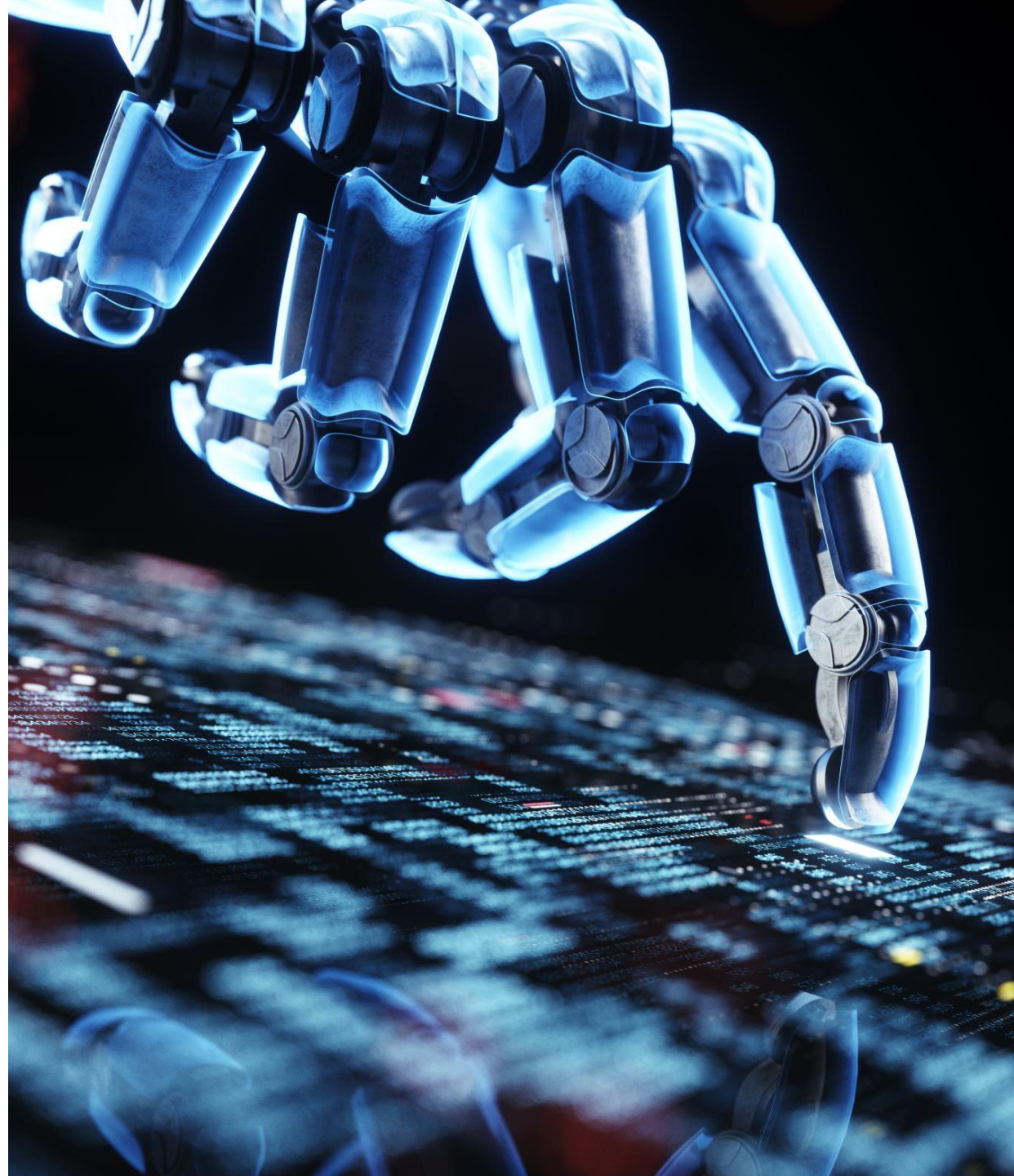


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**REALITY REIMAGINED:**

**CAN VIRTUAL-DRIVEN  
INSPECTIONS SHAPE A  
SMARTER, MORE  
PRODUCTIVE, AND  
SAFER BUILT  
ENVIRONMENT?**

BCA Smart Inspection Seminar 2026



1. Company Profile
2. From Conventional to Digital: Kimly 's Digitalisation Journey
3. Virtual TOP in Action
  - Belgravia Ace, and evolution from JTC Logistics Hub @ Gul
4. Inspection Reimagined: Physical vs 360° Capture vs LiDAR
  - A Structured Technical Comparison
5. Creating Value Across the Ecosystem
  - Stakeholder Benefit Matrix
6. Beyond Virtual TOP
  - Expanding Virtual Technologies into Wider Project Applications
7. Measured Impact
  - Quantified Lessons and Performance Insights
8. Scaling the Innovation
  - Roadmap, Replicability and Future Direction

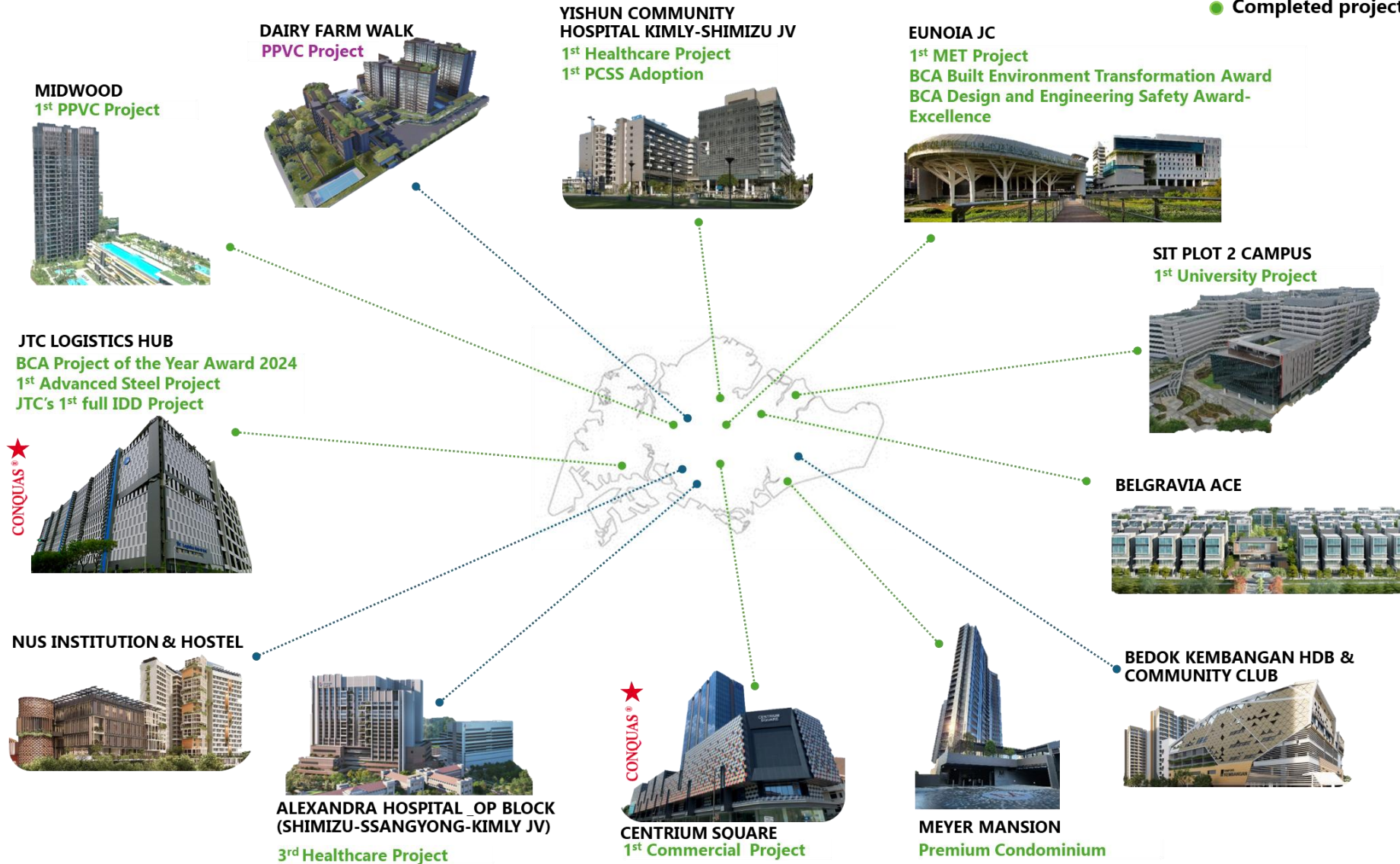


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## **Company Profile**

# COMPANY PROFILE

- Current project
- Completed project



# AWARDS AND RECOGNITION

**2021**

**2022**

**2023**

**2024**

**2025**

SKILLSFUTURE Employer Award

BCA IDD Award (Organization) – Gold

BCA IDD Award (Project) – Gold (JTC Logistics Hub)

MOM Safety and Health Award Recognition for Projects (SHARP) Award (Midwood)

BizSAFE Certificate – Star

BCA Built Environment Transformation Awards (Eunoia Junior College)

MOM Safety and Health Award Recognition for Projects (SHARP) Award (Meyer Mansion) CARE Champion 2022

Engage Rocket Workplace of the Year Awards 2022 (Best Onboarding Experience) – Bronze

CONQUAS Star (JTC Logistics Hub)

BCA Green & Gracious Builder Star Award

Adam Smith Awards Asia 2022 (Overall Winner : Harnessing the Power of Technology)

Tripartite Alliance Award (TAA) 2023

Progressive Wage (PW) Mark

BizSAFE Certificate – Star

Eco Office certification-Elite

BCA Green & Gracious Builder Star Award

BCA Project of the Year (JTC Logistics Hub)

DESA Award 2024 (JTC Logistics Hub)

BCA Company of the Year 2025 (Small & Mid-Sized Firms) Award

Champion of Good 2025

The Straits Time Singapore's Best Employers 2025

BCA Green & Gracious Builder (Star Award)



PPVC Manufacturer Accreditation Scheme





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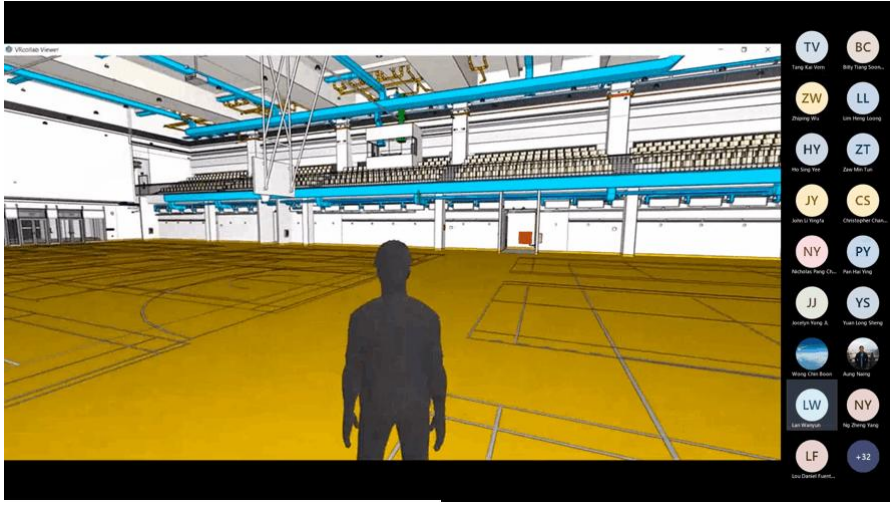
## **From Conventional to Digital: Kimly 's Digitalisation Journey**

# DIGITAL TRANSFORMATION JOURNEY





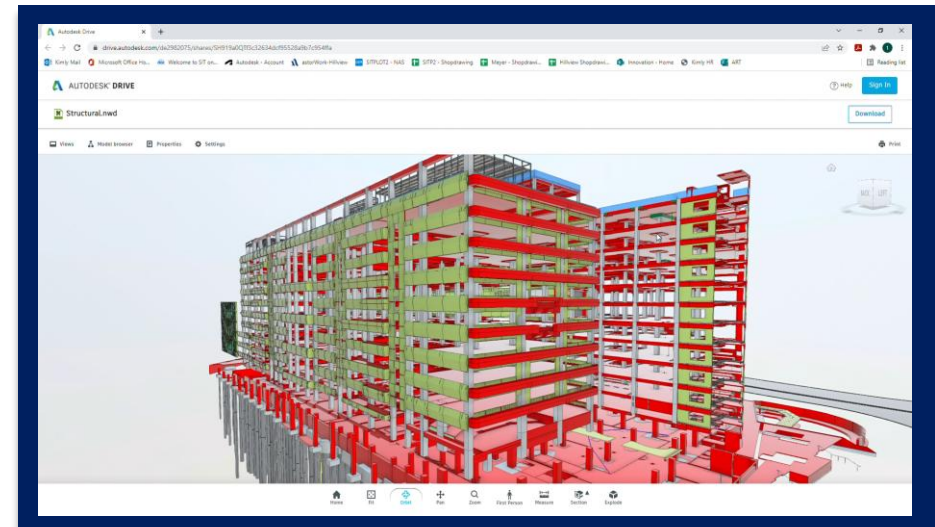
# DIGITAL TRANSFORMATION JOURNEY



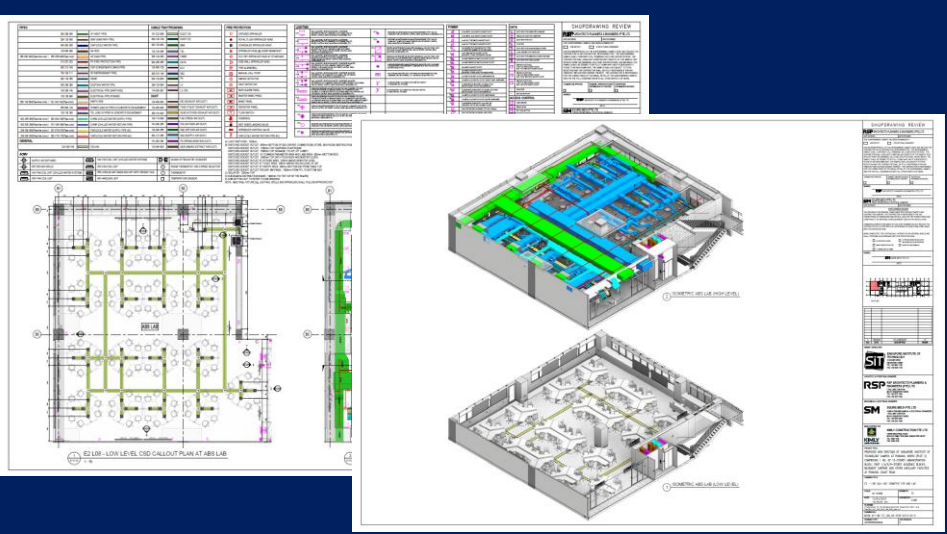
**BIM WALK THROUGH (SIT Campus P2)**



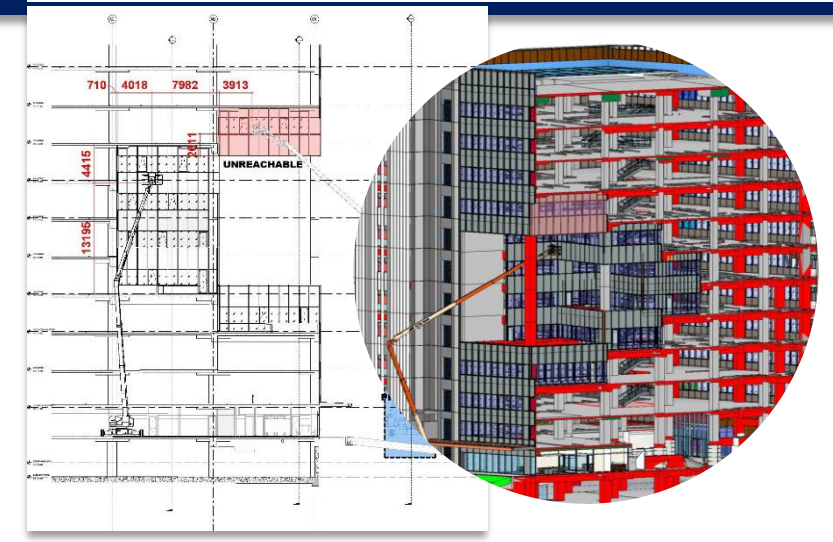
**VIRTUAL MOCKUP USING VR**



**COMMON DATA ENVIRONMENT (SIT Campus P2)**




**BIM BASED SHOPDRAWING**

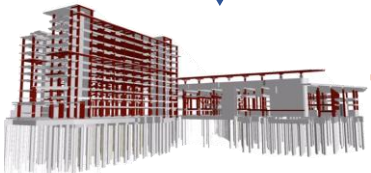


**MAINTENANCE STUDY USING BOOM LIFT**

# DIGITAL TRANSFORMATION JOURNEY

## TENDER STAGE

  
**TENDER  
DRAWING**



**TENDER MODEL**

Engineering Study  
Quantity Take off  
4D simulation

## CONSTRUCTION STAGE

  
**CONTRACT  
DRAWING**



**CONSTRUCTION  
BIM**

  
**Construction Simulation**



**ICE SESSION**



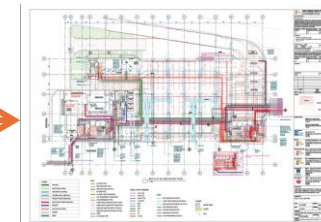
**COORDINATED  
BIM**



**Reduction in  
Abortive Reworks /  
Construction Waste**

## AS BUILT STAGE

  
**3D LIDAR  
SCANNING**



**SHOP DRAWING**



**AS-  
BUILT**

Accurate and efficient,  
As-built  
Documentation.

# SITE VISUALIZATION

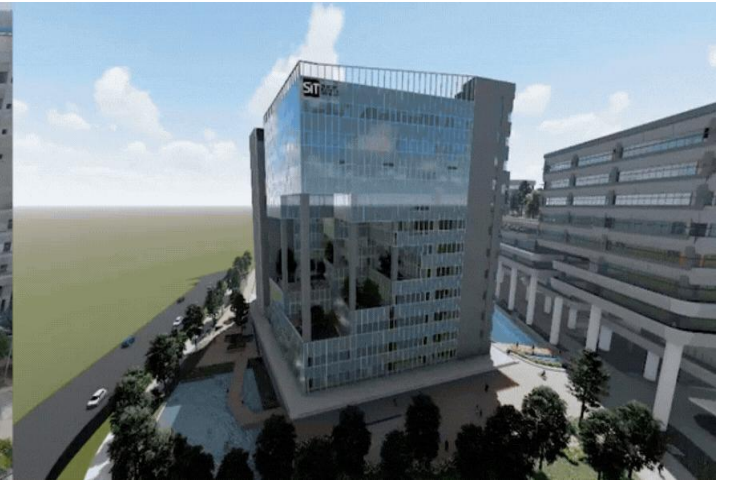
## BIM + PHOTOGRAMMETRY



## DRONE – ACTUAL SITE PROGRESS



## BIM – FINAL PRODUCT

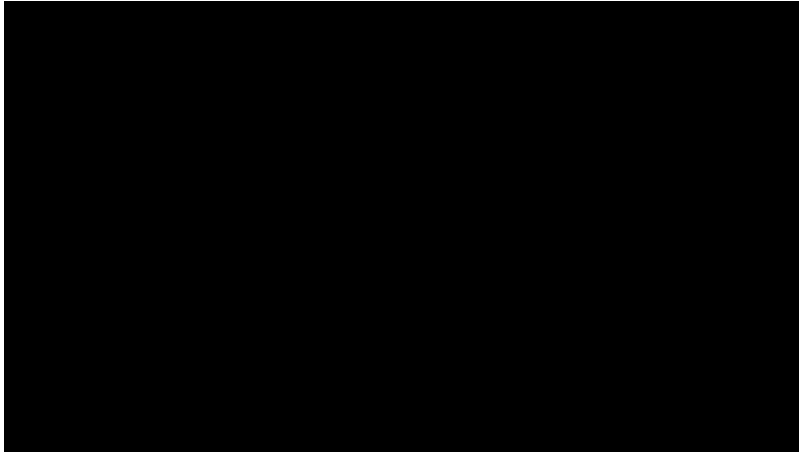


- ✓ Interfacing Planning
- ✓ Better Appreciation Of Project Risk & Existing Conditions
- ✓ Stakeholder Engagement

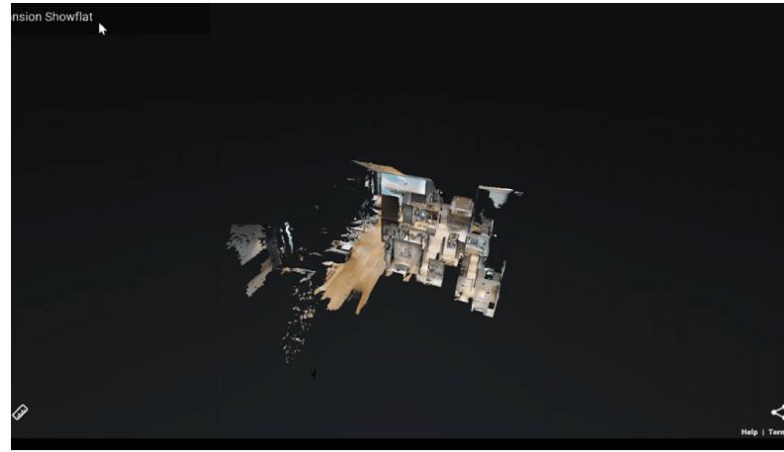
- ✓ Drone Footage
- ✓ Coordination
- ✓ As-built Verification And Milestone Documentation



# PROGRESS MONITORING & MILESTONE DOCUMENTATION



**DRONE PROGRESS MONITORING**  
EUNOIA JUNIOR COLLEGE



**3D SCANNING OF SHOW FLAT**  
(MATTERPORT)  
MEYER MANSION



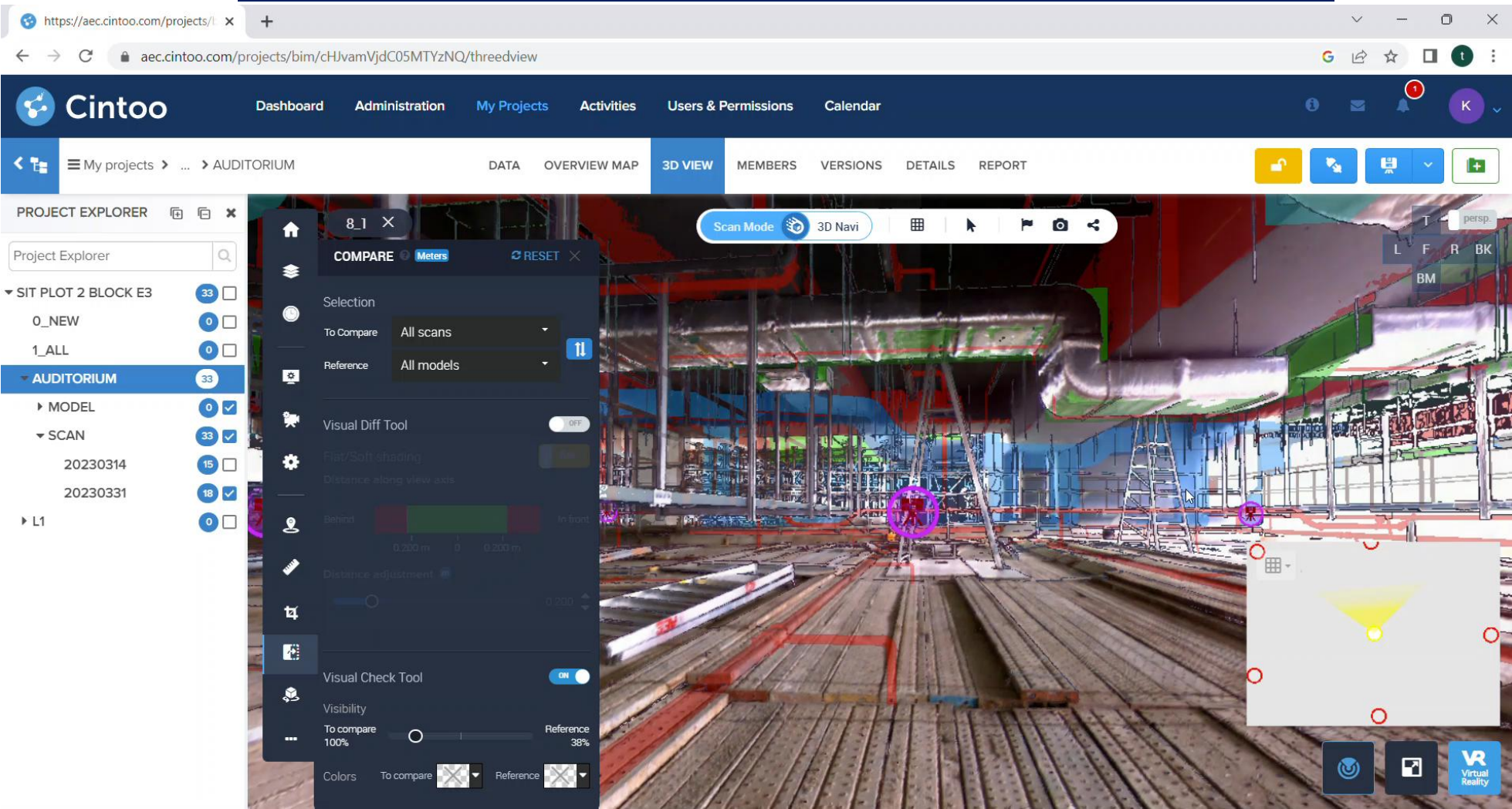
**LIDAR SCANNING OF AS-BUILT**  
JTC LOGISTICS HUB



**DRONE & LASER SCAN – EXISTING & AS-BUILT SITE VERIFICATION**

# CLOUD BASED POINT CLOUD VIEWING

## SIT CAMPUS P2 BLK E3 – AUDITORIUM SCAN WITH BIM OVERLAY



STAKEHOLDER EASY ACCESS - COORDINATION, AS-BUILT VERIFICATION AND MILESTONE DOCUMENTATION



## **Virtual TOP in Action**

Belgravia Ace, and evolution from JTCLH

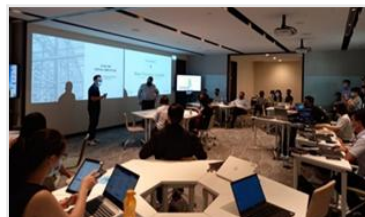
A Temporary Occupation Permit (TOP) is issued by the BCA when a building is deemed safe for occupation. A Virtual TOP replaces or supplements traditional on-site inspections with remote sensing technologies — enabling faster, safer, and more data-rich evaluations.

## Pilot Virtual TOP Inspection (Industrial)

### JTC Logistics Hub @ Gul

The first-of-its-kind, high-rise integrated logistics hub housed container depots, warehouses and heavy vehicle park under one roof. Singapore's 1<sup>st</sup> Virtual TOP adopting virtual inspection methodology.

- ✓ April 2021
- ✓ Utilised LiDAR scanning
- ✓ Remote Inspection & Verification with the stakeholders and authority in JTC Summit
- ✓ Video Call with Site Team to show the actual measurement
- ✓ Matterport, Recap Pro
- ✓ Matterport/Trimble X7 3D Scanner



## 1<sup>st</sup> Virtual TOP Inspection (Cluster Landed Housing)

### Belgravia Ace

Comprising a total 107 strata landed houses, including 104 Semi-Detached Houses, 2 Corner Terrace Houses, and 1 Inter Terrace House. **3 months ahead virtual inspection.**

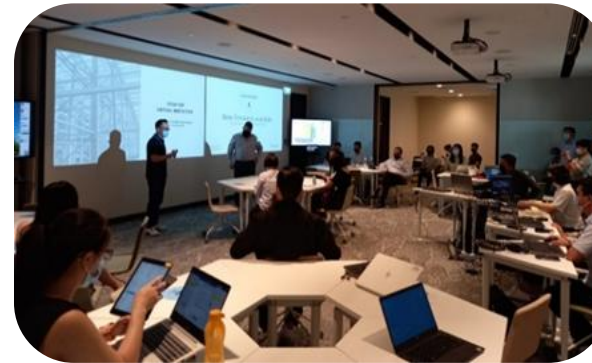
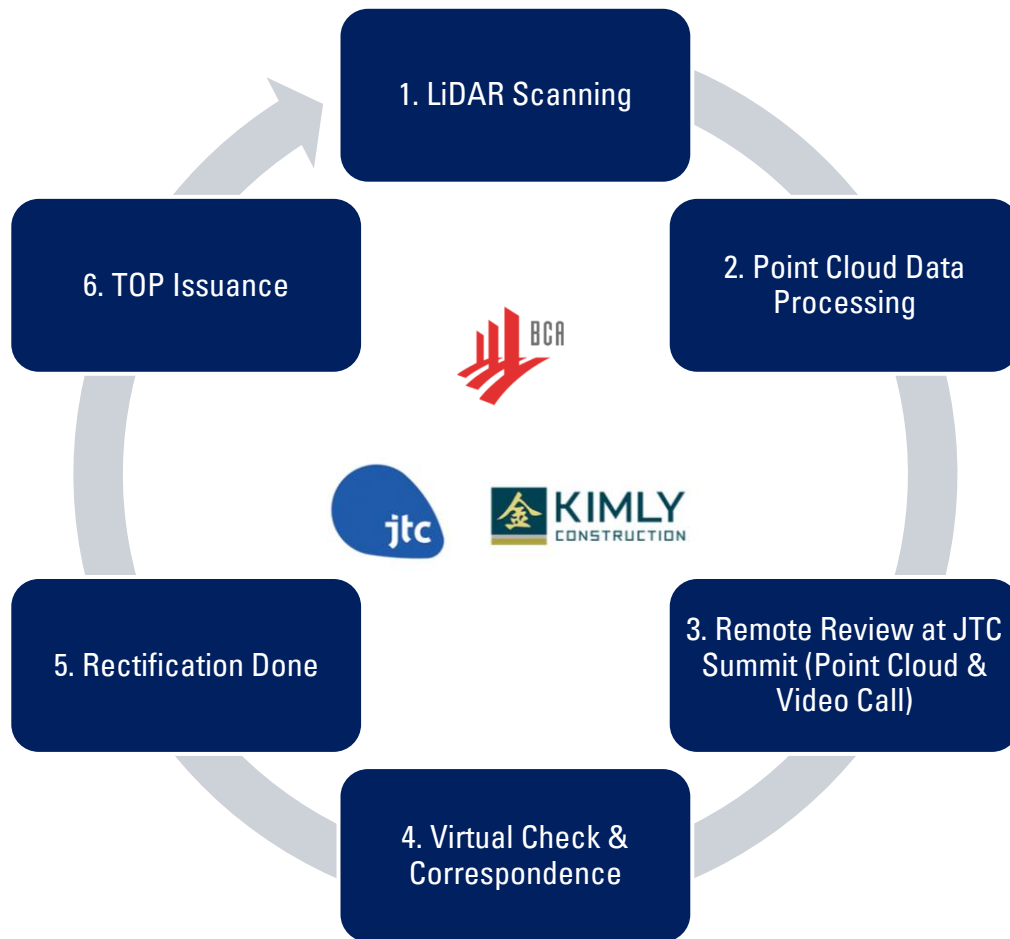
- ✓ 360° Captures + LiDAR data
- ✓ Physical Inspection for Common Areas
- ✓ Virtual Walkthroughs for BCA Reviewers
- ✓ Inspection comments & verification on 360° /LiDAR scanning platform
- ✓ Airsquare, Cintoo
- ✓ Trimble X7 & Insta 360 Camera



# VIRTUAL TOP IN ACTION

Industrial-JTC Logistics Hub @ Gul

In April 2021, Kimly pioneered the first Virtual TOP inspection. Leveraging laser scanning data, measurements and close-up photos are captured digitally in advance — making the process significantly faster and more efficient than conventional on-site inspection



# VIRTUAL TOP IN ACTION

## Belgravia Ace-From Pilot to Practice



KIMLY  
CONSTRUCTION

Building on experience, Kimly worked closely with BCA to identify the extent of Virtual TOP before adopting it for Belgravia Ace- a development of greater scale and complexity.

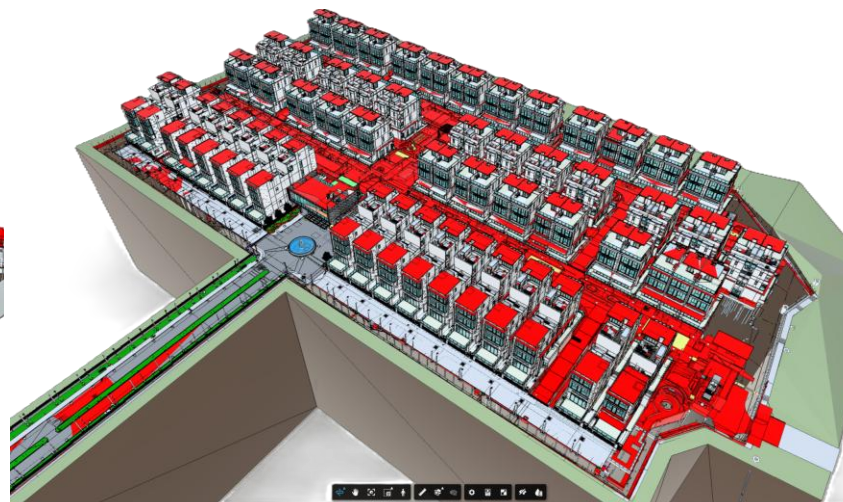
### Four Key Processes within Virtual Inspection

Assessing Project Suitability for Virtual Inspections

Preparing for Virtual Capture Platform and Equipment

Conducting the Virtual Capture

Submission and Reviewing of the Virtual Capture for Virtual Inspection



- QP to approach BCA for pre-consultation for Virtual Inspection
- Prepare **Virtual Inspection Plan** & Get Approval from BCA Officer
- QP to instruct the capture according to the **Virtual Inspection Plan**
- Project Team to attach close-up measurements to demonstrate compliance based on this [Virtual TOP photo checklist](#)





# VIRTUAL TOP IN ACTION

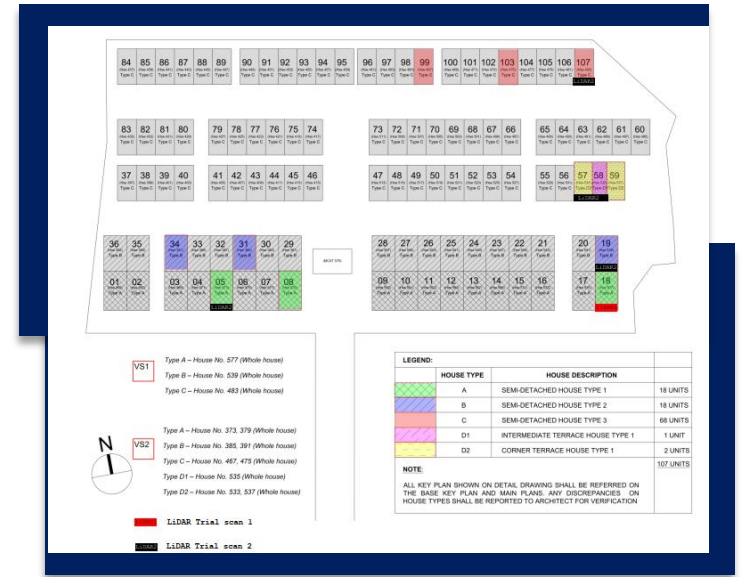
## Belgravia Ace-Virtual Inspection Plan

### ➤ Required info in the virtual inspection plan template:

- Project Reference No.
- Project Description
- 360 Capture Platform
- Type of Inspection
- Area covered (Please indicate the typical/non typical areas)
- Proposed scanned areas
- Expected Submission Date
- 360 Capture Link

BELGRAVIA ACE VIRTUAL INSPECTION PLAN				
Project Reference number	A1404-00450-2017	Project Description	PROPOSED STRATA LANDED HOUSING DEVELOPMENT COMPRISING 104 UNITS OF 3-STOREY ENVELOPE CONTROL STRATA SEM-DETACHED DWELLING HOUSES AND 3 UNITS OF 3-STOREY ENVELOPE CONTROL STRATA TERRACE DWELLING HOUSES (TOTAL 107 RESIDENTIAL UNITS - PHASE 3) WITH ROOF TERRACE AND BASEMENT CAR PARK AND PROVISION FOR SWIMMING POOL & COMMUNAL FACILITIES ON LOT 17941L, PT MK 18 AT BELGRAVIA DRIVE (SERANGGON PLANNING AREA)	
		360 Capture platform Vendor	Airsquare	
Type of Inspection	Areas Covered (Please indicate which are typical design and which are not)	Proposed Scanned Area	Expected Submission Date	Current Scan (and the link for the platform) (to update this column at each submission)
Virtual Scan 1	Type A (typical), Type B (typical), Type C (typical)	Type A – House No. 577 (Whole house) Type B – House No. 539 (Whole house) Type C – House No. 483 (Whole house)	30 October 2025 03 November 2025	Submitted. Relevant parties invited to review on Airsquare platform Link to the platform <a href="https://argo.airsquare.aimain">https://argo.airsquare.aimain</a>
Virtual Scan 2	Type A (typical), Type B (typical), Type C (typical), Type D1 (1 unit only), Type D2 (typical 2 units only)	Type A – House No. 373, 379 (Whole house) Type B – House No. 385, 391 (Whole house) Type C – House No. 467, 475 (Whole house) Type D1 – House No. 535 (Whole house) Type D2 – House No. 533, 537 (Whole house)	30 November 2025 18 January 2026 19 January 2026	Submitted. Relevant parties invited to review on Airsquare platform Link to the platform <a href="https://argo.airsquare.aimain">https://argo.airsquare.aimain</a>
Physical Inspection	Common areas, Swimming pools, Clubhouse, carparks		8 December 2025 28 January 2026	

### Submit Virtual Inspection Plan Template



### Attach Building Plan With Colour Zones

# VIRTUAL TOP IN ACTION

## Belgravia Ace-Virtual Inspection Sampling Breakdown

### Physical Inspection

Common Areas,  
Swimming Pools,  
Clubhouse,  
Carparks

Air Aq  
Airsquire

### 360° Photo Capture

12 Samples

/ 107 Units

Cintoo

### LiDAR Scanning (Trial)

5 Samples

/ 107 Units



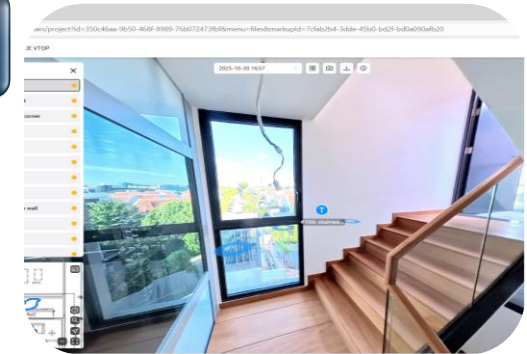
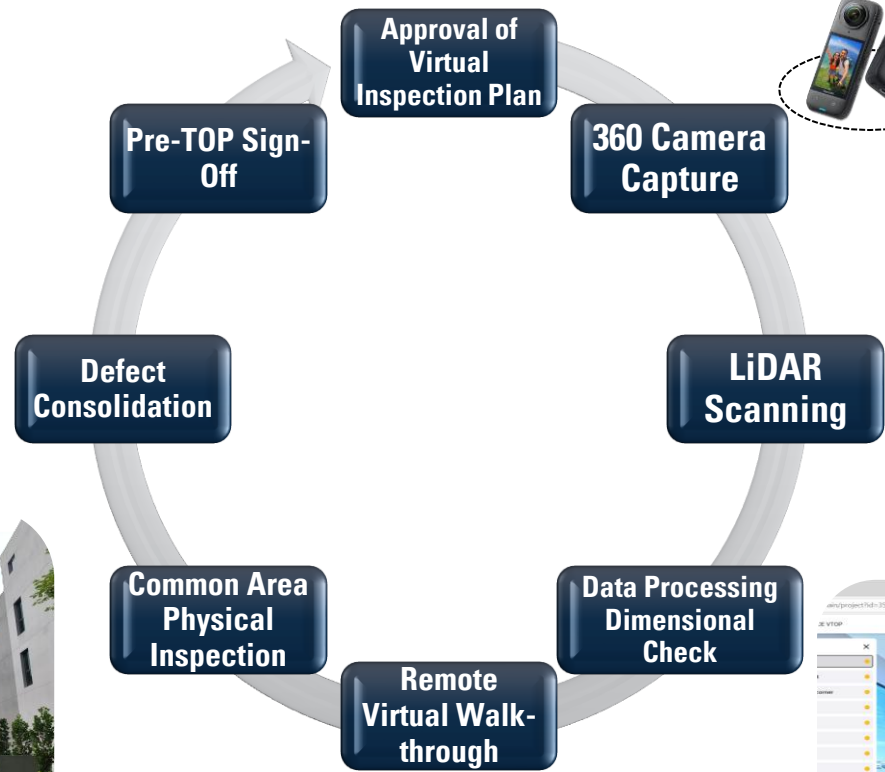
# VIRTUAL TOP IN ACTION

## Belgravia Ace- 360° Photo Capture and LiDAR Scanning

### 3-Months-Ahead TOP Inspection

Nov 2025

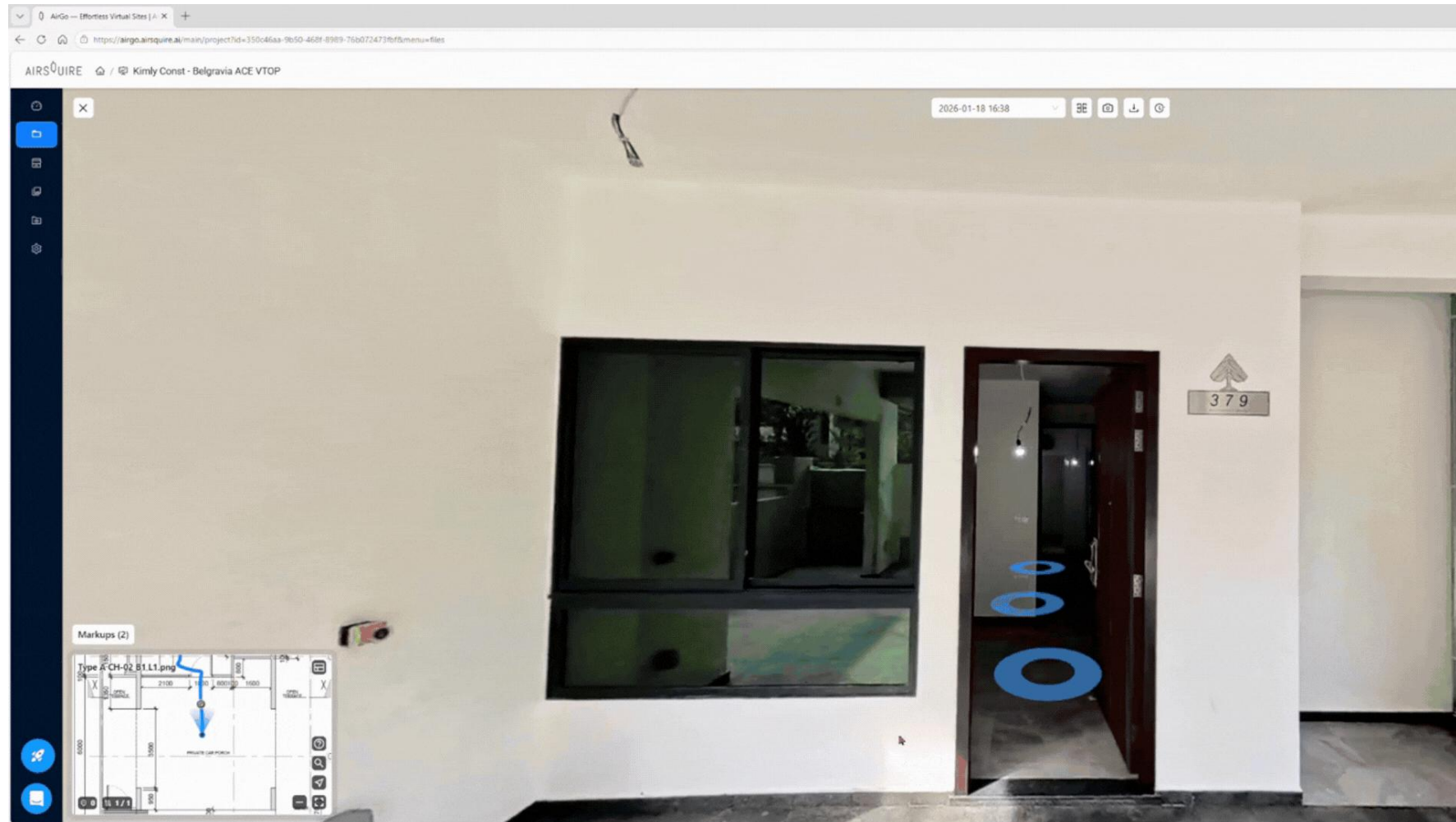
Feb 2026



# VIRTUAL TOP IN ACTION

Belgravia Ace- 360° Platform

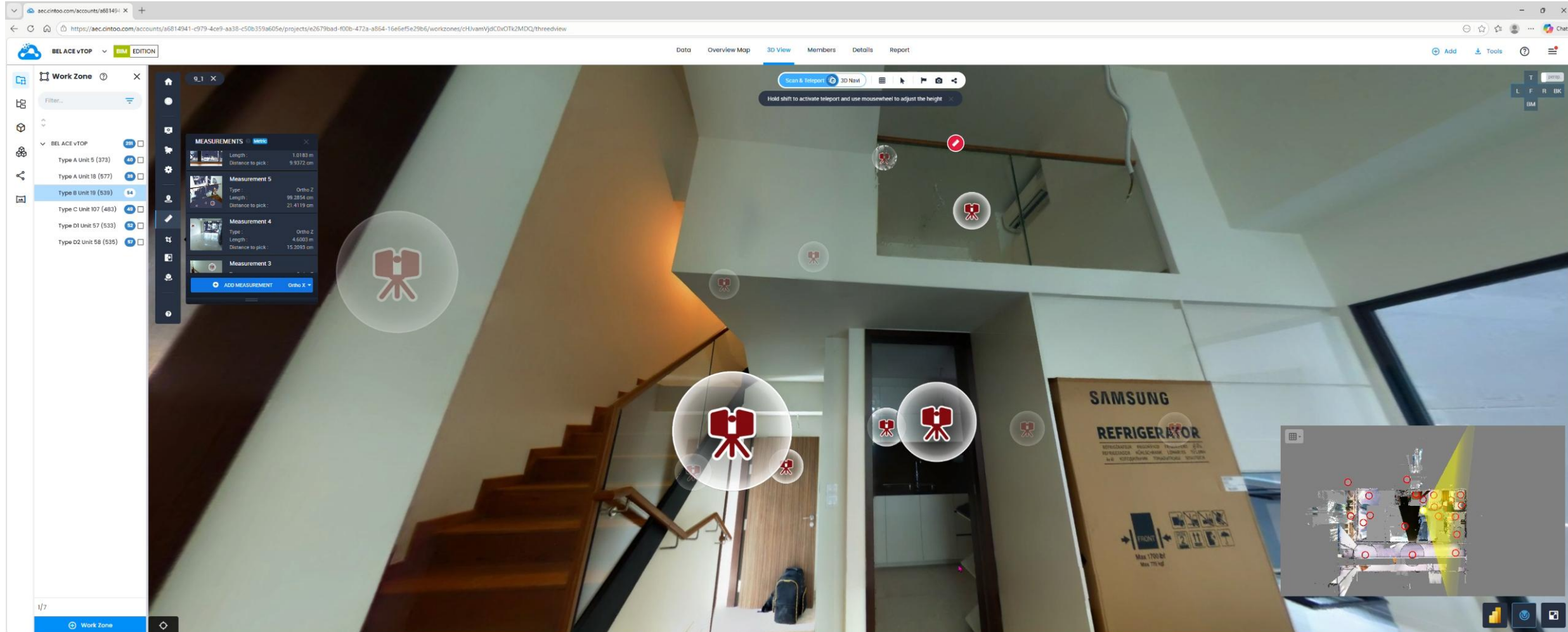
## Virtual Inspection By BCA & Clarification Via 360° Platform (Airsquire)



# VIRTUAL TOP IN ACTION

## Belgravia Ace- Virtual LiDAR Point Cloud Platform

### Virtual Inspection By BCA & Clarification Via Point Cloud Platform (Cintoo)



The screenshot displays the Cintoo virtual inspection platform interface. The main view is a 3D point cloud model of an interior space, including a staircase and a room with a large cardboard box labeled "SAMSUNG REFRIGERATOR". The interface includes a left sidebar with a "Work Zone" panel listing various units (Type A, B, C, D1, D2) and a "MEASUREMENTS" panel showing details for "Measurement 3", "Measurement 4", and "Measurement 5". The top navigation bar includes "Data", "Overview Map", "3D View", "Members", "Details", and "Report". The bottom status bar shows "Work Zone" and a zoom level of "1/7".

Measurement	Type	Length	Distance to pick
Measurement 3	Orto X	1.0183 m	9.9372 cm
Measurement 4	Orto Z	4.6003 m	15.2093 cm
Measurement 5	Orto Z	99.2854 cm	21.4119 cm



**Inspection Reimagined: Physical vs 360°  
Capture vs LiDAR**  
A Structured Technical Comparison

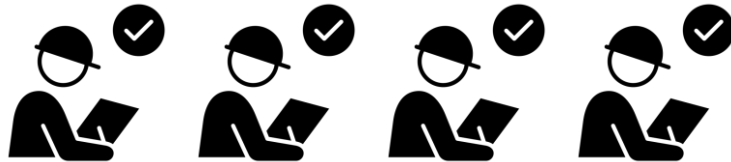
# INSPECTION REIMAGINED: PHYSICAL VS VIRTUAL

## Traditional Physical Inspection



**Subjective Documentation  
(Lack of Spatial Context)**

### Snapshot in Time



**Site accessibility constraints can lead to delays and costs**

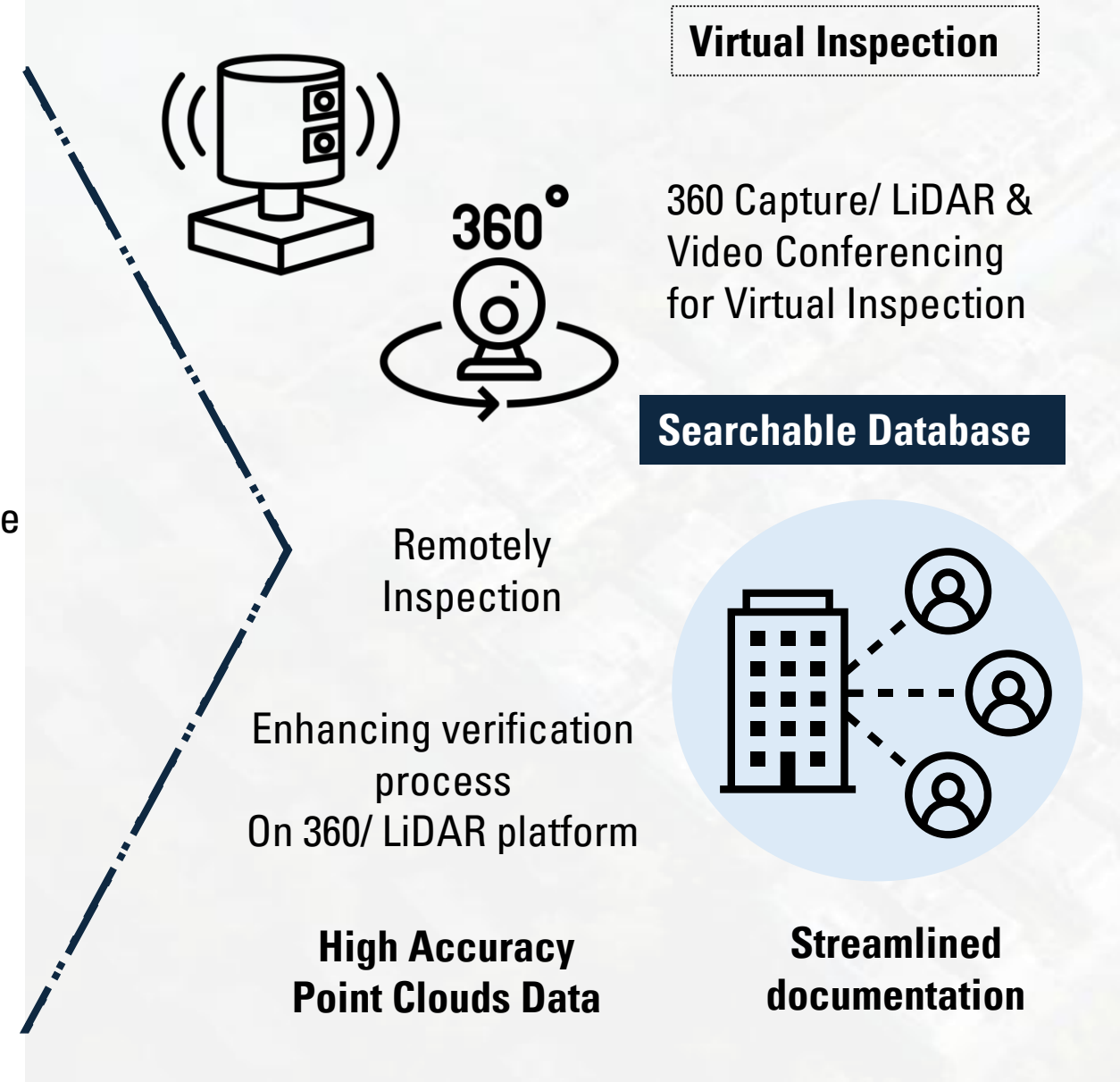
Physical site walk requires aligning the calendars of the BCA Officer, QP, Main Con Time

**Aligning calendars of all involved parties is difficult**

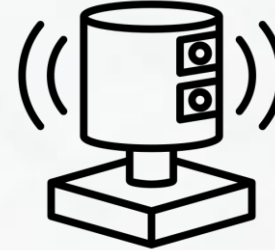
Abortive Visits



**Manual Data Entry back at the site office**



## Virtual Inspection



360 Capture/ LiDAR & Video Conferencing for Virtual Inspection

### Searchable Database

Remotely Inspection

Enhancing verification process  
On 360/ LiDAR platform



**High Accuracy Point Clouds Data**

**Streamlined documentation**

# TECHNICAL COMPARISON: PHYSICAL VS 360 VS LiDAR

Feature	Physical Inspection	360° Photo Capture	LiDAR Scanning
<b>Primary Output</b>	Manual Checklist/ 2D Photos	Immersive 360 Degree Virtual Tour	<b>High-Precision 3D Point Cloud</b>
<b>Coverage</b>	Full tactile & Visual	Full visual, no dimensional data	<b>3D Spatial Geometry</b>
<b>Accuracy</b>	Subjective/ Variable	Visual context <small>**Unable to measure</small>	<b>Millimetre Level (2-5mm)</b>
<b>Speed</b>	Slow (Requires Travel) 1 unit /30-60 min	Fast (Walk-Through) 1 unit/appx 10 min	<b>Moderate (Setup Time)</b> 1 unit/ 15-25 min
<b>Lighting Required</b>	Daylight/ Artificial	Moderate	<b>Works in Low Light</b>
<b>Best For</b>	Tactile defects, final sign-off	Virtual walkthroughs, stakeholder review	<b>As Built Data Validation, Compliance Checks</b>



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**Creating Value Across the Ecosystem**  
Stakeholder Benefit Matrix

# CONTRACTOR'S POV- MERITS & LIMITATIONS

## MERITS

**Faster Defect Turnaround**  
(Minimal WD)

Objective **Digital Evidence**

Fewer On-Site Inspection Visits

Freedom to Measure by BCA Inspector

**Higher Accuracy** Of Data Capture

Reduced Rectification & Rework

## LIMITATIONS

Data Capture Quality Dependency  
(Garbage in, Garbage Out)

NEW Workflow Disruption  
(Struggle to Adapt)

Upfront Equipment & Training **Cost**

# STAKEHOLDER BENEFIT MATRIX

## BCA/ GOV AGENCY

- Remote verification, **reducing physical site visits**
- Clearer and auditable compliance records
- Digital documentation trails

## CONSULTANT/ RE/ RTO

- Digital record & management
- Reduced disputes over as-is site conditions
- **Single source of truth for site records**

## DEVELOPER

- Minimize defects during actual inspection, so actual **turnover time for project completion is shorter**
- Better embarking on digital journey

## BUILDER

- **Man-hour savings on documentation**
- **Improved safety through reduced site exposure**
- **Reduced disputes** after work completion



## **Beyond vTOP**

Expanding Virtual Technologies into Wider  
Project Applications

# EXPANDING INTO WIDER PROJECT APPLICATIONS

Project Type	Virtual TOP Suitability	Suggested Technology	Key Considerations
<b>Public Housing (HDB BTO)</b>	Yes	LiDAR + 360	High unit repetition = scanning economies at scale
<b>Industrial</b>	Yes	LiDAR	Proven precedent; open floor plates ideal for scan
<b>Private Residential (High-rise)</b>	Yes	LiDAR + 360	Varied layouts; 360 more practical unit-by-unit
<b>Commercial Office</b>	Yes	LiDAR	Effective for Large Floor Areas, MEP coordination benefit
<b>Healthcare</b>	Moderate	360 walkthrough	Fit-out complexity

# BEYOND VIRTUAL TOP INSPECTION

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**As-Built  
Verification**



**Progress  
Monitoring**



**A&A Works**



**Discrepancy  
Checks**



**Facilities  
Handover**



**Defects  
Liability  
Period**



## **Measured Impact**

Quantified Lessons and Performance  
Insights

# QUANTIFIED LESSONS AND PERFORMANCE INSIGHTS

Feature	Physical Inspection	360° Photo Capture	Improvement	Lidar Scanning (Tripod)	Improvement
<b>Capturing / Scanning Per Unit</b>	-	<b>2.0 manhours</b> (2 pax; 1.0 hr)	-	<b>2.5 manhours</b> (2 pax; 1.25 hr)	-
<b>Inspection Per Unit</b>	<b>9.0 manhours</b> (9 pax; 1 hours)	<b>3.0 manhour</b> ( 4 pax; 0.75 hr)	<b>67%</b>	<b>1.0 manhour</b> (2 pax; 0.5 hr)	<b>89%</b>
<b>Total Manhour Per Unit</b>	9.0 manhours	5.0 manhours	44%	3.5 manhours	61%
<b>Total Manhour for 12 units</b>	108 manhours	42 manhours	44%	36 manhours	61%
		<p>For <b>360° Photo Capture</b> may require follow-up captures for compliance close-ups or to address BCA comments — additional site access may still be needed.</p>		<p>Initial setup time offset by richer data — BCA officers can measure independently from the point cloud without revisiting the site.</p>	



## **Scaling the Innovation**

Roadmap, Replicability and Future  
Direction

# ROADMAP, REPLICABILITY AND FUTURE DIRECTION

- **Implement VTOP for all potential projects**
- **Standardised VTOP capture protocols**
- **Scaling of the Innovation**

## Handheld mobile LiDAR Scanner





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**THANK YOU**

