite servers purge and push data to cloud







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# Data capture – Mode 2

## Live Cameras - Moveable



- 4MP Pan Tilt Zoom cameras are placed on actual floor of work
- The camera scans the floor in a grid like pattern
- Picks and provides data for PPE violations and unsafe acts for H&S
- Onsite servers purge and push data to cloud

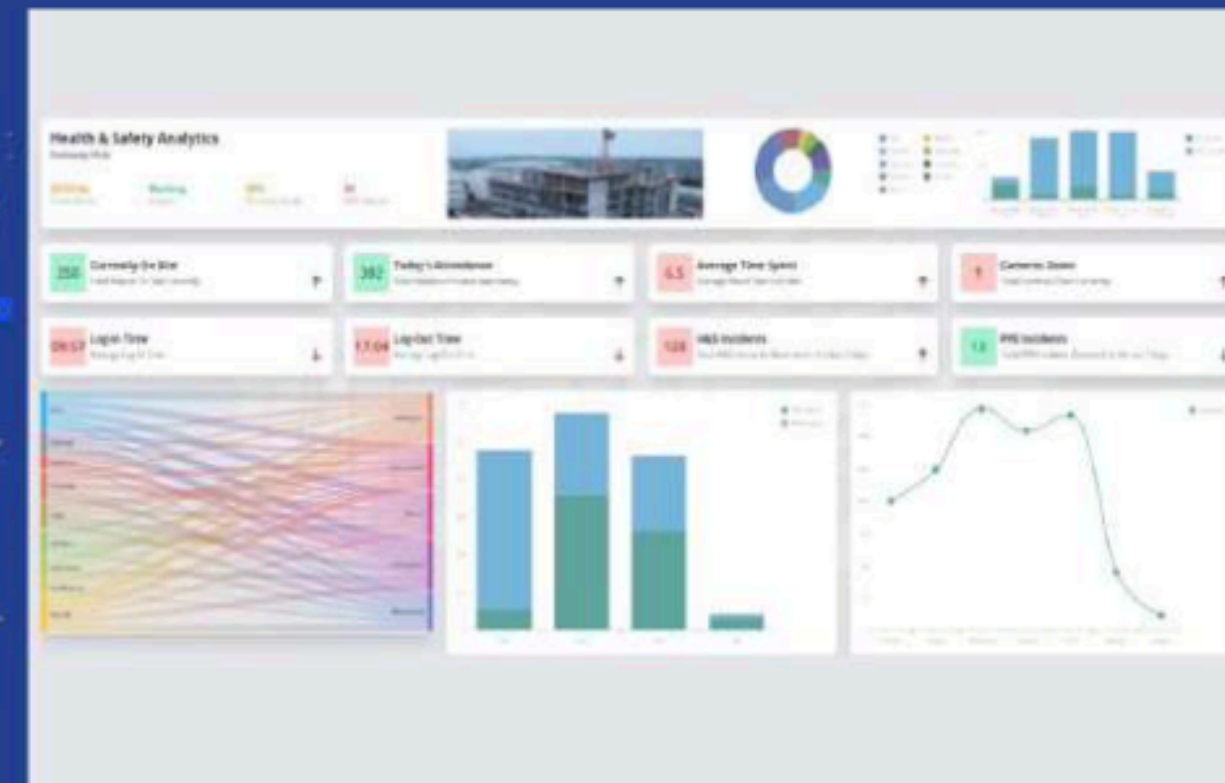




# Live Camera Analytics Output – Attendance & PPE incidents

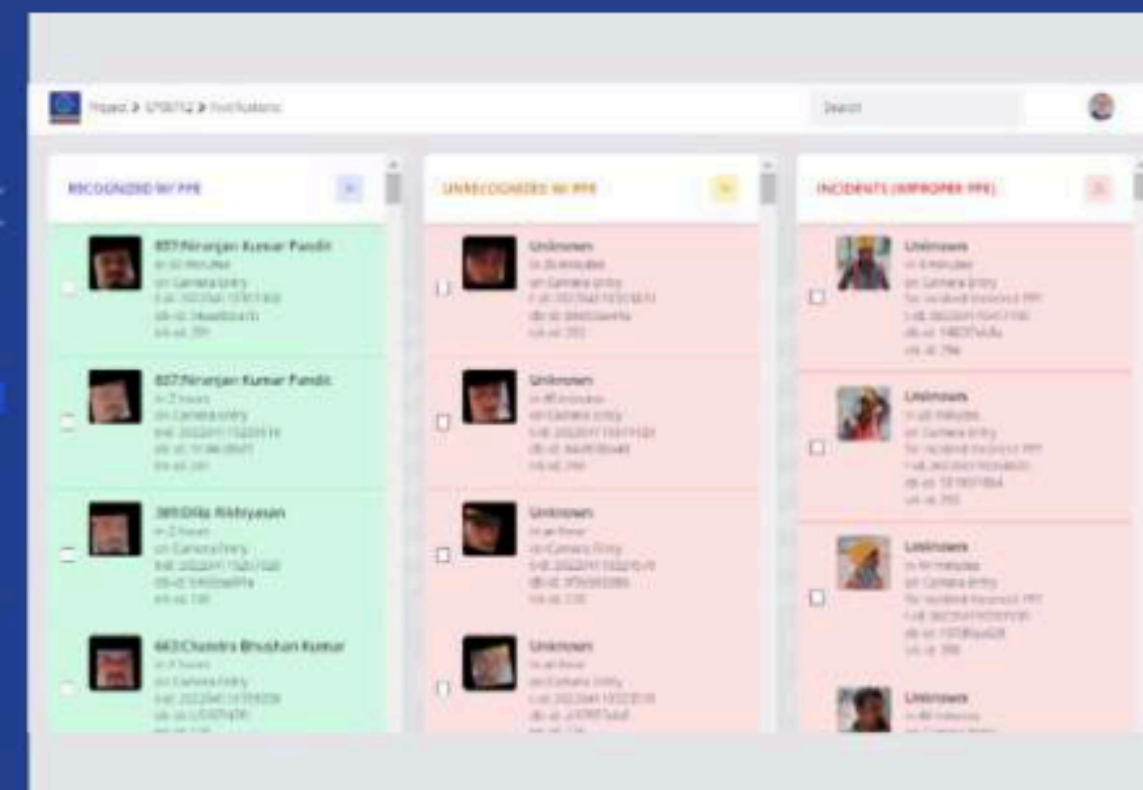
Attendance Report

Photo	Employee Name	Company	Trade	Category	Sub category	Entry Timestamp	Exit Timestamp
	MD Iman	BLK	Civil	Mason	Blockwork	4/29/2022 8:09 AM	4/29/2022 4:19 PM
	Bejing Nurul	BLK	Civil	Mason	Blockwork	4/29/2022 2:39 PM	4/29/2022 4:01 PM
	Djak Prasad	BLK	Civil	Helper	Masonry	4/29/2022 3:48 PM	4/29/2022 3:48 PM
	Surya Kumar Raj	BLK	Civil	Rites	Reinforcement	4/29/2022 3:16 PM	4/29/2022 3:31 PM
	Advik Raj	BLK	Electrical	Electrician	Grade	4/29/2022 8:01 AM	4/29/2022 3:21 PM
	Krishna Kumar	BLK	Civil	Carpenter	Shuttering&Formwork	4/29/2022 8:10 AM	4/29/2022 3:25 PM
	Gowdhan Tobin	BLK	Civil	Rites	Shuttering & Formwork	4/29/2022 3:10 PM	4/29/2022 3:15 PM
	Sybil Dhale	BLK	Civil	Rites	Reinforcement	4/29/2022 3:14 PM	4/29/2022 3:14 PM



H&S Incident Report

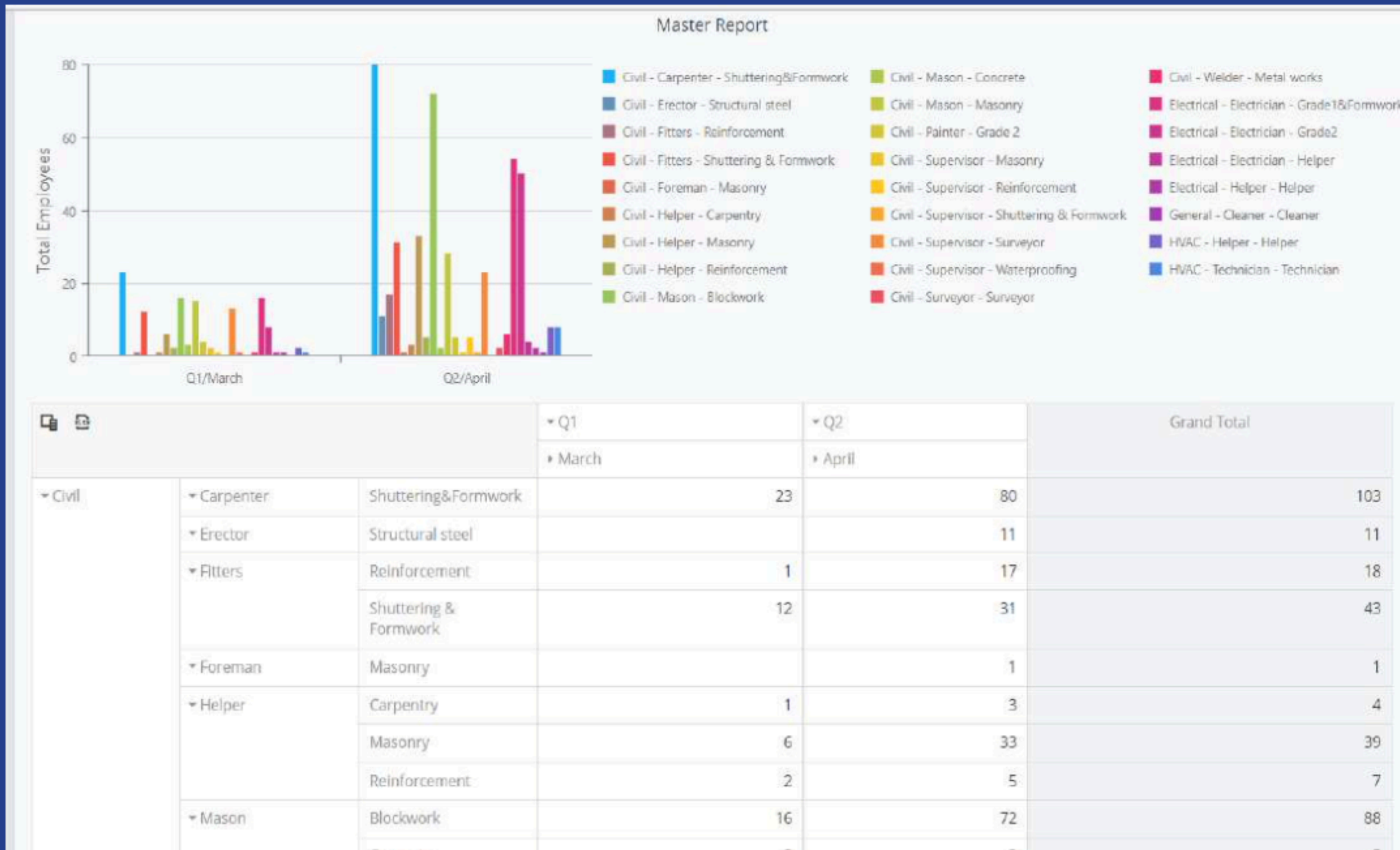
Employee Name	Company	Trade	Category	Sub category	Timestamp	Incident Details	Camera ID
Employee Name: Albar Alam (Count: 2)							
	BLK	Civil	Carpenter	Shuttering&Formwork	4/29/2022 2:08 PM	Incident PPE	Entry
	BLK	Civil	Carpenter	Shuttering&Formwork	4/29/2022 4:20 PM	Incident PPE	Exit
Employee Name: Anil Handran (Count: 5)							
Employee ID: CP-EXT-49P-ANIL-HANBRAM-0991 (Count: 5)							
	BLK	Electrical	Electrician	Grade&Formwork	4/19/2022 3:11 AM	Incident PPE	Entry
	BLK	Electrical	Electrician	Grade&Formwork	4/19/2022 2:40 PM	Incident PPE	Entry
	BLK	Electrical	Electrician	Grade&Formwork	4/14/2022 11:25 AM	Incident PPE	Entry



- Workers crossing the gate camera get recognised as they pass and their attendance is noted.
- PPE violations are picked up at the gate camera and the worksite camera and notified as H&S incident
- Option available to blacklist repeat offenders. Alarm triggered if blacklisted person tries to enter site
- Future developments include expanding the types of H&S incidents detected.



# Resource Management



- Facial recognition enabled on the cameras at entry and exit gates
- Simple onboarding process – can be done even from handheld mobile devices
- Attendance reports available for any required time frame
- Master report depicts the quantum of each type of resource available at site – enables easier resource management
- Future developments include automation and predictive analytics in resource management for all types of resources





## Other aspects

# Task Management, Access control

All Tasks My Tasks Main Tasks

+ New

#	Status	Task Name	Assignees	Due Date	Start Date	Last Modified	Priority	Actions
00008659	Closed	Incident occurred for Unknown on 2023-01-25 09:30:16	Sneha Sabu	25/01/2023	25/01/2023	25/01/2023	HIGH	
00008664	Closed	[Reassigned] [Sub Task]: Inform contractor	Sneha Sabu	25/01/2023	25/01/2023	25/01/2023	MEDIUM	
00009634	Closed	Incorrect PPE at CAMERA-CPO0803-0005887	Sneha Sabu	24/03/2023	24/02/2023	24/02/2023	MEDIUM	
00009636	Closed	Incorrect PPE at Entry	Unknown, Sneha Sabu, Yashoda Seshadri	24/03/2023	24/02/2023	24/02/2023	NONE	Delete
00010606	Closed	[Reassigned] Incorrect PPE at CAMERA-CPO0803-0005887	Sneha Sabu	27/04/2023	27/03/2023	31/03/2023	NONE	
00008601	Completed	Incident occurred for Unknown on 2023-01-23 17:51:31	Sneha Sabu	23/02/2023	23/01/2023	25/01/2023	HIGH	

Showing 1 to 6 of 6

Project Admin Super Admin Contractor Consultant Client Project Viewer General Viewer PMFC MI

PRIVILEGE (ACCESS ROLE)	READ/VIEW	CREATE/ADD	CHANGE/UPDATE	TRASH/DELETE	MODIFIED BY	MODIFIED
BIM Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Construction Defects Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Construction Project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Cost Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Health and Safety Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Live Streams Camera	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Live Streams Camera Settings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Live Streams Notifications	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Live Streams Onboard People	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Live Streams Reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Material Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
People Management	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Resource Management Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Roles and Permissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Schedule Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776
Task Manager	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	snehasabu@colliers.com	2022-03-01 14:46:09.666776

- Task management – Automated and manual – available on the platform for defects, PPE non conformance and site works
- Access control – based on projects and roles
- Future developments include automated tracking and check for rectification of defects



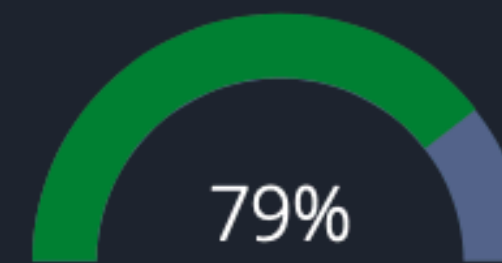
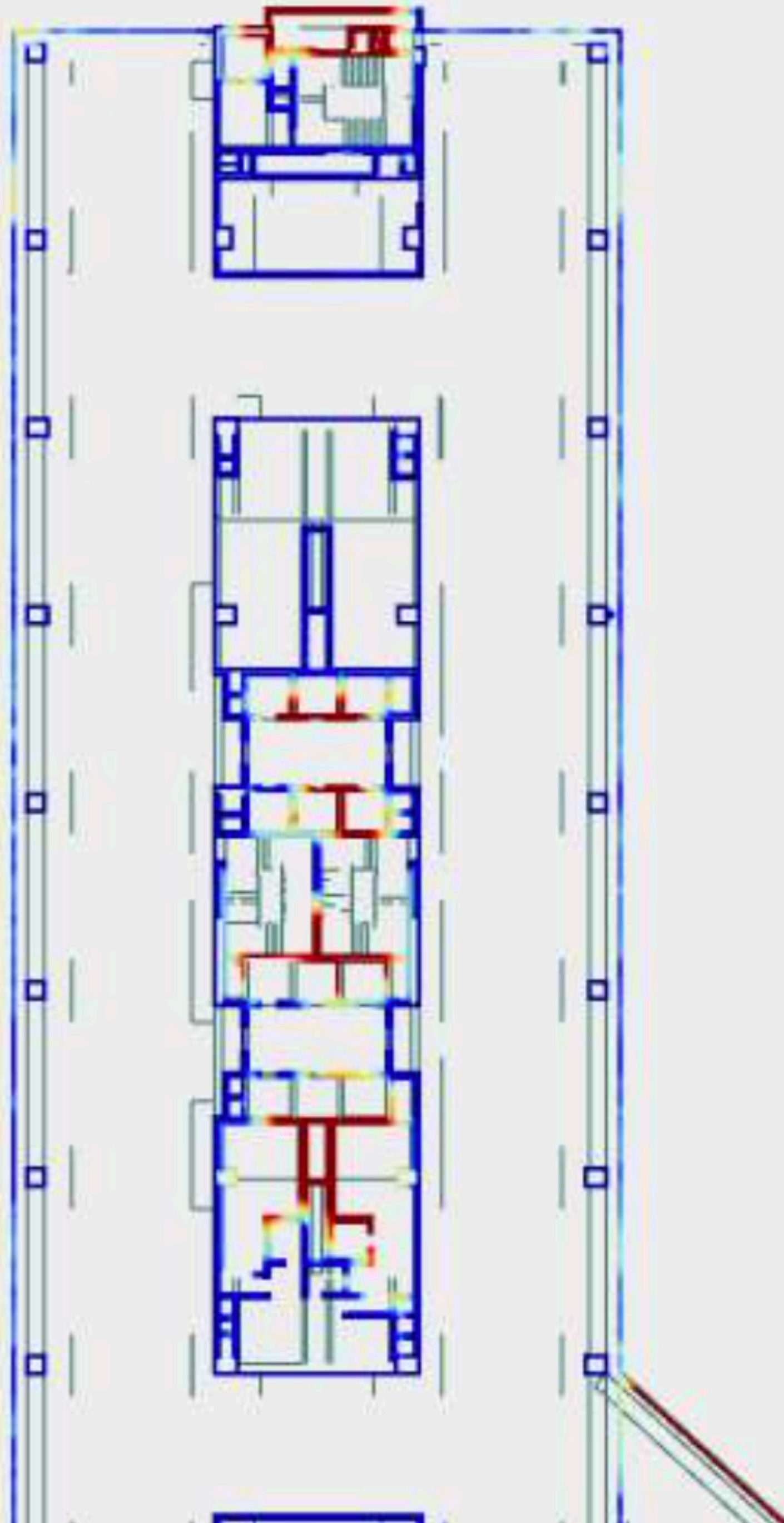
# Benefits of the System

- Virtual monitoring – easier monitoring of remote sites, reduced travel costs
- Automated Supervision. – Reduced Manpower. Engineer focus on problem solving
- Attract better talent
- H&S Analytics – Early warning system. Safer project sites
- Efficient projects – Software assisted resource management, cost and time monitoring.
- Defect analytics – Create a better product
- Competitive edge – Provide cutting edge technology
- Make early adopters trendsetters on a global level
- Easy to monitor inaccessible sites



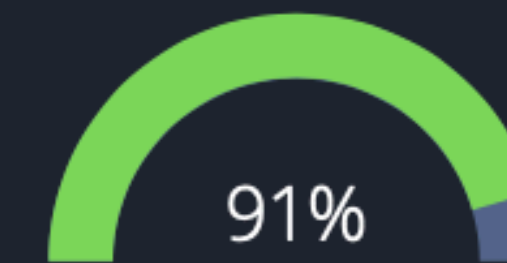


# Measured results



79%

Reduced  
Delays



91%

Early Defect  
Identification



91%

Savings on  
"on-site" monitoring  
staff and visits

After using the System, clients have seen up to:

- 79% reduction in delays in project completion (time saved from the additional buffer added in the original plan)
- 91% early detection of defects (measured while comparing the total number of defects found during the handover of the project)
- Overall 91% of savings were observed due to reduction in the requirement of on-site visits, on-site monitoring staff and transparent communication on defects and status



