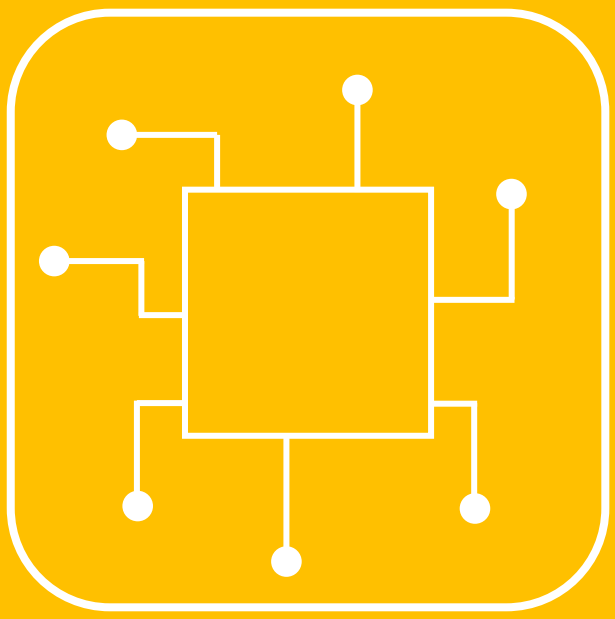


Green Mark Version 7

In

TECHNICAL GUIDE

Revision Log

Revision	Description	Effective Date
R1	First Release	2 Sep 2026

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IN1 Integrated

A maximum of **2 points** can be scored across the **IN1 Integrated** section for both **Non-Residential Buildings** and **Residential Buildings**.

IN1.1 5-Step SMART Process *(For Non-Residential)*

The objective of adopting the 5-step SMART[1] process is to equip building owners, developers and facilities managers with a structured framework for planning, implementing and continuously improving smart building technologies throughout the building lifecycle. The process encourages project teams to define desired operational outcomes first, before selecting digital solutions that support improved building performance, operational efficiency, sustainability, occupant wellbeing, resilience and long-term maintainability.

The project team should **collaboratively develop the SMART Process** throughout the project lifecycle, ensuring that operational requirements are considered during planning, design, construction and facility management.

To facilitate the process, the project team may refer to the guiding questions below.

5 Step Smart Process	Guiding Questions
Step 1 – Set business objectives and outcomes	• What operational outcomes do I want to achieve? • What KPIs should be established? • How will these KPIs be measured and monitored? • Which facility management services should be prioritised?
Step 2 – Map out Smart FM solutions as enablers	• Which smart solutions best support the desired outcomes? • What level of smartness (Type 1, Type 2 or Type 3) is appropriate? • How will different smart solutions integrate? • Is there a system architecture illustrating data flow across systems?
Step 3 – Adopt suitable implementation model	• Which systems will be owned by the building owner? • Which systems will be provided by FM companies or service providers? • How will data ownership, interoperability and long-term portability be maintained?
Step 4 – Review procurement contract	• What procurement approach is most suitable? • Can outcome-based contracts be adopted? • Can integrated FM contracts be implemented? • Are cybersecurity, data ownership and lifecycle support adequately addressed?
Step 5 – Track outcomes and review for continuous improvement	• How will KPIs be monitored after implementation? • How frequently will performance be reviewed? • What improvement actions will be implemented based on operational data?

[1] https://www1.bca.gov.sg/growth-and-transformation/facilities-management/smart-facilities-management/

Assessment Criteria

IN1.1 5-Step SMART Process	New Buildings	Existing Buildings
Adoption of the **5-Step SMART Process** to provide a structured framework for planning, implementing and continuously improving smart building technologies.	1 Point (Prerequisite for IN badge)	2 Points (Prerequisite for IN badge)

Prerequisite

Projects pursuing the **Intelligence Badge** shall complete the 5-Step SMART Process.

For **new buildings**, the report shall be jointly developed by the developer and the project team, with facility management operational requirements incorporated during design and construction.

For **existing buildings**, the report shall be jointly developed by the building owner and the appointed facilities management team.

Mandatory consideration for AC energy optimisation

For buildings with central air-conditioning systems, the project team shall establish **Energy Usage Optimisation** as one of the desired business outcomes under Step 1 of the 5-Step SMART Process. The project team shall evaluate the adoption of adaptive air-conditioning optimisation solutions (where applicable) and document the assessment within the SMART Process report. Where such solutions are not adopted, the report shall provide the technical justification together with the alternative measures adopted to achieve the intended energy performance outcomes.

Documentation Requirements

At Design stage:

- **New Buildings**: Submit the 5-Step SMART Process report signed by the developer.
- **Existing Buildings**: Submit the 5-Step SMART Process report signed by the building owner and facilities manager.

At Verification stage:

- Submit the updated 5-Step SMART Process report signed by the building owner (or developer for new buildings) and the facilities management team, demonstrating implementation progress and any updates made during the project lifecycle.

IN1.2 Digital Life Cycle

The Digital Life Cycle section introduces digital processes that strengthen data continuity throughout the building lifecycle, from construction and commissioning to operation and maintenance. By replacing paper-based records, manual inspections and fragmented handover processes with structured digital platforms and digital asset information, project teams can improve quality assurance, operational readiness, traceability and long-term asset management.

The Digital Life Cycle framework supports three key stages of the building lifecycle:

(i) **Digital FM Handover** *(for Non-Residential and Residential)*

(ii) **Digital Testing and Commissioning** *(for Non-Residential)*

(iii) **Digital Defects Management** *(for Residential)*

This structure preserves digital information from construction through operations, enabling building owners and facilities managers to access accurate asset records, testing documentation and maintenance information throughout the asset lifecycle.

(i) Digital FM Handover *(For Non-Residential and Residential)*

To support long-term data continuity and operational readiness by enabling the structured digital handover of an as-built BIM model and associated asset information for effective facilities management.

Assessment Criteria

IN1.2 Digital Life Cycle	**New Buildings**	**Existing Buildings**
(i) **Digital FM Handover**: Development and delivery of an as-built BIM model and digital transfer of asset information, including as-built records, manufacturer data, warranties, T&C records and O&M manuals.	1 Point	N/A

To qualify for points, the project team must execute a digital information handover that integrates the following three layers:

- **IFC-SG Compliant Spatial Modelling**: Delivery of an as-built BIM model structured in the IFC-SG format, with applicable IFC-SG localised property sets assigned to the corresponding BIM objects.
- **Centralised Asset Documentation Transfer**: Digital compilation and transfer of as-built records, manufacturer data, equipment warranties, and Operation & Maintenance (O&M) manuals, digitally mapped to the corresponding IFC-SG system, equipment or asset object IDs. Coverage shall include major MEP systems for non-residential buildings and major common-property MEP systems for residential buildings. Major MEP systems include, where applicable, air-conditioning and mechanical ventilation, electrical, water services, fire protection and vertical transportation systems.
- **Testing & Commissioning (T&C) Logs**: Digital upload of applicable signed regulatory compliance records and functional T&C reports, with records searchable and linked to the corresponding systems or equipment in the BIM model.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications explicitly requiring the contractor to deliver an as-built BIM model in IFC-SG format and digitally compile the required asset information, O&M manuals, warranties and T&C records for handover to the FM team.

<u>At Verification stage:</u>

- A one-page document with screenshots of the digital repository or Common Data Environment (CDE) demonstrating:
    - as-built BIM model in IFC-SG format;
    - asset information;
    - O&M manuals;
    - warranties; and
    - T&C records.

(ii) Digital Testing and Commissioning *(For Non-Residential)*

To support building performance and operational readiness by enabling the systematic management, tracking and documentation of testing and commissioning (T&C) activities for major MEP systems through a centralised digital platform.

Assessment Criteria

IN1.2 Digital Life Cycle	**New Buildings**	**Existing Buildings**
(ii) **Digital Testing and Commissioning**: A digital platform to manage, track and document the testing and commissioning of major MEP systems.	1 Point	1 Point (For re-commissioning or retro commissioning)

To qualify for points, the digital T&C platform must provide a centralised digital environment for managing T&C workflows and records and integrate the following three layers:

- **Digital Inspections & Checklists**: Digitise applicable pre-commissioning inspections, testing and commissioning checklists and forms, enabling test results, supporting photo/video evidence and asset identification to be recorded digitally.
- **Digital Progress Tracking & Issue Management**: Provide a centralised dashboard that tracks the status of T&C workflows (e.g. Not Started, In Progress, Passed, Failed) and enables identified defects or performance deviations to be logged, assigned and tracked through rectification and closure.
- **Electronic Sign-Off & Audit Trail**: Enable electronic sign-off by relevant parties, with completed T&C activities securely recorded and timestamped, and an audit trail maintained for traceability.

The digital T&C platform shall cover all applicable major MEP systems subject to T&C, including, where applicable, air-conditioning and mechanical ventilation, electrical distribution, emergency power, water services and fire protection systems.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or Commissioning Plan explicitly requiring the use of a digital T&C platform that supports digital inspections and checklists, progress and issue tracking, electronic sign-off, and audit trails.

<u>At Verification stage:</u>

- A one-page document with screenshots of the digital T&C platform showing:
    - overall T&C progress and/or issue tracking across the applicable major MEP systems; and
    - a sample completed T&C record for a major MEP asset (e.g. chilled water pump or AHU), showing the completed checklist, electronic sign-off and audit trail.

(iii) Digital Defects Management *(For Residential)*

To improve the efficiency and traceability of defect rectification during residential handover and the Defects Liability Period (DLP) by enabling defects to be digitally reported, managed, tracked and closed through a centralised platform.

Assessment Criteria

IN1.2 Digital Life Cycle		**New Buildings**	**Existing Buildings**
(iii)	**Digital Defects Management**: A digital platform to report, manage and track residential building defects and their rectification through to closure.	1 Point	1 Point

To qualify for points, the digital defects management platform must provide a centralised digital environment for reporting, managing and tracking residential defects and integrate the following three layers:

- **Resident Self-Reporting Interface**: Enable residents to report defects (e.g. chipped paint, hollow tiles, pipe leaks) through a mobile app or web portal, with the ability to upload photo evidence and identify the defect location.
- **Workflow Routing & Status Tracking**: Enable reported defects to be routed and assigned to the responsible parties, with rectification status (e.g. Pending, In Progress, Resolved) tracked through to closure.
- **Digital Closure & Audit Trail**: Enable residents or authorised inspection personnel to digitally acknowledge or sign off completed rectifications, with a secure, timestamped record maintained throughout the defect lifecycle.

The digital defects management platform shall be made available for all residential units upon handover and throughout the applicable Defects Liability Period (DLP).

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications requiring the use of a digital defects management platform that supports resident self-reporting, workflow routing and status tracking, and digital acknowledgement or sign-off of completed rectifications.

<u>At Verification stage:</u>

- A one-page document with screenshots of the digital defects management platform showing:
    - the resident-facing defect submission interface with photo upload and defect location identification; and
    - the backend dashboard showing defect assignment and status tracking, together with a sample completed defect record demonstrating digital acknowledgement or sign-off and the associated audit trail.

IN2 Data Driven

A maximum of **5 points** can be scored across the **IN2 Data Driven** section for **Non-Residential Buildings**, and a maximum of **3 points** can be scored for **Residential Buildings**.

IN2.1 Good Practices to Facilitate Data Management

The Good Practices to Facilitate Data Management section introduces digital practices that establish an interoperable, secure and scalable data foundation for smart buildings. By replacing fragmented, proprietary systems with open architectures, standardised data models and interoperable digital platforms, these practices improve data accessibility, facilitate system integration, reduce vendor lock-in, and enable building owners and facilities managers to maximise the value of operational data throughout the building lifecycle.

The Good Practices to Facilitate Data Management framework supports the following digital capabilities:

(i) **Data Exchange Between Robots, Lifts and Automated Doorways** *(for Non-Residential)* / **Data Exchange Between Robots and Lifts** *(for Residential)*

(ii) **Robot Fleet Management** *(for Non-Residential and Residential)*

(iii) **Performance Dashboard to Monitor Building Assets' Performance and Operations** *(for Non-Residential)*

(iv) **Adoption of Open Building Management System (BMS)** *(for Non-Residential)*

(v) **Adoption of Open CCTV** *(for Non-Residential)*

(vi) **Adoption of an Open Building Asset Ontology (for Non-Residential)**

These practices establish a robust digital foundation that enables seamless data exchange across building systems, supports advanced analytics, artificial intelligence (AI), predictive maintenance and automation, and equips building owners and facilities managers to continuously improve building performance and operational efficiency throughout the building lifecycle.

(i) Data exchange between robots, lifts, and automated doorways *(For Non-Residential and Residential)*

To facilitate autonomous building operations by enabling service robots to communicate seamlessly with building systems through interoperable digital interfaces. This improves operational efficiency, reduces manual intervention, and enables robots to navigate safely and seamlessly within the building environment.

The digital communication framework shall enable interoperability between robotic systems and building systems through open communication middleware, allowing robots to exchange operational information with lifts and, where applicable, automated doorways and access control systems.

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management		**New Buildings**	**Existing Buildings**
(i)	Data exchange between robots, lifts, and automated doorways. **Residential Buildings** – Enables data exchange between robots and lifts. **Non-Residential Buildings** – Enables data exchange between: • Robots and lifts (0.5 point) • Robots and automated doorways (including gantry) (0.5 point)	1 Point 1 Point	1 Point 1 Point

The framework shall support the following functional capabilities:

(i) Robot and Lift Integration (Applicable to Non-Residential and Residential)

The lift control system for digital lift shall support communication with service robots to enable autonomous lift operations, including (but not exhaustive):

When using OPC UA as message protocol

- Lift mode
- Lift position
- Next destination
- Lift door status

When using MQTT as message protocol

- Call action
- Monitor events

The integration shall comply with SS 713:2025 (or equivalent recognised standards) where applicable.

(ii) Robot and Automated Doorway Integration (Applicable to Non-Residential Only)

Where automated doors and gantries are deployed, the system shall enable service robots to communicate with these systems to support autonomous navigation.

The integration (when using OPC UA as the message protocol) shall support functions including:

- Door ID
- Door status

Where interfacing with a security system or card access system using dry contact, the function shall include Open Door status.

Coverage Requirements

- **Residential Buildings**: The digital communication network shall cover all lifts along the designated robotic operating routes.

- **Non-Residential Buildings**: The digital communication network shall cover all lifts, together with automated doors, gantries, and other access control barriers along the designated robotic operating routes.

Documentation Requirements

At Design stage:

- Tender specifications showing the requirements of data exchange between robots, lift, and/or automated doorways with reference to SS 713:2025 (or equivalent).

At Verification stage:

- A copy of the formal **User Acceptance Test (UAT)** documentation signed off by Client showing the system(s) are done according to the checklist/requirements.

(ii) Robot Fleet Management *(For Non-Residential and Residential)*

To improve operational productivity, optimise resource utilisation, and enable coordinated autonomous building operations by deploying a robot fleet management system that schedules, monitors, and manages multiple service robots operating within the building.

A robot fleet management system coordinates the operation of multiple robots through a common management platform, enabling efficient task scheduling, traffic management, and operational visibility. The platform may support robots from the same manufacturer or multiple vendors and enables building owners and facilities managers to deploy robotic services more efficiently across different facility management functions.

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management	**New Buildings**	**Existing Buildings**
(ii) Robot Fleet Management		
Residential Buildings. Demonstrate robot fleet management for at least two types of service robots.	1 Point	1 Point
Non-Residential Buildings. Demonstrate: • Scheduled fleet management (0.5 point) • Interactive fleet management through an open robotic middleware (e.g. Open-RMF) (0.5 point)	1 Point	1 Point

The robot fleet management platform shall support the following functional capabilities:

(i) Fleet Scheduling and Management (Applicable to Non-Residential and Residential)

The platform shall centrally manage at least two different types of service robots (e.g. cleaning, security, delivery, concierge or inspection robots) and support functions including:

- pre-defined task scheduling and dispatch;
- robot status monitoring;
- battery charging management;
- mission history and reporting; and
- fault notification and operational alerts.

(ii) Interactive Fleet Management (Applicable to Non-Residential Only)

Where multiple robot fleets or heterogenous robots from multiple vendors are deployed, the platform shall support dynamic coordination through an open robotic middleware (e.g. Open-RMF or equivalent).

The platform should support capabilities including:

- cross-vendor task coordination;
- traffic and path conflict resolution;
- shared resource management (e.g. lifts, charging stations, and common pathways);
- priority management between robots; and
- interoperability through open interfaces.

Documentation Requirements

At Design stage:

- Tender specifications showing the requirements of robot fleet management with reference to TR 130:2025 (or equivalent).

At Verification stage:

- A copy of the formal **User Acceptance Test (UAT)** documentation signed off by Client showing the system is done according to the checklist/requirements.

(iii) Performance dashboard to monitor building assets' performance and operations *(For Non-Residential)*

To improve operational transparency, support data-driven decision-making, and facilitate building performance management by consolidating key operational and management information into a **unified digital dashboard**.

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management	**New Buildings**	**Existing Buildings**
(iii) **Performance Dashboard**: A **unified digital dashboard** to monitor different aspects of building performance and operations through: a. **Operational Dashboard** – provides current building performance and operational information to support daily building operations *(0.05 point per item)*: ▪ Total System Efficiency (TSE) for ACMV systems ▪ Energy consumption by major building systems ▪ Renewable energy generation ▪ Indoor Air Quality (IAQ) monitoring ▪ Active work order status	Up to 0.25 Point	Up to 0.25 Point
b. **Managerial Dashboard** – provides historical performance trends and management insights to support long-term planning and decision-making *(0.05 point per item)*: ▪ Energy Use Intensity (EUI) ▪ Mean Time Between Failures (MTBF) ▪ Mean Time to Repair (MTTR) ▪ Zonal occupancy ▪ Utility consumption benchmarking Where a listed item is not applicable to the building, an alternative performance metric of equivalent relevance and functionality may be proposed.	Up to 0.25 Point	Up to 0.25 Point

The dashboard shall support the following two functional layers:

Operational Dashboard (Up to 0.25 points | 0.05 point per item)

The Operational Dashboard shall provide current building performance and operational information to support daily building operations. The selectable items include:

- **Total System Efficiency (TSE)**: Monitoring of ACMV system efficiency (kW/RT).
- **Energy Consumption Breakdown**: Monitoring of energy consumption by major building systems, such as ACMV, lighting and lifts/escalators.
- **Renewable Energy Generation**: Monitoring of power and cumulative energy generation from on-site renewable energy systems.
- **Indoor Air Quality (IAQ) Monitoring**: Monitoring of key IAQ parameters across relevant building zones, with indication of whether monitored parameters are within specified thresholds.
- **Active Work Order Status**: Monitoring of maintenance work orders by status, such as open, in progress and pending.

Managerial Dashboard (Up to 0.25 points | 0.05 point per item)

The Managerial Dashboard shall provide historical performance trends and management insights to support planning and performance management. The selectable items include:

- **Energy Use Intensity (EUI)**: Tracking of building energy consumption normalised by gross floor area (kWh/m²/year).
- **Mean Time Between Failure (MTBF)**: Tracking of the average operating time between failures of selected critical building equipment.
- **Mean Time to Repair (MTTR)**: Tracking of the average time taken to rectify equipment failures and restore operation.

- **Zonal Occupancy**: Historical tracking of occupancy patterns across building zones or floors to support operational planning.
- **Utility Consumption Benchmarking**: Comparison of current electricity and/or water consumption against historical building performance or established baselines.

Where a listed dashboard item is not applicable to the building, an alternative performance metric of equivalent relevance and functionality may be proposed. The alternative metric shall support the intended purpose of the respective Operational or Managerial Dashboard and be derived from relevant building systems or data sources.

The dashboard shall digitally obtain data from the relevant building systems or data sources and present the information through a unified graphical user interface that supports both operational monitoring and long-term performance management.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating that a unified Performance Dashboard will be provided, including the Operational and Managerial Dashboard performance indicators to be monitored.

At Verification stage:

- A one-page document with screenshots of the Performance Dashboard demonstrating the performance indicators claimed for points, including the Operational Dashboard displaying current building performance and operational indicators, and the Managerial Dashboard displaying historical performance trends and management indicators.

(iv) Adoption of Open Building Management System (BMS) *(For Non-Residential)*

As buildings become more complex and the demands for sustainability, occupant comfort, and operational efficiency increase, open BMS has become an essential foundation for digital and AI-ready buildings. This would lead to better system reliability, resilience and performance throughout the building lifespan.

An open BMS utilises standard protocols (such as BACnet, Modbus, MQTT, OPC UA etc.), open Application Program Interfaces (APIs) such as RESTful API or MQTT, and vendor-neutral technologies to create a flexible, interoperable building control system. This approach not only enables seamless integration of diverse systems and more effective data utilisation but also avoid vendor lock-in (i.e. exclusive BMS service provider / system integrator dependency for future data sharing, integration, upgrades or replacements).

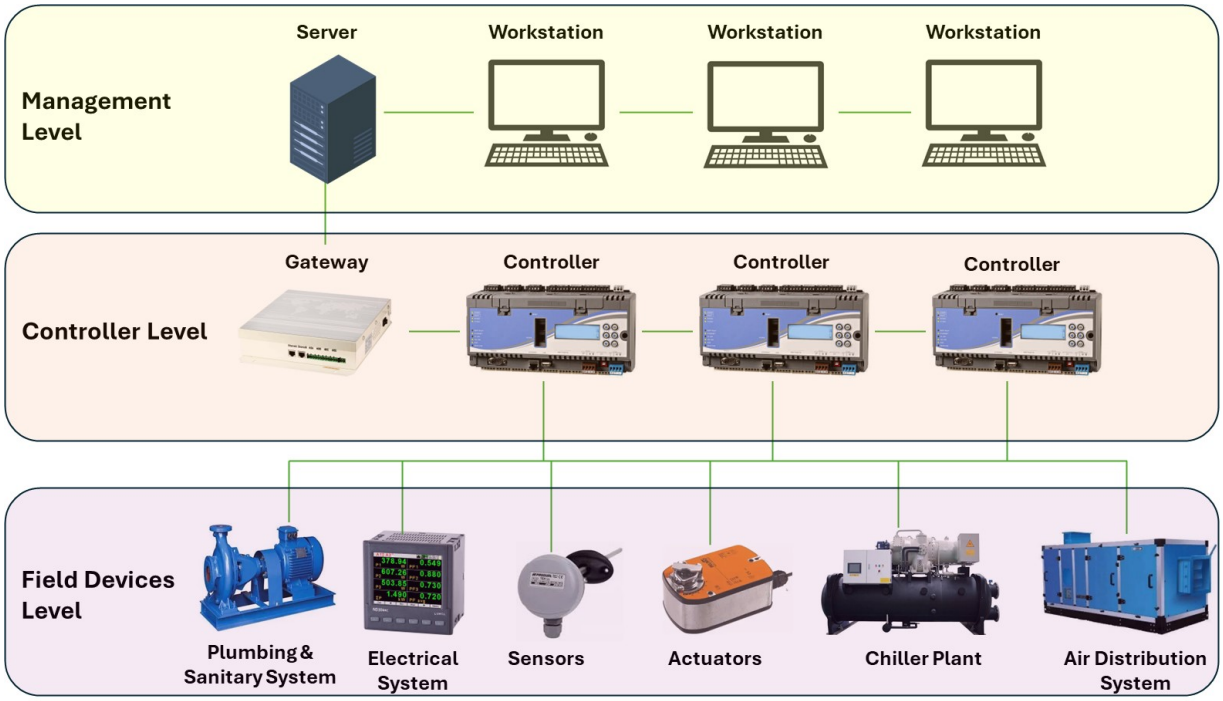


Figure: Simplified BMS schematic diagram

While the above schematic diagram represents a simplified on-premises BMS, the intent of this criterion would apply to the following deployment BMS architecture.

a) Standard on-premises single building
b) Multiple buildings connected to a single unified management layer
c) Multiple buildings connected to a management layer on cloud

It is defined based on the following principles:

Technically open

The BMS architecture supports integration with multiple vendor systems and solutions, enabling data sharing between systems without requiring the system manufacturer's involvement or approval.

The BMS uses **standard protocols** which allows interoperability and data transfer across multiple vendor systems.

Comprehensive **API documentation** including configuration, transactions, data models, commands / actions and events / alarms is publicly available online or made available upon request at no cost. This enables third-party software applications to communicate and exchange data across platforms.

Commercially open

There is no proprietary system or vendor lock-in. All BMS data (machine readable format) would be owned by the building owner. The system will be fully functional if the building owner decides to appoint another vendor to maintain the BMS. Minimally, the following must be available to the building owners.

1. Highest level system administrative login and password
2. Network schematic diagram

3. Connections diagram of sensors and equipment to each controller, gateway, field device, device address and register number.

The open architecture allows any system integrator to connect, manage, and control various devices regardless of manufacturer, including third-party subsystems (such as lighting controls, fire safety, and security), IoT platforms (both on-premises and cloud-based), and analytics tools.

Building owners may assume fully accountability to engage qualified service provider or system integrator. The BMS contract will obligate the BMS vendor/manufacturer to provide access to necessary spares/parts to the qualified service provider or system integrator when requested by the building owner.

BMS Naming Convention

The BMS will **adopt a common and consistent, machine-readable naming convention** for all BMS data points so that the location, equipment and point function can be understood and identified easily.

Example:
Site – Building name – Level or Zone – System – Equipment – Point Type

S01-BLDG03-L06-ELV-LVSWBD02-Panel_Temp-High_Alarm
S02-BLDG03-L07-HVAC-AHU02-Ret_Air_Temp-Sensor
S02-BLDG03-ZN-07E-HVAC-VAV07E-Zone_Temp-Setpoint

Control logic programme ownership

The system manufacturer / system integrator allows necessary provision for control logic programme to be made available to the building owner (end user) which enables the building owner to modify the BMS control logic and BMS point configuration independently at the management level. This includes the BMS authoring tool used to modify and configure the HMI (human machine interface) linked to the downstream controllers which would enable the building owner to modify the program logics of the downstream controllers. Any modifications should be carried out by a competent engineer with full visibility and knowledge of the system to avert risk during operations.

Training and handover documentation

To ensure operational continuity, the system manufacturer / system integrator provides relevant training and documentation minimally as outlined below.

Training	• The adopted BMS naming convention and data structures • Use of the BMS HMI for operations
Handover documentation	• As-built drawings • BMS naming convention and point lists • Control logic diagrams / applications and configuration files • User guides for the HMI • Change-control and rollback procedures

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management	**New Buildings**	**Existing Buildings**
(iv) The adoption of **Open Building Management System (BMS)** that facilitates seamless integration and interoperability through standard protocols and open APIs, enabling multi-vendor systems to interface while avoiding both technical and commercial lock-in, and ensuring building owners have full access, control, and documentation for scalable and maintainable operations.	1 Point	1 Point

Documentation Requirements

At Design stage:

- Tender specifications stating the principles of open BMS architecture.

At Verification stage:

- Letter of completion confirming the installation, testing and commissioning and handover is carried out as per tender specification signed by the BMS manufacturer / system integrator and design consultant. The letter of completion must also be signed by the building owner to acknowledge the work is carried out.
- The letter of completion confirming the installation, testing and commissioning and handover is carried out as per tender specifications may be signed by the BMS manufacturer / system integrator and building owner if no consultant is appointed.
- Documentary evidence of handover of documents to building owner.

Guidance Notes (Not part of Green Mark Assessment)

The following are good practices that building owners may consider implementing for the BMS. These are additional guidance notes which will not be assessed in Green Mark.

a) Building owners should manage the use of the highest-level system administrative login and password. They should not be used for daily operations.

b) BMS controller input/output (I/O) list indicating the number of equipment and BMS points linked to each controller should be handed over to the building owner

c) Engineering tools required to onboard new equipment and the respective points on the BMS controllers should be handed over to the building owner

d) During tender stage, schedule of rates (SOR) for items such as upgrading of BMS software, adding additional equipment etc. should be included to help building owners better manage operating cost

e) Scenario-based flow charts indicating the timeline for replacement of controllers etc. should be submitted to the building owner

f) The BMS shall be supported by the system manufacturer / system integrator for a minimum of 10 (recommended) and 15 years (where possible) from project completion, including at least:

    1) BMS head-end software (workstation / server applications, dashboards, databases) and required licences
    2) Direct Digital Controllers (DDCs) and other BMS controllers / gateways, including equivalent replacement models
    3) Spare parts and repair services for controllers, panels and key field interfaces
    4) Firmware and security patches for all BMS components (head-end, controllers, gateways)
    5) Technical documentation and software tools required to operate, engineer and maintain the system

g) Future DDC models, firmware updates, and software tools from the system manufacturer / system integrator shall remain backward compatible with the DDCs provided in the project. Where full backward compatibility is not technically feasible, the manufacturer / system integrator should offer functionally equivalent replacement options (certified to open protocols) and documented upgrade procedures to minimise disruption to building operations.

h) For good cybersecurity practices, refer to the Intelligence Section criterion IN 2.2.

i) Provide a minimum of 20% spare I/O capacity at individual controllers by point count. This allows for future integration of additional equipment and sensors.

j) The BMS should have a data retention period of minimally 3 years.

k) The BMS system manufacturer or system integrator provides a digital system record for all design, commissioning and handover documentation. This is a structured repository of BMS documentation made available to building owners that cover system configuration, naming convention, commissioning records and traceability of system changes.

(v) Adoption of Open CCTV *(For Non-Residential)*

As buildings become more complex and the demands for operational efficiency increase, open CCTV system has become an essential foundation for future-ready buildings. An open CCTV system utilises standard protocols (such as ONVIF etc.), open Application Program Interfaces (APIs), and vendor-neutral technologies. This approach enables seamless integration of diverse systems and more effective data utilisation.

An open CCTV system is defined based on the following principles:

Technically open

The system architecture supports integration with multiple vendor systems and solutions, enabling data sharing between systems without requiring the CCTV vendor's / system integrator's involvement or approval.

The Video Management System (VMS), CCTV cameras and Network Video Recorders (NVRs) operate on **standard protocols** for live streaming such as TCP/IP, IPv4/v6, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, PPPoE, NTP, SMTP, UDP, SNMP, p2p, etc. The CCTV System should operate on standard IP networking and video streaming protocols including but not limited to TCP/IP, HTTP/HTTPS, RTP, RTSP, SNMP, NTP and ONVIF, which allows interoperability across systems multiple vendor systems.

Comprehensive **Software Development Kit (SDK)** or **API** documentation for the Video Management System including configuration, transactions, data models, commands / actions and events / alarms is publicly available online or made available upon request with no licensing costs. This enables third-party software applications such as video analytic tools to communicate and exchange data across platforms.

The Video Management System should also support modern integration interfaces including RESTful APIs, MQTT or WebSocket for real-time event streaming and integration with other building systems.

The SDK or API documentation should include interface requirement specifications document, which is used to supplement the System Architecture, shall specify the requirements imposed on one or more systems, subsystems or other system components to achieve one or more interfaces among these entities that can cover any number of interfaces.

(i) Specify the requirements imposed on one or more systems, subsystems or other system components to achieve one or more interfaces among these entities.

(ii) Interface identification and diagrams: Describe the interfacing entities and the interface characteristics (e.g., systems, subsystems, parameters, size, frequency, etc.). One or more interface diagrams must be provided to depict the interfaces.

(iii) Detailed interface characteristics: Describe the characteristics from the point of view of the interfacing entities.

Commercially open

There is no proprietary system or vendor lock-in. The system will be fully functional if the building owner decides to appoint another vendor to maintain the CCTV system. Minimally, the following must be available to the building owners.

1. Highest level system administrative login and password for the device user interface and administration of all devices including CCTV cameras, NVRs, Digital Video Recorders (DVRs) and Video Management System (VMS)
2. As-built drawings, network schematic diagram, equipment list and assigned IP addresses of all components
3. Connections diagram of all CCTV cameras to the NVRs, DVRs and VMS

The CCTV system must be able to do live streaming to more than one endpoint simultaneously

The open architecture allows any CCTV vendor / system integrator and developer to connect with other systems including third-party analytics tools or digital twin systems etc without restrictions.

The VMS shall provide the SDKs or APIs for integration with 3rd parties, including but not limited to the following:

a) Master Device List such as:

(i) Camera ID
(ii) Location of camera (latitude-longitude)
(iii) Description of camera
(iv) Type of camera (PTZ or fixed camera, etc.)
(v) Camera FOV

b) Live Video Streams from the Devices

c) On-demand Video Streams from the Devices

d) Control of PTZ Functions; Playback of Recorded Video Streams and Files

e) Health Status

Additionally for SDKs, the manufacturer SDKs for all the installed equipment shall be provided. Where applicable, the Contractor shall provide an integrated SDK to access customised features of the CCTV System.

The SDK shall provide access to all available features of the CCTV System as follows:

a) Image snapshot from live video stream(s)
b) Record live video stream(s)
c) Configuration of video stream(s) (e.g., playback speed, recorded resolution, frame rates etc.)
d) Automatically resume playing the live stream after a network failure or power failure recovery
e) Logs, alarms and events; Query and transfer of data from the Frontend Video Analytics servers
f) Management, configuration and access to VA algorithms and the related data generated
g) Management and configuration (including patching) of device firmware
h) Management and configuration of software updates
i) Data analytics

CCTV Naming Convention

The CCTV system will **adopt a common and consistent naming convention** for data points which is handed over to the building owner.

Example:
Site Name - Building name – Level – Equipment

Site 01 – Building02 – 04 – cctv07
Site 02 – Building01 – 05 – cctv012

Device User Interface ownership

The CCTV vendor / system integrator allows for full device user interface ownership to the building owner (end user) which enables the building owner to add, configure, integrate new CCTV cameras and connect to with 3rd party systems directly.

Handover documentation

The CCTV vendor / system integrator provides documentation to ensure operational continuity.

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management	**New Buildings**	**Existing Buildings**
(v) The adoption of **Open CCTV** that facilitates seamless integration and interoperability through standard protocols (e.g. ONVIF) and open APIs/SDKs, enabling third-party integration without vendor lock-in.	0.5 Point	0.5 Point

Documentation Requirements

At Design Stage:

- Tender specifications stating the principles of open CCTV architecture.

At Verification Stage:

- Letter of completion confirming the installation, testing and commissioning and handover is carried out as per tender specification signed by the CCTV vendor / system integrator and design consultant. The letter of completion must also be signed by the building owner to acknowledge the work is carried out.
- The letter of completion confirming the installation, testing and commissioning and handover is carried out as per tender specifications may be signed by the CCTV vendor / system integrator and building owner if no consultant is appointed.
- Documentary evidence of handover of documents to building owner.

Guidance Notes (Not part of Green Mark Assessment)

The following are good practices that building owners may consider implementing for the CCTV system. These are additional guidance notes which will not be assessed in Green Mark.

a) All devices should be listed on ONVIF conformant product list.

b) For good cyber security practices, refer to the Intelligence Section criterion IN 2.2

(vi) Adoption of an Open Building Asset Ontology *(For Non-Residential)*

To improve data consistency and interoperability across building systems by adopting a recognised open building asset ontology or semantic data standard that enables building data and relationships to be consistently understood and used across different systems and applications.

Assessment Criteria

IN2.1 Good Practices to Facilitate Data Management		**New Buildings**	**Existing Buildings**
(vi)	Adoption of a recognised **open building asset ontology** or semantic data standard to provide consistent descriptions of building assets and their relationships, such as Brick Schema or Project Haystack.	1 Point	1 Point

The adoption of an open building asset ontology or semantic data standard shall be based on the following three principles:

- **Standardised Semantic Modelling**: The building shall adopt a recognised open building asset ontology or semantic data standard, such as **Brick Schema**, **Project Haystack**, **RealEstateCore**, or **equivalent**, to provide consistent semantic descriptions of building systems, equipment, spaces, sensors and associated data points.
- **Relationship and Topology Modelling**: The ontology shall define relationships between building spaces, systems, equipment and associated data points, enabling applications to interpret how building entities are connected and related. Examples include relationships between sensors and spaces, equipment and systems, and equipment and the spaces or zones they serve.
- **Open Data Accessibility**: The ontology-based data model shall be accessible through documented APIs or equivalent standard interfaces, enabling third-party applications to access and use the semantic building information without dependence on proprietary data formats.

The adopted ontology shall be applied to the major building systems integrated into the building's digital platform, including, where applicable, ACMV, electrical, lighting and water systems.

Documentation Requirements

At Design stage:

- Tender Specifications or Master Systems Integration (MSI) specification stating the adoption of a recognised open building asset ontology or semantic data standard (e.g. Brick Schema, Project Haystack or equivalent), including the major building systems to be covered.

At Verification stage:

- A one-page document demonstrating:
  - the implemented asset ontology or semantic data model;
  - examples of semantic relationships between building spaces, systems, equipment and associated data points; and
  - evidence that the ontology-based data model is accessible through documented APIs or equivalent standard interfaces.

References

- Project Haystack.
- Brick Schema.

IN2.2 Data Privacy and Security

The Data Privacy and Security section introduces two governance criteria, **Data Privacy** and **Data Security**, to strengthen the protection of digital building systems, operational technologies and organisational information. As buildings become increasingly connected and data-driven, robust governance frameworks are essential to safeguard personal data, maintain cybersecurity resilience, and build stakeholder confidence in digital building operations.

The Data Privacy and Security framework supports two key areas of digital governance:

(i) **Data Privacy** *(for Non-Residential and Residential)*

(ii) **Data Security** *(for Non-Residential and Residential)*

Together, these practices promote responsible data governance, protect building systems against cyber threats, and enable building owners and facilities managers to operate smart buildings with greater confidence, resilience and regulatory compliance.

(i) Data Privacy *(For Non-Residential and Residential)*

To strengthen organisational accountability and safeguard personal data by requiring building owners or facility management companies to adopt recognised data privacy certifications that demonstrate accountable data privacy management practices.

Assessment Criteria

IN2.2 Data Privacy and Security		New Buildings	Existing Buildings
(i)	**Data Privacy**: Adoption of a recognised data privacy certification by the building owner or appointed FM company responsible for managing building-related personal data, to demonstrate accountable data privacy management practices, such as IMDA's Data Protection Trustmark (DPTM) or ISO/IEC 27701.	0.5 Point	0.5 Point

To qualify for points, the building owner or appointed FM company responsible for managing building-related personal data shall hold and maintain a valid data privacy certification. Acceptable certifications include:

- **IMDA Data Protection Trustmark (DPTM)**; or
- **ISO/IEC 27701** – Privacy Information Management Systems (PIMS); or
- **Equivalent recognised data privacy certification** providing independent assurance of organisational privacy management practices.

Public Sector Provision: Government agencies may demonstrate compliance through applicable whole-of-government data protection and privacy policies or requirements.

Documentation Requirements

At Design stage:

- *(For Private Sector):* Submit a Letter of Intent or an extract of the Tender Specifications stating that the building owner or appointed FM company responsible for managing building-related personal data shall hold or obtain an approved data privacy certification before building handover.
- *(For Public Sector):* Submit an extract of the Tender Specifications or an official declaration confirming adherence to applicable whole-of-government data protection and privacy policies or requirements.

At Verification stage:

- *(For Private Sector)*: Submit a copy of the valid data privacy certification showing the certified organisation, scope of certification and validity period.
- *(For Public Sector)*: Submit an official declaration or endorsement from the relevant authorised officer confirming adherence to applicable whole-of-government data protection and privacy policies or requirements.

References

- Data Protection Trustmark Certification
- ISO/IEC 27701:2019 Security techniques — Extension to ISO/IEC 27001 and ISO/IEC 27002 for privacy information management — Requirements and guidelines

(ii) Data Security *(For Non-Residential and Residential)*

To strengthen the cybersecurity resilience of smart buildings by requiring building owners or facility management companies to adopt recognised information security certifications that demonstrate accountable information security and cybersecurity management practices.

Assessment Criteria

IN2.2 Data Privacy and Security	**New Buildings**	**Existing Buildings**
(ii) Data Security: Adoption of a recognised information security certification by the building owner or appointed FM company responsible for managing the building's digital systems, to demonstrate accountable information security and cybersecurity management practices, such as CSA Cyber Essentials, Cyber Trust or ISO/IEC 27001.	0.5 Point	0.5 Point

To qualify for points, the building owner or appointed FM company responsible for managing the building's digital systems shall hold a valid information security certification. Acceptable certifications include:

- **CSA Cyber Essentials; or**
- **ISO/IEC 27001**: Information Security Management Systems (ISMS); or
- **Equivalent recognised information security certification** providing independent assurance of organisational cybersecurity management practices.

Public Sector Provision: Government agencies may demonstrate compliance through applicable whole-of-government information security and cybersecurity policies or requirements.

Guidance Notes (Not part of Green Mark Assessment)

Building owners and FM companies are encouraged to adopt appropriate cybersecurity practices for building Operational Technology (OT) systems. The following are some good practices from the CSA's Cyber Essentials Mark for OT Security that building owner and/or facility management company may consider implementing for the OT systems:

a) As teams managing OT and IT are typically distinct and may operate independently, OT-specific security awareness training shall be provided to employees that are involved in operating and maintaining the OT environment.
b) Cyber hygiene practices and guidelines for OT system should be developed that include operational security, common risks & suspicious activity in OT environments, and OT incident response.
c) An up-to-date asset inventory of all the hardware and software assets should be maintained, including firmware version installed in these assets.
d) When introducing external devices and removable storage media, e.g., those used by the organisation's OT vendors for support and maintenance, the organisation shall do so only when necessary and only after a sanitisation process has been performed, as these devices and media may be used by vendors to support multiple customer deployments, potentially leading to "cross-infection" from other infected sites.
e) Virus and malware protection solutions should be used and installed on endpoints (e.g., desktop computer) to detect attacks.
f) Firewalls for segmentation between OT and IT (or corporate) networks should be used to only allow authorised traffic to/from the IT network.
g) Remote access to the OT environment should use secured connections e.g., VPNs and support MFA where feasible.
h) Account management shall be established to maintain and manage the inventory of accounts. Access shall be managed to ensure employees can access only the information and systems required for their job role.
i) All factory default passwords should be changed and replaced with a strong passphrase, unused physical and logical ports are disabled, and only secured communication protocols are used.
j) The implementation of critical or important updates for operating systems and applications (e.g., security patches) should be prioritised and obtained from official or trusted sources, as soon as feasible.

Refer to the prevailing CSA Cyber Essentials requirements and relevant OT cybersecurity guidance for further good practices.

Documentation Requirements

<u>At Design stage:</u>

- *(For Private Sector)*: Submit a Letter of Intent or an extract of the Tender Specifications stating that the building owner or appointed FM company responsible for managing the building's digital systems shall hold or obtain an approved information security certification before building handover.
- *(For Public Sector)*: Submit an extract of the Tender Specifications or an official declaration confirming adherence to applicable whole-of-government information security and cybersecurity policies or requirements.

At Verification stage:

- *(For Private Sector)*: Submit a copy of the valid information security certification showing the certified organisation, scope of certification and validity period.
- *(For Public Sector)*: Submit an official declaration or endorsement from the relevant authorised officer confirming adherence to applicable whole-of-government information security and cybersecurity policies or requirements.

References

- CSA's Cybersecurity Certification for Organisations
- ISO/IEC 27001:2022 Information security, cybersecurity and privacy protection — Information security management systems — Requirements

IN2.3 Voluntary Disclosure of Building Energy Data *(For Non-Residential)*

To support industry benchmarking, building performance research and decarbonisation by encouraging building owners to voluntarily share building operational and energy performance data with a recognised national data platform.

Assessment Criteria

IN2.3 Voluntary Disclosure of Building Energy Data	New Buildings	Existing Buildings
Voluntary Disclosure of Building Energy Data: Voluntary sharing of building operational and energy performance data with a recognised national building energy data platform, such as the SLEB Smart Hub, to support building performance benchmarking and analytics. This includes:		
(i) **Operational Data**: Building-level electricity and water consumption, waste generation, and on-site renewable energy generation, where applicable.	(i) 0.25 Point	(i) 0.25 Point
(ii) **Energy Performance Data**: Energy consumption by major building systems, including ACMV, lighting, and lifts and escalators (L&E), where applicable.	(ii) 0.25 Point	(ii) 0.25 Point

To qualify for points, the building owner or facility management company shall digitally submit building performance data to a recognised national building energy data platform (e.g. the SLEB Smart Hub).

The data sharing shall support the following two categories:

- **Operational Data.**
  - total electricity consumption;
  - total water consumption;
  - waste generation, where available; and
  - on-site renewable energy generation, where applicable.
- **Energy Performance Data.**
  - Air-conditioning and Mechanical Ventilation (ACMV);
  - lighting; and;
  - lifts and escalators.

The data-sharing mechanism shall cover landlord-controlled utility consumption and applicable major building systems that contribute to the building's operational energy performance.

Documentation Requirements

At Design stage:

- A commitment letter identifying the building performance datasets to be shared with the recognised national platform.

At Verification stage:

- Evidence that the building performance datasets identified at Design stage have been successfully submitted to the recognised national platform (e.g. SLEB Smart Hub).
- Data may be submitted through APIs or approved digital file formats (e.g. CSV or Excel).
- Where historical monthly consumption data is available, up to 12 consecutive months of operational data should be submitted.

Guidance Notes

The SLEB Smart Hub is a digital platform for benchmarking and analysing building energy performance. Building owners are encouraged to adopt the standard data fields provided by the platform to facilitate consistent reporting and industry benchmarking. Please refer to the SLEB Smart Hub user guide for the applicable data-sharing procedures and requirements.

Equivalent national platforms may be accepted where recognised by the Building and Construction Authority (BCA).

IN3 Responsive

A maximum of **8 points** can be scored across the **IN3 Responsive** section for **Non-Residential Buildings**, and a maximum of **10 points** can be scored for **Residential Buildings**.

IN3.1 Energy Efficiency

The Energy Efficiency section introduces adaptive air-conditioning (AC) control technologies that continuously optimise building cooling systems based on real-time operating conditions, occupancy and environmental data. By replacing static control strategies with intelligent, data-driven optimisation, these technologies improve energy efficiency, maintain occupant comfort, and enhance the overall performance and reliability of air-conditioning systems.

The Energy Efficiency framework supports two key adaptive AC optimisation technologies:

(i) **Adaptive AC Control System (Water Side)** *(for Non-Residential)*

(ii) **Adaptive AC Control System (Air Side)** *(for Non-Residential)*

Together, these technologies enable building owners and facilities managers to continuously optimise air-conditioning system performance, reduce energy consumption, support decarbonisation objectives, and improve long-term operational efficiency throughout the building lifecycle.

(i) Adaptive AC control system (Water Side) *(For Non-Residential)*

To improve central cooling plant energy efficiency and support long-term operational performance by deploying an adaptive control system that continuously optimises central chilled water plant operation in response to changing operating conditions.

Assessment Criteria

IN3.1 Energy Efficiency	New Buildings	Existing Buildings
(i) **Adaptive AC control system (Water Side)**: An adaptive control system that optimises central chilled water plant performance by automatically adjusting BMS control parameters or setpoints in response to changing operating conditions. It uses operational data such as power, temperatures, flow rates and cooling load to improve overall plant energy efficiency. The system shall be implemented under an outcome-based contract with defined energy performance targets.	1 Point	1 Point

To qualify for points, the adaptive control system shall continuously optimise the operation of the central chilled water plant through the following three functional layers:

- **Operational Data Acquisition**.

  The system shall continuously acquire and process operational data from the central chilled water plant, including, as applicable to the plant configuration, chiller power consumption, chilled and condenser water temperatures, water flow rates, cooling load, and other operational parameters necessary for optimisation.

- **Adaptive Water-Side Optimisation**.

  The system shall continuously analyse operational data and automatically optimise the chilled water plant by dynamically adjusting BMS control parameters or setpoints in response to changing operating conditions. These may include chilled water supply temperature setpoint, condenser water temperature setpoint(s), chiller sequencing, pump operating speeds, cooling tower operation and other water-side control strategies that improve overall plant efficiency. The optimisation may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Outcome-Based Performance Management**.

  The adaptive control system shall be implemented under an outcome-based contract with defined energy performance targets and contractual performance obligations linked to the achievement of those targets. The contract shall include:

  ✓ clearly defined energy performance targets;
  ✓ a measurement and verification (M&V) methodology for assessing achievement of the performance targets; and
  ✓ performance monitoring throughout the contract period.

The adaptive control system shall provide whole-plant optimisation of the landlord-operated central chilled water plant, including chillers, cooling towers and associated chilled and condenser water pumping systems.

Exclusions:

- Conventional Building Management Systems (BMS) operating using fixed schedules or static setpoints without adaptive optimisation in response to changing operating conditions.
- Conventional maintenance contracts without defined energy performance targets and associated contractual performance obligations.
- Developments served by District Cooling Systems (DCS)**.**

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating the provision of an adaptive water-side optimisation system, including operational data acquisition and automatic adjustment of control parameters or setpoints.
- Documentation confirming that the adaptive control system will be procured under an outcome-based contract with defined energy performance targets and performance obligations.

At Verification stage:

- A one-page document containing:
    - screenshots of the optimisation dashboard or BMS demonstrating operational data monitoring and automatic adjustment of control parameters or setpoints for chilled water plant optimisation; and
    - documentary evidence of the outcome-based contract, including the agreed energy performance targets, M&V methodology and associated performance obligations.

(ii) Adaptive AC control system (Air Side) *(For Non-Residential)*

To improve air-side air-conditioning energy efficiency and maintain indoor environmental quality by deploying an adaptive control system that continuously optimises cooling and ventilation in response to changing operating, occupancy and environmental conditions.

Assessment Criteria

IN3.1 Energy Efficiency	**New Buildings**	**Existing Buildings**
(ii) **Adaptive AC control system (Air Side)**: An adaptive control system that optimises air-side AC performance by automatically adjusting BMS control parameters or setpoints in response to changing operating, occupancy or environmental conditions. It uses data such as occupancy, CO_2 concentration, temperature, humidity and weather conditions to improve energy efficiency while maintaining indoor environmental quality. The system shall be implemented under an outcome-based contract with defined energy performance targets.	1 Point	1 Point

To qualify for points, the adaptive control system shall continuously optimise the operation of the building's air-side air-conditioning systems through the following three functional layers:

- **Operational Data Acquisition**.

  The system shall continuously acquire and process operational and environmental data, including, as applicable to the system configuration and optimisation strategy, indoor and outdoor temperature, relative humidity, CO_2 concentration, occupancy, weather conditions or forecasts, and other operational parameters necessary for optimisation

- **Adaptive Air-Side Optimisation**.

  The system shall continuously analyse operational data and automatically optimise the air-side air-conditioning systems by dynamically adjusting BMS control parameters or setpoints in response to changing operating, occupancy or environmental conditions. These may include AHU fan speed, VAV airflow or zone control setpoints, static pressure setpoint, outdoor air ventilation rate or setpoint, supply air temperature setpoint, and other air-side control strategies that improve system efficiency while maintaining indoor environmental quality. The optimisation may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Outcome-Based Performance Management**.

  The adaptive control system shall be implemented under an outcome-based contract with defined energy performance targets and contractual performance obligations linked to the achievement of those targets. The contract shall include:

  - ✓ clearly defined energy performance targets;
  - ✓ a measurement and verification (M&V) methodology for assessing achievement of the performance targets; and
  - ✓ performance monitoring throughout the contract period.

The adaptive control system shall cover air-side systems serving at least 85% of the landlord-controlled air-conditioned floor area.

Exclusions:

- Conventional Building Management Systems (BMS) operating using fixed schedules or static setpoints without adaptive optimisation in response to changing operating conditions.
- Conventional maintenance contracts without defined energy performance targets and associated contractual performance obligations.
- Standalone tenant-controlled air-conditioning systems that are not connected to the landlord-operated adaptive control system.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating the provision of an adaptive air-side optimisation system, including operational data acquisition and automatic adjustment of control parameters or setpoints.
- Documentation confirming that the adaptive control system will be procured under an outcome-based contract with defined energy performance targets and performance obligations.

At Verification stage:

- A one-page document containing:
    - screenshots of the optimisation dashboard or BMS demonstrating operational data monitoring and automatic adjustment of control parameters or setpoints for air-side optimisation, together with evidence demonstrating the required system coverage; and
    - documentary evidence of the outcome-based contract, including the agreed energy performance targets, M&V methodology and associated performance obligations.

IN3.2 Predictive Maintenance

The Predictive Maintenance section introduces intelligent monitoring technologies that continuously assess the operating condition of critical building systems to detect anomalies, predict equipment degradation, and enable proactive maintenance before failures occur. By replacing reactive maintenance and periodic inspections with continuous sensing, automated diagnostics and predictive analytics, these technologies improve equipment reliability, reduce unplanned downtime, optimise maintenance resources, and extend asset lifespan.

The Predictive Maintenance framework supports the following smart maintenance technologies:

(i) **Remote Monitoring & Diagnostics (RM&D) for Lift System** *(for Non-Residential and Residential)*

(ii) **Remote Monitoring & Diagnostics (RM&D) for AC System** *(for Non-Residential)*

(iii) **Remote Monitoring & Diagnostics (RM&D) for Electrical System** *(for Non-Residential)*

(iv) **Smart Fire Extinguishers and Exit Lights System** *(for Non-Residential)*

(v) **Smart Electrical Monitoring System** *(for Residential)*

(vi) **Smart Water Pump System** *(for Residential)*

(vii) **Smart Water Leak Detection System** *(for Residential)*

(viii) **Carpark Mechanical Ventilation Monitoring System** *(for Residential)*

Together, these technologies enable building owners and facilities managers to proactively identify equipment degradation, optimise maintenance planning, improve operational reliability, reduce maintenance costs, and enhance the long-term resilience of critical building systems throughout the building lifecycle.

(i) Remote Monitoring & Diagnostics for Lift System *(For Non-Residential and Residential)*

To enhance the reliability, safety and operational performance of lift systems by deploying intelligent monitoring technologies that continuously analyse lift operating conditions, detect anomalies, and predict equipment failures before service disruptions occur.

Assessment Criteria

IN3.2 Predictive Maintenance	**New Buildings**	**Existing Buildings**
(i) **RM&D for Lift System**: A digital system to automatically track and log the usage, operations, and response of lifts, to detect lift anomalies, predict future anomalies/breakdowns, and provide several possible recommendations for diagnosis and reduction of such anomalies and breakdowns.	1 Point	1 Point

To qualify for points, the RM&D system shall continuously monitor and analyse lift operations through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process lift operational data, including where applicable:
  - ✓ Lift operating status.
  - ✓ Car movement and travel patterns.
  - ✓ Lift utilisation.
  - ✓ Door operation.
  - ✓ Motor operation.
  - ✓ Fault and alarm status.
  - ✓ Other operational parameters necessary for diagnostics.
- **Predictive Diagnostics**.

  The system shall continuously analyse operational data to detect abnormal operating conditions and predict potential equipment failures, including where applicable:
  - ✓ abnormal operating behaviour;
  - ✓ repeated fault occurrences;
  - ✓ equipment degradation;
  - ✓ performance deterioration; and
  - ✓ other conditions that may affect lift reliability.

  The diagnostics may be rule-based, model-based or AI-assisted.
- **Predictive Maintenance Dashboard**.

  The platform shall:
  - ✓ automatically record and classify lift faults and abnormal operating events;
  - ✓ generate predictive maintenance alerts or diagnostic recommendations;
  - ✓ provide historical operating trends and fault records; and
  - ✓ present the information through a digital dashboard for facility management personnel.

The RM&D system shall cover **all lifts** within the development.

Documentation Requirements

At Design stage:

- Tender specifications stating that an RM&D solution complying with the prevailing **Code of Practice (CoP)** on **Remote Monitoring and Diagnostics (RM&D) for Lifts** and recognised by the Building and Construction Authority (BCA) will be provided for all lifts.

At Verification stage:

- A copy of the application approval for RM&D Lifts using RM&D solutions to maintain at reduced maintenance frequency
- Photographs demonstrating the installation of the RM&D hardware on the lift system (see below example).



References

- Remote Monitoring and Diagnostics (RM&D) for Lifts in Singapore | Building and Construction Authority for the CoP and BCA acceptable solution.

(ii) Remote Monitoring & Diagnostics for AC System *(For Non-Residential)*

To improve air-conditioning system reliability and reduce unplanned downtime by continuously monitoring equipment condition, detecting abnormal operating conditions and equipment degradation, and enabling predictive maintenance.

Assessment Criteria

IN3.2 Predictive Maintenance	**New Buildings**	**Existing Buildings**
(ii) **RM&D for AC System**: A digital system that continuously monitors and analyses air-conditioning systems and equipment to detect abnormal operating conditions, diagnose faults or equipment degradation, and provide maintenance alerts or diagnostic recommendations.	0.5 point (airside) 0.5 point (waterside)	0.5 point (airside) 0.5 point (waterside)

To qualify for points, the RM&D system shall continuously monitor and analyse the air-conditioning system through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process operational data, as applicable to the system configuration and diagnostic strategy, including:

  Water Side: chilled and condenser water temperatures, water flow rates, equipment operating status, power consumption, equipment condition parameters, and other operational parameters necessary for diagnostics.

  Air Side: supply and return air temperatures, fan operating status and speed, static pressure, filter differential pressure, damper position, and other operational parameters necessary for diagnostics.

- **Automated Diagnostics**.

  The system shall continuously analyse operational data to detect abnormal operating conditions, diagnose faults or equipment degradation, and identify potential maintenance needs. Examples may include tube or coil fouling, refrigerant leakage, pump or fan degradation, sensor drift, filter blockage and valve or damper malfunction. The diagnostics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Diagnostics & Maintenance Dashboard**.

  The platform shall automatically record identified abnormal operating events or diagnostic findings, generate maintenance alerts or diagnostic recommendations, provide historical trends of key equipment parameters, and present the information through a digital dashboard for facility management personnel.

Coverage:

- **Water Side:** Landlord-operated central chilled water plant, including chillers, cooling towers and associated chilled and condenser water pumping systems.
- **Air Side:** Landlord-operated air-side systems serving at least 85% of the landlord-controlled air-conditioned floor area.

Waterside and air-side RM&D shall be assessed and awarded points independently.

Exclusions:

- Conventional Building Management Systems (BMS) or Supervisory Control and Data Acquisition (SCADA) systems that only display operational data or generate threshold alarms without automated fault or equipment degradation diagnostics.
- Standalone tenant-controlled air-conditioning systems that are not connected to the landlord-operated RM&D platform.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that an RM&D solution with continuous operational monitoring and automated diagnostics will be provided for the waterside and/or air-side air-conditioning system.

At Verification stage:

- A one-page document containing:
    - screenshots of the RM&D dashboard showing monitored equipment and key operational parameters; and
    - screenshots demonstrating automatically identified abnormal operating conditions, equipment degradation or diagnostic findings, together with the associated maintenance alerts or recommendations.

(iii) Remote Monitoring & Diagnostics for Electrical System *(For Non-Residential)*

To improve the reliability and safety of the building's electrical distribution system by continuously monitoring equipment condition, detecting abnormal operating conditions and equipment degradation, and enabling proactive maintenance to reduce the risk of equipment failure and power disruption.

Assessment Criteria

IN3.2 Predictive Maintenance		**New Buildings**	**Existing Buildings**
(iii)	**RM&D for Electrical System**: A digital system that continuously monitors and analyses electrical equipment to detect abnormal operating conditions and equipment degradation and provide diagnostic recommendations and predictive maintenance alerts.	0.5 Point	0.5 Point

To qualify for points, the RM&D system shall continuously monitor and analyse the electrical distribution system through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process operational and condition data from major electrical distribution equipment, including, as applicable to the system configuration and diagnostic strategy, equipment temperature, circuit loading, current, voltage, power quality, operating status and other parameters necessary for diagnostics. The system shall utilise permanently installed sensors or equivalent monitoring devices capable of continuous condition monitoring.

- **Automated Diagnostics**.

  The system shall continuously analyse operational data to detect abnormal operating conditions, diagnose equipment degradation and identify potential maintenance needs. Examples of diagnostic conditions may include abnormal temperature rise, potential loose connections or contact degradation, phase imbalance, equipment deterioration and other conditions affecting electrical system reliability. The diagnostics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Diagnostics & Maintenance Dashboard**.

  The platform shall automatically record identified abnormal operating events or diagnostic findings, generate maintenance alerts or diagnostic recommendations, provide historical trends of key electrical parameters, and present the information through a digital dashboard for facility management personnel.

The RM&D system shall cover all incoming and outgoing circuit breakers within the landlord-operated Low Voltage Main Switchboard(s) (LVMSB), or equivalent main electrical distribution equipment serving the development.

Exclusions:

- Periodic manual thermographic inspections using handheld infrared cameras.
- Conventional digital power meters or protection relays that provide monitoring or alarm functions without automated fault or equipment degradation diagnostics.
- Standalone monitoring devices that are not connected to the RM&D platform.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating that permanently installed condition monitoring devices and an RM&D platform with automated diagnostics will be provided for the electrical distribution system.
- Electrical Single-Line Diagram (SLD) or equivalent documentation identifying the LVMSB(s) and circuit breakers to be covered by the RM&D system.

At Verification stage:

- A one-page document containing:
    - screenshots of the RM&D dashboard showing monitored electrical equipment and key operating or condition parameters; and
    - screenshots demonstrating automatically identified abnormal operating conditions or equipment degradation, together with the associated maintenance alerts or diagnostic recommendations.

(iv) Smart Fire Extinguishers and Exit Lights System *(For Non-Residential)*

To improve fire safety readiness, support regulatory compliance and reduce manual inspection efforts by continuously monitoring the status and condition of fire extinguishers and emergency exit lights to enable timely maintenance.

Assessment Criteria

IN3.2 Predictive Maintenance	**New Buildings**	**Existing Buildings**
(iv) **Smart Fire Extinguishers and Exit Lights**: A digital system that continuously monitors the status and condition of fire extinguishers and emergency exit lights, detects abnormal conditions, and supports proactive maintenance.	0.5 Point	0.5 Point

To qualify for points, the monitoring system shall continuously monitor fire extinguishers and emergency exit lights through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process equipment status and condition data, including, where applicable:

  Fire Extinguishers
  - ✓ pressure status;
  - ✓ equipment presence or removal; and
  - ✓ other relevant condition parameters.

  Emergency Exit Lights
  - ✓ lamp operating status;
  - ✓ battery condition;
  - ✓ charging status; and
  - ✓ self-test status or results.

  The system shall utilise permanently installed sensors or embedded monitoring devices capable of continuously reporting equipment status to a central platform.

- **Automated Diagnostics**.

  The system shall continuously analyse monitored data to detect abnormal conditions, equipment faults or degradation, and identify potential maintenance needs. Examples include:

  Fire Extinguishers
  - ✓ pressure loss;
  - ✓ equipment removal; and
  - ✓ other monitored abnormal conditions.

  Emergency Exit Lights
  - ✓ battery degradation;
  - ✓ lamp failure;
  - ✓ charging failure;
  - ✓ self-test failure; and
  - ✓ other conditions affecting emergency operation.

  The diagnostics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Diagnostics & Maintenance Dashboard**.

  The platform shall automatically record identified abnormal conditions or diagnostic findings, generate maintenance alerts or recommendations, provide historical equipment status and maintenance records, and present the information through a digital dashboard for facility management personnel.

The system shall cover at least 85% of fire extinguishers and all emergency exit lights under the landlord's management and maintenance responsibility.

Exclusions:

- Manual inspection records, paper logbooks or QR-code-based inspection systems that rely on physical site inspections without continuous remote monitoring.
- Emergency exit lights requiring manual functional testing without remote monitoring or self-test capability.
- Fire extinguishers without continuous digital condition monitoring.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or relevant system specifications demonstrating that permanently installed sensors or embedded monitoring devices, together with a central monitoring platform, will be provided for fire extinguishers and emergency exit lights.

At Verification stage:

- A one-page document containing:
    - screenshots of the monitoring dashboard showing the monitored status and condition of fire extinguishers and emergency exit lights; and
    - screenshots demonstrating abnormal conditions or diagnostic findings detected by the system, together with the associated maintenance alerts or recommendations.

(v) Smart Electrical Monitoring System *(For Residential)*

To improve the reliability and operational performance of the building's electrical distribution system by continuously monitoring electricity consumption and electrical parameters of major common services, detecting abnormal conditions, and supporting timely operational and maintenance actions.

Assessment Criteria

IN3.2 Predictive Maintenance	New Buildings	Existing Buildings
(v) **Smart Electrical Monitoring System**: A digital system that continuously monitors electricity consumption and electrical parameters of major common services (e.g. water pumps and common-area lighting), detects abnormal consumption or electrical conditions, and provides alerts and insights to support facility management and maintenance.	1 Point	1 Point

To qualify for points, the smart electrical monitoring system shall continuously monitor and analyse the electrical distribution system through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process electrical data from major common services, including, as applicable, electricity consumption, current, voltage, power factor, harmonic distortion, equipment operating status and other relevant electrical parameters. The system shall utilise permanently installed smart meters or equivalent monitoring devices capable of continuous electrical monitoring.

- **Automated Analytics & Anomaly Detection**.

  The system shall continuously analyse electrical data to identify abnormal consumption, loading or electrical conditions and potential operational issues. Examples include abnormal energy consumption, phase imbalance, voltage abnormalities, harmonic distortion and abnormal equipment loading. The analytics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Monitoring & Alert Dashboard**.

  The platform shall automatically record identified abnormal conditions, generate alerts or recommendations, provide historical trends of electrical consumption and key operating parameters, and present the information through a digital dashboard for facility management personnel.

The system shall cover the main electrical supply and electrical feeds serving the applicable major common services, including, where applicable, domestic and booster water pumps, common-area mechanical ventilation and common-area lighting.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that permanently installed smart meters or equivalent monitoring devices, together with a central monitoring platform, will be provided for the main electrical supply and applicable major common services.
- Electrical Single-Line Diagram (SLD) or equivalent documentation identifying the electrical feeds to be monitored.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the monitoring dashboard showing electrical consumption and key operating parameters of the monitored electrical feeds; and
  - screenshots demonstrating anomaly detection or abnormal electrical conditions identified by the system, together with the associated alerts or recommendations.

(vi) Smart Water Pump System *(For Residential)*

To improve the reliability of the domestic water supply system by continuously monitoring pump operating conditions, detecting abnormal conditions and performance degradation, and enabling proactive maintenance to reduce the risk of water supply disruptions.

Assessment Criteria

IN3.2 Predictive Maintenance	**New Buildings**	**Existing Buildings**
(vi) **Smart Water Pump System**: A digital system that continuously monitors domestic water pumps and associated water storage facilities, detects abnormal operating conditions and performance degradation, and supports proactive maintenance.	1 Point	1 Point

To qualify for points, the smart water pump system shall continuously monitor and analyse the operation of the domestic water pumping system through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process operational data, including, as applicable to the system configuration, pump operating status, water tank level, water pressure, water flow rate, motor current or power consumption, and other relevant operating or condition parameters. The system shall utilise permanently installed sensors, meters, controllers or equivalent monitoring devices capable of continuous monitoring.

- **Automated Analytics & Anomaly Detection**.

  The system shall continuously analyse operational data to identify abnormal operating conditions, performance degradation and potential maintenance needs. Examples include abnormal pump cycling, abnormal power or current consumption, loss of water pressure, reduced pumping performance, and possible leakage or blockage. The analytics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Monitoring & Alert Dashboard**.

  The platform shall automatically record identified abnormal operating conditions, generate maintenance alerts or recommendations, provide historical trends of key operating parameters, and present the information through a digital dashboard for facility management personnel.

The system shall cover all common-property domestic water transfer and booster pumps and associated water storage tanks serving the development.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that the domestic water pumping system will be provided with permanently installed monitoring devices and connected to a central monitoring and analytics platform.
- Equipment schedules, schematics or equivalent documentation identifying the pumps and associated water storage tanks to be monitored.

<u>At Verification stage:</u>

- A one-page document with screenshots of the monitoring and analytics platform demonstrating pump/tank monitoring, historical operating trends, and anomaly detection with associated maintenance alerts or recommendations.

(vii) Smart Water Leak Detection System *(For Residential)*

To reduce water loss and the risk of damage to building assets and services by continuously detecting and locating water leaks in high-risk common areas and utility spaces, enabling timely maintenance intervention.

Assessment Criteria

IN3.2 Predictive Maintenance	**New Buildings**	**Existing Buildings**
(vii) **Smart Water Leak Detection System**: A digital system that continuously monitors high-risk common areas and utility spaces for water leakage, automatically detects and identifies potential leak locations, and provides alerts to support timely maintenance.	1 Point	1 Point

To qualify for points, the smart water leak detection system shall continuously monitor potential water leakage within high-risk common areas and utility spaces through the following three functional layers:

- **Continuous Leak Monitoring**.

  The system shall utilise permanently installed leak detection devices, such as water leak sensing cables, spot leak detectors, flood sensors, smart flow meters, acoustic leak detection sensors or equivalent technologies, capable of continuously monitoring for potential water leakage.

- **Automated Leak Detection & Analytics**.

  The system shall continuously analyse monitored data to detect water leakage or abnormal conditions that may indicate a potential leak, such as abnormal continuous water flow or pressure changes. The analytics may be rule-based, model-based, AI-assisted, or a combination thereof.

- **Leak Alert & Management Dashboard**.

  The platform shall automatically record detected leak events or abnormal conditions, generate maintenance alerts or recommendations, identify the affected location or monitoring zone, provide historical records of leak events, and present the information through a digital dashboard for facility management personnel.

The system shall cover applicable high-risk common areas and utility spaces where water leakage could result in significant equipment damage or service disruption, including, where applicable, electrical switch rooms, lift pits, water tank rooms, pump rooms and telecommunications rooms.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that a smart water leak detection system integrated with a central monitoring platform will be provided.
- M&E layout drawings, schematics or equivalent documentation identifying the proposed leak detection locations and monitoring zones.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the monitoring dashboard showing the monitored locations or zones and their status; and
  - screenshots demonstrating detected leak events or abnormal conditions, together with the associated location/zone identification and maintenance alerts, generated during operation or system testing.

(viii) Carpark Mechanical Ventilation (MV) Monitoring System *(For Residential)*

To maintain safe air quality within enclosed or mechanically ventilated carparks, improve ventilation system reliability, and support timely maintenance through continuous air quality monitoring, automated ventilation control and detection of abnormal operating conditions.

Assessment Criteria

IN3.2 Predictive Maintenance		**New Buildings**	**Existing Buildings**
(viii)	**Carpark MV Monitoring System**: A digital system that continuously monitors and manages mechanical ventilation in carpark areas using air quality and operational data to automatically regulate ventilation, detect abnormal operating conditions, and support timely maintenance.	1 Point	1 Point

To qualify for points, the carpark MV monitoring system shall continuously monitor and analyse the mechanical ventilation system through the following three functional layers:

- **Continuous Operational Monitoring**.

  The system shall continuously acquire and process environmental and operational data, including, as applicable, CO concentration, NO_2 concentration, fan operating status and speed, motor current or power consumption, ventilation operating hours, and other relevant parameters. The system shall utilise permanently installed environmental sensors, controllers or equivalent monitoring devices capable of continuous monitoring.
- **Automated Control & Anomaly Detection**.

  The system shall continuously analyse environmental and operational data to regulate ventilation operation based on measured air quality and identify abnormal operating conditions, performance degradation or potential maintenance needs. Examples include abnormal fan operation, abnormal motor current or power consumption, equipment failures and control faults. The analytics may be rule-based, model-based, AI-assisted, or a combination thereof.
- **Monitoring & Alert Dashboard**.

  The platform shall automatically record identified abnormal operating conditions, generate maintenance alerts or recommendations, provide historical trends of air quality and ventilation system performance, and present the information through a digital dashboard for facility management personnel.

The system shall cover all carpark mechanical ventilation zones serving enclosed or mechanically ventilated carpark areas within the development.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that permanently installed air quality sensors and a digitally monitored demand-controlled mechanical ventilation system with anomaly detection will be provided.
- M&E layout drawings or equivalent documentation identifying the carpark MV zones and associated air quality sensors to be monitored.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the monitoring dashboard showing air quality readings and ventilation system operating status;
  - screenshots demonstrating automated ventilation control in response to measured air quality; and
  - screenshots demonstrating abnormal operating conditions detected by the system, together with associated maintenance alerts or recommendations.

IN3.3 Decarbonisation

The Decarbonisation section introduces smart technologies that enable building owners and facilities managers to measure, monitor and reduce operational carbon emissions through continuous energy monitoring and greenhouse gas (GHG) emissions tracking. By replacing periodic manual reporting and aggregated utility data with real-time monitoring and digital carbon accounting, these technologies support informed decision-making, improve sustainability performance, and accelerate progress towards organisational and national decarbonisation goals.

The Decarbonisation framework supports two key technologies:

(i) **Tenant Smart Energy Monitoring** *(for Non-Residential)*

(ii) **Greenhouse Gas (GHG) Emissions Monitoring and Tracking** *(for Non-Residential)*

Together, these technologies enable building owners and tenants to better understand energy consumption and carbon emissions, strengthen sustainability reporting, support Green Lease implementation, and drive continuous improvements in building and organisational decarbonisation.

(i) Tenant Smart Energy Monitoring (For Non-Residential)

To improve tenant energy performance and strengthen landlord-tenant collaboration by providing a digital platform that continuously monitors tenant electricity consumption and provides insights to support better energy management.

Assessment Criteria

IN3.3 Decarbonisation	New Buildings	Existing Buildings
(i) **Tenant Smart Energy Monitoring**: A digital system that enables landlords and tenants to monitor and analyse tenant electricity consumption, providing historical trends, benchmarking and energy insights to support improved energy management.	1 Point	1 Point

To qualify for points, the tenant smart energy monitoring platform shall continuously monitor and analyse tenant energy consumption through the following three functional layers:

- **Continuous Energy Monitoring**.

  The system shall continuously acquire and process tenant-level energy consumption data through permanently installed smart meters or equivalent digital metering devices. Where separately metered, monitoring may include major tenant end-use loads such as air-conditioning, lighting, plug loads and other significant tenant-controlled loads. The platform shall provide the landlord with tenant energy information and each participating tenant with digital access to its respective current and historical energy consumption data.
- **Energy Performance Analytics**.

  The system shall analyse tenant energy consumption to establish historical baselines, benchmark performance against historical or anonymised/aggregated peer benchmarks, identify abnormal consumption, and provide energy-saving insights or opportunities. The analytics may be rule-based, model-based, AI-assisted, or a combination thereof.
- **Tenant Energy Dashboard**.

  The platform shall provide participating tenants with access to their energy consumption, performance trends, benchmarking information, energy reports, and recommendations or insights to support energy management through a digital dashboard or tenant portal.

The system shall cover tenants occupying at least 50% of the total Net Lettable Area (NLA) of the development.

Exclusions:

- Utility or tenant meters that provide billing data only without digital energy monitoring and analytics.
- Manual meter reading or spreadsheet-based energy reporting.
- Systems that do not provide participating tenants with digital access to their respective energy consumption and performance information.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that tenant-level electricity monitoring and analytics, together with a tenant energy dashboard or portal, will be provided.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the tenant-facing dashboard or portal showing the participating tenant's electricity consumption and historical trends; and
  - screenshots demonstrating energy analytics, such as benchmarking, abnormal consumption detection, or energy-saving insights and recommendations.

(ii) Greenhouse Gas (GHG) Emissions Monitoring and Tracking *(For Non-Residential)*

To support building and organisational decarbonisation by enabling the digital monitoring, calculation and reporting of greenhouse gas (GHG) emissions using recognised carbon accounting methodologies, with the flexibility to expand across organisational and value-chain emissions.

Assessment Criteria

IN3.3 Decarbonisation	**New Buildings**	**Existing Buildings**
(ii) **Greenhouse Gas (GHG) Emissions Monitoring and Tracking**: A digital platform that calculates and tracks GHG emissions using recognised carbon accounting methodologies and applicable emission factors. Projects may track:		
a. **Scope 1 & Scope 2 Emissions**: Building-related Scope 1 and Scope 2 emissions, with capability to incorporate additional organisational Scope 1 and Scope 2 emissions beyond the building boundary; and/or.	0.25 Point	0.25 Point
b. **Scope 3 Emissions**: At least two applicable Scope 3 emission categories to support tracking of indirect emissions across the organisation's value chain.	0.25 Point	0.25 Point

To qualify for points, the GHG emissions monitoring and tracking platform shall support one or both of the following emissions tracking categories, depending on the points claimed:

- **Scope 1 & Scope 2 Emissions Tracking**
  The platform shall:
  - automatically ingest relevant operational and energy data from utility meters, building systems, equipment or other digital data sources;
  - automatically calculate and update Scope 1 and Scope 2 emissions using applicable recognised emission factors;
  - provide carbon dashboards, historical trends and downloadable reports; and
  - cover landlord-controlled energy use and emission sources within the defined building reporting boundary.

  The platform shall also support system integration or structured digital import of additional organisational Scope 1 and Scope 2 data beyond the building boundary, where applicable, to enable expansion towards organisation-wide emissions accounting.
- **Scope 3 Emissions Tracking**
  The platform shall support the calculation and reporting of at least two applicable Scope 3 emission categories. Data shall be obtained through automated system integration or structured digital data import, with traceable source data relevant to the selected Scope 3 categories.

Exclusions:

- Spreadsheet-based carbon calculators that rely primarily on manual periodic data entry.
- Standalone carbon calculators that generate one-off emissions estimates without ongoing emissions tracking.
- Platforms that only display source activity data (e.g. energy consumption, fuel use, waste or other activity data) without calculating the corresponding GHG emissions using applicable recognised emission factors.
- Carbon reports prepared periodically without an ongoing digital platform for emissions monitoring and tracking.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that the GHG emissions monitoring and tracking platform will calculate emissions using recognised carbon accounting methodologies and

applicable emission factors and support the Scope 1 & Scope 2 and/or Scope 3 emissions tracking categories claimed for points.

At Verification stage:

- A one-page document containing screenshots of the platform demonstrating the emissions tracking categories claimed for points:
    - **For Scope 1 & Scope 2**: calculated Scope 1 and Scope 2 emissions, including historical trends or reporting; and/or
    - **For Scope 3**: calculated emissions for at least **two selected Scope 3 categories**, including the associated activity/source data.

IN3.4 Digital Operations, Occupant Experience & Wellbeing

The Digital Operations, Occupant Experience & Wellbeing section introduces smart technologies that enhance building operations, improve occupant experience, and promote healthier, safer and more responsive buildings. By replacing manual processes, paper-based workflows and reactive service delivery with intelligent digital platforms, real-time monitoring and automated workflows, these technologies improve operational efficiency, strengthen safety and security, enhance occupant wellbeing, and deliver a more seamless building experience.

The Digital Operations, Occupant Experience & Wellbeing framework supports the following smart technologies:

(i) **Digital User Feedback Platform** *(for Non-Residential and Residential)*

(ii) **Community Experience Platform** *(for Non-Residential and Residential)*

(iii) **Continuous IAQ Surveillance** *(for Non-Residential)*

(iv) **Property Management System** *(for Residential)*

(v) **Smart Facility Booking System** *(for Residential)*

(vi) **Smart Landscape System** *(for Residential)*

(vii) **Pest Monitoring System** *(for Residential)*

(viii) **Smart Security Management System** *(for Residential)*

(ix) **Fire Protection Equipment Blockage Monitoring System** *(for Residential)*

(x) **Smart Visitor Management System** *(for Residential)*

Together, these technologies enable building owners and facilities managers to digitise building operations, improve service delivery, enhance occupant wellbeing and safety, strengthen community engagement, and deliver a more intelligent and responsive built environment throughout the building lifecycle.

(i) Digital User Feedback Platform *(For Non-Residential and Residential)*

To enhance occupant satisfaction, service quality and operational responsiveness by digitally collecting, managing and analysing occupant feedback to support timely resolution and continuous improvement.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(i) **Digital User Feedback Platform**: A digital system to collect, track and manage occupant feedback and service requests, and analyse feedback trends.	0.5 Point	0.5 Point

To qualify for points, the digital user feedback platform shall digitally collect and manage occupant feedback through the following three functional layers:

- **Digital Feedback Collection**.

  The platform shall provide an accessible digital interface for occupants to submit feedback, service requests or building-related issues through a mobile application, web portal, digital kiosk or equivalent digital interface. Feedback may relate to matters such as building operations, indoor environmental quality, maintenance, cleanliness, safety and security.
- **Digital Case Management**.

  The platform shall assign a unique tracking reference to each submission, enable feedback to be routed and assigned to the appropriate facility management personnel or responsible party, track case status, enable users to receive status updates, and maintain response and resolution history.
- **Performance Analytics Dashboard**.

  The platform shall aggregate and analyse occupant feedback, identify recurring issues and service trends, provide historical performance and resolution statistics, and present the information through a digital dashboard for facility management personnel.

Coverage:

- **Non-residential:** The platform shall be made accessible to building occupants through the designated digital feedback channel(s).
- **Residential:** The platform shall be made available to **all residential units**.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating that the digital user feedback platform will provide digital feedback submission, case management and performance analytics.

At Verification stage:

- A one-page document containing:
  - screenshots of the occupant-facing interface demonstrating digital feedback submission and case status tracking; and
  - screenshots of the facility management dashboard demonstrating case assignment and tracking, response or resolution history, and feedback analytics or historical performance trends.

(ii) Community Experience Platform *(For Non-Residential and Residential)*

To enhance occupant engagement and strengthen community interaction by enabling convenient digital access and participation in community programmes and services.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	**New Buildings**	**Existing Buildings**
(ii) **Community Experience Platform**: A digital platform that provides building occupants with access to community programmes and services, and enables digital registration, booking or other interactive participation.	0.5 Point	0.5 Point

To qualify for points, the community experience platform shall provide digital community services through the following three functional layers:

- **Digital Community Services.**

  The platform shall provide occupants with convenient digital access to community programmes, information and services, which may include community events, wellness programmes, facility information, community announcements, forums and other building or estate services.

- **Self-Service Registration and Engagement.**

  The platform shall provide interactive participation functionality that enables occupants to browse available programmes or services, view relevant details, and digitally register, book or otherwise participate in community activities. The platform shall also provide confirmations or notifications, where applicable.

- **Community Analytics Dashboard.**

  The platform shall record participation and usage statistics, analyse utilisation and engagement trends of programmes and services, and present the information through a digital dashboard for facility management personnel.

Coverage:

- **Non-residential:** The platform shall be made accessible to building occupants through the designated digital channel(s).
- **Residential:** The platform shall be made available to all residential units.

Exclusions:

- Static digital displays, electronic notice boards or information-only portals that do not provide interactive registration, booking or participation functions.
- General public event platforms that are not deployed or configured specifically for the building or residential development.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating that the community experience platform will provide digital community services, interactive registration or participation, and community engagement analytics.

At Verification stage:

- A one-page document containing:
  - screenshots of the occupant-facing platform demonstrating community programmes or services and digital registration, booking or other interactive participation functionality; and
  - screenshots of the management dashboard showing programme participation, usage statistics or engagement analytics.

(iii) Continuous IAQ Surveillance *(For Non-Residential)*

To promote a healthy indoor environment and improve ventilation efficiency by continuously monitoring indoor air quality and automatically adjusting ventilation in response to IAQ or occupancy conditions.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	**New Buildings**	**Existing Buildings**
(iii) **Continuous IAQ Surveillance**: A digital system that continuously monitors indoor air quality, automatically adjusts ventilation in response to IAQ or occupancy conditions, and provides trends and alerts to support ongoing IAQ management.	1 Point	1 Point

To qualify for points, the continuous IAQ surveillance system shall monitor indoor environmental conditions and support automated ventilation response through the following three functional layers:

- **Continuous IAQ Monitoring.**

  The system shall continuously acquire and process indoor environmental data using permanently installed IAQ sensors, including temperature, relative humidity, CO_2, HCHO or TVOC, and $PM_{2.5}$. The sensor network shall provide representative coverage of regularly occupied areas in accordance with SS 554 or an equivalent recognised standard.

- **Automated Ventilation Control.**

  The IAQ monitoring system shall be integrated with the BMS or relevant ventilation control system to automatically adjust ventilation operation in response to monitored IAQ parameters, occupancy information, or a combination thereof, while maintaining applicable ventilation and indoor air quality requirements.

- **IAQ Performance Dashboard.**

  The platform shall continuously record and archive IAQ data, provide historical trends, generate alerts or reports for abnormal IAQ conditions, make current IAQ information accessible to building occupants through digital displays, mobile applications, web portals or equivalent digital interfaces, and present the information through a digital dashboard for facility management personnel.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that permanently installed IAQ sensors will be provided in accordance with SS 554 or an equivalent recognised standard and integrated with the BMS or relevant ventilation control system for automated ventilation control.
- IAQ sensor layout and/or ACMV control schematics demonstrating the proposed sensor coverage and integration with the ventilation system.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the IAQ dashboard showing monitored IAQ parameters and automated ventilation response to IAQ or occupancy conditions;
  - screenshots of historical IAQ trends and archived monitoring data; and
  - photographs or screenshots demonstrating occupant access to current IAQ information through digital displays, mobile applications, web portals or equivalent digital interfaces.

Guidance Notes

- As occupant density may change over time, wireless IAQ sensors are encouraged to facilitate relocation when space layouts are reconfigured. Where occupancy sensors are deployed, the occupancy data may also be used to optimise the placement of IAQ sensors and further improve ventilation performance.

- Historical data from continuous IAQ monitoring may supplement periodic IAQ surveillance by providing longer-term insights into indoor environmental conditions.

References

- SS554:2026 Code of Practice for Indoor Air Quality for Air-Conditioned Buildings.
- SS553:2026 Code of Practice for Air-Conditioning and Mechanical Ventilation Systems in Buildings
- ASHRAE 62.1 Ventilation and Acceptable Indoor Air Quality

(iv) Property Management System *(For Residential)*

To improve operational efficiency and service delivery by providing a centralised digital platform for managing residential estate operations, maintenance workflows, asset information and resident-facing services.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(iv) **Property Management System**: A digital platform that supports residential estate operations by managing maintenance workflows, asset information and applicable resident-facing services.	1 Point	1 Point

To qualify for points, the property management system shall support digital estate management through the following three functional layers:

- **Digital Estate Operations**.

  The platform shall digitally manage estate operations, including maintenance management and asset information, together with other applicable functions such as resident communication, document management, billing and payment.
- **Digital Workflow Management**.

  The platform shall generate and assign work orders, schedule preventive maintenance activities, route maintenance requests to the appropriate personnel, and maintain digital records of maintenance activities and relevant asset information.
- **Operational Management Dashboard**.

  The platform shall monitor maintenance activities and work order status, provide maintenance and service performance indicators, generate management reports and historical trends, and present the information through a digital dashboard for property management personnel.

The property management system shall be actively used by the appointed Managing Agent (MA) for estate management operations, and its applicable resident-facing functions shall be made available to all residential units upon estate handover.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating that the property management system will provide digital estate operations, maintenance and asset management, digital workflow management, and applicable resident-facing functions.

At Verification stage:

- A one-page document with screenshots of the property management system demonstrating digital maintenance workflows, operational management information, and applicable resident-facing functions.

(v) Smart Facility Booking System *(For Residential)*

To improve resident convenience and operational efficiency by enabling digital self-service booking and integrated management of shared facilities.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(v) **Smart Facility Booking System**: A digital platform that enables residents to book shared facilities, prevents conflicting bookings, and integrates with functions such as digital payment, access control or building services.	0.5 Point	0.5 Point

To qualify for points, the smart facility booking system shall support the management of shared facilities through the following three functional layers:

- **Digital Facility Booking**.

  The platform shall enable residents to view facility availability, reserve shared facilities, modify or cancel bookings, and receive booking confirmations or notifications. The platform shall support all shared facilities where booking is required.

- **Integrated Facility Management**:

  The platform shall automatically prevent conflicting bookings and provide at least one of the following integrated functions:
  - digital payment, where applicable;
  - access control linked to facility bookings; or
  - building services control, such as lighting or air-conditioning, linked to booking schedules.

- **Facility Management Dashboard**.

  The platform shall provide facility utilisation statistics, monitor booking status and facility usage, generate operational reports and historical utilisation trends, and present the information through a digital dashboard for property management personnel.

The system shall support all bookable shared facilities provided within the residential development.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or system functional specification demonstrating that the smart facility booking system will provide digital facility booking, prevention of conflicting bookings, at least one integrated function (e.g. digital payment, access control or building services control), and facility utilisation reporting.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the resident-facing interface demonstrating facility availability, booking and confirmation;
  - screenshots demonstrating prevention of conflicting bookings and at least one integrated function, such as digital payment, access control or building services control; and
  - screenshots of the management dashboard showing booking status, facility utilisation statistics or historical utilisation trends.

(vi) Smart Landscape System *(For Residential)*

To improve water efficiency and support healthy landscapes by continuously monitoring landscape conditions and automatically adjusting irrigation based on soil moisture and rainfall or weather conditions.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	**New Buildings**	**Existing Buildings**
(vi) **Smart Landscape System**: A digital system that monitors soil moisture and relevant environmental conditions to automatically adjust irrigation based on landscape and rainfall or weather conditions, with monitoring and alerts to support landscape management.	0.5 Point	0.5 Point

To qualify for points, the smart landscape system shall continuously monitor and manage irrigation through the following three functional layers:

- **Continuous Landscape Monitoring**.

  The system shall continuously acquire and process landscape conditions using permanently installed sensors or equivalent monitoring devices, including soil moisture and other relevant environmental parameters, where applicable.
- **Automated Irrigation Control**.

  The system shall automatically adjust irrigation based on monitored soil moisture and relevant site or weather conditions. The system shall adjust or suspend irrigation in response to rainfall conditions using on-site rain sensing, weather data or equivalent information, rather than relying solely on fixed-time schedules.
- **Landscape Management Dashboard**.

  The platform shall record soil conditions and irrigation events, provide historical trends, display irrigation system status and relevant environmental information, generate alerts for abnormal irrigation conditions or equipment faults, and present the information through a digital dashboard for facility management personnel.

Applicability: This criterion applies to permanent soil-based landscaped areas served by automatic irrigation systems. It does not apply to hydroculture, indoor or temporary planting, or manually irrigated landscaped areas. The smart irrigation system shall serve all applicable automatic irrigation zones within the development.

Documentation Requirements

<u>At Design stage:</u>

- Landscape and irrigation layout plans identifying the automatic irrigation zones and proposed sensor locations.
- An extract of the Tender Specifications or system functional specification demonstrating that irrigation will be automatically adjusted based on monitored soil moisture and rainfall or weather conditions.

<u>At Verification stage:</u>

- A one-page document containing:
  - screenshots of the Landscape Management Dashboard demonstrating soil moisture trends, irrigation events, rainfall or weather response, and system status; and
  - site photographs showing installed landscape sensors and automated irrigation control equipment.

(vii) Pest Monitoring System *(For Residential)*

To promote proactive, data-driven pest management by using digital technologies to detect pest activity early, support targeted intervention and reduce reliance on routine manual inspections.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(vii) **Pest Monitoring System**: A digital system that uses automated monitoring and data analytics to detect pest activity and trends, enabling early intervention, targeted pest management and reduced reliance on manual inspections.	0.25 Point (One pest type) 0.50 Point (Two or more pest types)	0.25 Point (One pest type) 0.50 Point (Two or more pest types)

To qualify for points, the digital pest monitoring system shall provide automated pest monitoring through the following three functional layers:

- **Continuous Pest Monitoring**.

  The system shall provide continuous or event-based automated monitoring of pest activity using connected sensors, smart traps, cameras or equivalent digital monitoring devices deployed at locations identified through a pest risk assessment or pest management plan. The system shall monitor one or more common pest types, such as rodents, mosquitoes, cockroaches, termites or flies.

- **Automated Pest Analytics**.

  The system shall analyse monitored data to identify pest activity, hotspots and activity trends to support targeted pest management interventions.

- **Pest Management Dashboard**.

  The platform shall automatically generate digital alerts, notifications or work orders in response to detected pest activity or predefined trigger conditions; maintain records of pest activity, alerts and pest management interventions; provide historical trends and hotspot analysis; and present the information through a digital dashboard for facility management personnel.

Projects monitoring one qualifying pest type shall be awarded 0.25 point, while projects monitoring two or more qualifying pest types shall be awarded 0.50 point.

The required functionalities may be provided through separate pest-monitoring systems or a shared platform, provided that the monitoring solution for each pest type claimed for points satisfies the above requirements.

Exclusion:

- Conventional bait stations, traps or monitoring devices that rely on manual inspection without automated digital monitoring.
- Pest control programmes relying solely on scheduled inspections or routine treatments without automated digital pest monitoring and analytics.

Documentation Requirements

At Design stage:

- A schematic layout showing the proposed locations of digital monitoring devices for each pest type claimed, based on the pest risk assessment or pest management plan.
- An extract of the Tender Specifications or system functional specification demonstrating automated pest monitoring, analytics and digital alerting capabilities.

At Verification stage:

- A one-page document containing:
  - site photographs confirming installation of the digital monitoring devices; and
  - screenshots of the dashboard demonstrating pest activity monitoring, alerts, activity trends or hotspot analysis for each pest type claimed for points.

(viii) Smart Security Management System *(For Residential)*

To enhance estate safety and security by deploying intelligent security technologies that continuously monitor security events, automatically detect potential incidents, and enable timely intervention through real-time analytics and digital incident management.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(viii) **Smart Security Management System**: A digital system that uses automated security monitoring and analytics to detect abnormal security events, generate alerts, and support timely incident response and investigation.	0.5 Point	0.5 Point

To qualify for points, the smart security management system shall continuously monitor and manage security events through the following three functional layers:

- **Continuous Security Monitoring**.

  The system shall continuously acquire and process security data using CCTV with video analytics, intrusion detection sensors or equivalent automated security monitoring technologies deployed at applicable perimeter, ingress/egress and other security-sensitive common areas.

- **Automated Security Analytics**.

  The system shall automatically analyse security data to detect security events or abnormal conditions and support timely intervention. Analytics may include intrusion detection, line-crossing, unattended-object detection or other relevant security analytics.

- **Security Management Dashboard**.

  The platform shall automatically generate security alerts when predefined events or abnormal conditions are detected, maintain security event and incident records, provide historical event trends, support incident investigation and response, and present the information through a digital dashboard for security or facility management personnel.

The intelligent monitoring system shall cover at least 85% of the identified perimeter and critical ingress/egress monitoring locations within the residential development.

Documentation Requirements

<u>At Design stage:</u>

- An extract of the Tender Specifications or security system architecture demonstrating that automated security monitoring, analytics and digital alerting capabilities will be provided.
- Security layout or equivalent documentation identifying the perimeter and critical ingress/egress monitoring locations to be covered.

<u>At Verification stage:</u>

- A one-page document with screenshots demonstrating automated detection of security events, associated alerts, and security event or incident records on the management dashboard.
- Evidence confirming coverage of at least 85% of the identified perimeter and critical ingress/egress monitoring locations.

(ix) Fire Protection Equipment Blockage Monitoring System *(For Residential)*

To improve fire safety readiness and support regulatory compliance by continuously monitoring access to fire protection equipment, detecting persistent obstructions, and enabling timely corrective action through automated alerts.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(ix) **Fire Protection Equipment Blockage Monitoring System**: A digital system that continuously monitors access to fire protection equipment, detects persistent obstructions, and provides alerts and event records to support timely corrective action.	0.5 Point	0.5 Point

To qualify for points, the fire protection equipment blockage monitoring system shall continuously monitor access to applicable fire protection equipment through the following three functional layers:

- **Continuous Accessibility Monitoring**.

  The system shall use automated monitoring technologies, such as video analytics, proximity sensors or equivalent sensing technologies, to continuously monitor predefined keep-clear zones around applicable fire protection equipment, such as fire hose reels, fire extinguishers, breeching inlets and other equipment requiring unobstructed access.

- **Automated Obstruction Detection**.

  The system shall automatically detect objects or conditions obstructing access to monitored fire protection equipment, determine whether the obstruction persists beyond a predefined threshold, and identify repeated obstruction events or locations to support timely corrective action.

- **Fire Safety Management Dashboard.**

  The platform shall automatically generate digital alerts for persistent obstruction events, maintain records of obstruction events and associated response or rectification actions, provide historical trends and obstruction analysis, and present the information through a digital dashboard for facility management or security personnel.

The monitoring system shall be deployed at fire protection equipment locations identified as having a higher risk of obstruction within the common areas of the residential development.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or system functional specification demonstrating automated obstruction detection and digital alerting capabilities.
- A monitoring layout identifying the fire protection equipment locations selected for blockage monitoring based on obstruction risk.

At Verification stage:

- A one-page document with screenshots demonstrating monitored equipment locations, obstruction detection and associated alerts or event logs generated during operation or system testing.
- Site photographs or equivalent evidence confirming installation of the monitoring devices at the identified locations.

(x) Smart Visitor Management System *(For Residential)*

To enhance estate security, improve visitor experience and streamline visitor access through digital registration, visitor authorisation and integration with building access control systems.

Assessment Criteria

IN3.4 Digital Operations, Occupant Experience & Wellbeing	New Buildings	Existing Buildings
(x) **Smart Visitor Management System**: A digital platform that enables visitor registration and authorisation, integrates with building access control, and maintains digital records of visitor access activities.	0.5 Point	0.5 Point

To qualify for points, the smart visitor management system shall manage visitor access through the following three functional layers:

- **Digital Visitor Registration**.

  The system shall enable digital visitor registration through resident pre-registration, self-service kiosks, QR code-based registration or equivalent digital methods. The system shall support visitor registration and resident or authorised-party approval prior to or upon arrival.

- **Integrated Visitor Access Management**.

  The system shall issue or activate temporary visitor access credentials or authorisations and integrate with the building access control system to enable entry through designated visitor access points. The system shall also support lift access control, where provided, and maintain digital records of visitor access activities.

- **Visitor Management Dashboard**.

  The platform shall record visitor registration and access activities, provide visitor status and access records, generate visitor logs and historical reports, support review and audit of visitor access history, and present the information through a digital dashboard for property management or security personnel.

The system shall cover all designated visitor pedestrian and vehicular access points within the residential development, with integration to lift access control where provided.

Exclusions

- Digital visitor registration systems that are not integrated with visitor authorisation or building access control.
- Conventional intercom systems without digital visitor registration and visitor management capabilities.

Documentation Requirements

At Design stage:

- An extract of the Tender Specifications or access control system specification demonstrating digital visitor registration, visitor authorisation and integration with the building access control system, including lift access control where provided.

At Verification stage:

- A one-page document with screenshots demonstrating:
  - digital visitor registration or pre-registration;
  - visitor access records and status on the management dashboard; and
  - integration with the building access control system, including lift access control where provided.

Intelligence - Innovation

A maximum of **2 points** can be scored across the **Innovation** section for both **Non-Residential Buildings** and **Residential Buildings**. Points awarded under this section contribute towards the overall score for the Intelligence section, subject to the maximum allowable score.

The Innovation section recognises projects that implement innovative technologies or digital solutions that go beyond the prescribed Intelligence criteria. Projects are encouraged to demonstrate measurable improvements in building performance, operational efficiency, occupant experience or sustainability.

Assessment Criteria

Intelligence - Innovation	**New Buildings**	**Existing Buildings**
Projects may demonstrate innovative solutions that deliver substantial improvements in building intelligence or performance. Innovation points will be awarded on a case-by-case basis, based on the demonstrated benefits and significance of the impact	Up to 2 Points	Up to 2 points

Innovation points are awarded on a case-by-case basis for technologies or solutions that demonstrate functionality, application or performance beyond the requirements prescribed elsewhere in the Green Mark criteria.

The innovation shall demonstrate measurable or clearly substantiated operational, environmental, occupant or other building performance benefits

As a general guide:

- **0.25 point**: Innovation with demonstrated benefits at a specific system or application level.
- **0.50 point**: Innovation with demonstrated substantial benefits at the whole-building or multi-system level, or exceptional performance improvement within a specific application.

Multiple innovations may be considered, subject to the maximum allowable score for the Innovation section. **The same functionality or performance outcome shall not be double counted under another Green Mark criterion**.

Projects that submit Green Mark application after 31 May 2023 and attain Smartscore Office Gold or Platinum will be awarded 1 and 2 points respectively. Similarly, any project that attains the Intelligence Badge will be awarded 2 credits within the Innovation section of the Smartscore Office certification.

Documentation Requirements

At Design stage:

- A concise proposal describing the innovation, how it goes beyond the prescribed Green Mark requirements, its intended benefits and expected performance outcomes, supported by technical justification where applicable.

At Verification stage:

- A one-page document demonstrating the implemented innovation and its achieved or measurable performance benefits.

Guidance Notes

Examples may include, but are not limited to:

- Advanced Digital Twin applications providing integrated analytics, simulation or decision support;
- Cloud BMS applications providing advanced analytics or optimisation beyond conventional BMS functionality;
- API-enabled lift integration supporting advanced building applications or operational optimisation; and
- AI-enabled operational optimisation beyond the prescribed Green Mark requirements.

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